



Together, Investing in Municipal Excellence

STILLWATER UTILITIES AUTHORITY MEETING AGENDA

DECEMBER 18, 2023

723 S. Lewis Street, Room 1122B

Stillwater, OK 74074

5:30 PM

Chair Will Joyce, Vice Chair Amy Dzialowski, Trustees Christie Hawkins, Kevin Clark, & Tim Hardin

1. Call Meeting to Order

2. Consent Docket

Items listed on the consent docket are routine administrative matters that may be approved without discussion. The Trustees will take action on these items collectively with a single vote. The requested action is indicated for each item listed. Should a Trustee elect to discuss, amend, revise, or table any item listed on the consent docket, the item will be moved to the section of the agenda titled "Items Removed from the Consent Docket" for consideration and possible action. Additionally, a Trustee or the General Manager may simply ask the Chair to remove an item from the consent docket prior to action by the Trustees and no action will be taken on the removed item at this meeting.

a.	Authorize General Manager to execute Pole Attachment Agreement #1 with First United Methodist Church for property located at 802 S Duck Street	SUA-23-64	Loren Smith
b.	Authorize the Stillwater Utilities Authority Chair to sign a Letter of Binding Commitment for the Drinking Water State Revolving Fund loan in the amount of \$37,000,000	SUA-23-67	David Barth
c.	Accept award of \$2 million in OWRB ARPA Grant No. ARP-23-0135-G funds from Oklahoma Water Resources Board for the Recovered Water Pump Station and Finished Water Pump Station Project and approve associated budget amendments	SUA-23-66	Shelly Crynes

d.	Approve December 4, 2023 regular meeting minutes
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3. Public Comment on Items Listed on Agenda

Stillwater City Code, Section 2-53(a) & (b), provides that taxpayers or residents of the city, or their authorized legal representatives, may address the Council at a regularly scheduled meeting on **any item of business listed on the meeting agenda** provided they have submitted a written request prior to the meeting either online at Request to speak form or via the form found in the lobby outside Council chambers prior to meetings.

4. Items Removed from the Consent Docket

Items removed from the consent docket are placed on this section of the agenda for discussion, revision, amendment and/or tabling prior to action by the Trustees. The Trustees may take action, including a vote or series of votes, on items removed to this section of the agenda after the requested discussion, revision, or amendment.

5. General Orders

The Stillwater Utilities Authority will hear a staff presentation, discuss, and take action including a vote or series of votes on each item listed as presented or as amended or revised by the Stillwater Utilities Authority unless the agenda entry specifically states that no action will be taken. The requested action is indicated in each agenda entry but may be amended or revised prior to action by the Stillwater Utilities Authority.

a.	Rural Water Advisory Board semi-annual report	Robert Sitton
b.	Consider bid award for the Recovered Water Pump Station and Finished Water Pump Station Project to Crossland Heavy Equipment in the amount of \$25,627,000 and approve associated budget amendment appropriating \$20,351,768 for the project	SUA-23-65 Chris Humes

6. Resolutions

The City Council will hear a staff presentation, discuss, and take action including a vote or series of votes on each resolution listed as presented or as amended or revised by the City Council.

a.	RESOLUTION SUA-2023-9: A RESOLUTION AUTHORIZING A LOAN FROM THE OKLAHOMA WATER RESOURCES BOARD IN THE PRINCIPAL AMOUNT OF \$37,000,000; AUTHORIZING THE ISSUANCE OF A SERIES 2023 DRINKING WATER SRF PROMISSORY NOTE IN THE PRINCIPAL AMOUNT OF SAID LOAN; APPROVING AND AUTHORIZING THE EXECUTION OF A LOAN AGREEMENT FOR DRINKING WATER SRF LOAN AND A SECURITY AGREEMENT PERTAINING TO SAID PROMISSORY NOTE; RATIFYING AND CONFIRMING A LEASE AGREEMENT AND OPERATION AND MAINTENANCE CONTRACT AND A SALES TAX AGREEMENT WITH THE CITY OF STILLWATER; APPROVING AND AUTHORIZING PAYMENT OF FEES AND EXPENSES; APPROVING VARIOUS COVENANTS AND AUTHORIZING EXECUTION OF OTHER DOCUMENTS PERTAINING TO SAID LOAN AND CONTAINING OTHER PROVISIONS RELATING THERETO
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7. Questions and Inquiries

8. Reports from Officers and Boards

Announcements and remarks of general interest may be made by Trustees, General Manager or General Counsel. Items of City business that may require discussion or action, including a vote or series of votes, are listed below

9. Adjourn

On December 14, 2023 at 2:30 p.m., a true and correct copy of this agenda was posted on the kiosk outside City Hall, 723 S. Lewis Street, Stillwater, OK.

The City of Stillwater encourages participation from all citizens. If participation at any public meeting is not possible due to a disability, please notify the City Manager's office at least 48 hours prior to the meeting by calling 405.742.8209.

- Meetings are televised on AT&T U-verse channel 99 and Optimum channel 14.
- Find meeting agendas and minutes online at [Agendas and Minutes](#)
- Official minutes are archived in the City Clerk's office.

Strategic Priorities At A Glance



#1 EFFECTIVE SERVICES & ACCOUNTABLE GOVERNMENT

To provide effective services and accountable government by practicing fiscal responsibility, transparency and outstanding customer service.



#2 MOTIVATED MANAGEMENT

To serve with integrity and demonstrate proactive leadership, motivated management and smart planning skills needed to create a better community.



#3 SAFE COMMUNITY

To promote a safe and secure community for all residents through equitable services, enhanced relationships, and responsive care.



#4 CONNECTED SPACES

To develop a strong sense of place by providing opportunities and services, such as transportation, utilities, and parks to best meet the needs of the public.



#5 UNIQUE CULTURE

To cultivate partnerships that enhance the spirit of Stillwater with equal access to services and amenities, strong and connected neighborhoods, and a thriving economy.



#6 ENGAGED & INVESTED RESIDENTS

To encourage participation and an understanding of government through outreach and inclusive initiatives that inspire trust and pride in local government.

REPORT TO: STILLWATER UTILITIES AUTHORITY**MEETING DATE: DECEMBER 18, 2023**

Agenda Item:	2.a. SUA-23-64
Previous/Related Action:	None
Background/Issue:	The First United Methodist Church needs fiber optics communication between their new Mission Building facility located at 802 S. Duck Street and their main building location at 400 S. Duck Street. They are requesting to enter into a Pole Attachment Agreement with the SUA.
Proposal/Solution:	Authorize and execute The First United Methodist Church Pole Attachment Licensing Agreement #1 (POLATT23-0004).
Financial Source/Impact:	Each agreement will generate annual revenue in the amount of \$20 per pole.
Related Strategic Priority:	#4 CONNECTED SPACES #5 UNIQUE CULTURE #1 EFFECTIVE SERVICES & ACCOUNTABLE GOVERNMENT
Recommended Action/Motion:	Motion to authorize the General Manager to execute The First United Methodist Church Pole Attachment Licensing Agreement #1 (POLATT23-0004).
Prepared By:	Loren Smith, Electric Utility Dir.
Reviewed By:	Loren Smith Patti Osmus
Submitted By:	Kimberly Meek, General Manager

Attachments

1. First United Methodist Church Pole Attachment Agreement #1

Stillwater Utilities Authority Pole Attachment Licensing Agreement

Original issue: 07/16/18

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Part One – Pole Attachment Licensing Agreement

This Pole Attachment Licensing Agreement (the “Agreement”) dated July 25, 2023 is made by and between the Stillwater Utilities Authority (“Utility”), located in the State of Oklahoma, and Stillwater First United Methodist Church (“Licensee”).

Recitals

- A. Licensee proposes to install and maintain Communications Facilities and associated equipment, Licensee’s Attachments, on Utility’s Poles to provide Communications Services; and
- B. Utility is willing, when it may lawfully do so, to issue one or more Permits authorizing the placement or installation of Licensee’s Attachments on Utility’s Poles, provided that Utility may refuse, on a nondiscriminatory basis, to issue a Permit where there is insufficient Capacity or for reasons relating to safety, reliability, generally applicable engineering purposes, and/or any other Applicable Standard; and

[NOTE: The following Recitals may be used where Licensee and Utility have an existing pole attachment agreement.]

- C. On July 25, 2023, Utility and Licensee entered into a [Insert name of Pole Attachment agreement] (e.g., the “___ Agreement”); [and]
- D. By registered letter dated _____, 20____, Utility gave notice to Licensee that Utility/ Licensor was terminating the ___ Agreement effective _____, 2____; [and]
- E. The parties intend that this Agreement replace the ___ Agreement on its termination; [and]
- F. Therefore, in consideration of the mutual covenants, terms and conditions set out below the parties agree as follows:

AGREEMENT

Article 1—Definitions

For the purposes of this Agreement, the following terms, phrases, words, and their derivations, shall have the meaning given below, unless more specifically defined within a specific Article or Paragraph of this Agreement. When not inconsistent with the context, words used in the present tense include the future and past tense, and words in the singular number include the plural number. The words “shall” and “will” are mandatory

and “may” is permissive. Words not defined shall be given their common and ordinary meaning.

- 1.1 **Affiliate**: when used in relation to Licensee, means another entity that owns or controls, is owned or controlled by, or is under common ownership or control with Licensee.
- 1.2 **Applicable Standards**: means all applicable engineering and safety standards governing the installation, maintenance, and operation of facilities and the performance of all work in or around electric Utility Facilities and includes the most current versions of National Electric Safety Code (“NESC”), the National Electrical Code (“NEC”), and the regulations of the Occupational Safety and Health Administration (“OSHA”), each of which is incorporated by reference in this Agreement, and the safety, engineering and construction requirements and standards of Utility.
- 1.3 **Attaching Entity**: means any public or private entity, including Licensee that, pursuant to a license agreement with Utility, places an Attachment on Utility’s Pole to provide Communications Service.
- 1.4 **Attachment(s)**: means Licensee’s Communications Facilities that are placed directly on Utility’s Poles within the Communication Space, or Overlashed onto an existing Attachment, but does not include either a Riser or a service drop attached to a single Pole where Licensee has an existing Attachment on such Pole.
- 1.5 **Capacity**: means the ability of a Pole to accommodate an additional Attachment based on Applicable Standards, including space and loading considerations.
- 1.6 **Climbing Space**: means that portion of a Pole’s surface and surrounding space that is free from encumbrances to enable Utility employees and contractors to safely climb, access, and work on Utility Facilities and equipment.
- 1.7 **Communications Facilities**: means wireline or wireless facilities, including but not limited to, fiber optic, copper, and/or coaxial cables, wireless antennas, receivers or transceivers utilized to provide Communications Service. This term excludes power supplies, demarcation boxes, power transfer switches, grounding equipment, metering facilities and other associated equipment.
- 1.8 **Communications Service**: means the transmission or receipt of voice, video, data, broadband Internet, or other forms of digital or analog signals over Communications Facilities.
- 1.9 **Communication Space**: means the communication space as defined in the latest version of the National Electrical Safety Code.

- 1.10 **Licensee:** means the party listed as Licensee in the first paragraph of this agreement.
- 1.11 **Make-Ready Work:** means all work that Utility reasonably determines to be required to accommodate Licensee's Communications Facilities and/or to comply with all Applicable Standards. Such work includes, but is not limited to, rearrangement and/or transfer of Utility Facilities or existing Attachments, inspections, engineering work, permitting work, tree trimming (other than tree trimming performed for normal maintenance purposes), pole replacement and construction but does not include Licensee's routine maintenance.
- 1.12 **Occupancy:** means the use or reservation of space for Attachments on a Utility Pole.
- 1.13 **Overlash:** means to place an additional wire or cable Communications Facility onto an existing attached Communications Facility.
- 1.14 **Pedestals/Vaults/Enclosures:** means above- or below-ground housings that are not attached to Utility Poles but are used to enclose a cable/wire splice, power supplies, amplifiers, passive devices, and/or to provide a service connection point
- 1.15 **Permit:** means written or electronic authorization (see Appendix C) by Utility for Licensee to make or maintain Attachments to specific Utility Poles pursuant to the requirements of this Agreement. Licensee's attachments made prior to the Effective Date and authorized by Utility ("Existing Attachments") shall be deemed Permitted Attachments hereunder.
- 1.16 **Pole:** means a pole owned or controlled by Utility excluding transmission poles that is capable of supporting Attachments for Communications Facilities.
- 1.17 **Post-Construction Inspection:** means the inspection by Utility or Licensee or some combination of both to verify that the Attachments have been made in accordance with Applicable Standards and the Permit.
- 1.18 **Pre-Construction Survey:** means all work or operations required by Applicable Standards and/or Utility to determine the Make-Ready Work necessary to accommodate Licensee's Communications Facilities on a Pole. Such work includes, but is not limited to, field inspection and administrative processing.
- 1.19 **Reserved Capacity:** means capacity or space on a Pole that Utility has identified and reserved for its own future utility requirements at the time of the Permit grant, including the installation of communications circuits for operation of Utility's electric system.

- 1.20 **Riser**: means metallic or plastic encasement materials placed vertically on the Pole to guide and protect wires and cables.
- 1.21 **Tag**: means to place distinct markers on wires and cables, coded by color or other means specified by Utility and/or applicable federal, State or local regulations, that will readily identify the type of Attachment (*e.g.*, cable TV, telephone, high-speed broadband data, public safety) and its owner.
- 1.22 **Utility Facilities**: means all personal property and real property owned or controlled by Utility, including Poles and related facilities.

Article 2—Scope of Agreement

- 2.1 **Grant of License**. Subject to the provisions of this Agreement, Utility grants Licensee a revocable, nonexclusive license authorizing Licensee to install and maintain Attachments to Utility's Poles.
- 2.2 **Parties Bound by Agreement**. Licensee and Utility agree to be bound by all provisions of this Agreement.
- 2.3 **Permit Issuance Conditions**. Utility will issue one or more Permit(s) to Licensee only when Utility determines, in its sole judgment, exercised reasonably, that (i) it has sufficient Capacity to accommodate the requested Attachment(s), (ii) Licensee meets all requirements set forth in this Agreement, and (iii) such Permit(s) comply with all Applicable Standards.
- 2.4 **Reserved Capacity**. Access to space on Utility Poles will be made available to Licensee with the understanding that certain Poles may be subject to Reserve Capacity for future electric service use. At the time of Permit issuance, Utility shall notify Licensee if capacity on particular poles is being reserved for reasonably foreseeable future electric use. For Attachments made with notice of such a Reservation of Capacity, on giving Licensee at least sixty (60) calendar days prior notice, Utility may reclaim such Reserved Capacity at any time following the installation of Licensee's Attachment if required for Utility's future utility service. If reclaimed for Utility's use, Utility may at such time also install associated facilities, including the attachment of communications lines for internal Utility operational or governmental communications requirements. Utility shall give Licensee the option to remove its Attachment(s) from the affected Pole(s) or to pay for the cost of any Make-Ready Work needed to expand Capacity for core utility service requirements, so that Licensee can maintain its Attachment on the affected Pole(s). The allocation of the cost of any such Make-Ready Work (including the transfer, rearrangement, or relocation of third-party Attachments) shall be determined in accordance with Article 9. Licensee shall not be required to bear any of the costs or rearranging or replacing its Attachment(s), if such

rearrangement or replacement is required as a result of an additional attachment or the modification of an existing attachment sought by any other entity.

- 2.5 No Interest in Property.** No use, however lengthy, of any Utility Facilities, and no payment of any fees or charges required under this Agreement, shall create or vest in Licensee any easement or other ownership or property right of any nature in any portion of such Facilities. Neither this Agreement, nor any Permit granted under this Agreement, shall constitute an assignment of any of Utility's rights to Utility Facilities. Notwithstanding anything in this Agreement to the contrary, Licensee shall, at all times, be and remain a Licensee only.
- 2.6 Licensee's Right to Attach.** Nothing in this Agreement, other than a Permit issued pursuant to Article 6, shall be construed as granting Licensee any right to attach Licensee's Communications Facilities to any specific Pole.
- 2.7 Utility's Rights over Poles.** The parties agree that this Agreement does not in any way limit Utility's right to locate, operate, maintain, or remove its Poles in the manner that will best enable it to fulfill its service requirements or to comply with any federal, state, or local legal requirement.
- 2.8 Expansion of Capacity.** Utility will take reasonable steps to expand Pole Capacity when necessary to accommodate Licensee's request for Attachment. Notwithstanding the foregoing sentence, nothing in this Agreement shall be construed to require Utility to install, retain, extend, or maintain any Pole for use when such Pole is not needed for Utility's own service requirements.
- 2.9 Other Agreements.** Except as expressly provided in this Agreement, nothing in this Agreement shall limit, restrict, or prohibit Utility from fulfilling any agreement or arrangement regarding its Poles into which Utility has previously entered, or may enter in the future, with others not party to this Agreement.
- 2.10 Permitted Uses.** This Agreement is limited to the uses specifically stated in the recitals set forth above and no other use shall be allowed without Utility's express written consent to such use. Nothing in this Agreement shall be construed to require Utility to allow Licensee to use Utility's Poles after the termination of this Agreement.
- 2.11 Overlashing.** The following provisions apply to Overlashing:
- 2.11.1** Licensee shall obtain a Permit for each Overlashing, in accordance with the requirements of Article 6. Absent such authorization, Overlashing constitutes an unauthorized Attachment and is subject to removal or, at

Utility's discretion, imposition of an Unauthorized Attachment fee, as specified in Appendix A, Item 3.

2.11.2 Authorized Overlapping to accommodate Attachments of Licensee or its Affiliate(s) shall not increase the Annual Attachment Fee paid by Licensee pursuant to Appendix A, Item 1. Licensee or Licensee's Affiliate shall, however, be responsible for all Make-Ready Work and other charges associated with the Overlapping. Licensee shall not have to pay a separate Annual Attachment Fee for such Overlashed Attachment.

2.11.3 At Licensee's request, Utility may allow Overlapping to accommodate facilities of a third party, not affiliated with Licensee. In such circumstances, the third party must enter into a License Agreement with Utility, obtain Permit(s), and pay a separate Attachment Fee (Appendix A, Item 1) as well as the costs of all necessary Make-Ready Work required to accommodate the Overlapping. Utility shall not grant such Permit(s) to third parties allowing Overlapping of Licensee's Communications Facilities without Licensee's consent. Authorized Overlapping shall not increase the fees and charges paid by Licensee pursuant to Appendix A, Item 1. Nothing in this Agreement shall prevent Licensee from seeking a contribution from an Overlapping third party to defray fees and charges paid by Licensee.

2.11.4 Make-Ready Work procedures set forth in Article 7 shall apply, as necessary, to all Overlapping.

2.11.5 Overlapping shall only be permitted if the existing attachment is located in the communication space.

2.12 **Enclosures.** Licensee shall not place Pedestals, Vaults, and/or other Enclosures on or within ten (10) feet of any Pole or other Utility Facilities without Utility's prior written permission. If permission is granted, all such installations shall be per the Specifications and Drawings in Appendix D of this Agreement and charges as provided in Appendix A. Such permission shall not be unreasonably withheld. Further, Licensee agrees to move any such above-ground enclosures in order to provide sufficient space for Utility to set a replacement Pole.

Article 3—Fees and Charges

3.1 **Payment of Fees and Charges.** Licensee shall pay to Utility the fees and charges specified in Appendix A and shall comply with the terms and conditions specified in this Agreement.

- 3.2 **Payment Period.** Unless otherwise expressly provided, Licensee shall pay any invoice its receives from Utility pursuant to this Agreement within thirty (30) calendar days after Utility issues the invoice.
- 3.3 **Billing of Attachment Fee.** Utility shall invoice Licensee for the per-pole Attachment Fee annually, in arrears. Utility will submit to Licensee an invoice for the annual rental period not later than June 30th of each year. The initial annual rental period shall commence upon the execution of this Agreement and conclude on June 30th of the next year, and each subsequent annual rental period shall commence on the following July 1st and conclude on June 30th of the subsequent year. The invoice shall set forth the total number of Utility's Poles on which Licensee was issued and/or holds Permit(s) for Attachments during such annual rental period, including any previously authorized and valid Permits.
- 3.4 **Refunds.** No fees and charges specified in Appendix A shall be refunded on account of any surrender of a Permit granted under this Agreement. Nor shall any refund be owed if a Pole is not used or abandoned by Utility.
- 3.5 **Late Charge.** If Utility does not receive payment for any fee or other amount owed within thirty (30) calendar days after it becomes due, Licensee shall pay interest to Utility at the rate of ten (10%) per month, or the maximum interest allowed by law, whichever is greater, on the amount due.
- 3.6 **Payment for Work.** Licensee will be responsible for payment to Utility for all work that Utility or Utility's contractors perform pursuant to this Agreement to accommodate Licensee's Communications Facilities.
- 3.7 **Advance Payment.** At its sole discretion, Utility may require that Licensee pay in advance all reasonable costs, including, but not limited to administrative, construction, inspections, and Make-Ready Work expenses, in connection with the initial installation or rearrangement of Licensee's Communications Facilities pursuant to the procedures set forth in Articles 6 and 7 below.
- 3.8 **True-Up.** Whenever Utility, in its discretion, requires advance payment of estimated expenses prior to undertaking an activity on behalf of Licensee and the actual cost of the activity exceeds the advance payment of estimated expenses, Licensee agrees to pay Utility for the difference in cost, provided that Utility documents such costs with sufficient detail to enable Licensee to verify the charges. To the extent that Utility's actual cost of the activity is less than the estimated cost, Utility shall refund to Licensee the difference in cost.
- 3.9 **Determination of Charges.** Wherever this Agreement requires Licensee to pay for work done or contracted by Utility, the charge for such work shall include all

reasonable material, labor, engineering, administrative, and applicable overhead costs. Utility shall bill its services based upon actual costs, and such costs will be determined in accordance with Utility's cost accounting systems used for recording capital and expense activities. All such invoices shall include an itemization of dates of work, location of work, labor and equipment costs per hour, persons employed, and costs of materials used. If Licensee was required to perform work and fails to perform such work, necessitating completion of the work by Utility, Utility may either charge an additional ten percent (10%) of its costs or assess the penalty specified in Appendix A.

- 3.10 **Work Performed by Utility.** Whenever this Agreement requires Utility to perform any work, Utility, at its sole discretion, may utilize its employees or contractors, or any combination of the two, to perform such work.
- 3.11 **Default for Nonpayment.** Nonpayment of any amount due under this Agreement beyond sixty (60) days shall constitute a material default of this Agreement.

Article 4—Specifications

- 4.1 **Installation/Maintenance of Communications Facilities.** After a Permit is issued pursuant to this Agreement, Licensee's Communications Facilities shall be installed and maintained in accordance with the requirements and specifications of Appendix D. All of Licensee's Communications Facilities must comply with all Applicable Standards. Licensee shall be responsible for the installation and maintenance of its Communications Facilities. Licensee shall, at its own expense, make and maintain its Attachment(s) in safe condition and good repair, in accordance with all Applicable Standards. Notwithstanding anything in this Agreement to the contrary, Licensee shall not be required to update or upgrade its Attachments if they met Applicable Standards at the time the attachments were made, unless such updates or upgrades are required by any revised Applicable Standards.
- 4.2 **Tagging.** Licensee shall Tag all of its Communications Facilities as specified in Appendix D and/or applicable federal, State, and local regulations upon installation of such Facilities. Within one year of the execution of this Agreement, Licensee shall also tag any untagged Communications Facilities that were on Utility Poles on the effective date of this Agreement. Failure to provide proper tagging will be considered a violation of the Applicable Standards.
- 4.3 **Interference.** Licensee shall not allow its Communications Facilities to impair the ability of Utility or any third party to use Utility's Poles, nor shall Licensee allow its Communications Facilities to interfere with the operation of any Utility

Facilities, third-party facilities or City of Stillwater facilities including cables, conductors, traffic controls networks and/or systems, communication networks and/or systems, radio communication network and/or systems, emergency management networks and/or systems and all related facilities.

- 4.4 **Protective Equipment.** Licensee and its employees and contractors shall utilize and install adequate protective equipment to ensure the safety of people and facilities. Licensee shall, at its own expense, install protective devices designed to handle the electric voltage and current carried by Utility's facilities in the event of a contact with such facilities. Except as provided in Paragraph 16.1, Utility shall not be liable for any actual or consequential damages to Licensee's Communications Facilities, Licensee's customers' facilities, or to any of Licensee's employees, contractors, customers, or other persons.
- 4.5 **Utility Right to Correct.** If Licensee's Communications Facilities, or any part of them, are installed, used, or maintained in violation of this Agreement, and Licensee has not corrected the violation(s) within thirty (30) calendar days from receipt of written notice of the violation(s) from Utility, Utility at its option, may correct such conditions. Utility will attempt to notify Licensee in writing prior to performing such work whenever practicable. When Utility believes, however, that such violation(s) pose an immediate threat to the safety of any person, interfere with the performance of Utility's service obligations, or present an immediate threat to the physical integrity of Utility Facilities, Utility may perform such work and/or take such action as it deems necessary without first giving written notice to Licensee. As soon as practicable afterward, Utility will advise Licensee of the work performed or the action taken. Licensee shall be responsible for all actual and reasonable costs incurred by Utility in taking action pursuant to this Paragraph, and Licensee shall indemnify Utility against any liability, costs, and expenses, including reasonable attorney's and expert fees, arising out of or relating to any such work.
- 4.6 **Restoration of Utility Service.** Utility's service restoration requirements shall take precedence over any and all work operations of Licensee on Utility's Poles.
- 4.7 **Effect of Failure to Exercise Access Rights.** If Licensee does not exercise any access right granted pursuant to this Agreement and/or applicable Permit(s) within ninety (90) calendar days of the effective date of such right and any extension to such Permit(s), Utility may, but shall have no obligation to, use the space scheduled for Licensee's Attachment(s) for its own needs or make the space available to other Attaching Entities. In such instances, Utility shall endeavor to make other space available to Licensee, upon written application under Article 6, as soon as reasonably possible and subject to all requirements of this Agreement, including the Make-Ready Work provisions. If Utility uses the space for its own

needs or makes them available to other parties, then from the date that Utility or a third party begins to use such space, For purposes of this paragraph, Licensee's access rights shall not be deemed effective until any necessary Make-Ready Work has been performed.

- 4.8 Removal of Nonfunctional Attachments.** At its sole expense, Licensee shall remove any of its Attachments or any part thereof that becomes nonfunctional and no longer fit for service ("Nonfunctional Attachment") as provided in this Paragraph 4.8. A Nonfunctional Attachment that Licensee has failed to remove as required in this paragraph shall constitute an unauthorized Attachment and is subject to the Unauthorized Attachment fee specified in Appendix A, Item 3. Except as otherwise provided in this Agreement, Licensee shall remove Nonfunctional Attachments within one (1) year of the Attachment becoming nonfunctional, unless Licensee receives written notice from Utility that removal is necessary to accommodate Utility's or another Attaching Entity's use of the affected Pole(s), in which case Licensee shall remove the Nonfunctional Attachment within sixty (60) days of receiving the notice. Where Licensee has received a Permit to Overlash a Nonfunctional Attachment, such Nonfunctional Attachment may remain in place until Utility notifies Licensee that removal is necessary to accommodate Utility's or another Attaching Entity's use of the affected Pole(s). Licensee shall give Utility notice of any Nonfunctional Attachments as provided in Article 15.

Article 5—Private and Regulatory Compliance

- 5.1 Necessary Authorizations.** Before Licensee occupies any of Utility's Poles, Licensee shall obtain from the appropriate public or private authority, or from any property owner or other appropriate person, any required authorization to construct, operate, or maintain its Communications Facilities on public or private property. Utility retains the right to require evidence that appropriate authorization has been obtained before any Permit is issued to Licensee. Licensee's obligations under this Article 5 include, but are not limited to, its obligation to obtain and pay for all necessary approvals to occupy public/private rights-of-way and easements and all necessary licenses and authorizations to provide the services that it provides over its Communications Facilities. Licensee shall defend, indemnify, and reimburse Utility for all losses, costs, and expenses, including reasonable attorney's fees that Utility may incur as a result of claims by governmental bodies, owners of private property, or other persons, that Licensee does not have sufficient rights or authority to attach Licensee's Communications Facilities on Utility's Poles or to provide particular services.

- 5.2 Lawful Purpose and Use.** Licensee's Communications Facilities must at all times serve a lawful purpose, and the use of such Facilities must comply with all applicable federal, State and local laws.
- 5.3 Forfeiture of Utility's Rights.** No Permit granted under this Agreement shall extend, or be deemed to extend, to any of Utility's Poles to the extent that Licensee's Attachment would result in a forfeiture of Utility's rights. Any Permit that would result in forfeiture of Utility's rights shall be deemed invalid as of the date that Utility granted it. Further, if any of Licensee's existing Communications Facilities, whether installed pursuant to a valid Permit or not, would cause such forfeiture, Licensee shall promptly remove its Facilities upon receipt of written notice from Utility. If Licensee does not remove its Communications Facilities in question within thirty (30) days of receiving written notice from Utility, Utility may at its option perform such removal at Licensee's expense. Notwithstanding the forgoing, Licensee shall have the right to contest any such forfeiture before any of its rights are terminated, provided that Licensee shall indemnify Utility for liability, costs, and expenses, including reasonable attorney's fees, that may accrue during Licensee's challenge.
- 5.4 Effect of Consent to Construction/Maintenance.** Consent by Utility to the construction or maintenance of any Attachments by Licensee shall not be deemed consent, authorization, or acknowledgment that Licensee has obtained all required Authorizations with respect to such Attachment.

Article 6—Permit Application Procedures

- 6.1 Permit Required.** Licensee shall not make any Attachments to any of Utility's Poles without first applying for and obtaining a Permit pursuant to the applicable requirements of Appendix B. If updates or upgrades are required by Applicable Standards, Licensee shall not be required to obtain Permits for Attachment(s) existing as of the effective date of this Agreement. Such grandfathered Attachments shall, however, be subject to the Attachment Fees specified in Appendix A and the tagging provisions in Paragraph 4.2. Licensee shall provide Utility a list of all such pre-existing Attachments within six (6) months of the effective date of this Agreement.
- 6.2 Permits for Overlashing.** As set out in Paragraph 2.11, Permits are required for any Overlashing allowed under this Agreement and Licensee, Licensee's Affiliate or other third party, as applicable, shall pay any necessary Make-Ready Work costs to accommodate such Overlashing.
- 6.3 Professional Certification.** Unless otherwise waived in writing by Utility, as part of the Permit application process and at Licensee's sole expense, a qualified and experienced professional engineer, or an employee or contractor of Licensee who

has been approved by Utility, must participate in the Pre-Construction Survey, conduct the Post-Construction Inspection, and certify that Licensee's Communications Facilities can be and were installed on the identified Poles in compliance with the standards in Paragraph 4.1 and in accordance with the Permit. The professional engineer's qualifications must include experience performing such work, or substantially similar work, on electric distribution systems. The Utility may require the Licensee's professional engineer to conduct a post-construction inspection that the Utility will verify by means that it deems to be reasonable.

Utility, at its discretion, may waive the requirements of this Paragraph 6.3, with respect to service drops.

6.4 Utility Review of Permit Application. Upon receipt of a properly executed Application for Permit (Appendix C), which shall include the Pre-Construction Survey, certified per Paragraph 6.3 above, and detailed plans for the proposed Attachments in the form specified in Appendix D, Utility will review the Permit Application and discuss any issues with Licensee, including engineering or Make-Ready Work requirements associated with the Permit Application. Utility acceptance of the submitted design documents does not relieve Licensee of full responsibility for any errors and/or omissions in the engineering analysis. Unless otherwise agreed, the Permit application process shall be consistent with the following timeline:

6.4.1 Review Period. Utility shall review and respond to properly executed and complete Permit Applications for routine installations as promptly as is reasonable with a goal of providing a response during normal circumstances of within seventy-five (75) days of receipt. For Permit Applications seeking Attachments to 50 or more Poles, the Utility may require additional time to review. The Utility's response will either provide a written explanation as to why the Application is being denied, in whole or in part, or provide an estimate of the costs of all necessary Make-Ready Work.

6.4.2 Upon receipt of Utility's Make-Ready estimate, Licensee shall have fourteen (14) days to approve the estimate and provide payment in accordance with this Agreement and the specifications of the estimate.

6.4.3 Utility will complete routine Make-Ready Work within sixty (60) days of receipt of payment. If there are extenuating circumstances that make the necessary Make-Ready more complicated or time-consuming, including, but not limited to the number of Poles, seasonal weather conditions, the Utility shall identify those factors in the Make-Ready estimate and the parties shall agree upon a reasonable timeframe for completion.

6.4.4 Utility may toll the time period for completion of Make-Ready Work by written notice in order to respond to severe storms, natural disasters, or other emergency situations.

6.5 **Permit as Authorization to Attach.** Upon completion of any necessary Make-Ready Work and receipt of payment for such work, Utility will sign and return the Permit Application, which shall serve as authorization for Licensee to make its Attachment(s).

Article 7—Make-Ready Work/Installation

7.1 **Estimate for Make-Ready Work.** If Utility determines that it can accommodate Licensee's request for Attachment(s), including Overlapping of an existing Attachment, it will, upon request, advise Licensee of any estimated Make-Ready Work charges necessary to accommodate the Attachment.

7.2 **Payment of Make-Ready Work.** Upon completion of the Make-Ready Work, Utility shall invoice Licensee for Utility's actual cost of such Make-Ready Work. Alternatively, Utility, at its discretion, may require payment in advance for Make-Ready Work based upon the estimated cost of such work. In such case, upon completion Licensee shall pay Utility's actual cost of Make-Ready Work. The costs of the work shall be itemized in accordance with Paragraph 3.9 and trued up in accordance with Paragraph 3.8.

7.3 **Who May Perform Make-Ready Work.** Make-Ready Work shall be performed only by Utility and/or a contractor authorized by Utility to perform such work. If Utility chooses not to or cannot perform the Make-Ready Work to accommodate Licensee's Communications Facilities within sixty (60) calendar days of Licensee's agreement, to Make-Ready Work estimate, Licensee may request the ability to use a qualified contractor to perform such work and shall specify when such work would be performed. In all instances, "qualified contractors," if allowed, must be pre-approved by Utility for such work on an annual basis.

7.4 **Scheduling of Make-Ready Work.** In performing all Make-Ready Work to accommodate Licensee's Communications Facilities, Utility will attempt to include such work in its normal work schedule. If Licensee requests that the Make-Ready Work be performed on a priority basis or outside of Utility's normal work hours, Licensee will pay any resulting increased costs. Nothing in this Agreement shall be construed to require Utility to perform Licensee's work before other scheduled work or Utility service restoration.

7.5 **Notification of Make-Ready Work.** Before starting Make-Ready Work, Utility shall notify all Attaching Entities of the date and location of the scheduled work

and shall afford all such entities an opportunity to make any modifications to their existing Attachments in connection with the Make-Ready Work.

7.6 Written Approval of Installation Plans Required. Before making any Attachments to Utility's Poles, including Overlapping of existing Attachments, Licensee must obtain Utility's written detailed plan approval for the Attachments. Such detailed plans shall accompany a Permit application as required under Paragraph 6.4.

7.7 Licensee's Installation/Removal/Maintenance Work.

7.7.1 All of Licensee's installation, removal, and maintenance work, by either Licensee's employees or authorized contractors, shall be performed at Licensee's sole cost and expense, in a good and workmanlike manner, and must not adversely affect the structural integrity of Utility's Poles or other Facilities or other Attaching Entity's facilities or equipment. All such work is subject to the insurance requirements of Article 18.

7.7.2 All of Licensee's installation, removal, and maintenance work, either by its employees or authorized contractors, shall comply with all applicable regulations specified in Paragraph 4.1. Licensee shall assure that any person installing, maintaining, or removing its Communications Facilities is fully qualified and familiar with all Applicable Standards, the provisions of Article 17, and the Minimum Design Specifications contained in Appendix D.

Article 8—Transfers

8.1 Required Transfers of Licensee's Communications Facilities. If Utility reasonably determines that a transfer of Licensee's Communications Facilities is necessary, Utility will, at its option, either require Licensee to perform such transfer at its own expense within thirty (30) calendar days after receiving notice from Utility, or perform the transfer itself, using its personnel, and/or contractors. If Licensee fails to transfer its Facilities within thirty (30) calendar days after receiving such notice from Utility, Utility shall have the right to transfer Licensee's Facilities using its personnel and/or contractors. The costs of such transfers shall be apportioned as specified under Article 9. Utility shall not be liable for damage to Licensee's Facilities except to the extent provided in Paragraph 16.1. The written advance notification requirement of this Paragraph shall not apply in emergency situations. In emergency situations, Utility shall provide such advance notice as is practical, given the urgency of the particular situation. Utility shall then provide written notice of any such actions taken within ten (10) days following the occurrence. Irrespective of who owns Facilities that

are Overlashed on to Licensee's Attachments, Licensee is responsible for the transfer of such Facilities and the costs of doing so.

Article 9—Modifications and/or Replacements

- 9.1 Licensee's Action Requiring Modification/Replacement.** If any Pole to which Licensee desires to make Attachment(s) is unable to support or accommodate the additional facilities in accordance with all Applicable Standards, Utility will notify Licensee of the necessary Make-Ready Work, and associated costs, to provide adequate Pole space, including, but not limited to, replacement of the Pole and/or rearrangement or transfer of Utility's Facilities, as well as the facilities of other Attaching Entities. Licensee shall be responsible for separately entering into an agreement with other Attaching Entities concerning the allocation of costs for the relocation or rearrangement of such entities' existing Attachments. If Licensee elects to go forward with the necessary changes, Licensee shall pay to Utility the actual cost of the Make-Ready Work, performed by Utility, in accordance with Paragraph 3.9. Utility, in its discretion, may require advance payment. Licensee shall also be responsible for obtaining and furnishing to Utility before the commencement of any Make-Ready Work, agreements between Licensee and the other Attaching Entities (including Overlashers) concerning the relocation or rearrangement of their Attachments and the costs involved.
- 9.2 Treatment of Multiple Requests for Same Pole.** If Utility receives Permit Applications for the same Pole from two or more prospective licensees within sixty (60) calendar days of the initial request, and accommodating their respective requests would require modification of the Pole or replacement of the Pole, Utility will allocate among such licensees the applicable costs associated with such modification or replacement.
- 9.3 Guying.** The use of guying to accommodate Licensee's Attachments shall be provided by, and at the expense of, Licensee and to the satisfaction of Utility, as specified in Appendix D. Licensee shall not attach its guy wires to Utility's anchors without prior written permission of Utility. If permission is granted, charges may apply.
- 9.4 Allocation of Costs.** The costs for any rearrangement or transfer of Licensee's Communications Facilities or the replacement of a Pole (including any related costs for tree cutting or trimming required to clear the new location of Utility's cables or wires) shall be allocated to Utility and/or Licensee and/or other Attaching Entity on the following basis:
- 9.4.1** If Utility intends to modify or replace a Pole solely for its own requirements, it shall be responsible for the costs related to the modification/replacement of the Pole. Licensee shall not be responsible

for costs associated with the rearrangement or transfer of Licensee's Communications Facilities, unless and to the extent the rearrangement or transfer is necessary in connection with Utility's reacquisition of Reserved Capacity from Licensee. Prior to making any such modification or replacement, Utility shall provide Licensee written notification of its intent in order to provide Licensee a reasonable opportunity to modify or add to its existing Attachment. Should Licensee decide to do so, it must seek Utility's written permission in accordance with this Agreement. If Licensee elects to add to or modify its Communications Facilities, Licensee shall pay its Pro-Rata of the costs incurred by Utility in making the space on the Poles accessible to Licensee.

- 9.4.2** If the modification or replacement of a Pole is necessitated by the requirements of Licensee, Licensee shall be responsible for all costs caused by the modification or replacement of the Pole as well as the costs associated with the transfer or rearrangement of any other Attaching Entity's Communications Facilities. At the time Licensee submits a Permit Application to Utility, Licensee shall submit evidence, in writing, that it has made arrangements to reimburse all affected Attaching Entities for their costs caused by the transfer or rearrangement of their Facilities. Utility shall not be obligated in any way to enforce or administer Licensee's responsibility for the costs associated with the transfer or rearrangement of another Attaching Entity's Facilities pursuant to this Paragraph 9.4.2.
- 9.4.3** If the modification or the replacement of a Pole is the result of an additional Attachment or the modification of an existing Attachment sought by an Attaching Entity other than Utility or Licensee, the Attaching Entity requesting the additional or modified Attachment shall bear the entire cost of the modification or replacement, as well as the costs for rearranging or transferring Licensee's Communications Facilities. Licensee shall cooperate with such third-party Attaching Entity to determine the costs of moving Licensee's facilities.
- 9.4.4** If the Pole must be modified or replaced for reasons unrelated to the use of the Pole by Attaching Entities (*e.g.*, storm, accident, deterioration), Utility shall pay the costs of such modification or replacement and Licensee shall pay the costs of rearranging or transferring its Communications Facilities.

- 9.5 **Utility Not Required to Relocate.** Nothing in this Agreement shall be construed to require Utility to relocate its Attachments or to modify or replace its Poles for the benefit of Licensee.

Article 10—Abandonment or Removal of Utility Facilities

- 10.1 **Notice of Abandonment or Removal of Utility Facilities.** If Utility desires at any time to abandon, remove, or underground any Utility Facilities to which Licensee's Communications Facilities are attached, it shall give Licensee notice in writing to that effect at least sixty (60) calendar days prior to the date on which it intends to abandon or remove such Utility's Facilities. Notice may be limited to thirty (30) calendar days if Utility is required to remove or abandon its Utility Facilities as the result of the action of a third party and the lengthier notice period is not practical. Such notice shall indicate whether Utility is offering Licensee an option to purchase the Pole(s). If, following the expiration of the thirty (30) day period, Licensee has not yet removed and/or transferred all of its Communications Facilities and has not entered into an agreement to purchase Utility's Facilities pursuant to Paragraph 10.2, Utility shall have the right, but not the obligation, to remove or transfer Licensee's Communications Facilities at Licensee's expense. Utility shall give Licensee prior written notice of any such removal or transfer of Licensee's Facilities.
- 10.2 **Option to Purchase Abandoned Poles.** Should Utility desire to abandon any Pole, Utility may, in its sole discretion, grant Licensee the option of purchasing such Pole at a price to be negotiated with Utility. Licensee must notify Utility in writing within thirty (30) calendar days of the date of Utility's notice of abandonment that Licensee desires to purchase the abandoned Pole. Thereafter, Licensee must also secure and deliver proof of all necessary governmental approvals and easements allowing Licensee to independently own and access the Pole within forty-five (45) calendar days. Should Licensee fail to secure the necessary governmental approvals, or should Utility and Licensee fail to enter into an agreement for Licensee to purchase the Pole within forty-five (45) calendar days, Licensee must remove its Attachments as required under Paragraph 10.1. Nothing in this Agreement shall be construed as requiring Utility to sell Licensee Poles that Utility intends to remove or abandon.
- 10.3 **Underground Relocation.** If Utility moves any portion of its aerial system underground, Licensee shall remove its Communications Facilities from any affected Poles within sixty (60) calendar days of receipt of notice from Utility and must either relocate its affected Facilities underground with Utility or find other means to accommodate its Facilities. If Licensee does not remove its Attachments within sixty (60) days, Utility shall have the right to remove or transfer Licensee's Communications Facilities at Licensee's expense. Licensee's

failure to remove its Facilities as required under this Paragraph 10.3 shall subject Licensee to the penalty provisions of Appendix A.

Article 11—Removal of Licensee’s Facilities

Removal on Expiration/Termination. At the expiration or other termination of this License Agreement or individual Permit(s), Licensee shall remove its Communications Facilities from the affected Poles at its own expense. If Licensee fails to remove such Facilities within sixty (60) calendar days of expiration or termination or some greater period as allowed by Utility, Utility shall have the right, but not the obligation, to remove or transfer such Facilities removed at Licensee’s expense.

Article 12—Termination of Permit

12.1 Automatic Termination of Permit. Any Permit issued pursuant to this Agreement shall automatically terminate when Licensee ceases to have authority to construct and operate its Communications Facilities on public or private property at the location of the particular Pole(s) covered by the Permit. Permits will also expire if the Licensee’s facilities are not installed and operational within six (6) months of the Permit issuance date.

12.2 Surrender of Permit. Licensee may at any time surrender any Permit for Attachment(s) and remove its Communications Facilities from the affected Pole(s), provided, however, that before commencing any such removal, Licensee must obtain Utility’s written approval of Licensee’s plans for removal, including the name of the person or entity performing such work and the date(s) and time(s) during which such work will be completed. All such work is subject to the insurance requirements of Article 18. No refund of any fees or costs will be made upon removal. If Licensee surrenders such Permit pursuant to the provisions of this Article, but fails to remove its Attachments from Utility’s Facilities within thirty (30) calendar days, Utility shall have the right, but not the obligation, to remove or transfer Licensee’s Attachments at Licensee’s expense.

Article 13—Inspection of Licensee’s Facilities

13.1 Inspections. Utility may conduct an inventory and inspection of Attachments at any time. Within thirty (30) calendar days of receiving written notice from Utility, Licensee shall correct all Attachments that Utility identifies as being out of compliance with Applicable Standards. If Utility finds that five percent (5%) or more of Licensee’s Attachments are either in non-compliance or not permitted, Licensee shall pay its *pro-rata* share of the costs of the inspection.

13.2 Notice. Utility will give Licensee reasonable advance written notice of such inspections, except in those instances in which safety considerations justify the need for such inspection without delay.

- 13.3 **No Liability.** Inspections performed under this Article 13, or the failure to do so, shall not operate to impose upon Utility any liability of any kind whatsoever or to relieve Licensee of any responsibility, obligations, or liability, whether assumed under this Agreement or otherwise existing.
- 13.4 **Attachment Records.** Notwithstanding the above inspection provisions, Licensee shall furnish to Utility annually an up-to-date electronic map depicting the locations of its Attachments, in a format specified by Utility.

Article 14—Unauthorized Occupancy or Access

- 14.1 **Penalty Fee.** If any of Licensee's Attachments are found occupying any Pole for which no Permit has been issued, Utility, without prejudice to its other rights or remedies under this Agreement, may assess an Unauthorized Access Penalty Fee, as specified in Appendix A, Item 3. If Licensee fails to pay such Fee within thirty (30) calendar days of receiving notification of it, Utility shall have the right, but not the obligation, to remove such Communications Facilities at Licensee's expense.
- 14.2 **No Ratification of Unauthorized Use.** No act or failure to act by Utility with regard to any unauthorized use shall be deemed as ratification of the unauthorized use. Unless the parties agree otherwise, a Permit for a previously unauthorized Attachment shall not operate retroactively or constitute a waiver by Utility of any of its rights or privileges under this Agreement or otherwise, and Licensee shall remain subject to all obligations and liabilities arising out of or relating to its unauthorized use.

Article 15—Reporting Requirements

At the time that Licensee pays its annual Attachment Fee, Licensee shall also provide the following information to Utility:

- 15.1 The Poles on which Licensee has installed, during the relevant reporting period, Risers and service drops, for which no Permit was required.
- 15.2 All Attachments that have become nonfunctional during the relevant reporting period. The report shall identify the Pole on which the nonfunctional Attachment is located, describe the nonfunctional equipment, and indicate the approximate date the Attachment became nonfunctional.
- 15.3 Any equipment Licensee has removed from Poles during the relevant reporting period. The report shall identify the Pole from which the equipment was removed, describe the removed equipment, and indicate the approximate date of removal. This requirement does not apply where Licensee is surrendering a Permit pursuant to Paragraph 12.2.

Article 16—Liability and Indemnification

16.1 Liability. Utility reserves to itself the right to maintain and operate its Poles in the manner that will best enable it to fulfill its service requirements. Licensee agrees to use Utility's Poles at Licensee's sole risk.

16.2 Indemnification. Licensee, and any agent, contractor, or subcontractor of Licensee, shall defend, indemnify, and hold harmless Utility and its officials, officers, board members, council members, commissioners, representatives, employees, agents, and contractors against any and all liability, costs, damages, fines, taxes, special charges by others, penalties, payments (including payments made by Utility under any Workers' Compensation Laws or under any plan for employees' disability and death benefits), and expenses (including reasonable attorney's fees of Utility and all other costs and expenses of litigation) ("Covered Claims") arising in any way, including any act, omission, failure, negligence, or willful misconduct, in connection with the construction, maintenance, repair, presence, use, relocation, transfer, removal or operation by Licensee, or by Licensee's officers, directors, employees, agents, or contractors, of Licensee's Communications Facilities, except to the extent of Utility's gross negligence or willful misconduct solely giving rise to such Covered Claims. Such Covered Claims include, but are not limited to, the following:

16.2.1 Intellectual property infringement, libel and slander, trespass, unauthorized use of television or radio broadcast programs and other program material, and infringement of patents;

16.2.2 Cost of work performed by Utility that was necessitated by Licensee's failure, or the failure of Licensee's officers, directors, employees, agents or contractors, to install, maintain, use, transfer, or remove Licensee's Communications Facilities in accordance with the requirements and specifications of this Agreement, or from any other work this Agreement authorizes Utility to perform on Licensee's behalf;

16.2.3 Damage to property, injury to or death of any person arising out of the performance or nonperformance of any work or obligation undertaken by Licensee, or Licensee's officers, directors, employees, agents, or contractors, pursuant to this Agreement;

16.2.4 Liabilities incurred as a result of Licensee's violation, or a violation by Licensee's officers, directors, employees, agents, or contractors, of any law, rule, or regulation of the United States, any State, or any other governmental entity or administrative agency.

16.3 Environmental Hazards. Licensee represents and warrants that its use of Utility's Poles will not generate any Hazardous Substances, that it will not store or dispose on or about Utility's Poles or transport to Utility's Poles any hazardous substances and that Licensee's Communications Facilities will not constitute or contain and will not generate any hazardous substance in violation of federal, state, or local law now or hereafter in effect, including any amendments. "Hazardous Substance" shall be interpreted broadly to mean any substance or material designated or defined as hazardous or toxic waste, hazardous or toxic material, hazardous or toxic or radioactive substance, dangerous radio frequency radiation, or other similar terms by any federal, state, or local laws, regulations or rules now or hereafter in effect, including any amendments. Licensee further represents and warrants that in the event of breakage, leakage, incineration, or other disaster, its Communications Facilities would not release any Hazardous Substances. Licensee and its agents, contractors, and subcontractors shall defend, indemnify, and hold harmless Utility and its respective officials, officers, board members, council members, commissioners, representatives, employees, agents, and contractors against any and all liability, costs, damages, fines, taxes, special charges by others, penalties, punitive damages, or expenses (including reasonable attorney's fees and all other costs and expenses of litigation) arising from or due to the release, threatened release, storage, or discovery of any Hazardous Substances on, under, or adjacent to Utility's Poles attributable to Licensee's use of Utility's Poles.

Should Utility's Poles be declared to contain Hazardous Substances, Utility, Licensee, and all Attaching Entities shall share proportionately in the cost of disposal of the affected Poles based on each entity's individual percentage use of same. For Attaching Entities, such percentage shall be derived from the sum of space occupied by each Attaching Entity plus its share of the common space, including the NESC safety space. For Utility, such percentage shall be equal to the space above the NESC safety space plus its share of the common Space. If the source or presence of the Hazardous Substance is solely attributable to particular parties, such costs shall be borne solely by those parties.

16.4 Municipal Liability Limits. No provision of this Agreement is intended, or shall be construed, to be a waiver for any purpose by Utility of any applicable State limits on municipal liability or governmental immunity. No indemnification provision contained in this Agreement under which Licensee indemnifies Utility shall be construed in any way to limit any other indemnification provision contained in this Agreement.

16.5 If Utility brings a successful action in a court of competent jurisdiction to enforce this Agreement, Licensee shall pay Utility's reasonable attorney's fees.

Article 17—Duties, Responsibilities, and Exculpation

- 17.1 Duty to Inspect.** Licensee acknowledges and agrees that Utility does not warrant the condition or safety of Utility's Facilities, or the premises surrounding the Facilities, and Licensee further acknowledges and agrees that it has an obligation to inspect Utility's Poles and/or premises surrounding the Poles, prior to commencing any work on Utility's Poles or entering the premises surrounding such Poles.
- 17.2 Knowledge of Work Conditions.** By executing this Agreement, Licensee warrants that it has acquainted, or will fully acquaint, itself and its employees and/or contractors and agents with the conditions relating to the work that Licensee will undertake under this Agreement and that it fully understands or will acquaint itself with the facilities, difficulties, and restrictions attending the execution of such work.
- 17.3 DISCLAIMER.** UTILITY MAKES NO EXPRESS OR IMPLIED WARRANTIES WITH REGARD TO UTILITY'S POLES, ALL OF WHICH ARE HEREBY DISCLAIMED, AND UTILITY MAKES NO OTHER EXPRESS OR IMPLIED WARRANTIES, EXCEPT TO THE EXTENT EXPRESSLY AND UNAMBIGUOUSLY SET FORTH IN THIS AGREEMENT. UTILITY EXPRESSLY DISCLAIMS ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.
- 17.4 Duty of Competent Supervision and Performance.** The parties further understand and agree that, in the performance of work under this Agreement, Licensee and its agents, employees, contractors, and subcontractors will work near electrically energized lines, transformers, or other Utility Facilities. The parties understand and intend that energy generated, stored, or transported by Utility Facilities will not be interrupted during the continuance of this Agreement, except in emergencies endangering life or threatening grave personal injury or property. Licensee shall ensure that its employees, agents, contractors, and subcontractors have the necessary qualifications, skill, knowledge, training, and experience to protect themselves, their fellow employees, agents, contractors, and subcontractors; employees, agents, contractors, and subcontractors of Utility; and the general public, from harm or injury while performing work permitted pursuant to this Agreement. In addition, Licensee shall furnish its employees, agents, contractors, and subcontractors competent supervision and sufficient and adequate tools and equipment for their work to be performed in a safe manner. Licensee agrees that in emergency situations in which it may be necessary to de-energize any part of Utility's equipment, Licensee shall ensure that work is suspended until the equipment has been de-energized and that no such work is conducted unless and until the equipment is made safe.

- 17.5 **Requests to De-energize.** If Utility de-energizes any equipment or line at Licensee's request and for its benefit and convenience in performing a particular segment of any work, Licensee shall reimburse Utility in accordance with Paragraph 3.9, for all costs and expenses that Utility incurs in complying with Licensee's request. Before Utility de-energizes any equipment or line, it shall provide, upon request, an estimate of all costs and expenses to be incurred in accommodating Licensee's request.
- 17.6 **Interruption of Service.** If Licensee causes an interruption of service by damaging or interfering with any equipment of Utility, Licensee shall, at its own expense, immediately do all things reasonable to avoid injury or damages, direct and incidental, resulting therefrom and shall notify Utility immediately.
- 17.7 **Duty to Inform.** Licensee further warrants that it understands the imminent dangers (INCLUDING SERIOUS BODILY INJURY OR DEATH FROM ELECTROCUTION) inherent in the work necessary to make installations on Utility's Poles by Licensee's employees, agents, contractors, or subcontractors, and Licensee accepts the duty and sole responsibility to notify and inform Licensee's employees, agents, contractors, or subcontractors of such dangers, and to keep them informed regarding same.

Article 18—Insurance

- 18.1 **Policies Required.** At all times during the term of this Agreement, Licensee shall keep in force and effect all insurance policies as described below. These insurance requirements shall extend to all agents, contractors, subcontractors or others working on behalf of the Licensee in performing any and all work contemplated under this Agreement:
- 18.1.1 **Workers' Compensation and Employers' Liability Insurance.** Statutory workers' compensation benefits and employers' liability insurance with a limit of liability no less than that required by Oklahoma law at the time of the application of this provision for each accident. This policy shall be endorsed to include a waiver of subrogation in favor of Utility. Licensee shall require subcontractors and others not protected under its insurance to obtain and maintain such insurance.
- 18.1.2 **Commercial General Liability Insurance.** Policy will be written to provide coverage for, but not limited to, the following: premises and operations, products and completed operations, personal injury, blanket contractual coverage, broad form property damage, and independent contractor's coverage.

- 18.1.3 Automobile Liability Insurance.** Business automobile policy covering all owned, hired and non-owned private passenger autos and commercial vehicles.
- 18.1.4 Umbrella Liability Insurance.** Coverage is to be in excess of the sum employers' liability, commercial general liability, and automobile liability insurance required above.
- 18.1.5 Property Insurance.** Each party will be responsible for maintaining property insurance on its own facilities, buildings, and other improvements, including all equipment, fixtures, and utility structures, fencing, or support systems that may be placed on, within, or around Utility Facilities to fully protect against hazards of fire, vandalism and malicious mischief, and such other perils as are covered by policies of insurance commonly referred to and known as "extended coverage" insurance or self-insure such exposures.
- 18.2 Qualification; Priority; Contractors' Coverage.** The insurer must be authorized to do business under the laws of the State of Oklahoma and have an "A" or better rating in Best's Guide. Such insurance will be primary. All contractors and all of their subcontractors who perform work on behalf of Licensee shall carry, in full force and effect, workers' compensation and employers' liability, comprehensive general liability, and automobile liability insurance coverages of the type that Licensee is required to obtain under this Article 18 with the same limits.
- 18.3 Certificate of Insurance; Other Requirements.** Prior to the execution of this Agreement and prior to each insurance policy expiration date during the term of this Agreement, Licensee will furnish Utility with a certificate of insurance ("Certificate") and, upon request, certified copies of the required insurance policies. The Certificate shall reference this Agreement and workers' compensation and property insurance waivers of subrogation required by this Agreement. Utility shall be given thirty (30) calendar days advance notice of cancellation or nonrenewal of insurance during the term of this Agreement. Utility, its council members, board members, commissioners, agencies, officers, officials, employees and representatives (collectively, "Additional Insureds") shall be named as Additional Insureds under all of the policies, except workers' compensation, which shall be so stated on the Certificate of Insurance. All policies, other than workers' compensation, shall be written on an occurrence and not on a claims-made basis. All policies may be written with deductibles, not to exceed \$100,000, or such greater amount as expressly allowed in writing by Utility. Licensee shall defend, indemnify and hold harmless Utility and Additional Insureds from and against payment of any deductible and payment of any premium on any policy required under this Article. Licensee shall obtain

Certificates from its agents, contractors, and their subcontractors and provide a copy of such Certificates to Utility upon request.

- 18.4 Limits.** The minimum limits of liability for policies required by this Article shall be provided to Licensee by Utility. The limits of liability may be increased or decreased as required by Utility in the event of any factors or occurrences, including substantial increases in the level of jury verdicts or judgments or the passage of state, federal, or other governmental compensation plans, or laws that would materially increase or decrease Licensee's exposure to risk.
- 18.5 Prohibited Exclusions.** No policies of insurance required to be obtained by Licensee or its contractors or subcontractors shall contain provisions that: (1) exclude coverage of liability assumed by this Agreement with Utility except as to infringement of patents or copyrights or for libel and slander in program material, (2) exclude coverage of liability arising from excavating, collapse, or underground work, (3) exclude coverage for injuries to Utility's employees or agents, or (4) exclude coverage of liability for injuries or damages caused by Licensee's contractors or the contractors' employees, or agents. This list of prohibited provisions shall not be interpreted as exclusive.
- 18.6 Deductible/Self-insurance Retention Amounts.** Licensee shall be fully responsible for any deductible or self-insured retention amounts contained in its insurance program or for any deficiencies in the amounts of insurance maintained.

Article 19—Authorization Not Exclusive

Utility shall have the right to grant, renew, and extend rights and privileges to others not party to this Agreement by contract or otherwise, to use Utility Facilities covered by this Agreement. Such rights shall not interfere with the rights granted to Licensee by the specific Permits issued pursuant to this Agreement.

Article 20—Assignment

- 20.1 Limitations on Assignment.** Licensee shall not assign its rights or obligations under this Agreement, nor any part of such rights or obligations, without the prior written consent of Utility, which consent shall not be unreasonably withheld.
- 20.2 Obligations of Assignee/Transferee and Licensee.** No assignment or transfer under this Article 20 shall be allowed until the assignee or transferee becomes a signatory to this Agreement and assumes all obligations of Licensee arising under this Agreement. Licensee shall furnish Utility with prior written notice of the transfer or assignment, together with the name and address of the transferee or assignee. Notwithstanding any assignment or transfer, Licensee shall remain fully liable under this Agreement and shall not be released from performing any of the

terms, covenants, or conditions of this Agreement without the express written consent to the release of Licensee by Utility.

- 20.3 Sub-licensing.** Without Utility's prior written consent, Licensee shall not sub-license or lease to any third party, including but not limited to, allowing third parties to place Attachments on Utility's Facilities, including Overlapping, or to place Attachments for the benefit of such third parties on Utility's Poles. Any such action shall constitute a material breach of this Agreement. The use of Licensee's Communications Facilities by third parties (including but not limited to leases of dark fiber) that involves no additional Attachment or Overlapping is not subject to this Paragraph 20.3.

Article 21—Failure to Enforce

Failure of Utility or Licensee to take action to enforce compliance with any of the terms or conditions of this Agreement or to give notice or declare this Agreement or any authorization granted hereunder terminated shall not constitute a waiver or relinquishment of any term or condition of this Agreement, but the same shall be and remain at all times in full force and effect until terminated, in accordance with this Agreement.

Article 22— Issue Resolution Process

- 22.1 Dispute Resolution.** Except for an action seeking a temporary restraining order or an injunction or to compel compliance with this dispute resolution procedure, the parties can invoke the dispute resolution procedures in this Article at any time to resolve a controversy, claim, or breach arising under this Agreement. Each party will bear its own costs for dispute resolution activity.
- 22.2 Initial Meeting.** At either party's written request, each party will designate knowledgeable, responsible, senior representatives to meet and negotiate in good faith to resolve a dispute. The representatives will have discretion to decide the format, frequency, duration, and conclusion of these discussions. The parties will conduct any meeting in-person or via conference call, as reasonably appropriate.
- 22.3 Executive Meeting.** If ninety (90) days after the first in-person meeting of the senior representatives, the parties have not resolved the dispute to their mutual satisfaction, each party will designate executive representatives at the director level or above to meet and negotiate in good faith to resolve the dispute. To facilitate the negotiations, the parties may agree in writing to use mediation.
- 22.4 Unresolved Dispute.** If after sixty (60) days from the first executive-level, in-person meeting, the parties have not resolved the dispute to their mutual satisfaction; either party may invoke any legal means available to resolve the dispute, including enforcement of the default and termination procedures set out in Article 24.

- 22.5 Confidential Settlement.** Unless the parties otherwise agree in writing, communication between the parties under this Article will be treated as confidential information developed for settlement purposes, exempt from discovery and inadmissible in litigation.
- 22.6 Business as Usual.** During any dispute resolution procedure or lawsuit, the Utilities will continue providing services to each other and performing their obligations under this Agreement.

Article 23—Termination of Agreement

- 23** Utility shall have the right, pursuant to the procedures set out in this Article 23, to terminate this entire Agreement, or any Permit issued under it, whenever Licensee is in default of any material term or condition of this Agreement, including, but not limited to, the following circumstances:
- 23.1.1** Construction, operation, or maintenance of Licensee's Communications Facilities in violation of law, or in aid of any unlawful act or undertaking; or
 - 23.1.2** Construction, operation, or maintenance of Licensee's Communications Facilities after any authorization required of Licensee has lawfully been denied or revoked by any governmental authority or any private holder of easements or other rights, or violation of any other agreement with Utility; or
 - 23.1.3** Construction, operation, or maintenance of Licensee's Communications Facilities without the insurance coverage required under Article 18.
- 23.2** Utility will notify Licensee in writing of any defaults by Licensee under this Agreement. Licensee shall take immediate corrective action to eliminate any such defaults within fifteen (15) calendar days, or such longer period as the parties may agree, and shall confirm in writing to Utility that the cited condition or conditions have ceased or been corrected, or are in the process of being corrected.
- 23.3** If Licensee contests the existence of the default, it may invoke the dispute resolution procedures of Article 22.
- 23.4** If the parties are unable to resolve the dispute and Licensee fails to discontinue or correct a default in a timely manner or fails to give the required confirmation, Utility may immediately terminate this Agreement or any Permit(s) granted under it. In the event of termination of this Agreement or any of Licensee's rights, privileges, or authorizations, Utility may seek removal of Licensee's Communications Facilities pursuant to the terms of Article 11, from any or all of

Utility's Poles. In such instance, Licensee shall remain liable to Utility for all fees and charges accrued pursuant to the terms of this Agreement.

Article 24—Term of Agreement

24.1 This Agreement shall become effective upon its execution and, if not terminated in accordance with other provisions of this Agreement, shall continue in effect for a term of five (5) years and, unless terminated by either party, agreement may be renewed for one (1) additional five (5) year term by mutual assent of the parties. Either party may terminate this Agreement at the end of the initial term by giving written notice of intent to terminate the Agreement at the end of the term. Such a notice must be given least ninety (90) calendar days prior to the end of the then-current term.

24.2 Even after the termination of this Agreement, Licensee's indemnity obligations shall continue with respect to any claims or demands related to Licensee's Communications Facilities, as provided for in Article 16.

Article 25—Amending Agreement

This Agreement shall not be amended, changed, or altered except in writing and with approval by authorized representatives of both parties.

Article 26—Notices

26.1 Wherever in this Agreement notice is required to be given by either party to the other, such notice shall be in writing and shall be effective when personally delivered to, or when mailed by certified mail with return receipt requested, with postage prepaid, and except where specifically provided for elsewhere, properly addressed as follows:

If to Utility, at: ATTN: City Clerk

723 S Lewis St., Stillwater, OK 74074

If to Licensee, at: ATTN: Business Administrator
400 W. 7th Ave., Stillwater, OK 74074

or to such other address as either party, from time to time, may give the other party in writing.

26.2 The above notwithstanding the parties may agree to utilize electronic communications such as email for notifications related to the Permits application and approval process and necessary transfer or pole modifications.

26.3 Licensee shall maintain a staffed 24-hour emergency telephone number, not available to the general public, where Utility can contact Licensee to report damage to Licensee's facilities or other situations requiring immediate communications

between the parties. Such contact person shall be qualified and able to respond to Utility's concerns and requests.

Article 27—Entire Agreement

This Agreement and its appendices constitute the entire agreement between the parties concerning attachments of Licensee's Communications Facilities on Utility's Poles within the geographical service area covered by this Agreement. Unless otherwise expressly stated in this Agreement, all previous agreements, whether written or oral, between Utility and Licensee are superseded and of no further effect.

Article 28 -- Severability

If any provision or portion thereof of this Agreement is or becomes invalid under any applicable statute or rule of law, and such invalidity does not materially alter the essence of this Agreement to either party, such provision shall not render unenforceable this entire Agreement. Rather, the parties intend that the remaining provisions shall be administered as if the Agreement did not include the invalid provision.

Article 29 —Governing Law

All matters relating to this Agreement shall be governed by the laws (without reference to choice of law) of the State of Oklahoma.

Article 30—Incorporation of Recitals and Appendices

The recitals stated above and all appendices to this Agreement are incorporated into and constitute part of this Agreement.

Article 31—Performance Bond

On execution of this Agreement, Licensee shall provide to Utility a performance bond or letter of credit in an amount of (\$1000 per Small Wireless Facility). The bond shall be with an entity and in a form acceptable to Utility. The purpose of the bond is to ensure Licensee's performance of all of its obligations under this Agreement and for the payment by Licensee of any claims, liens, taxes, liquidated damages, penalties, and fees due to Utility that arise by reason of the construction, operation, maintenance, or removal of Licensee's Communications Facilities on or about Utility's Poles.

Article 32—*Force Majeure*

32.1 If either Utility or Licensee is prevented or delayed from fulfilling any term or provision of this Agreement by reason of fire, flood, earthquake, or like acts of nature, wars, revolution, civil commotion, explosion, acts of terrorism, embargo, acts of the government in its sovereign capacity, material changes of laws or regulations, labor difficulties, including without limitation, strikes, slowdowns, picketing or boycotts, unavailability of equipment of vendor, or any other such cause not attributable to the negligence or fault of the party delayed in performing the acts required by the Agreement, then performance of such acts shall be excused for the period of the unavoidable delay, and the affected party

shall endeavor to remove or overcome such inability as soon as reasonably possible.

- 32.2 Utility shall not impose any charges on Licensee stemming solely from Licensee's inability to perform required acts during a period of unavoidable delay as described in Paragraph 32.1, provided that Licensee present Utility with a written description of such force majeure within a reasonable time after occurrence of the event or cause relied on, and further provided that this provision shall not operate to excuse Licensee from the timely payment of any fees or charges due Utility under this Agreement.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement in duplicate on the day and year first written above.

(UTILITY)

BY: _____

Title: _____

(LICENSEE)

BY: _____

Title: Mark A. Whigfield - CHAIR

UTILITY

STATE OF OKLAHOMA

: ss

County of Payne

I, the undersigned, a Notary Public in and for the State of Oklahoma, hereby certify that on the ____ day of _____, 2____, personally appeared before me [NAME] _____, [TITLE] _____ to me known to be the individual described in and who executed the foregoing instrument and acknowledged that they signed and sealed the same as their free and voluntary act and deed, for the uses and purposes therein mentioned.

GIVEN under my hand and official seal the day and year above written.

Notary Public in and for the
State of Oklahoma, residing at
_____, Oklahoma

LICENSEE

STATE OF [INSERT STATE]

: SS

County of Payne

I, the undersigned, a Notary Public in and for the State of Oklahoma, hereby certify that on the 29 day of November, 2023, personally appeared before me [NAME] MARK WHITFIELD, [TITLE] TRUSTEE CHAIR to me known to be the individual described in and who executed the foregoing instrument and acknowledged that they signed and sealed the same as their free and voluntary act and deed, for the uses and purposes therein mentioned.

GIVEN under my hand and official seal the day and year above written.

Keyata Wright



Notary Public in and for the
State of Oklahoma, residing at
Shillwater, OK

APPENDIX A—Fees and Charges

Effective Date / /

Collocation (Attachment) Rate: \$20.00 per pole/per year

One-time License Agreement Fee	\$350.00
Permit Application Fee	\$200.00 per Permit Application (1-5 Attachments)
Permit Application Fee	\$100.00 per Permit Application (6 -25 Attachments)
Make Ready Work Charges	See Article 3 of Agreement
Miscellaneous Charges	See Article 3 of Agreement [or Attach Fee Schedule for Work Performed for the Licensee]
Inspection Fees.....	See Article 3 of Agreement

5 x annual collocation (attachment) rate, per occurrence.

1/5 annual attachment fee per day, per pole, first 30 days; after the initial 30 days the penalty shall be equal to the annual collocation (attachment) rate per day, per pole.

NOTE: The Utility may increase the fees and rates it adopts under this appendix by ten percent (10%) every five (5) years rounded to the nearest dollar.

APPENDIX B—Pole Attachment

Permit Application Process

The following procedure is to be followed by each Licensee seeking to make new Attachments on Utility's Poles, or overlash to existing pole tenant facilities on Utility's Poles. Note that no entity may make any Attachments to Utility's Poles or overlash to existing pole tenant facilities on Utility's Poles without having first entered into a binding Pole Attachment Licensing Agreement with Utility. Third parties seeking to overlash to an existing pole tenant facility must also have a written overlash agreement with the pole tenant to be overlash. The overlash agreement must be provided to the Utility at the time of application.

1. Licensee shall submit a written request to perform a Pre-Construction Inspection. The request must include a preliminary route description. Licensee shall have a professional engineer or utility-approved employee or contractor, participate in a Pre-Construction Inspection, which will include a review of the proposed Attachment(s) to determine the feasibility of the request and identify any potential Make-Ready Work. Appendix F to this Agreement contains the minimum design review information that an applicant must provide and a worksheet for determining the minimum specifications that the proposed Attachment must meet.
2. Following the Pre-Construction Inspection, Licensee shall submit a completed Permit Application (Appendix C) that includes: route map, information required in Appendix F, installation plans, recommendations on Make-Ready Work, and a pole-loading analysis stamped by a professional engineer. Licensee shall prepare the Permit Application in adherence with the Applicable Standards (Section 1.2 of Agreement) and specifications (Appendix D).
3. At the Licensee's expense, the Utility will review the recommendations from the inspection and the pole-loading analysis, and discuss any issues with the Licensee.
4. Upon receipt of written authorization, Utility will proceed with Make-Ready Work according to the specific agreed-upon installation plans and the terms of the Agreement, including payment for the Make-Ready Work charges as set out by Utility and agreed to by the Licensee.
5. Upon completion of the Make-Ready Work, the Utility will *sign* and return the Application for Permit authorizing the Licensee to make its Attachment(s) in accordance with agreed-upon installation plans.

6. Unless waived in writing by the Utility, the Licensee's professional engineer, utility-approved employee, or contractor shall submit written certification that he/she has completed the Post-Construction Inspection and that the installation was done in accordance with the provisions of the Permit. The Post-Construction Inspection shall be submitted within ninety (90) calendar days after installation is complete. The Utility will verify the inspection by means that it deems to be reasonable.

APPENDIX C - Application for Permit

Application Date: 7 / 25 / 2013

To: Stillwater Utilities Authority
Attn: Electric Engineering
411 E 3rd Ave
Stillwater, OK 74074

Desire to: Attach to Utility Pole(s)

Remove Attachment from Utility Pole(s)

Overlash to existing facility attached to Utility Pole(s)

Permit No. _____

Occupancy Permit No. _____

Number of Poles this permit 5 Sheet 1 of 1

Licensee Name: Stillwater First United Methodist Church

Address: 400 W 7th Ave., Stillwater, OK 74074

Contact Person: DANIEL GUTHRIE Phone 405-372-5854

Title: Business Administrator

Utility Contact Person: VERNON HALL Phone 405-742-8367

Title: Power Distribution Engineering Specialist

Narrative Description of proposed activity: Attach to 5 NEW Poles

Application for Permit

In accordance with the terms and conditions of the Pole Attachment Licensing Agreement dated _____, application is hereby made for a Permit to attach to and/or vacate Pole(s) in the locations detailed on the attached Route Map(s). Also, attached is documentation as required by Appendix F of the Agreement. If applicable, the engineer's name, this State's registration number, and phone number are:

Name: _____ Phone: _____

Registration #: _____

Permission is hereby granted to Licensee to attach and/or vacate poles listed on the attached Field Data Summary Sheets, subject to payment of the necessary Make-Ready Work charges as set out by Utility and agreed to by the Licensee.

SUBMITTED:

APPROVED:

Licensee Stillwater First United Methodist Church Utility _____

By MARIE WHITFIELD By _____

Title FUMC TRUSTEE CHAIR Title _____

Date 11/29/23 Date _____

Inspection required

APPENDIX D - Specifications for Licensee's Attachments to Utility Poles

Licensee, when making Attachments to Utility Poles, will adhere to the following engineering and construction practices.

- A. All Attachments shall be made in accordance with the Applicable Standards, as defined in Paragraph 1.2 of this Agreement.

B. Clearances

1. **Attachment and Cable Clearances:** Licensee's Attachments on Utility Poles, including metal attachment clamps and bolts, metal cross-arm supports, bolts and other equipment, must be attached so as to maintain the minimum separations specified in the National Electrical Safety Code ("NESC") and in drawings and specifications Utility may from time to time furnish Licensee. (See Drawings A-01 to A-99.)

Note: Attachments shall only be placed within the communication space as defined in the NESC.

2. **Service Drop Clearance:** From the pole to the home/building the parallel minimum separation between Utility's service drops and communications service drops shall be twelve (12) inches, per NESC 235C1b (exception 3). (see drawing A-5)
3. All other drop clearances at the midspan must conform to NESC table 235-6.

Sag and Mid-Span Clearances: Licensee will be particularly careful to leave proper sag in its lines and cables and shall observe the established sag of power line conductors and other cables so that minimum clearances are: (a) achieved at poles located on both ends of the span; and (b) retained throughout the span. At mid-span, a minimum of twelve (12) inches of separation must be maintained between all telecommunication cables that meet NESC rule 230E1 (includes common phone, CATV, and fiber optic cables lashed to an effectively grounded messenger strand, or self-supporting cables).

NESC table 235-6 requires:

- 12" from neutral (by exception #16)
- 30" from supply lines carrying 0 to 8.7 kV (secondary)
- 30" plus 0.4" per kV in excess of 8.7 (primary)

4. **Vertical Risers:** All Risers, including those providing 120/240 volt power for Licensee's equipment enclosure, shall be placed on the quarter faces of the Pole and must be installed in conduit with weatherhead (if possible), attached to the Pole with stand-off brackets. A two (2) inch clearance in any direction from cable, bolts, clamps, metal supports, and other equipment shall be maintained. (*See Drawings A-02 and A-04.*)
5. **Climbing Space:** A clear Climbing Space must be maintained at all times on the face of the Pole. All Attachments must be placed so as to allow and maintain a clear and proper Climbing Space on the face of the Utility Pole. Licensee's cable/wire Attachments shall be placed on the same side of the Pole as those of other Attaching Entities. In general, all other Attachments and Risers should be placed on Pole quarter faces. (*See Drawing A-09.*)
6. **Pedestals and Enclosures:** Every effort should be made to install Pedestals, vaults and/or Enclosures at a minimum of ten (10) feet from Poles or other Utility Facilities, or the distance specified by the utility, whichever is greater.

C. Down Guys and Anchors

1. Licensee shall be responsible for procuring and installing all anchors and guy wires to support the additional stress placed on the Utility's Poles by Licensee's Attachments. Anchors must be guyed adequately.
2. Anchors and guy wires must be installed on each Utility Pole where an angle or a dead-end occurs. Licensee shall make guy attachments to Poles at or below its cable Attachment. No proposed anchor can be within four (4) feet of an existing anchor without written consent of Utility.
3. Licensee may not attach guy wires to the anchors of Utility or third-party user without the anchor owner's specific prior written consent.
4. No Attachment may be installed on a Utility Pole until all required guys and anchors are installed. No Attachment may be modified, added to, or relocated in such a way as will materially increase the stress or loading on Utility Poles until all required guys and anchors are installed.
5. Licensee's down guys, if needed, shall be bonded, to the vertical ground wires of Utility's Pole, in accordance to NESC rule 92C. If there is no vertical ground present at the pole, the connections to the system neutral are to be made by the utility as an item of Make-Ready Work. Utility will determine if guys should be grounded or insulated.

D. Certification of Licensee's Design

1. Licensee's Attachment Permit application must be signed and sealed by a professional engineer, registered in the [State], certifying that Licensee's aerial cable design fully complies with the NESC and Utility's Construction Standards and any other applicable federal, state or local codes and/or requirements.
2. This certification shall include the confirmation that the design is in accordance with pole strength requirements of the NESC, taking into account the effects of Utility's Facilities and other Attaching Entities' facilities that exist on the Poles without regard to the condition of the existing facilities.

E. Miscellaneous Requirements

1. **Cable Bonding:** Licensee's messenger cable shall be bonded according to NESC rule 92C1 as a minimum, or at every pole with a vertical ground, as determined by the utility. If no ground exists on a pole to be bonded, Licensee shall install a Pole ground in accordance with the attached detail drawing. (See Drawings A-03 to A-04.)
2. **Customer Premises:** Licensee's service drop into customer premises shall be protected as required by the most current edition of the NEC.
3. **Communication Cables:** All Communications cables/wires not owned by Utility shall be attached within the Communications space that is located 40 inches below the lowest Utility conductors. (See Drawings A-01 through A-11.)
4. **Riser Installations:** All Licensee's Riser installations shall be in utility-approved conduit materials and placed on stand-off brackets. Ground wires may be attached directly to Pole. (See Drawings A-02 to A-04.)
5. **Tagging:** All Licensee's cables shall be identified with a band-type communications cable tag or other identification acceptable to Utility at each Attachment within twelve (12) inches of the Pole. The communications tag shall be consistent with communication industry standards and shall include at least the following: Licensee name, emergency contact number, and cable type. At the discretion of Utility, Tags shall be color-coded to permit identification of Attaching Entity by observation from the ground.

F. Utility Construction Drawings and Specifications

1. Refer to the attached Utility Construction Drawings, and obtain additional construction specifications from Utility in accordance with its requirements.

2. Apply the Utility's construction drawings and specifications in accordance with the NESC, NEC, and any other federal, state, or local code requirements.

APPENDIX E - Distribution Line Minimum Design Review Information and Suggested Worksheet

The following guidelines are provided, and corresponding information must be submitted with each Permit application for Pole Attachments on Utility's system. Utility may direct that certain Attachments do not require the submittal of Design Review Information. These Attachments are noted at the end of this section.

Each Permit application must include a report from a professional engineer registered to practice in the State of Oklahoma, and experienced in electric utility system design, or a utility-approved employee or contractor of Licensee. This report must clearly identify the proposed construction and must verify that the Attachments proposed will maintain Utility's compliance with NESC Class B construction for the loading district as outlined in the NESC Section 25.

Utility may or may not require that all of the following information be submitted at the time of the Permit application. The applicant shall have performed all required calculations and be ready to provide the detailed information below within fifteen (15) calendar days of notice. Applicant shall keep copies of the engineering data available for a period of twenty (20) years.

In determining compliance, the following minimum conditions shall be used in the calculations for pole strength:

1. All single-phase lines shall be assumed to have been reconductored to 477 ACSR 26/7, code name Hawk conductor for both phase and neutral. If a larger conductor size exists, the larger size shall be used in the calculations.
2. All three-phase lines shall be assumed to have been to 477 ACSR 26/7, code name Hawk conductor for three (3) phases and neutral. If existing conductors are larger than 4/0 AWG ACSR, the larger size shall be used in the calculations.
3. All pole lines shall assume a secondary/service conductor, installed from pole to pole, of #4/0 AWG triplex cable, with an ACSR messenger.
4. For pole strength calculations, all poles shall be as they actually exist, or be considered Class 4 for calculations.
5. All line angles or dead ends shall be guyed and anchored. Transverse pole strength shall not be assigned to attaching pole users for line angles, *i.e.*, pole should be viewed as being void of other cables, conductors, wires, or guys and considering only the applicant's wires/cables for guying calculations.
6. Points of attachment shall be as they actually exist on the poles.

7. For a Utility-approved joint use of anchors, the Licensee shall utilize guy insulators in its guys.
8. Lessee shall comply with any NESC and/or Utility safety factors, whichever are more conservative, in their designs. The engineer for the Permit applicant shall provide for each application the following confirmations:

Required permits that have been obtained (insert n/a if not applicable):

- _____ (y/n) U.S. Corp of Engineers.
- _____ (y/n) Highway—state, county, city.
- _____ (y/n) Railroad.
- _____ (y/n) Local zoning boards, town boards, etc.
- _____ (y/n) Joint-use permits, if required.
- _____ (y/n) Notified other pole users of contacts or crossings.

Confirm that you have:

- _____ (y/n) Obtained appropriate franchise(s).
- _____ (y/n) Obtained pole/anchor easements from landowners.
- _____ (y/n) Obtained crossing and overhang permits.
- _____ (y/n) Obtained permit to survey R/W.
- _____ (y/n) Completed State of Oklahoma Department of Transportation requirements.
- _____ (y/n) Placed permit number on plans.
- _____ (y/n) Complied with Underground Facility Location requirements.
- _____ (y/n) Included sag/tension data on proposed cable.

Calculations are based upon the latest edition of the NESC and the latest editions of the requirements of the State of Oklahoma.

It is Licensee's responsibility to obtain all necessary permits and provide the Utility with a copy of each.

The engineer for the Permit applicant shall provide for each Pole(s) the following information:

Project ID _____

Pole number _____ [if pole tag missing, contact Utility]

Pole class _____ [existing—*i.e.*, 4, 3, 2...]

Pole size _____ [existing—*i.e.*, 35, 40...]

Pole type _____ [Southern Yellow Pine, Douglas Fir...]

Pole fore span _____ [feet]

Pole fore span direction _____ [degrees from Magnetic North]

Pole back span _____ [feet]

Pole back span direction _____ [degrees from Magnetic North]

Calculated bending

moment at ground level _____ [ft-lbs]

Existing:

Power phase condition _____ quantity of _____ AWG/MCM
_____ CU/AA/ACSR @ _____ feet above ground line

Power neutral condition _____ quantity of _____ AWG/MCM
_____ CU/AA/ACSR @ _____ feet above ground line

Power sec condition _____ quantity of _____ AWG/MCM
_____ CU/AA/ACSR @ _____ feet above ground line

Power service #1 _____ qty of _____ size @ _____ ft above ground line
@ _____ ° _____ ' _____ "

Power service #2 _____ qty of _____ size @ _____ ft above ground line
@ _____ ° _____ ' _____ "

Power service #3 _____ qty of _____ size @ _____ ft above ground line
@ _____ ° _____ ' _____ "

Telco #1 cables _____ qty of _____ dia @ _____ ft above ground line

Telco service #1 _____ qty of _____ size @ _____ ft above ground line

@ _____ ° _____ ' _____ "

Telco service #2 _____ qty of _____ size @ _____ ft above ground line

@ _____ ° _____ ' _____ "

CATV #2 cables _____ qty of _____ dia @ _____ ft above ground line

CATV service #1 _____ qty of _____ size @ _____ ft above ground line

@ _____ ° _____ ' _____ "

CATV service #2 _____ qty of _____ size @ _____ ft above ground line

@ _____ ° _____ ' _____ "

User #3 cables _____ qty of _____ dia @ _____ ft above ground line

User #4 cables _____ qty of _____ dia @ _____ ft above ground line

User #5 cables _____ qty of _____ dia @ _____ ft above ground line

User #6 cables _____ qty of _____ dia @ _____ ft above ground line

Equipment #1 type _____ qty of _____ size @ _____ ft above ground line

Equipment #1 type _____ qty of _____ size @ _____ ft above ground line

Equipment #1 type _____ qty of _____ size @ _____ ft above ground line

Equipment #1 type _____ qty of _____ size @ _____ ft above ground line

Proposed:

Proposed cables _____ qty of _____ dia @ _____ ft above ground line

fore and back span direction _____ ° _____ ' _____ ", _____ ° _____ ' _____ "

Proposed cables _____ qty of _____ dia @ _____ ft above ground line

fore and back span direction _____ ° _____ ' _____ ", _____ ° _____ ' _____ "

Equipment #1 type _____ qty of _____ size @ _____ ft above ground line

Equipment #2 type _____ qty of _____ size @ _____ ft above ground line

AGL = Above Ground Level

The minimum vertical clearance under all loading conditions measured from the proposed cable to ground level on each conductor span shall be stated above. Variations in topography resulting in ground elevation changes shall be considered when stating the minimum vertical clearance within a given span.

Calculated pole bending moment at ground level: _____ [ft-lbs]

Pole breaking bending moment at ground level: _____ [ft-lbs]

Calculated transverse safety factor: _____ [ratio should be greater than 1.00]

Proposed loading data [provide similar data for each cable proposed]:

A. Weight data (cable and messenger)—

1. Vertical weight, bare = _____ [#ft]

B. Tension data (final tensions on messenger)—

1. NESC maximum load for area of construction: _____ [lbs]

2. 60° F, NO wind: _____ [lbs]

Permit applicant's engineer shall provide for each transverse guy, or dead end to which guys and/or anchors are attached, the following information:

Pole number _____

Calculated cable messenger tension under

NESC maximum loading conditions _____ [lbs]

If connection is:

A dead end, is it a single or double? _____ [S, D]

A change in tension, what is change? _____ [lbs]

A line angle, what is angle change? _____ [degrees]

What is tension change at angle? _____ [lbs]

For each dead end:

Point of attachment for guy hook _____ [feet AGL]

Anchor distance from pole _____ [feet]

Calculated guy tension _____ [lbs]

Rated guy working strength _____ [lbs]

For each change in tension:

Point of attachment for guy hook _____ [feet AGL]

Anchor distance from pole _____ [feet]

Calculated guy tension _____ [lbs]

Rated guy working strength _____ [lbs]

For each line angle:

Point of attachment for guy hook _____ [feet AGL]

Anchor distance from pole _____ [feet]

Calculated guy tension _____ [lbs]

Rated guy working strength _____ [lbs]

For each anchor:

Anchor distance to nearest anchor _____ [feet]

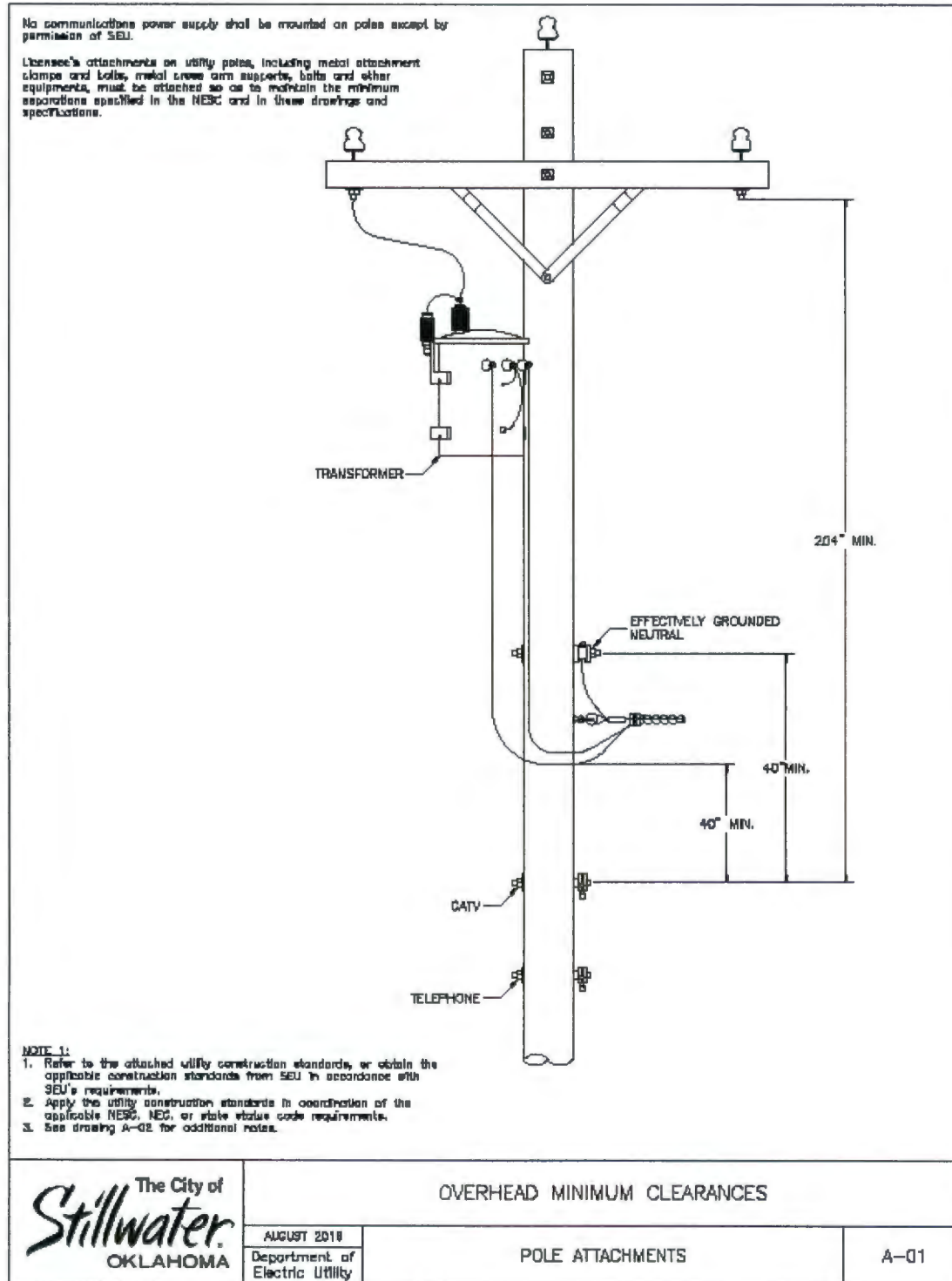
Calculated anchor tension _____ [lbs]

Rated anchor strength _____ [lbs]

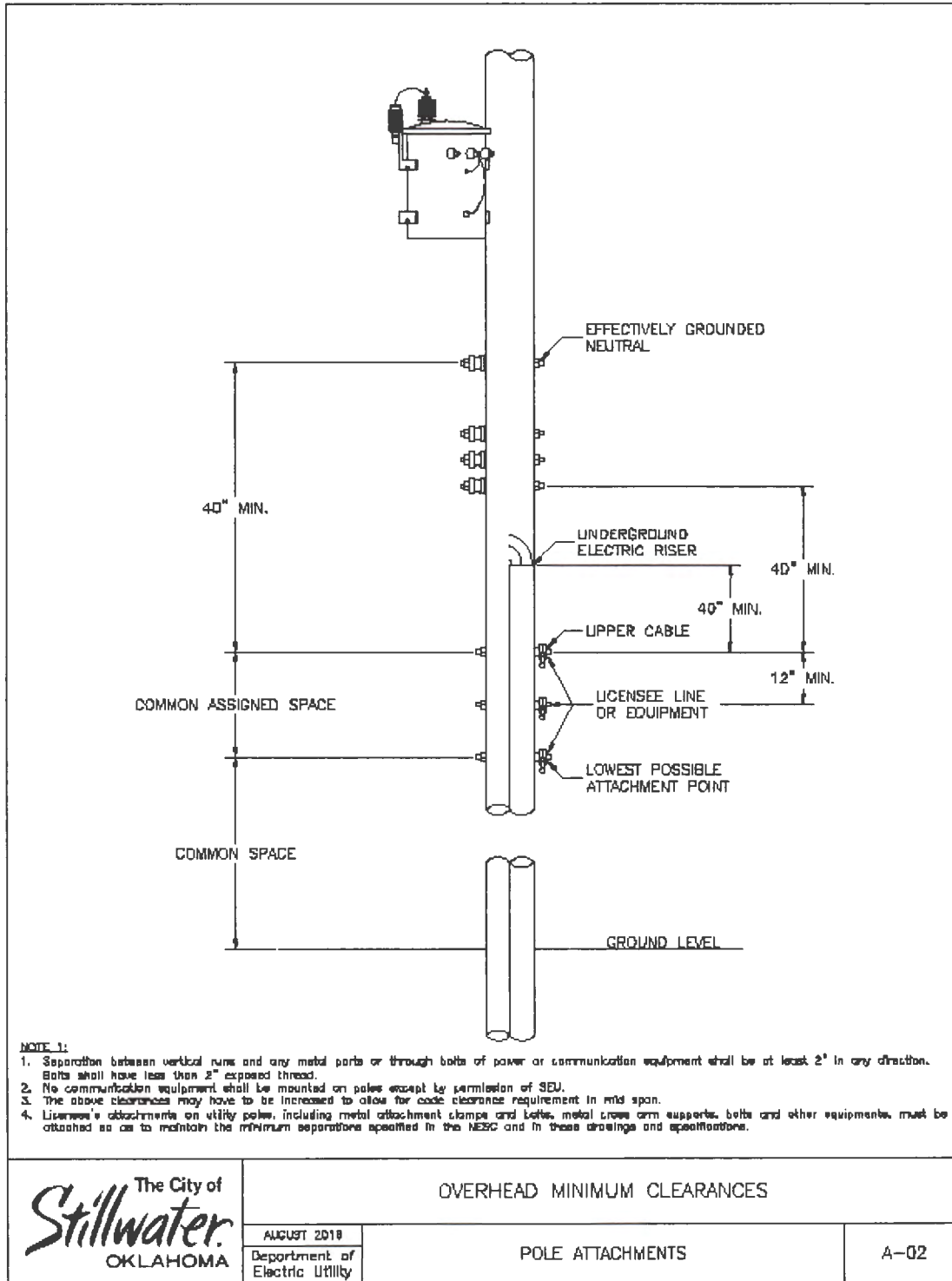
APPENDIX F - Field Data Summary Sheet Instructions

<u>Column</u>	<u>Instructions</u>
Utility Pole Number	If a Pole stencil is not in place, it may be left for Utility if the accompanying sketch is adequate to determine the Location.
Communication Company's	This must correspond with the plan sheet or
Plan Sheet Pole Number	Pole Sketch Pole identification number.
Pole Height and Class.....	List the present Pole height and class and list the proposed Pole height and class if it is necessary for Utility to replace the Pole for clearance, etc.
Guy Attachments.....	All unbalanced loading on Poles must be guyed. Attachments to Utility's anchors will not be allowed.
Attachment Height.....	Communications Company attachment height above ground level. List guy lead in feet.
Inches Below Utility	The number of inches Communications Company is to be attached below Utility while maintaining clearance as required in Item #4.
Span Length.....	List the back span length for each attachment.
Inches Sag.....	List the messenger sag for the design listed on the cover sheet at 60 degrees Fahrenheit.
Ground Clearance.....	List the ground clearance at the low point of the back span. Must not be less than the National Electrical Safety Code (latest edition).

Drawing A-01— Overhead Minimum Clearances



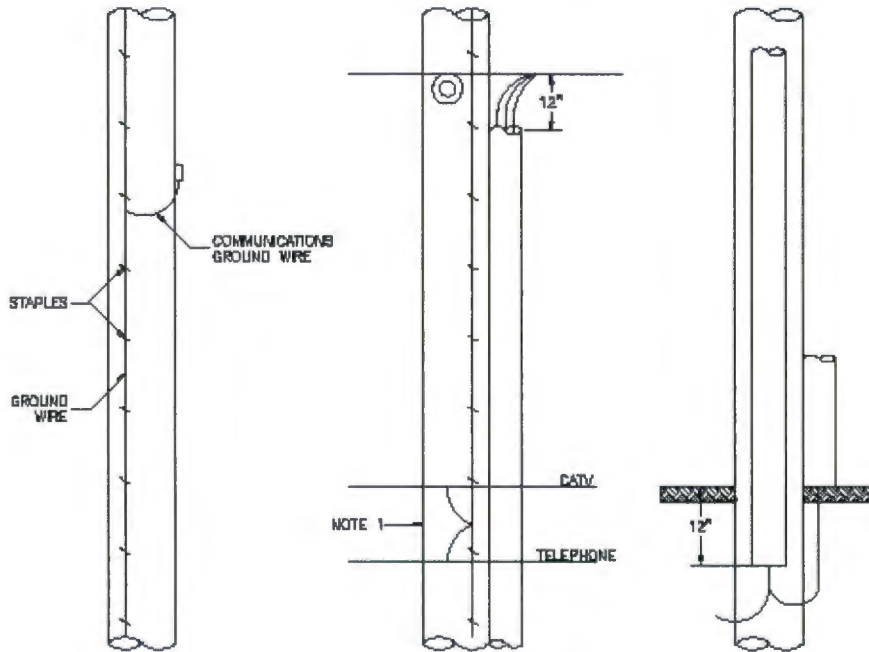
Drawing A-02 — Overhead Minimum Clearances



Drawing A-03 — Grounding Connections

No communications power supply shall be mounted on poles except by permission of SEU.

Licensee's attachments on utility poles, including metal attachment clamps and bolts, metal cross arm supports, bolts and other equipments, must be attached so as to maintain the minimum separations specified in the NEC and in these drawings and specifications.



NOTE 1:

1. Licensee shall bond to utility pole ground wherever utility has a down ground on the pole. If the ground is under the metal U-guard, contact utility to make the ground connection.
2. If no pole ground exists install a pole down ground on the pole. Protect the pole ground with a ground wire mauling. Top of ground rod shall be at least 6" below grade.
3. Bond wire shall be #8 bare copper or larger. If bond wire is unsupported more than 12" long, staple to pole.
4. When communications are underground, the power is overhead and it is required that the communications ground be interconnected to the power supply ground. The connection shall be made below grade.
5. In no case shall licensee ground be connected to guys/anchors.
6. If a neutral isolation device is installed on this pole the attachor must contact SEU for special grounding instructions.
7. Licensee's messenger cable shall be bonded to SEU's pole ground wire at each pole that has a ground wire.

The City of
Stillwater
OKLAHOMA

GROUNDING CONNECTIONS

AUGUST 2018

Department of
Electric Utility

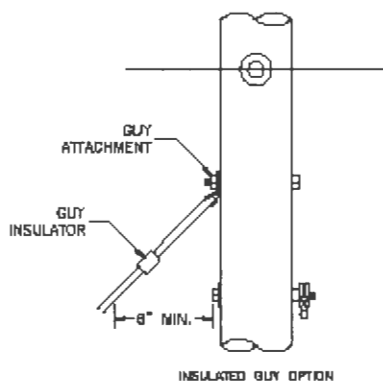
POLE ATTACHMENTS

A-03

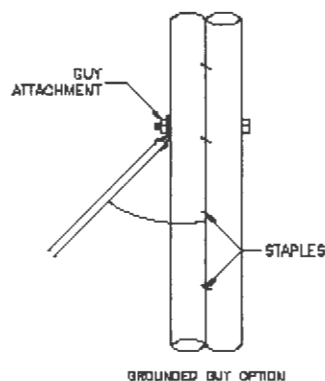
Drawing A-04 — Guy Wire Requirements

No communications power supply shall be mounted on poles except by permission of SEU.

Licensee's attachments on utility poles, including metal attachment clamps and bolts, metal cross arm supports, bolts and other equipments, must be attached so as to maintain the minimum separations specified in the NESC and in these drawings and specifications.



INSULATED GUY OPTION



GROUNDING GUY OPTION

CONTACT SEU TO DETERMINE IF
GUTS ARE TO BE INSULATED OR
GROUNDED.

NOTE 1:

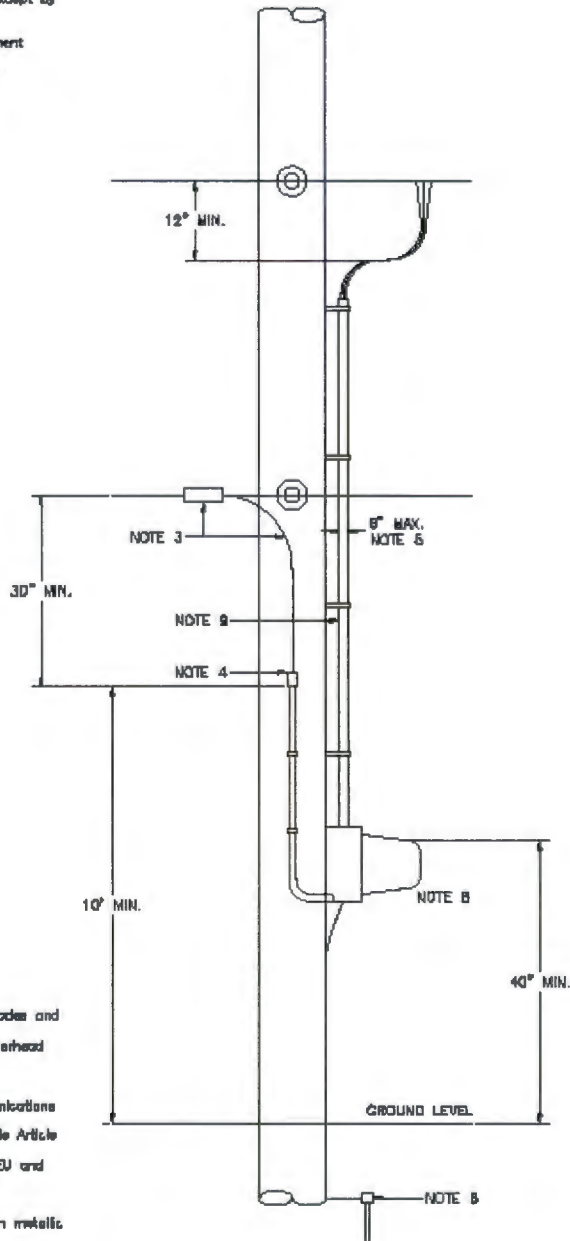
1. Licensee shall be responsible for procuring and installing all anchors and guy wires to support the additional stress placed on utility's poles licensee's attachments.
2. Anchors and guy wires must be set on each utility pole where there is a turn or angle and on all dead-end utility poles.
3. Licensee may not place guy wires on the anchors of SEU or third party user without prior written consent of all attaching entities and anchor owners.
4. No attachment may be installed on a utility pole until all required guys and anchors are installed. Nor may any attachment be modified or relocated in such a way as will materially increase the stress or loading on utility poles until all required guys and anchors are installed.
5. Licensee's down guys shall not be bonded to ground or neutral wires or SEU's pole and shall not provide a current path to ground from the pole ground or power system neutral. If permitted or required by SEU, grounded guys should be installed.
6. On jointly used structures, guys that pass within 12" of supply conductors, and also pass within 12" of communication cables, shall be protected with a suitable insulating covering where the guy passes the supply conductors, unless the guy is effectively grounded or insulated with a strain insulator at a point below the lowest supply conductor and above the highest communication cable.

	GUY WIRE REQUIREMENTS		
	AUGUST 2016 Department of Electric Utility	POLE ATTACHMENTS	A-04

Drawing A-05 — Power Service

No communications power supply shall be mounted on poles except by permission of SEU.

Licensee's attachments on utility poles, including metal attachment clamps and bolts, metal cross arm supports, bolts and other equipments, must be attached so as to maintain the minimum separations specified in the NEC and in these drawings and specifications.



NOTE 1:

1. This installation shall comply with all applicable electrical codes and state, city, village, town, and SEU requirements.
2. Service entrance conductors shall extend 30" beyond weatherhead and have 600 volt rated insulation.
3. Communication power supply cable.
4. Communication power supply.
5. 6" maximum between service entrance conduit and communications cable, if possible.
6. Grounding shall be in accordance with National Electric Code Article 250. Top of rod to be 6" below grade.
7. Location of all licensee equipment is to be approved by SEU and shall be relocated by licensee if incorrect.
8. Proof of compliance shall be appropriately certified, install disconnect and overcurrent protection with meter.
9. All wires on poles will be placed in rigid steel or aluminum metallic conduit on the quarter face of the pole.
10. This service detail applies to all commercial users requiring power for pole mounted devices.

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OKLAHOMA

POWER SERVICE

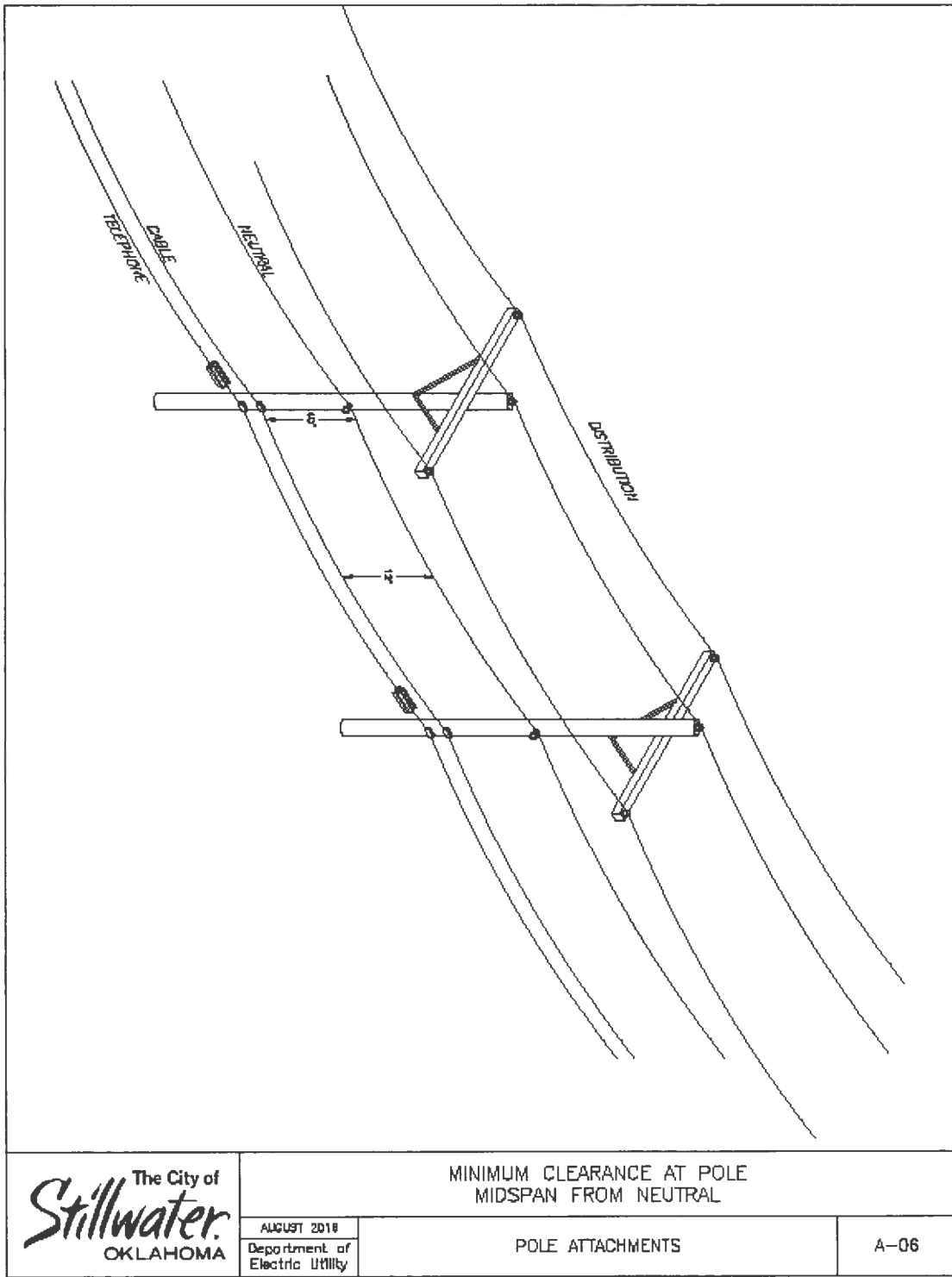
AUGUST 2018

Department of
Electric Utility

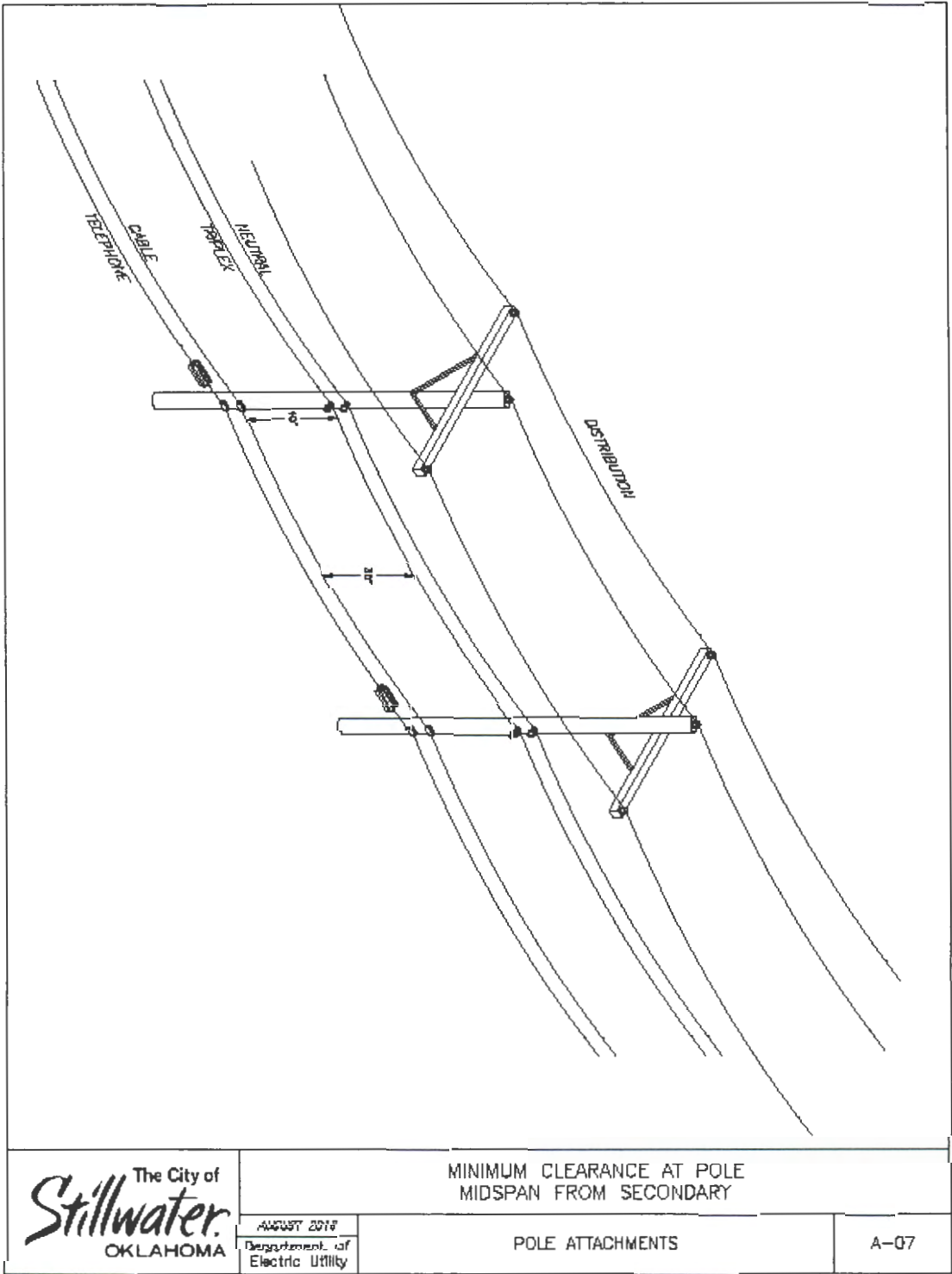
POLE ATTACHMENTS

A-05

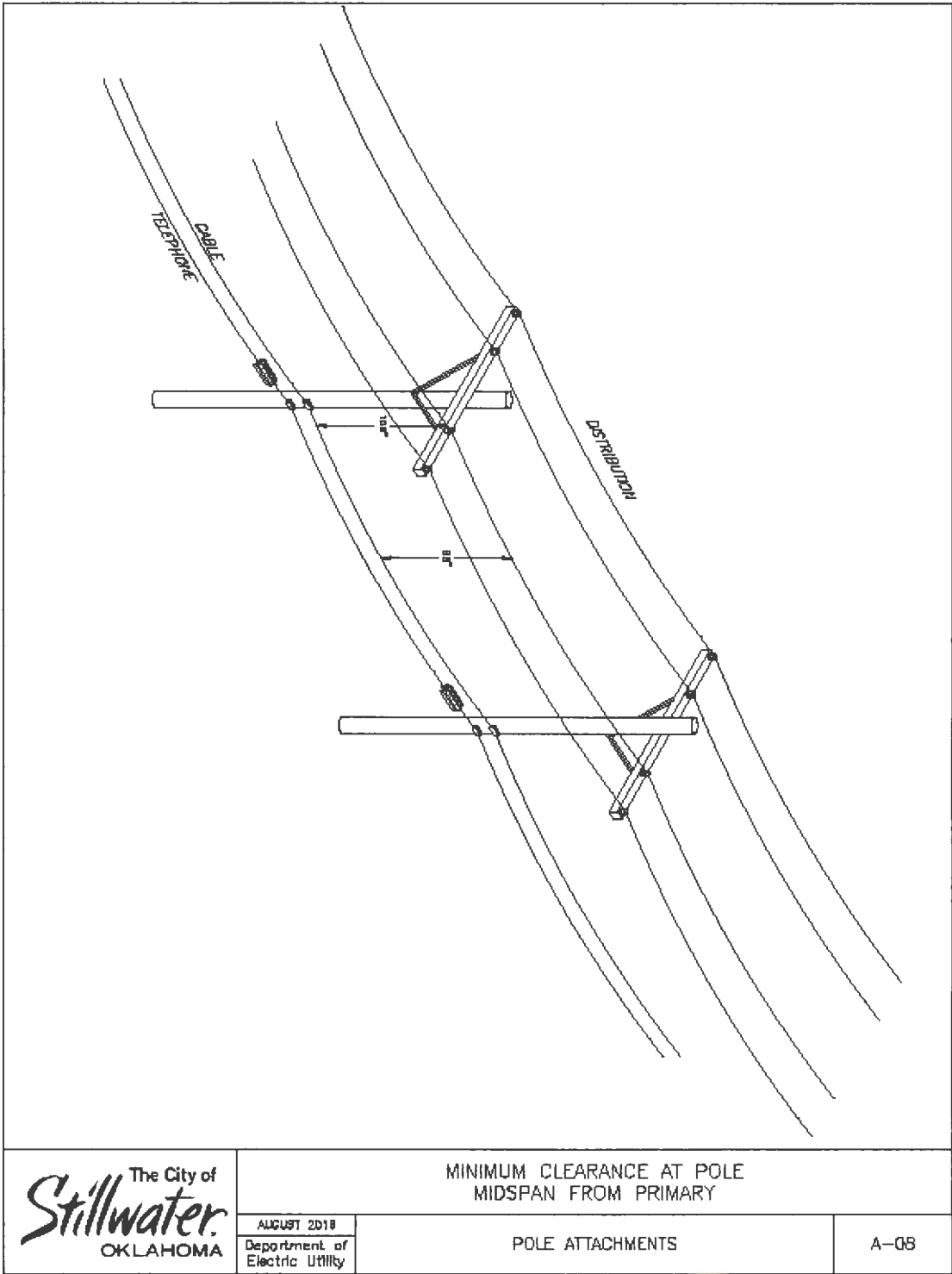
Drawing A-06 — Minimum Clearance at Pole/Midspan from Neutral



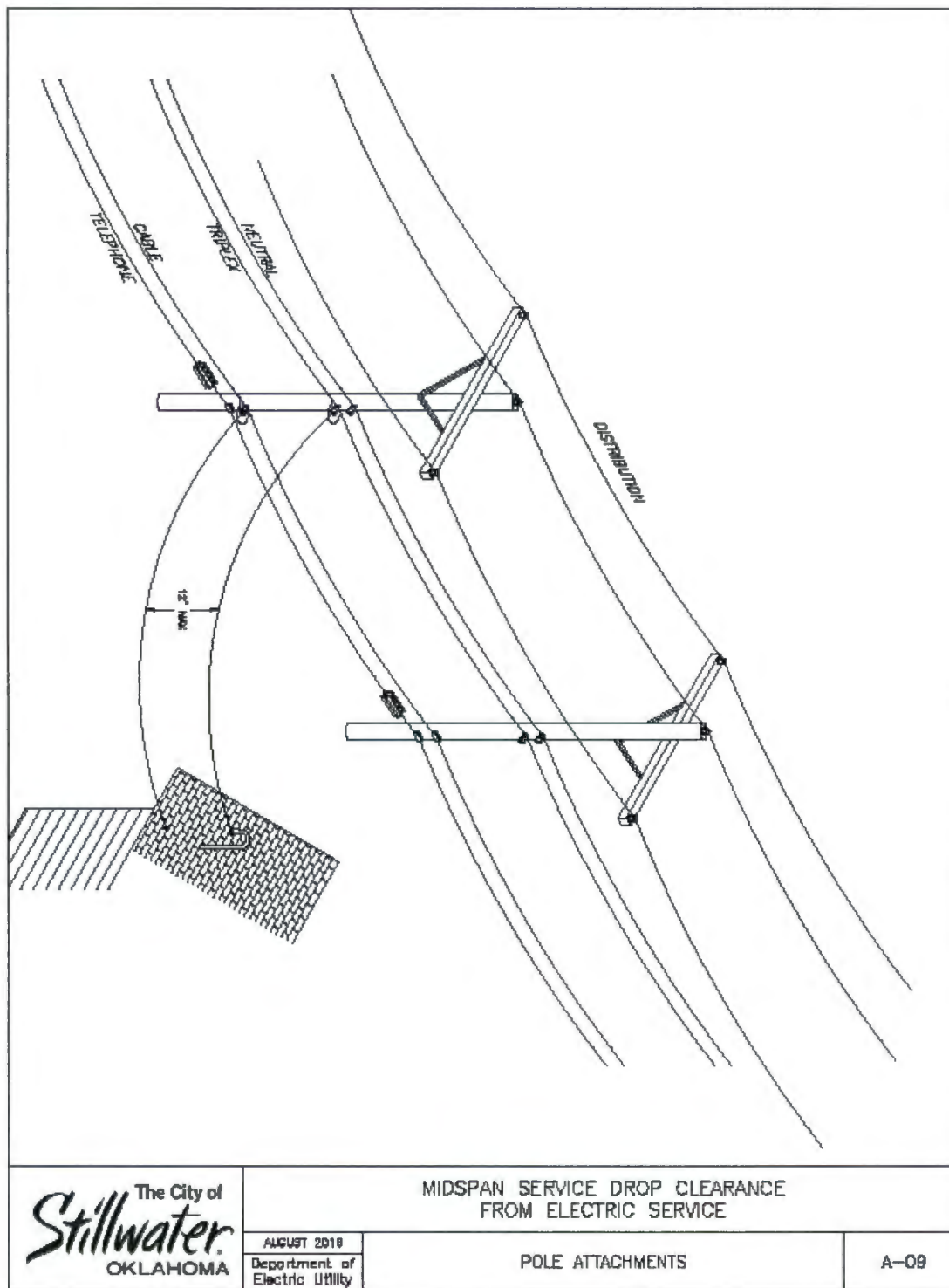
Drawing A-07 — Minimum Clearance at Pole/Midspan from Secondary



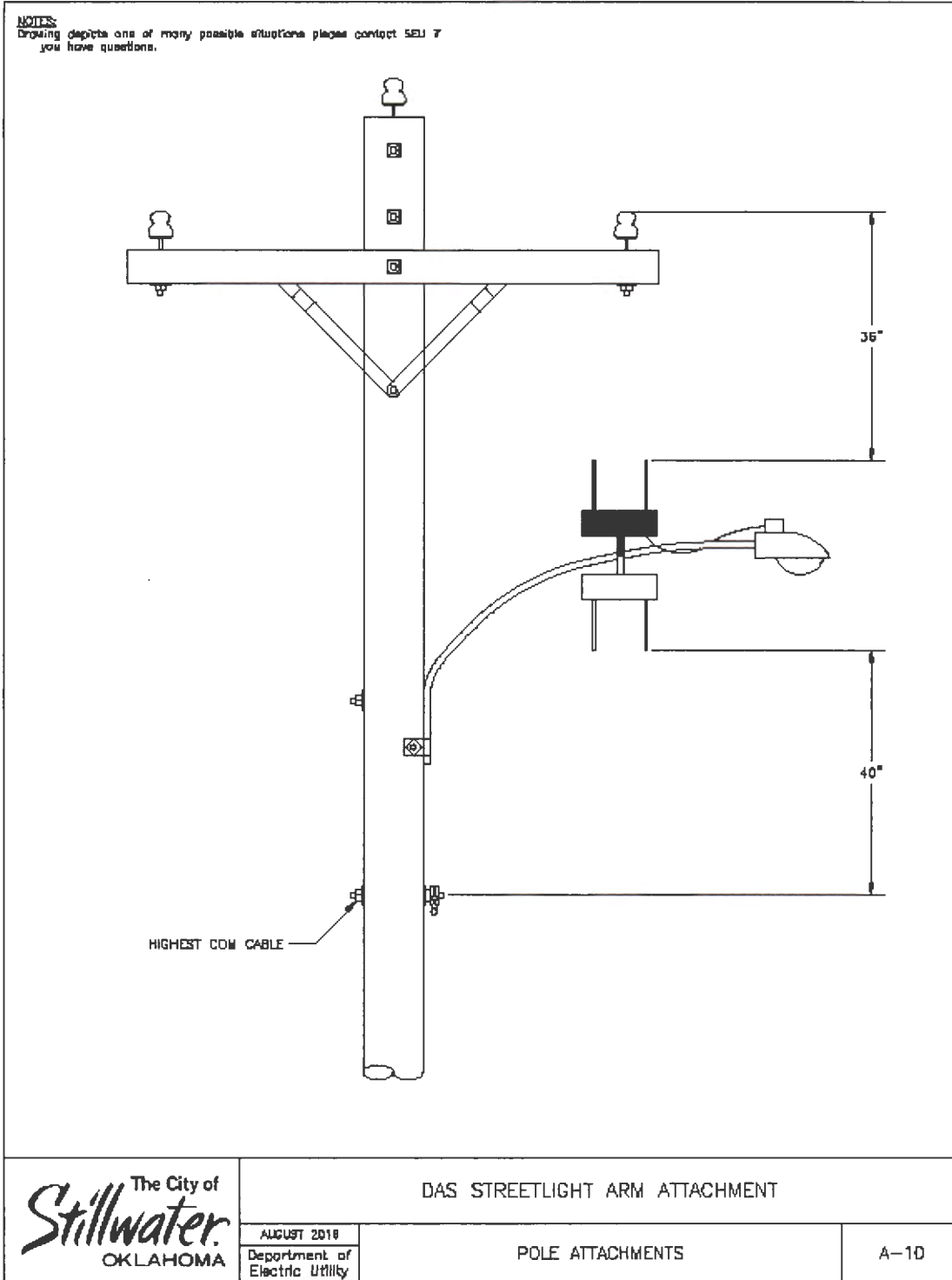
Drawing A-08 — Minimum Clearance at Pole/Midspan from Primary



Drawing A-09 — Midspan Service Drop Clearance from Electric Service



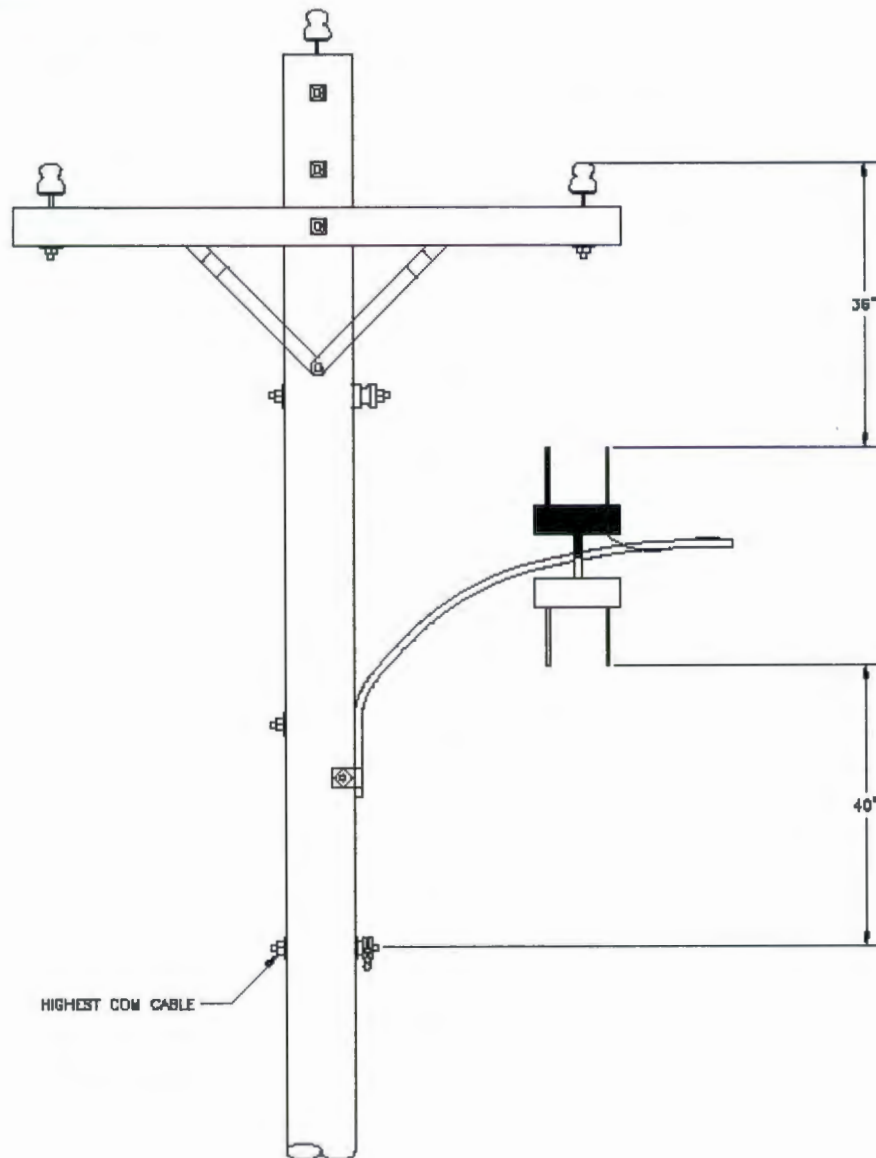
Drawing A-10 — DAS Streetlight Arm Attachment



Drawing A-11 — DAS Bracket Arm Attachment

NOTES

Drawing depicts one of many possible situations please contact SEU if you have questions.



The City of
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OKLAHOMA

DAS BRACKET ARM ATTACHMENT

AUGUST 2018

Department of
Electric Utility

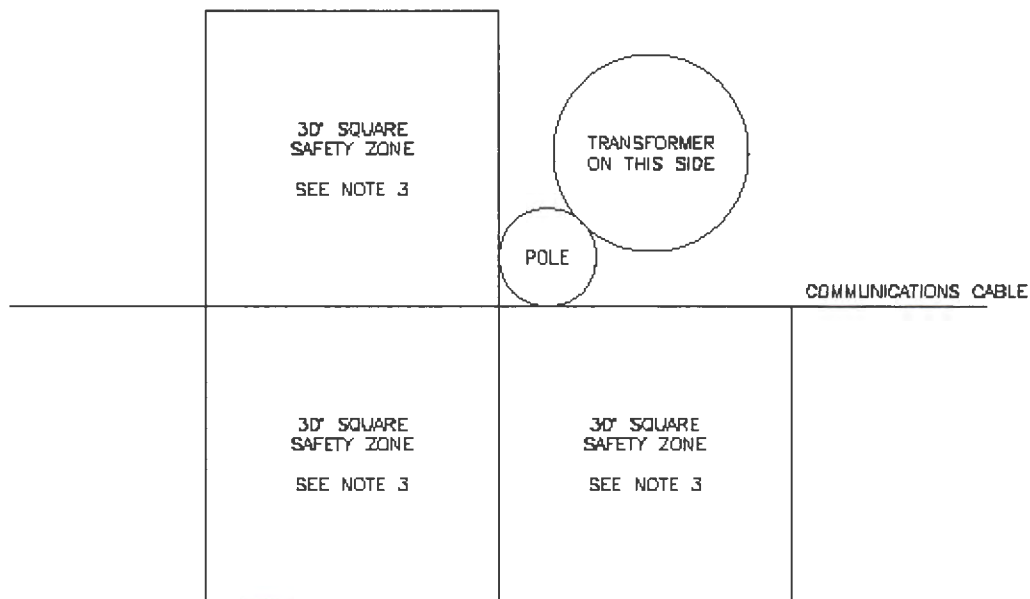
POLE ATTACHMENTS

A-11

Drawing A-12 — Climbing Space Requirements

No communications power supply shall be mounted on poles except by permission of SEU.

Licensee's attachments on utility poles, including metal attachment clamps and lugs, metal cross arm supports, bolts and other equipments, must be attached so as to maintain the minimum separations specified in the NEBC and in these drawings and specifications.



NOTE 1:

1. For new cable installations locate cable on the same side of the pole as SEU's lowest conductor.
2. Standoff brackets to mount cable to pole are not allowed without approval of SEU.
3. Climbing and workspace through the communication spaces shall extend from 40" below the lowest communication cable to the top of the pole.
4. On transformer poles the communication service drops shall be located so that they originate from the messenger on the side of the pole opposite the transformer.
5. Minimum clearances for climbing and working space shall be followed as per NEBC Section 236.

	CLIMBING SPACE REQUIREMENTS		
	AUGUST 2018	POLE ATTACHMENTS	A-12
	Department of Electric Utility		

REPORT TO: STILLWATER UTILITIES AUTHORITY**MEETING DATE: DECEMBER 18, 2023**

Agenda Item:	2.b. SUA-23-67
Previous/Related Action:	CC 23-108 DWSRF Loan Application Resolutions
Background/Issue:	The purpose of this report is to obtain approval for the SUA Chair to sign the Letter of Binding Commitment for the Drinking Water State Revolving Fund (DWSRF) loan in the amount of \$37,000,000.
Proposal/Solution:	July 2023, City Council/SUA Trustees passed resolutions authorizing the application for a DWSRF loan to fund several projects at the water treatment plant including the finished water pump station, recovered water pump station, and chemical improvements. The loan application was filed with the Oklahoma Water Resources Board (OWRB) in July 2023. The next step in the process is loan closing. For the loan closing to occur, the SUA must accept the loan and the SUA Chair must sign the Letter of Binding Commitment. Acceptance of the loan occurs by adoption of Resolution SUA-2023-9 later on the agenda.
Financial Source/Impact:	No additional appropriations are necessary for this action.
Related Strategic Priority:	#1 EFFECTIVE SERVICES & ACCOUNTABLE GOVERNMENT
Recommended Action/Motion:	Motion to authorize the SUA Chair to sign the Letter of Binding Commitment.
Prepared By:	David Barth, Engineering Manager of Water Utilities
Reviewed By:	Candy Staring Patti Osmus
Submitted By:	Kimberly Meek, General Manager

Attachments

1. Stillwater LOBC to SUA 12-18-2023

BINDING COMMITMENT

December 1, 2023

Will Joyce, Chairman
Stillwater Utilities Authority
P.O. Box 1449
Stillwater, Oklahoma 74076

Re: Binding Commitment to Make a Drinking Water State Revolving Fund (DWSRF) Loan for Project No. P40-1021220-05, (Loan No. ORF-21-0001-DW), Drinking Water System Improvements

Dear Chairman Joyce:

We are pleased to inform you that the Oklahoma Water Resources Board (OWRB) has approved your application and concurred in awarding a DWSRF loan to Stillwater Utilities Authority in an amount not to exceed \$37,000,000.00 for the above referenced project. A copy of the November 30, 2023, Order approving your loan application is enclosed.

With the approval of the OWRB and upon your written acceptance of this "Binding Commitment," the State of Oklahoma, through the Department of Environmental Quality (DEQ), will commit to make a loan to the Stillwater Utilities Authority subject to the terms set forth in this letter and additional terms to be prescribed in the Promissory Note, Loan Agreement, and other appropriate loan documents to be executed at or prior to loan closing.

In accepting this "Binding Commitment," the Stillwater Utilities Authority acknowledges that it must agree to the following terms before the loan funds will be advanced:

1. The Stillwater Utilities Authority agrees that this project will be constructed in part with funds directly made available by the U.S. Environmental Protection Agency Capitalization Grant to the State of Oklahoma. As a result the applicant agrees to continue to document compliance with the federal Safe Drinking Water Act and all other federal crosscutting laws and authorities.
2. The Stillwater Utilities Authority agrees that only those items specified on the enclosed DW-043 are eligible for DWSRF funding: \$75,500.00 estimated fees and \$36,924,500.00 estimated project cost but not to exceed the aggregate principal amount of \$37,000,000.00.

BC/Stillwater Utilities Authority
Chairman Joyce
Page 2

3. The Stillwater Utilities Authority agrees that it will accept the "List of Conditions" that will be included in the Loan Agreement. The conditions will include as a minimum:
 - a. Any program requirement identified in this "Binding Commitment" that applies to the loan agreement.
 - b. Federal/State requirements listed in DEQ and OWRB DWSRF regulations.
 - c. The project schedule that has been coordinated with State and Federal enforcement authorities.
 - d. Any Federal, State, or local requirement previously identified that has a significant impact on the project.
 - e. Conditions and mitigative measures identified during the environmental review.
 4. The Stillwater Utilities Authority shall maintain separate Project accounts in accordance with generally accepted accounting standards, including (1) standards relating to the reporting of infrastructure assets and (2) those set forth in the "Standards for Audit of Government Organizations, Programs, Activities and Functions," published by the U.S. Government Accountability Office.
 5. A local trustee bank shall be selected by the borrower and approved by the OWRB before the loan agreement is executed. For a bank to qualify to serve as a local trustee, it must: (a) have a minimum of \$100,000,000.00 in assets; (b) have capital, surplus and undivided profits of at least \$10,000,000.00; (c) have a full-time trust officer; and (d) have previously acted or currently be acting as trustee on similar municipal revenue bond financings. The role of the trustee may include but is not limited to, disbursing loan funds upon requisitions by the borrower, collecting monthly payments from the borrower and making semi-annual loan payments to the OWRB's trustee bank. If the construction of the project is not completed within thirty (30) days prior to the third anniversary of the issuance date of the OWRB Bonds, the role of the trustee bank shall begin at the option of OWRB. The unfunded balance of the Loan may be deposited with the local trustee and disbursements shall be made in accordance with the loan agreement.
 6. Within 15 days after closing, please provide to the OWRB file-stamped copies of each Financing Statement (separate and apart from the copies that will be bound in the transcript we will receive later).
-

BC/Stillwater Utilities Authority
Chairman Joyce
Page 3

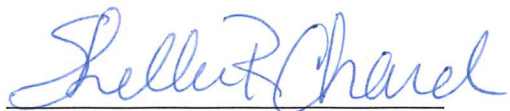
The terms and conditions set forth in the Promissory Note, Loan Agreement, and other loan documents shall be mutually agreed to and approved by the Stillwater Utilities Authority, DEQ, and OWRB or their authorized agents as appropriate before said documents are executed and binding upon the respective parties. The Promissory Note, Series 2023 shall be sufficient to provide funds of \$75,500.00 for estimated fees and \$36,924,500.00 for estimated project cost.

The Stillwater Utilities Authority must complete and submit to OWRB the "Insurance Certification" form to verify that sufficient insurance coverage is carried on the Stillwater Utilities Authority's system and personnel. This form will be sent to the Stillwater Utilities Authority upon project completion and must be returned to OWRB within 30 days of receipt.

As stated in the attached OWRB Order, upon Stillwater Utilities Authority's acceptance of this "Binding Commitment," the funds will be reserved for the Stillwater Utilities Authority until November 30, 2024. Accordingly, this "Binding Commitment" must be accepted by the Stillwater Utilities Authority as soon as possible in order to proceed with the loan closing in a timely fashion.

If the Borrower expends Federal funds in a total amount equal to or greater than \$750,000.00 in any fiscal year of the Borrower, then the Borrower shall complete and submit an annual audit report in accordance with the Revised OMB Guidance (a "Single Audit") and submit a copy thereof to the OWRB and the DEQ within one hundred fifty (150) days after the end of such fiscal year.

DEPARTMENT OF ENVIRONMENTAL QUALITY



Shellie R. Chard, Director
Water Quality Division



Date

ATTEST:



(Signature)



Date

(SEAL)



BC/Stillwater Utilities Authority
Chairman Joyce
Page 4

ACCEPTANCE:

On behalf of the Stillwater Utilities Authority, I, the undersigned, being duly authorized to take such action, do hereby accept and agree to the terms and conditions of this "Binding Commitment." Stillwater Utilities Authority understands that the State's purpose for this "Binding Commitment" is to inform the Stillwater Utilities Authority that the loan has been approved and that the funds for the loan will be reserved for a limited time upon Stillwater Utilities Authority acceptance of the terms of the "Binding Commitment." This "Binding Commitment" also acts as the written loan commitment from the borrower that is required under the Internal Revenue Code section 149(f)(4). Following Stillwater Utilities Authority's acceptance of the "Binding Commitment," the parties will proceed to close the loan in a timely fashion.

Stillwater Utilities Authority

(Signature)
Will Joyce, Chairman
Stillwater Utilities Authority

Date

(Signature)
Teresa Kadavy, Clerk
Stillwater Utilities Authority

Date

ATTEST:

(Signature)

Date

(SEAL)

**Enclosures: OWRB Order
DW-043**

BC/Stillwater Utilities Authority
Chairman Joyce
Page 5

BC Distribution List:

Erika Cooper, P.E.
Carollo Engineers
North Tower
211 N Robinson Ave
OKC, OK 73102

Joe Freeman, Chief, Financial Services Division
Oklahoma Water Resources Board
3800 North Classen Blvd.
Oklahoma City, Oklahoma 73118

REPORT TO: STILLWATER UTILITIES AUTHORITY**MEETING DATE: DECEMBER 18, 2023**

Agenda Item:	2.c. SUA-23-66
Previous/Related Action:	Resolution SUA-2022-9
Background/Issue:	Resolution SUA-2022-9 authorized the application to the Oklahoma Rural Water Resources Board (OWRB) for \$2 million dollars in ARPA grant funds. Conditional grant approval from OWRB was received on January 19, 2023, and full grant approval was received on November 30, 2023.
Proposal/Solution:	It is recommended that SUA Trustees accept the grant award and approve the associated budget amendments.
Financial Source/Impact:	\$2 million for the Recovered Water Pump Station and Finished Water Pump Station Project.
Related Strategic Priority:	#1 EFFECTIVE SERVICES & ACCOUNTABLE GOVERNMENT
Recommended Action/Motion:	Motion to accept \$2 million in ARPA grant funds from OWRB for the Recovered Water Pump Station and Finished Water Pump Station Project and approve the associated budget amendments.
Prepared By:	Shelly Crynes, Grants Manager
Reviewed By:	Christy Cluck Patti Osmus
Submitted By:	Kimberly Meek, General Manager

Attachments

1. SUA-23-66 Attachment OWRB Acceptance Agreement
2. SUA-23-66 Attachment Budget Amends OWRB \$2million

SUA-23-66

**OKLAHOMA WATER RESOURCES BOARD
AMERICAN RESCUE PLAN ACT GRANT AGREEMENT
between Stillwater Utilities Authority, Payne County
and Oklahoma Water Resources Board**

I, Mr. Will Joyce, duly authorized Chairperson of the Stillwater Utilities Authority, Payne County (hereinafter "Recipient"), do hereby accept and acknowledge said grant according to the terms of this American Rescue Plan Act ("ARPA" or the "Act") Grant Agreement.

In accepting said grant, Recipient duly acknowledges and agrees in all regards and respects that the Oklahoma Water Resources Board (the "Board") is a Subrecipient of a grant made available under the Act from the United States Treasury and the Recipient is a secondary subrecipient of such grant and, as such, Recipient must and shall comply with the requirements of all applicable federal and state statutory provisions and all Board rules, regulations and ARPA applicable grant policies including but not limited to: American Rescue Plan Act, Public Law No. 117-2 (March 11, 2021), 2 CFR 200 et seq, local, state and federal labor laws, and other relevant provisions in the list attached hereto as "**Attachment 2**". Without limiting the generality of the foregoing, the applicant agrees as follows:

1. **Description of approved project.** This grant has been approved by the Board for Recipient's project which is to construct a recovered water pump station and a finished water pump station as well as other related expenses (the "Project"), as provided in the Board's Order Approving ARPA Award attached hereto as "**Attachment 1**" and incorporated by reference herein.
2. **Determination of amount of grant and assurance of adequate funding.** The amount of this grant shall not exceed the amount of two million dollars only (\$2,000,000.00). The Recipient shall ensure that adequate funding is in place to complete the Project. In the event that this grant alone, is for any reason insufficient to complete the Project, the Recipient shall obtain or make available and apply other funds (including without limitation, by incurring loans or obtaining other grants) in an aggregate amount necessary to ensure completion of the Project.
3. **Creation and maintenance of separate accounting.** As a prerequisite to receiving grant money from the Board, Recipient shall establish and maintain separate accounting for said ARPA funds in a federally insured account.
4. **Expenditure of money in grant account only for authorized Project purposes.** The Board shall disburse proceeds of the grant to the Recipient only for incurred eligible project costs dated from March 3, 2021 and after in accordance with ARPA procedures. The Recipient shall submit certified requests for disbursement of funds proceeds to the Board on ARP-271 forms. The requests shall be accompanied by such invoices or other documentation as may be required by the Board to demonstrate that such amounts have been incurred by or on behalf of the Recipient for the payment of project costs. Upon

OWRB ARPA Grant Agreement
Grant No. ARP-23-0135-G

approval by the Board Staff, the Board shall provide for disbursement of that portion of the funds to the Recipient in an expeditious and timely manner. The Recipient covenants and agrees that all disbursements of funds received shall be immediately and expeditiously transferred or paid out, as appropriate, for payment of Project costs as specified by the Recipient on the corresponding ARP-271 form. ARPA Grant funds cannot be expended for reimbursement of products or services originally procured with other federal or state grant funds.

5. **Expiration of Approval.** All reimbursement invoices for eligible project activities must be received by the Board by August 31, 2026 unless extended in writing by the Board. If an acceptable reimbursement request is not received on or before August 31, 2026, and there is no notice of extension by the Board then the approval of this grant shall expire, and no further grant funds will be released to Recipient.
6. **De-obligation of unexpended grant money.** Upon completion of the project, the Recipient agrees to provide to the Board with a copy of a certification in such form as is acceptable to the Board regarding completion of the project and quantification of any unexpended funds. Thereafter, the Board will de-obligate any such unexpended funds.
7. **Single Audit.** If a Single Audit is required, Subrecipient will submit a copy of the audit report to the State of Oklahoma within 9 months from the end of Subrecipient's fiscal year. For fiscal years ending on or after December 25, 2015, a Single Audit is required if the subrecipient expends \$750,000 or more in federal assistance during its fiscal year and must be conducted in accordance with 2 CFR Chapter I, Chapter II, Part 200, Subpart F.
8. **Record Retention.** The Recipient agrees to maintain and make available to the State of Oklahoma and/or US Department of Treasury, upon request, all documents, and financial records sufficient to establish compliance with ARPA, including but not limited to those examples of records described in Attachment 2. Recipient shall maintain and retain its financial records, supporting documents, statistical records, and all other records pertinent to this Grant for seven (7) years after all funds have been expended, and longer if any litigation, claims, or audit is started before the end of that seven (7) year period; in which case, records must be retained until all litigation, claims, or audit findings involving the records have been resolved and final action has been taken. If the U.S. Department of Treasury requests transfer of any of Recipient's records to it, Recipient must collect and transmit all required records to Treasury within the time allowed by Treasury in the request and in the format required in section 2 CFR § 200.336 of the Uniform Guidance (as defined in Attachment 2).
9. **Remedies.** In the event of non-compliance, the OWRB has the authority to withhold disbursements of grant funds pending correction of the non-compliance, terminate the grant, recover from the Recipient grant funds expended by the Recipient for anything other than approved Project costs, or other remedies available by law.
10. **SAM.Gov Registration.** Recipient is registered with the U.S System for Award Management (SAM) and confirms that the Data Universal Numbering System (DUNS)

OWRB ARPA Grant Agreement
Grant No. ARP-23-0135-G

number or Unique Entity Identifier (UEI) listed is the correct such number for the Recipient as of the date hereof.

11. **Federal Requirements.** The Recipient may be subject to additional requirements as may be directed by OWRB in accordance with ARPA and associated procedures for implementing provisions of the Act.

In consideration of the Recipient's agreement to these terms and conditions, Recipient has entered and signed this American Rescue Plan Act Grant Agreement this __18th__ day of __December, 2023.

**Stillwater Utilities Authority, Payne
County, Oklahoma**

ATTEST:

By: _____
Mr. Will Joyce, Chairperson

By: _____

Title: _____

(BOARD SEAL)

ATTACHMENT 1

OWRB BOARD ORDER APPROVING AWARD
OF AMERICAN RESCUE PLAN ACT GRANT
[Following pages]

**PLEASE RETAIN THE FOLLOWING
BOARD ORDER FOR YOUR RECORDS**

ATTACHMENT 2

Recipient confirms understanding it is a Recipient of State Fiscal Recovery Funds, and agrees to comply with applicable federal compliance, reporting, and contract requirements, including but not limited to:

FEDERAL LAWS

American Rescue Plan Act, Public Law No. 117-2 (March 11, 2021), as amended.

2 CFR 200 *et seq.* Specific sections include but are not limited to:

- the property standards found in 2 CFR § 200.310 through 2 CFR § 200.316 if applicable,
- the procurement standards found in 2 CFR §200.317 through 2 CFR §200.327
- financial monitoring and reporting requirements found in 2 CFR§ 200.328 to 2 CFR§ 200.330 regarding oversight of information and information collection
- record retention found in Section 2 CFR §200.334 through 2 CFR §200.338
- audit requirements found in Sections 2 CFR §200.500 through 2 CFR §200.520

US Department of Treasury Final Rule, Coronavirus State and Local Fiscal Recovery Funds, 87 Fed. Reg. 4338, January 27, 2022 and all other applicable federal rules, policies, guidance, procedures, and directives including Reporting and Compliance Guidance, as may be amended.

In accordance with 2 CFR 200.501(a), the recipient hereby agrees to obtain a single audit from an independent auditor, if their organization expends \$750,000 or more in total federal funds in their fiscal year.

Uniform Guidance (2 CFR Part 200), including Uniform Administrative Requirements, Cost Principles, and Audit Requirements.

Davis Bacon Act, 40 U.S.C. §3141 and related Regulations for projects \$10 million or over
For projects over \$10 million (based on expected total cost):

a. A recipient may provide a certification that, for the relevant project, all laborers and mechanics employed by contractors and subcontractors in the performance of such project are paid wages at rates not less than those prevailing, as determined by the U.S. Secretary of Labor in accordance with subchapter IV of chapter 31 of title 40, United States Code (commonly known as the "Davis-Bacon Act"), for the corresponding classes of laborers and mechanics employed on projects of a character similar to the contract work in the civil subdivision of the State (or the District of Columbia) in which the work is to be performed, or by the appropriate State entity pursuant to a corollary State prevailing-wage-in-construction law (commonly known as "baby Davis-Bacon Acts"). If such certification is not provided, a recipient must provide a project employment and local impact report detailing:

- The number of employees of contractors and sub-contractors working on the project.
- The number of employees on the project hired directly and hired through a third party.

- The wages and benefits of workers on the project by classification; and whether those wages are at rates less than those prevailing.
- Recipients must maintain sufficient records to substantiate this information upon request.

Applicable US Department of Treasury guidance (as may be amended from time to time).

STATE LAWS

The Oklahoma Competitive Bidding Act of 1974, 61 Okla. Stat. §101 *et seq.*

The Oklahoma Consultant Act 61 Okla. Stat. §60 *et seq.* regarding procurement of engineering and architectural services for the Project.

EXAMPLES OF RECORDS TO BE RETAINED

- a. General ledger and subsidiary ledgers used to account for (a) the receipt of grant payments and (b) the disbursements from such payments to meet eligible expenses
- b. Budget records;
- c. Payroll, time records, human resource records to support costs incurred for payroll expenses related to the Grant.
- d. Receipts of purchases made related to the Grant;
- e. Contracts and subcontracts entered into using grant payments and all documents related to such contracts;
- f. Grant agreements and grant subaward agreements entered into using grant payments and all documents related to such awards;
- g. All documentation of reports, audits, and other monitoring of contractors, including subcontractors, and grant recipient and subrecipients;
- h. All documentation supporting the performance outcomes of contracts, subcontracts, grant awards, and grant recipient subawards;
- i. All internal and external email/electronic communications related to use of grant payments; and
- j. All investigative files and inquiry reports involving grant payments.

Budget Amendment Request

For Budget Year 2024

Department of Finance
723 S. Lewis Street/P.O. Box 1449
Stillwater, OK 74076-1449

Office: 405.372.0025
Web: stillwater.org

Date: 12/07/2023

Department: Finance

Requested by: Christy Cluck **SUA-23-66** ✓

Explanation: Revenue:
Increase revenue projections for award of ARPA grant for water project.

	Account Name	Account Number (xxxxxxx-xxxxx)	Project Number	Current Budget Amount	Amount of Change	New Budget Amount
Increase:	ARPA Grant	9129200 - 43100	23WT02912	\$ 0	\$ 2,000,000	\$ 2,000,000
		-				\$ 0
		-				\$ 0
		-				\$ 0
		-				\$ 0
Decrease:		-				\$ 0
		-				\$ 0
		-				\$ 0
		-				\$ 0
		-				\$ 0

Net Change: (will usually result in a total increase or decrease)

\$ 2,000,000

Reviewed by Department Manager: _____

Date: _____

Reviewed by Finance: Christy Cluck

Date: 12-11-2023

Approved by CMO: _____

Date: _____

Approved by City Council: ☐ Yes ☐ No

Date: _____

Processed by Finance: _____

Date: _____

Set ID: _____

Date Sent to SA&I: _____

--Print on Yellow Paper--



Budget Amendment Request

For Budget Year 2024

Department of Finance
723 S. Lewis Street/P.O. Box 1449
Stillwater, OK 74076-1449

Office: 405.372.0025
Web: stillwater.org

Date: 12/07/2023Department: FinanceRequested by: Christy Cluck544 23-66 ✓

Explanation:

Expenditures:
Appropriate funds for award of ARPA grant for water project.

	Account Name	Account Number (xxxxxxx-xxxxx)	Project Number	Current Budget Amount	Amount of Change	New Budget Amount
Increase:	ARPA Grant	9129216 - 54045	23WT02912	\$ 0	\$ 2,000,000	\$ 2,000,000
		-				\$ 0
		-				\$ 0
		-				\$ 0
		-				\$ 0
Decrease:		-				\$ 0
		-				\$ 0
		-				\$ 0
		-				\$ 0
		-				\$ 0

Net Change: (will usually result in a total increase or decrease)

\$ 2,000,000

Reviewed by Department Manager: _____

Date: _____

Reviewed by Finance: Christy CluckDate: 12-11-2023

Approved by CMO: _____

Date: _____

Approved by City Council: ☐ Yes ☐ No

Date: _____

Processed by Finance: _____

Date: _____

Set ID: _____

Date Sent to SA&I: _____

--Print on Yellow Paper--

IN ACCORDANCE WITH THE OKLAHOMA OPEN MEETING LAW THE AGENDA
WAS POSTED NOVEMBER 30, 2023 AT 4:45 P.M. AT THE MUNICIPAL BUILDING,
723 SOUTH LEWIS, STILLWATER, OKLAHOMA

MINUTES
STILLWATER UTILITIES AUTHORITY
REGULAR MEETING
COUNCIL HEARING ROOM
723 S. LEWIS
DECEMBER 4, 2023

PRESENT: CHAIR WILLIAM H. JOYCE, TRUSTEES CHRISTIE HAWKINS,
KEVIN CLARK AND TIM HARDIN
ABSENT: VICE CHAIR AMY DZIALOWSKI

1. CALL MEETING TO ORDER

Chair Joyce called the meeting to order at 5:57 p.m.

2. CONSENT DOCKET

- a. Approve November 13, 2023 regular meeting minutes
- b. Approve budget amendments reflecting increased revenue projection of \$367,040 and expenditure of \$367,040 related to the Simmons Bank electric service relocation project
- c. Approve budget amendments reflecting receipt and expenditure of insurance proceeds of \$3,395 for Water Utilities vehicle repair
- d. Approve budget amendment increasing revenue projections for a transfer of \$250,000 from Stillwater Economic Development Authority (SEDA) to Stillwater Utilities Authority (SUA) to cover Lakeview Landing financing provided to the developer through a loan from SUA to SEDA
- e. Approve budget amendment decreasing transfers of \$5,750,000 from Stillwater Utilities Authority to Stillwater Economic Development Authority for the Lakeview Landing agreement, which is being terminated

MOTION BY TRUSTEE HAWKINS, SECOND BY TRUSTEE HARDIN TO APPROVE THE CONSENT DOCKET AS PRESENTED.

ROLL CALL VOTE: JOYCE-YEA, HAWKINS-YEA, CLARK-YEA, HARDIN-YEA.
NAY-NONE. MOTION CARRIED WITH FOUR YEA VOTES.

3. PUBLIC COMMENT ON AGENDA ITEMS NOT SCHEDULED FOR PUBLIC HEARING

There were no requests to speak on agenda items not scheduled for public hearing.

4. ITEMS REMOVED FROM CONSENT DOCKET

None.

5. GENERAL ORDERS

- a. Approve budget amendment allocating \$630,000 for the increase in the cost of chemicals used at the Water Treatment Plant

Assistant City Manager Brady Moore reported that due to continued increases in chemical costs, and the adoption of the FY23 budget for FY24 as recommended for all departments by the Fiscal Advisory Committee, the FY24 Water Treatment Plant chemicals account does not contain adequate funding for the remainder of the fiscal year. Mr. Moore stated that previous action included approval of a budget amendment on March 20, 2023, allocating \$210,000 in additional funds.

MOTION BY TRUSTEE HAWKINS, SECOND BY TRUSTEE CLARK TO APPROVE A BUDGET AMENDMENT INCREASING THE WATER TREATMENT PLANT BUDGET BY \$630,000 FOR INCREASED CHEMICAL COSTS.

ROLL CALL VOTE: JOYCE-YEA, HAWKINS-YEA, CLARK-YEA, HARDIN-YEA.
NAY-NONE. MOTION CARRIED WITH FOUR YEA VOTES.

6. QUESTIONS & INQUIRIES

None.

7. REPORTS FROM OFFICERS & BOARDS

- a. Miscellaneous items from the General Counsel: No report.
- b. Miscellaneous items from the General Manager: No report.
- c. Miscellaneous items from Trustees: No report.
 - i) Discussion about scheduling items for upcoming meetings

8. ADJOURN

MOTION BY TRUSTEE CLARK, SECOND BY TRUSTEE HAWKINS TO ADJOURN THE DECEMBER 4, 2023 REGULAR MEETING OF THE STILLWATER UTILITIES AUTHORITY.

ROLL CALL VOTE: JOYCE-YEA, HAWKINS-YEA, CLARK-YEA, HARDIN-YEA.
NAY-NONE. MOTION CARRIED WITH FOUR YEA VOTES.

The December 4, 2023 regular meeting of the Stillwater Utilities Authority adjourned at 6:02 p.m.

WILLIAM H. JOYCE, CHAIR
STILLWATER UTILITIES AUTHORITY

TERESA KADAVY, SECRETARY
STILLWATER UTILITIES AUTHORITY

Report to Stillwater Utilities Authority
Sept. 15, 2023
Semi-Annual Report for 2023
(January - June)

Prepared by: Robert H. Sitton, Jr., Chairman
Stillwater Rural Water Advisory Board
Printed: Sept. 20, 2023

Report #30

Purpose:

The purpose of the Stillwater Rural Water Advisory Board, as stated in the Ordinance of Establishment is to advise and make recommendations to the City Council on matters pertaining to operation and maintenance of rural water systems operated and/or maintained by the City of Stillwater thru the Stillwater Utility Authority.

Meeting Information:

Normal meeting time for Stillwater Rural Water Advisory Board (SRWAB) is on the third Thursday quarterly at 12:00 noon. Four times a year, generally in January, April, July and October. Our calendar is posted. The meetings are open and I invite any of you to come.

Membership:

Current Members of SRWAB are made up of the Payne County Rural Water Corp. #3 Board Members. This board reduces it's number of board members from 7 to 5 at the annual meeting, September 28, 2017. Below is our current board.

Robert H. Sitton, Jr. Chairman	5717 W. Deanita Ln. Stillwater, OK 74075 Home (405)377-9555 Cell (405)612-5777	Term expires 2025 E-Mail sittonjrrobert@aol.com
J. Bryce Campbell Vice-Chairman	3309 Timberlake Dr. Stillwater, OK 74075 Home (405)747-0002	Term expires 2024 E-Mail jbrycecampbell@gmail.com
Danny Wick	2918 N. Country Club Rd. Stillwater, OK 74075 Cell (405)747-7884	Term expires 2023 E-Mail dannywick@ymail.com
Kent Bradley	3025 S. Isabell Pointe Dr. Stillwater, OK 74074 Home (405)372-7590 Cell (405)612-7920	Term expires 2024 E-Mail kentbradley@bcdco.us

Stephen Mayo

5421 W. Airport Rd.
Stillwater, OK 74075
Cell (405)762-0952

Term expires 2025

E-Mail Stephen.M.Mayo@gmail.com

Report Sections:

1. **Health of the System**

General Comments: The city staff has not been providing any information to our board, so it is hard to report to the SUA about the Health of the System. We are having a hard time trying to fulfill our responsibilities without the staff cooperation. I am providing attachments for the current SUA to understand why they are dealing with this Rural Water Advisory Board.

- Attachment 1. Payne County Rural Water Corp. #3 History
- Attachment 2. City Reports to SRWAB
- Attachment 3. Stillwater Water Plant Visit on 22 June 2023

2. **Activities related to the PCRWC#3 area**

Improvements: Those items listed in Amended Exhibit C of the agreement between City of Stillwater and Payne County Rural Water Corporation #3, which was accepted September 16, 2010.

- Attachment 4. Status of Projects Affecting Former PCRWC#3

Studies -

- a. **Yost Road Booster Pump Station Improvement Project Report** was presented to SRWAB July 18, 2013 by Mary Elizabeth Mach from Garver Engineers. The city has not moved any further on this project.
- b. **Water 2040** Package B has been completed.

3. **Awareness Items to Stillwater Utility Authority**

- a. **Yost Lake Pump Station**-The water department has done the studies and knows that there is a need to upgrade the Yost Lake Pump Station, that is on the Amended

Exhibit C, #12. The water department has put a moratorium on the Yost Zone, which is North-west of Western and Lakeview. Since this project has not moved forward, there has not been any meters approved to install, since water volume and pressure is an issue.

- b. **Flushing dead End Lines.** The water department had a schedule to flush the water system's dead end lines.

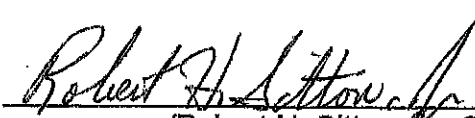
4. **General comments to Stillwater Utility Authority**

Comments from rural customers –We continue to get comments from customers in the rural water service area about their appreciation for the service they are receiving from the employees of the City of Stillwater. We are getting more and more complaints from customers in the Yost Pressure Zone as to low pressure. Future customers have visited with our board members on how to get a meter and we have to let them know that "We as a Board" feel that the current SUA is not forward thinking to improve the Yost Pressure Zone to add a long term revenue stream. We, as a board, are hoping that the current SUA members will view this project as did the previous SUA members did on the 2040 Water Plan. 2040 Water Plan was a futuristic plan and the city was able to complete Phase 1 and Phase 2 ahead of schedule and below budget. This current SUA board should complete Phase 3 of the 2040 plan and prove our current members that this board is futuristic and also willing to address today's problems.

5. **Recommendations to the Stillwater Utility Authority**

- a. **Approve** city staff to start providing the Stillwater Rural Water Advisory Board with the reports that were provided when the board first meet 9/6/2007 and the additional reports that were added 4/20/2014.
- b. **Approve** the work to upgrade the Yost Pump Station and get it in motion so the property owners in the Yost Pressure Zone can get water meters.
- c. **Follow-up** with the water department to insure that the rural water lines are being flushed on the State recommended schedule.
- d. **Follow-up** with the water department to insure that the Exhibit C is being worked on.
- e. **Start planning** on completing Phase 3 of the Water 2040 Plan.

Respectfully submitted,


s/Robert H. Sittton, Jr. Chairman

Attachment #1

Payne County Rural Water Corp. #3

History

As told to by:

Jerald Gammill-He started the corp by doing all the filing with the Federal Government. He acquired the customers and the funding to provide water to them.

Raleigh Jobes-Long time board member and the board member that negotiated the sale to the City of Stillwater.

Purpose of the water system:

The system was to service the rural people. It was estimated that the average farm household used less than 2,500 gallons per month. The water was to be used for people and livestock.

Operations of the Corp.:

1968-The Federal Govt. appropriated money to install Rural Water Systems. Payne County Rural Water Corp. #3 was established and a person was hired to sell memberships. Once enough customers were sold a membership into the corp. a contractor started installing lines and meters. The meters were installed for a fee. Federal money was acquired to purchase pipe and install. The first bill went out Nov. 1969 with 43 customers. A water line was connected to the OSU water treatment plant and Corp. #3 purchased it at a whole sale price. More customers wanted water so more money was acquired from the Federal government. Water lines, pumping stations and water towers were installed to service the customers. Payne County Rural Water Corp. #3 did not have any boundaries. They could install water lines and meters to people that request it. A water line was installed from the OSU water treatment plant to our newly installed lines. Since OSU got their water from Lake Carl Blackwell and the lake was within the Corp. #3 operating area, Corp. #3 obtained water rights to Lake Carl Blackwell.

1972-Rural people east of Stillwater established 51-East Corp.

1973-Rural people south of Stillwater established Payne County Rural Water District #3. They drew their boundaries into Corp. #3 area where Corp. #3 was already suppling water to these customers. There was an agreement between Corp. #3 and District #3 to allow this to work, since District #3 did not have water lines in the area.

1970's - 2005-During this time of expansion, the City of Stillwater started looking for another source of water. They had also been purchasing their water from OSU. They helped to built Lake McMurtry, which was to be used as a water source. It did not fill up in a timely manner to achieve that. Soon after they started talks with Ponca City about Kaw Lake. A 36" water line was installed from Kaw Lake to Yost Road, just west of 177. Stillwater built the existing water treatment plant. To help the city with the expenses, the Payne County Rural Water Corp. #3 started purchasing water from the plant at a whole sale price. This gave the City of Stillwater an income stream from Corp. #3. The City of Stillwater acquired District #1, which is north of the Yost Water Treatment Plant. They had been selling water to them on a whole and with their acquisition, all their customers became the city's customers. This moved District #1 from a whole sale purchaser to retail customers for the city.

Attachment #1
Payne County Rural Water Corp. #3
History

Payne County Rural Water Corp. #3 expand to 5 pump stations and 7 water towers. They were servicing over 1100 customers at the time of acquisition.

2006-The chairman of Payne County Rural Water Corp. #3 was approach by the City of Stillwater Manager, Dan Gallaway. They started talks about the City of Stillwater acquiring Payne County Rural Water Corp. #3. Within the talks, the city would issue certificates to each owner of the water meters in the Corp. #3 area. Those certificates were turned into the city with the city issuing a check for \$1000. to each one turned in. This amount of \$1000. was to purchase the membership and that would allow the city to own the meters, water lines, pump stations and water towers. Within the acquisition Corp. #3 office/shop could be rented to the city. This allowed the Corp. to reorganize into a non working corp, designed to advise and make recommendations to the City Council on matters pertaining to the operation and maintenance of the Corp. #3 system. Within the acquisition, the city created the Rural Water Advisory Board for the Corp. #3 board members to meet and fulfill the reasons of the new reorganized Corp. #3. The city did not need to rent the Corp. #3 office/shop, so Corp. #3 put it on the market to sell. It sold and the money is being managed by the existing Corp. #3 board members.

Acquisition was completed March 1, 2007. A city ordinance was pasts Aug. 2007 to create the Stillwater Rural Water Advisory Board. The first Stillwater Rural Water Advisory Board meeting was 9/6/2007.

Reasons for the city to acquire Payne County Rural Water Corp. #3:

1. The City of Stillwater had already purchased District #1.
2. The City of Stillwater was wanting to become a Regional Water Provider.
3. The City of Stillwater was already proving water to Corp. #3 at a whole sale price. They could have a better income stream, since they would sell water at retail.
4. The City of Stillwater would acquire the water rights that Corp. #3 had. They were to be updated at certain times. The city did not do that so they presently do not have those rights to Lake Carl Blackwell. This happened in 2011, in a letter from Bob Sandbo (Oklahoma Water Resources Board)
5. The City of Stillwater was looking into annexation and the purchase of this water corp. would be one step in the many to annex more land and people into the city. Master Annexation Plan was adopted Sept. 22, 2008

Attachment #2
City Reports to SRWAB

Robert H Sitton, Jr.
City of Stillwater
Rural Water Advisory Board
Chairman

Sept. 15, 2023

City of Stillwater Staff,

We were established Aug. 2007 to meet with city staff thru a city ordinance. I have added what the city has on its website.

Rural Water Advisory Board

The Rural Water Advisory Board consists of five members who during the term of service on the board are account holders residing in the geographical area located outside the corporate limits of the City of Stillwater and / or Stillwater Utilities Authority. Board members shall be nominated annually by account holders residing within the geographical area of the former rural water provider or providers represented on the board. The board shall advise and make recommendations to the City Council on matters pertaining to operation and maintenance of rural water systems operated and / or maintained by the City of Stillwater or Stillwater Utilities Authority.

Current Members		
Kent Bradley	Stephen Mayo	Robert Sitton
Bryce Campbell	Danny Wick	

The above Rural Water Advisory Board are made up of board members of the Payne Country Rural Water Corp. #3. We are a working Corporation with the State of Oklahoma to actively participate in the City of Stillwater Rural Water Advisory Board. The previous chairman of this board had requested basic information from the city so as this board could monitor what is happening within the system. The information that was provided at the first board meeting 9/6/2007 was:

Each one of the following reports were to be provided by the month.

1. Total Gallons Distributed to the #3 area
2. Total Gallons Billed to #3 Customers
3. Number of Active Customers in the #3 area
4. Number of New Customers in the #3 area
5. Number of Meter Requests in the #3 area
6. Number of Meters Installed in the #3 area.

These reports have been provided by a city staffers making the necessary calls to have IT, Customer Service or Water Service Department provide the numbers. Susan Hall was the "Water Resources Administrative Assistant" and she would make those calls or emails for those requests.

7. In 2014, I had requested to Add the Number of Hydrant Flushings done within #3 area. First report was started 4/20/2014.

Attachment #2

City Reports to SRWAB

All of these reports were given to the board when we had our meetings. While the city was mapping the system and taking it over, the board was having monthly meetings. Most of the problems of the systems were ironed out so this board went to meeting quarterly. During this time Anthony Daniel was the Water Utilities Director and he made sure that the board was provided the above reports. Anthony Daniel left in 2013.

Bill Millis replaced him as Acting Water Utilities Director.

In 2014, I had requested to Add the Number of Hydrant Flushing done within #3 area. First report was started 4/20/2014.

The above reports were provided without fail until the Oct. 19, 2017 meeting. Bill Millis asked Brandon Neal to prepare an "Unaccounted For Water Worksheet". Bill is wanting to report for the water loss instead of it being in the report to the SUA, which is Attachment #1, since the first report. That report was done regularly by Brandon Neal. We did not ask for this report, Bill Millis wanted it. That report was halted when Brandon Neal left the city staff.

April 16, 2020, the City of Stillwater cancelled our meetings due to the "Pandemic". Susan Hall left the city staff during the "Pandemic".

Jan. 21, 2021 was our first attended meeting after the "Pandemic". Cindy Gibson "Manager of Administrative Services" became our city staffer to post the meetings and provide the board with the agenda and minutes. I informed her as to what reports was needed for our board. Some was provided at times, thru Bill Millis.

April 21, 2022, Bill Millis provided the monthly report from the Crew Accomplishments Report. This provided me with Water Main Breaks, Service Line Leaks, Mains Flushed, Hydrants Flushed, Hydrant Meter -Set, Moves or Picked up, Meters Set, Low Pressure # of calls, Turn On/Off and the # of Lead/Copper Samples taken. This report gave me the numbers Meters Installed and Hydrant Flushed. This is a city internal report that is already being used. I am sure that all of the reports that has been used for our board are all reports that the city as already setup to use.

I, Robert Sitton, am requesting that the above 1. - 7. reports resume to be furnished to the Rural Water Advisory Board, so we can fulfill our duty to "advise and make recommendations to the City Council on matters pertaining to operation and maintenance of rural water systems operated and/or maintained by the City of Stillwater or Stillwater Utilities Authority."

Robert H., Sitton, Jr.
Chairman

Attachment #3

Stillwater Water Plant Visit on 22 June 2023

Stephen Mayo

Introduction

This note is to document the visit of Stephen Mayo and Robert Sitton to the Stillwater Water Plant to understand the limitations of the City of Stillwater to provide water to Payne County Rural Water Corporation #3. Stephen Mayo and Robert Sitton were escorted through the visit by James Driskel and Tom Ventris. James is the Water Utilities Director for the City of Stillwater. Tom is the Instrument and Controls Specialist for the water plant. The plant is located about ¼ mile west of the intersection of Yost Road and the US 177 North of Stillwater.

Process Flow

The City of Stillwater receives water primarily from Kaw reservoir near Ponca City. Kaw Lake is currently the sole water source. The City is working to add a waterline and pump station to utilize McMurtry Lake as a secondary source/terminal storage for raw water. Water comes into a large reservoir tank. The first process step is to remove suspended solids from the incoming water/soften the water. Lime is added to soften the water polymer flocculants are added to remove the solids. The pH is also adjusted to aid in removal of the solids. The plant is certified and capable of producing 18 million gallons per day, but current peak demands have only required about 12 million gallons per day. The current throughput is 6 million gallons per day. The observed 6 million gallons per day was about 33% of plant capacity.

Solids come out the bottom of each of these three trains and go to evaporation ponds (lagoons) in a water suspension. The evaporation ponds are where the solids settle out of suspension. Some of the water is recycled to the inlet of the plant, however, this is limited by the Oklahoma Department of Environmental Quality to 10% of the flow of water. Solids from the evaporation ponds are periodically cleaned out and deposited on to approved farms for disposal.

Water is recombined from each of the three trains to go through biological treatment. Biological treatment in this case means that the water is treated chemically to ensure the microbes are reduced with chemical agents sufficient for human consumption. Stillwater treats the water initially with ozone. The ozone is created from purchased oxygen. The liquid oxygen is stored on-site vaporized and is reacted to make the ozone. The pH is also adjusted after the streams are combined with carbon dioxide before filters that remove the final bit of solids.

After the ozone treatment, the water is also treated with chlorine and ammonia which combine to form chloramines. Chloramines is the secondary disinfection for the water distribution system. There are minimum and maximum requirements for this chlorine/ammonia treatment.

Payne County Rural Water Corporation #3 Water

Rural Water Corporation #3 Receives a slip stream of water after the treatment with chlorine / ammonia. The limiting step of this flow volume is the provision of two pumps powered by two 7.5 hp electrical motors. The water line to and from these pumps is four inches; however, within the pump installation there is a variety of piping sizes, with most being 3 inches. The flow volume currently to Rural Water Corporation #3 is about 0.45 million gallons per day.

Attachment #3

The pumps that deliver the water are limited by the power of the pump motors and the capacity of the pumps. The pump discharge has been throttled to reduce the power. The pump motors have burned up before this throttling procedure was performed. Additionally, the electrical meter providing power to the pumps is sometimes limited. The meter is a 100 amp meter and sometimes the power for the pumps has tripped because this limit has been reached. The group discussed at length the changing of this meter and trip to a 200 amp meter and trip to alleviate this potential bottleneck.

Power comes from a nearby Central Rural Electrical Cooperative (CREC) substation. The line transporting the electricity by the pump appears to be able to supply the additional power that an additional 100 amp would require; however, this needs further investigation with CREC. cursory inspection to debottleneck the electrical power supply would indicate only a meter and possible transformer replacement may be required to supply the additional electrical power. CREC has communicated with Stillwater and said the meter could be upgraded to 200 amp.

The next step in the process of delivery of water to Payne County Rural Corporation #3 is a water tower. This water tower is 80 feet tall and 12 feet in diameter. This water tower is located about 1 mile away from the pumps that feed it. Water comes into the water tower at the bottom. The water tower has an overflow pipe that comes from the top of the tower and will relieve at ground level. The height of this tower provides the maximum pressure to the Rural Water Corporation #3 water. Even with the current height of 80 feet, the low-pressure areas of Payne County Rural Corporation #3 would still be near the limit of 25 psig in most simulations. This limit of 25 psig is a requirement of Oklahoma Department of Environmental Quality to ensure the water remains safe to drink. To alleviate the pressure bottleneck to the Rural Water Corporation #3 supply system, the height of this tower would need to increase.

There are two other water towers in the system. Both of these water towers are out of service. One water tower is within sight of the in service water tower and is fully functional; however, this tower adds too much volume to the current system for water aging concerns. The other out of service water tower needs to be repaired. There have been problems with the land owner on which the out of service water tower is located. The same problems with water aging accompany this tower so repair has not been a priority.

Summary

The Payne County Rural Water Corporation #3 is a small fraction of the overall capacity of the Stillwater Water Plant capacity; however, there are identifiable bottlenecks in the delivery of water to the system. These bottlenecks are as follows:

1. Delivery of electrical power - The delivery of electrical power is near a limit for providing more flow to the Payne County Rural Water Corporation #3 system. This appears like an easy upgrade; however, this needs investigation.
2. Pump Electrical Supply - There appears to be short term and long-term power supply considerations for pumping supply. Probably increasing the power meter to supply 200 amp to the current location would avoid a pump trip.
3. Pump Capacity - The pumps are near limitations for supply of the water for current and future supply needs. There also appears to be a mismatch between the pump capacity and the pump driver. Investigation is required to ensure both driver and pumps are adequate.

Attachment #3

4. **Pump Driver Capacity** - The pump drivers appear to be inadequate for the short term to supply water with the existing pump capacity. Longer term, the pump driver needs to be commensurate with the long-term water supply needs.
5. **Water Tower Height** - Increasing the water tower height is necessary to provide water pressure that exceeds 25 psig in the highest points in the system.

Restrictions in the distribution system were not evaluated during this visit.

Attachment #4

Status of Projects Affecting Former PCRWC#3 (Amended Exhibit C and Other Projects)

Phase 1 – Items to be completed July 1, 2011 thru June 30, 2013

#1 - Hilltop Booster Pump Station

Project Description: Replace all piping in the vault of the lift station. Install second pump and refurbish electrical controls. Shown as Item 3a in Proposed Water Utilities General Capital Projects.

Status: Completed 2012 - Will be Abandoned with Water2040.

#2 - Various Locations

Project Description: Install flush/fire hydrants at locations to be determined by field operations personnel. Shown as Item 3b in Proposed Water Utilities General Capital Projects.

Status: Completed 2013

#3 - Country Club between 37th and 44th (map #01-31)

Project Description: Install 650 feet of 4" line. Shown as Item 3c in Proposed Water Utilities General Capital Projects.

Status: Phase 1 was completed in fall of 2016. Phase 2 is currently out to bid.

#4 - Vicinity of 19th - Location TBD

Project Description: Install chlorine injection facility to boost chlorine residual in the system. Shown as Item 3d in Proposed Water Utilities General Capital Projects.

Status: The City will address system wide chlorine residuals in its water quality study and master plan, currently in design.

#5 - OSU Plant

Project Description: Remove meter, abandon 3,000 feet of 10" line.

Status: Completed 2009

#6 - 44th and Country Club

Project Description: Install three cross-connections between parallel 4" pipes on 44th.

Status: Completed 2011

#11 - Hidden Oaks

Project Description: Install Booster Pump Station - 2 pumps, 3hp- at intersection of Hidden Oaks and 19th (annexed into the City Limits).

Status: Completed temporary pump station located on Range Road serving Hidden Oaks and Boulder Creek. Water2040 improvements will address long term needs in this area.

#13 - Nottingham Tower and Pump Station

Project Description: Add 20 feet to standpipe and build new pump station at Cottonwood and 19th, 2 pumps - 200 GPM at 100ft of head (approx. 10hp). Shown as Item 3a in Proposed Water Utilities General Capital Projects.

Status: The 44th Tower and Range BPS will replace Nottingham Tower and Pump Station.

#14 - Karsten Area

Project Description: Extend waterline to Fire Academy to improve water quality - Install 400 LF of 6" line. Shown as Item 3f in Proposed Water Utilities General Capital Projects.

Status: The City will look at the system requirements in this area in its water quality study and master plan, currently in design.

#17 - Bilyeu Tower

Project Description: Take out of service and remove. Relocate to property on Vista Drive. Install 650 feet of 6" line to connect to system and altitude valve. Shown as Item 3g in Proposed Water Utilities General Capital Projects.

Status: Bilyeu Tower has been taken out of service, and will be removed. Water pressure on Vista Lane is being addressed via Water2040 improvements.

#18 - Range Road Pump Station

Project Description: Demolish

Status: Completed 2009

#24 - School, Nottingham, Twin (2), Tan-Tar-A, Coyle Towers

Project Description: Remove altitude valves or install bypass so that tank floats on system.

Status: Completed 2012

#25 - Redlands Rd between SH51 and Lakeview

Project Description: Cap off 2.5" near Redland/Airport, connect 2.5" going north to T of 4"/3", move 5 individual services to 4", move connects for 2.5" pipes on W 2nd and W Virginia to the 4" line. Shown as Item 3b in Proposed Water Utilities General Capital Projects.

Status: Completed 2012

Phase 2 – Items to be completed July 1, 2011 thru June 30, 2015

#7 - Lakeview between Redland and Cottonwood

Project Description: Install ½ mile of 4" line on Lakeview to complete the loop.

Status: Delayed due to additional projects (ODOT projects and Yost Pump Station and Yost Tower).

#12 - Yost Booster Pump Station and School Tower

Project Description: Added: To replace #14, since this is needed now. Relocate and rebuild the pump station. It continues to flood during heavy rains. Add 20 feet to School Tower standpipe.

Status: Project currently in design phase. Pump station will be constructed at WTP and a new elevated storage tank will replace School and Reisbeck Towers.

#27 - 19th between Range and Country Club

Project Description: Connect dead ends with 600 LF of 3" line, including a creek crossing and bore under the road, install a flush hydrant.

Status: **Completed 2010.** Abandoned approximately 1 mile of small diameter water line and made connections between the rural and municipal systems to eliminate the dead end.

#32 - Lakeview Rd between Country Club Rd and Range Rd

Project Description: Install about 5300 LF of 6" line to connect 8" line at Country Club Rd and 6" line at Range Rd.

Status: Delayed due to additional projects (ODOT projects and Yost Pump Station and Yost Tower).

Phase 3 – Items to be completed July 1, 2011 thru June 30, 2017

#8 - Sangre ½ mile north of 44th

Project Description: Install master meter to City system and ½ mile of 6" pipe between meter and 44th.

Status: On hold - To be addressed by Water2040 Projects

#9 - Karsten Road south of SH51

Project Description: Install 130 feet of 6" pipe to loop 3".

Status: Delayed due to additional projects (ODOT projects and Yost Pump Station and Yost Tower).

#10 - Western between 56th and 44th

Project Description: Install 1300 feet of 6" pipe to connect new tower at 56th to water line on Western.

Status: **Completed as 18" water line in 2016.**

#15 - 44th and Country Club - Boersma Pump Station

Project Description: Add VFDs, controller and telemetry to Boersma Pump Station.

Status: **Replaced the entire pump station in 2012.**

#16 - White Tower

Project Description: Remove

Status: Completed 2017

#19 - OSU Pump Station

Project Description: Take out of service, install 7,600 feet of 4" pipe connected to OSU Farm with existing 2.5" pipe on 44th between Hackelman Rd and Karsten Creek Rd.

Status: Delayed due to additional projects (ODOT projects and Yost Pump Station and Yost Tower).

#20 - Booster Pump Stations

Project Description: Connect to WTP SCADA system to monitor

Status: SCADA installed at Boersma and Yost Pump Stations in 2012. Range and Nottingham stations will be demolished. Karsten, Hilltop and OSU stations delayed due to additional projects (ODOT projects and Yost Pump Station and Yost Tower). A future SCADA Master Plan is currently on the City's Capital project list and will address the SCADA needs for each site.

#21 - Eight Standpipes

Project Description: Install 8 foot security fence along perimeter of easement.

Status: Tan-Tar-A, Coyle, and Reisbeck are complete. School/Yost standpipe will be replaced with the Yost Tower Project, and the Twin Towers will be replaced with the 44th Tower. White, Nottingham and Bilyeu standpipes will be demolished.

#22 - Eight Standpipes

Project Description: Add diffusers/mixing systems.

Status: Mixing system installed at Tan-Tar-A Tower in 2017. Mixing system for Coyle Standpipe is delayed pending trial period at Tan-Tar-A Tower. Reisbeck and Bilyeu standpipes will be demolished. Yost standpipe will be replaced with the Yost Tower project, which will be designed with separate in/out feeds for effective mixing. Twin Towers will be demolished and replaced with 44th Tower, which is designed with separate in/out feeds for effective mixing.

#23 - Eight Standpipes

Project Description: Connect to WTP SCADA system to monitor

Status: Coyle and Tan-Tar-A SCADA is delayed due to additional projects (ODOT Projects and Yost Pump Station and Yost Tower). Reisbeck and Bilyeu Standpipes will be demolished. Yost standpipe will be replaced with the Yost Tower project, which will be connected to

SCADA. Twin Towers will be demolished and replaced with 44th Tower, which will be connected to SCADA.

#26 - Country Club Rd between 6th and McElroy

Project Description: Install 3500 LF of 6" line between end of City line on Country Club and RWC #3 line north of creek.

Status: Completed 2015

#28 - Woodlake Subdivision

Project Description: Install 350 feet of fusible PVC along the dam to cross the lake.

Status: Completed 2012

#29 - Karsten Creek, Hilltop Pump Station

Project Description: Install VFDs, controls and telemetry; add equipment to communicate with SCADA system at WTP.

Status: Karsten Creek Pump Station delayed due to additional projects (ODOT projects and Yost Pump Station and Yost Tower). Hilltop Pump Station to be demolished.

#30 - Tan-Tar-A Subdivision

Project Description: Install 1200 feet of 4" pipe to complete a loop to the Tan-Tar-A Subdivision.

Status: Delayed due to additional projects (ODOT projects and Yost Pump Station and Yost Tower).

#31 - Range Rd, Lakeview to Airport

Project Description: Connect dead end - Install 2900 feet of 6" pipe.

Status: Delayed due to additional projects (ODOT projects and Yost Pump Station and Yost Tower).

Additional Projects

A - ODOT Project - Harrington Creek Crossing on S.H. 51 East Bound Lane

Project Description: The bridge was replaced by ODOT and the water lines had to be moved per design.

Status: Completed 2012

B - ODOT Project - Range and McElroy Bridge Replacement

Project Description: The bridge was replaced over Stillwater Creek and the intersection realigned by ODOT, which required the existing rural water lines to be replaced.

Status: Completed 2013

C - Water2040 Program

Project Description: Upgrade the existing water systems (pumping, piping and storage) to improve service to municipal and rural system customers and allow for future development.

Status: Completed 2021

D - Water2040 Program - Highway 51 and Country Club Road Water Pump Station and Transmission Water Line to Range Tower

Project Description: New pump station needed to replace the existing below ground pump station at the corner of Country Club Road and HWY51.

Status: Completed 2017

E - ODOT Project - Phase 2 of the Modification of Country Club Road between McElroy and Lakeview

Project Description: Country Club Road was reconstructed by ODOT and the existing rural water main needed to be replaced.

Status: Completed 2016

F - Hydrant Flushing Schedule

Project Description: Monthly flushing schedule created and posted on City website for public view.

Status: Completed 2016-Currently not done on a regular basis.

REPORT TO: STILLWATER UTILITIES AUTHORITY

MEETING DATE: DECEMBER 18, 2023



Agenda Item:	5.b. SUA-23-65
Previous/Related Action:	SUA 21-56, December 20, 2021: Amendments to Carollo for design of FWPS and to Burns and McDonnell for pre-construction services.
Background/Issue:	• The purpose of this report is to provide Trustees with the bid results and recommended action for the Recovered Water Pump Station (RWPS) and Finished Water Pump Station (FWPS) Project (24WT02 formerly 21WT04). • The City of Stillwater WTP was constructed in 1985 with a treatment capacity of 12 mgd and was later expanded to 18 mgd in 2001. The existing FWPS is currently beyond its useful life, parts are difficult to obtain, and frequent maintenance is required. In addition, the current pumps cannot meet projected future demands. • The RWPS is original to the WTP and is at the end of its useful life.
Proposal/Solution:	This project consists of building a new FWPS designed to deliver 24 mgd, expandable to 30 mgd. The FWPS will include higher pressure pumps for the Yost Pressure Zone. The project also includes a new RWPS with a firm capacity of 3 mgd, new drain piping from the solid contact units and some piping modifications upstream of the lagoons. The initial advertisement for bids was August 12, 2023, and included a two-step process. The first step required prospective bidders to submit a statement of qualifications (SOQs) for all work to be performed for the project. Five SOQs were received and reviewed by the design engineer, Carollo, as well as by staff and all were determined to be qualified. Of the five that submitted SOQ's, only two submitted formal bids. A pre-bid conference was held on August 22, 2023, with eight prospective bidders in attendance, and a second walk through was held on October 13, 2023, with one prospective bidder in attendance. Bids were opened on November 1, 2023, and the total base bid amounts are summarized below. The engineer's estimate was \$42,300,000. Crossland Heavy Construction \$25,627,000

	Archer Western Construction \$34,336,900
	Staff and Carollo Engineers reviewed the bids and found the lowest responsive bidder to be Crossland Heavy Contractors, Inc.
Financial Source/Impact:	Ultimately, the project will be funded with an ARPA grant, an existing loan from the Oklahoma Water Resources Board (OWRB) for Water 2040 and a new loan that was approved by OWRB on November 30, 2023. The total cost for construction, inspection, testing, and contingency is as follows: \$25,627,000 for the bid; \$2,562,700 for a 10% contingency; \$393,760 for third party inspection; and \$35,000 for third party inspection services and testing. The loan approved by OWRB on November 30, 2023, is scheduled to close later this month. Until that loan is closed, a portion of the project will be funded by the Water Fund.
Related Strategic Priority:	#1 EFFECTIVE SERVICES & ACCOUNTABLE GOVERNMENT #4 CONNECTED SPACES
Recommended Action/Motion:	Staff recommends a motion to: • award a unit price contract to Crossland Heavy Contractors, Inc. for the Base Bid of \$25,627,000 and authorize the General Manager to sign related documents; • authorize total construction expenditures of \$28,618,460; and, • approve budget amendment appropriating \$20,351,768 for the project.
Prepared By:	Chris Humes
Reviewed By:	Candy Staring Patti Osmus
Submitted By:	Kimberly Meek, General Manager

Attachments

1. 2023-08-22 FWPS Drew Bareiss Insp Contract FINAL
2. SUA-23-65 Attachment Project Manual
3. SUA-23-65 Attachment Budget Amend

CONTRACT FOR PROFESSIONAL SERVICES

THIS AGREEMENT is made and entered into, by and between the Stillwater Utilities Authority, a public trust ("SUA") and Drew D. Bareiss ("DREW BAREISS").

WITNESSETH:

WHEREAS, DREW BAREISS has been retained to provide construction management, quality assurance, inspection, and testing service coordination for SUA on Finished Water Pump Station (24WT02); and

WHEREAS, the scope of services to be provided by DREW BAREISS is set forth in Exhibit "A" to this agreement;

NOW, THEREFORE, FOR AND IN CONSIDERATION OF THE FOREGOING AND THE MUTUAL COVENANTS AND AGREEMENTS HEREINAFTER SET FORTH, THE PARTIES HERETO AGREE AS FOLLOWS:

1. DREW BAREISS agrees to provide on behalf of SUA the services set forth in Exhibit "A", generally described as observing the progress and quality of the Work, enforcement of contract documents, coordination of testing services by others, and reporting the same.
2. The scope of services described in EXHIBIT A shall be subject to the modification or supplement upon the written agreement of the contracting parties. Modifications or supplement to the scope of services, and compensation for any such modification in the scope of services, shall be negotiated by the parties and authorized by an Amendment. Any modifications or supplement upon written agreement requires approval and signature of the General Manager.
3. SUA agrees to pay DREW BAREISS a sum not to exceed \$393,760 based on a standard hourly rate of \$107.00, for said services set forth in said Exhibit "A".
4. The parties hereto recognize that SUA is a political subdivision of the State of Oklahoma, and it cannot make payments for services rendered unless funds have been encumbered for said services. DREW BAREISS agrees to provide SUA with itemized contemporaneously documented hourly billings, on at least a monthly basis, at the rates specified in Paragraph 3 above. The billings shall itemize the individual services rendered, time spent on each service, and expenses incurred as to each service. DREW BAREISS agrees it will notify SUA in writing when it has expended services valued at \$295,320 (i.e. 75% of not to exceed value) and at any time they believe the total fees and costs to be charged will be more than the above

listed not-to-exceed total sum. Such notification shall be sent to SUA of Stillwater, c/o Chris Humes, chris.humes@stillwater.org and P.O. Box 1449, Stillwater, Oklahoma 74076.

5. During the performance of this contract, DREW BAREISS shall carry the following specified insurance in the amounts set forth in Exhibit "B".
6. Standard of Care. DREW BAREISS will perform the services to be provided pursuant to this Agreement in a manner consistent with that level of care and skill ordinarily exercised by other members of its profession practicing in the same locality, under similar conditions and at the date the services are provided.
7. Termination. This Agreement may be terminated by SUA for convenience at any time upon ten (10) days prior written notice to DREW BAREISS. This Agreement may be terminated for cause by the non-breaching party in the event the other party materially breaches this Agreement and provided the non-breaching party provides the breaching party ten (10) days prior written notice and the opportunity to cure such breach(es) specified in the notice. In the event termination is for the convenience of SUA, payment will be made for the value of all services rendered up to the time of termination. In the event termination is for breach of contract by DREW BAREISS, payment will be made only for the value of those services satisfactorily performed as determined by SUA.
8. No Indemnification by SUA. DREW BAREISS understands and acknowledges that SUA is a municipal corporation that is funded by its taxpayers to operate for the benefit of its citizens. Accordingly, and pursuant to Oklahoma law, SUA shall not indemnify nor hold DREW BAREISS harmless for loss, damage, expense or liability arising from or related to this Agreement, including any attorney's fees and costs. In addition, DREW BAREISS shall not limit its liability to SUA for actual loss or direct damages for any claim based on a material breach of this Agreement and the documents incorporated herein. SUA reserves the right to pursue all legal and equitable remedies to which it may be entitled.
9. Indemnification by DREW BAREISS. DREW BAREISS agrees to indemnify and hold SUA and their authorized representatives harmless from any and all costs, liabilities, expenses, suits, judgments and damages to persons or property to the proportionate extent caused by DREW BAREISS, its agents, employees or subcontractors and resulting from negligent acts, errors, mistakes or omissions in connection with DREW BAREISS's performance of the services to be performed pursuant to this Agreement.
10. Applicable Law. This Agreement and the rights and obligations of the parties hereunder shall be governed by and construed in accordance with the laws of the State of Oklahoma without regard to its choice of law principals. The parties agree that all causes of action shall be brought in the Federal or State Courts within the

State of Oklahoma. The parties stipulate that venue is proper in a court of competent jurisdiction in Payne County, Oklahoma and each party waives any objection to such venue. SUA does not and will not agree to binding arbitration of any disputes.

11. Entire Agreement. These Terms and Conditions, including Exhibit A and Exhibit B attached hereto constitute the entire agreement between DREW BAREISS and SUA. There are no agreements, understandings, restrictions, warranties or representations between the parties other than those set forth herein or herein provided.

IN WITNESS WHEREOF, Owner and Contractor have signed this Agreement in duplicate. One counterpart each has been delivered to Owner and Contractor. All portions of the Contract Documents have been signed or identified by Owner and Contractor or on their behalf.

This Agreement will be effective on _____, _____ (which is the Effective Date of the Agreement).

OWNER:

CONTRACTOR:

Stillwater Utilities Authority

By: _____

By: _____

Name/Title: Kimberly Meek, General Manager

Name/Title: _____

[CORPORATE SEAL]

Owner(s) address for giving notices:

PO Box 1449

Attest: _____

Stillwater, OK 74076

Title: _____

Address for giving notices:

APPROVED AS TO FORM AND LEGALITY THIS

_____ DAY OF _____, 20____.

KIMBERLY CARNLEY - City Attorney

License Number: _____
(where applicable)

Agent for service or process: _____

(If Contractor is a corporation or a partnership, attach evidence of authority to sign.)

EXHIBIT "A"

The Contract for Professional Services between SUA and DREW BAREISS CONSTRUCTION SERVICES, LLC (hereinafter referred to as "DREW BAREISS" or "Inspector") is amended and supplemented to include the following agreement of the parties. Inspector shall provide Basic and Additional Services as set forth below, in accordance with the general schedule described below.

PART 1 - BASIC SERVICES

Inspector shall provide construction management, quality assurance, inspection and coordination of testing services by others for the Project. Services shall include the following:

I. Construction Phase

- A. *Conferences and Meetings.* Participate in a pre-construction conference prior to commencement of Work at the Site. Participate in monthly construction progress meetings. Participate in other field meetings, including Contractor Preparatory Meetings, with the Contractor as needed and provide brief written summary of meeting/minutes to the Owner and Contractor and other attendees.
- B. *Liaison.* Serve as Owner's liaison with Contractor, working through Contractor's Superintendent. Assist in providing information regarding the intent of the Contract Documents. Communicate effectively with Contractor's staff, Owner's staff, Engineers, Customers and other Stakeholders as necessary for the proper execution of the Work.
- C. *Interpretation of Contract Documents.* Report to the Owner and Engineer when clarifications and interpretations of the Contract Documents are needed and transmit to Contractor clarifications and interpretations as issued by the Owner.
- D. *Modifications.* Notify Owner and Engineer of discrepancies, unanticipated field conditions and contractor change requests. Consider and evaluate Contractor's suggestions for modifications and report such suggestions to the Owner.
- E. *Review of Work and Rejection of Defective Work.* Disapprove or reject the Contractor's work while it is in progress if, on the basis of observations, Inspector believes that such work will not produce a completed project that conforms generally to the Contract Documents or that it will prejudice the integrity of the design concept of the completed project as a functioning whole as indicated in the Contract Documents. Promptly notify the Owner and the Contractor's designated representative for receiving such notices of any such disapproval and/or rejection.
- F. *Contract Document Review.* Provide review of plans and specifications for constructability and value engineering purposes. Assist with review of submittals by Contractor.

G. *Inspections, Tests, System Startups:*

1. Consult with owner in advance of scheduled major inspections, tests and system startups of important phases of the Work.
2. Assist SUA and Engineer with equipment startup and facility commissioning process.
3. Observe, record and report to Owner appropriate details relative to the test procedures and system start-ups.
4. Accompany visiting inspectors representing public or other agencies having jurisdiction over the Project, record the results of these inspections and report to the Owner.

H. *Records.* Maintain orderly files for correspondence, reports of meetings, reproductions of original Contract Documents including all Change Orders, Field Orders, Work Change Directives, Addenda, Drawings, clarifications and interpretations of the Contract Documents, material submittal documents, testing results, progress reports, and other Project related documents.

1. *Prepare a daily report or log book.* Record Contractor's hours on the Site, weather conditions, data relative to Project, equipment onsite, site visitors, daily activities, decisions, observations in general and specific observations in more detail as in the case of observing test procedures. Provide said reports/log electronically to the Owner on a weekly basis.
2. *Photography.* Photograph general construction progress and especially any areas of interest such as tie-in locations, pipe material transitions, etc. Photos should be digital format and should be capable of being provided electronically to the Owner during construction if needed. All photos shall be saved in an orderly fashion, and delivered electronically on CD at the end of project.
3. Upon completion of the Work, furnish original set of all Project related documentation to the Owner.

I. *Reports.*

1. Furnish to Owner periodic reports of Contractor's compliance with the progress schedule.
2. Assist Owner in the preparation of Change Orders, Field Orders, and Work Change Directives. Obtain supporting information from Contractor. Make recommendations on proposed Change Orders, Field Orders and Work Change Directives as requested.
3. Furnish Owner copies of all inspection, testing and system start-up reports.
4. Review and confirm contractor's mark-up of record drawings.
5. Immediately notify Owner of the occurrence of any Site accidents, emergencies, acts of God endangering the Work, damage to property by fire or other causes, or the discovery of any safety or other concerns.

J. *Payment Requests:* Review Contractor's Application for Payment with Contractor for

compliance with established procedure for their submission, confirm accurateness of application, and forward with recommendations to the Owner.

K. Completion:

1. Participate in a Substantial Completion inspection, assist in the determination of Substantial Completion and the preparation of lists of items to be completed or corrected.
2. Participate in a Final Inspection in the company of the Owner, Engineer and Contractor and prepare a final list of items to be completed and deficiencies to be remedied.
3. Observe whether all items of the final list have been completed or corrected and make recommendations to Owner concerning acceptance and issuance of the Notice of Acceptability of the Work.

L. Inspector shall not:

1. Authorize any deviation from the Contract Documents or substitution of materials or equipment (including "or-equal" items).
2. Undertake any of the responsibilities of the Contractor, subcontractors, suppliers or Contractor's superintendent.
3. Advise on, issue directions relative to, or assume control over any aspect of the means, methods, techniques, sequences or procedures of Contractor's work unless such advice or directions are specifically required by the Contract Documents.
4. Advise on, issue directions regarding, or assume control over safety practices, precautions, and programs in connection with the activities or operations of Owner or Contractor.
5. Participate in specialized field or laboratory tests or inspections conducted off-site by others except as specifically authorized by Owner.

M. For the purposes of this Contract:

1. Inspection hours may vary daily and weekly, to accommodate weather and contractors' work schedules, and are generally 8:00 am to 5:00 pm, Monday through Friday.
2. Contract time for the Finished Water Pump Station Project is anticipated to conclude during the Fall of 2025, barring any unforeseen issues.
3. This contract includes the following estimated DREW BAREISS level of effort:
 - a) 32 hours per week for 115 weeks = 3,680 total hours

II. Post Construction Phase Services.

A. No services identified.

PART 2 – ADDITIONAL SERVICES. *No services identified.*

End of Exhibit “A”

EXHIBIT "B"

INSURANCE REQUIREMENTS

Workmen's compensation:	Statutory	
Employers liability:	\$1,000,000	aggregate Comprehensive
Comprehensive general liability:	\$1,000,000	each occurrence
Property damage:	\$500,000	each occurrence
	\$1,000,000	aggregate
Automobile liability:		
Bodily injury:	\$300,000	each person
Property damage:	\$1,000,000	each occurrence

Stillwater Utilities Authority shall be named an additional insured on the Comprehensive General Liability policy in amounts equal to the liability limits for political subdivisions set forth in the Oklahoma Governmental Tort Claims Act, 51 O.S. §151, et seq. Provided, however, this shall not preclude DREW BAREISS from carrying insurance in amounts exceeding said liability limits so long as SUA is not named as an additional insured in any amount in excess of said statutory liability limits.

End of Exhibit "B"



Project Manual

Recovered Water Pump Station and Finished Water Pump Station

Project #24WT02

SUA Bid No. 55-2023

DWSRF Project No. P40-1021220-05

Recovered Water Pump Station, Finished Water Pump Station, and Piping Improvements at
the Stillwater Water Treatment Plant

Issued For Bid: 8/12/23

Bids Open: 10/18/23



Stillwater Utilities Authority
PO Box 1449
Stillwater, OK 74076
phone: 405-742-8325
fax: 405-742-8324

ODEQ Permit No. WT000060230641

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Department of Engineering
723 S. Lewis Street/P.O. Box 1449

Office: 405-742-8325
Web: Stillwater.org

Notice to Bidders

August 12, 2023

Notice is hereby given that the Stillwater Utilities Authority will receive sealed bids for the construction of:

**Recovered Water Pump Station and Finished Water Pump Station
Project #24WT02
SUA Bid No. 55-2023
DWSRF Project No. P40-1021220-05**

Scope of work to primarily include the following:

Recovered Water Pump Station, Finished Water Pump Station, and Piping Improvements at the Stillwater Water Treatment Plant

**** IMPORTANT **** The Stillwater Utilities Authority (SUA) will utilize a two-step bidding process to select a successful bidder for this project as follows:

Step 1: PREQUALIFICATION REQUIRED – Prospective bidders must complete and submit a Statement of Qualifications for all work to be performed for the project. This includes identifying and submitting qualifications for proposed subcontractors to be used to complete portions of the work identified in the Instructions to Bidders. **Statements of Qualifications must be received by the Office of the City Clerk no later than 3:00 PM on Monday, September 11, 2023.** Late submissions will not be accepted. PREQUALIFICATION IS REQUIRED TO SUBMIT A BID FOR THIS PROJECT. Bids received from prospective bidders that are not prequalified will not be accepted and will be returned unopened.

Step 2: PREQUALIFIED BIDDERS SUBMIT A BID – Prospective bidders that have been deemed qualified must complete and submit a bid in accordance with the bidding requirements. **Sealed Bids must be received by the Office of the City Clerk no later than 3:00 PM on Wednesday, October 18, 2023.** Bids shall be opened and read aloud at the above stated time for receipt of bids. Bid opening will occur in Room 1112 "B" of the Municipal Building, 723 South Lewis, Stillwater, Oklahoma, 74074.

Statements of Qualifications and Sealed Bids will be received electronically through <https://stillwater.ionwave.net> by the due dates listed above.

Notice to Bidders

To register for the City's online bidding portal, visit <https://stillwater.ionwave.net>.

Statements of Qualifications and Bids shall be submitted as stated in the Instructions to Bidders.

Any bid received by the City Clerk more than ninety-six (96) hours, excluding Saturdays, Sundays, and holidays, before the time set for the opening of bids, or any bid so received after the time set for opening of bids, shall not be considered and shall be returned unopened to the bidder submitting same.

Statements of Qualifications and Bids will be referred to city staff for evaluation. The SUA may award to the "lowest and best responsible bidder". The SUA reserves the right to reject any or all bids or portions thereof and to waive any technicalities in the bidding process. No bid may be altered, withdrawn, or resubmitted within 45 days after the date set for the opening of bids.

The documents describing the requirements for prequalification and this request for bids may be examined at <https://stillwater.ionwave.net>. Questions regarding the bid package should be directed to Chris Humes at chris.humes@stillwater.org and Erika Cooper, P.E. at ecooper@carollo.com.

Each bidder is required to submit with their bid a guarantee in the form of an acceptable bidder's bond, a certified check, or a cashier's check on a solvent bank in the state of Oklahoma, and in the amount of not less than five percent (5%) of the amount bid. The successful bidder shall execute a contract within 14 days of Notice of Award by the city.

The successful bidder shall file a performance bond, maintenance bond, statutory bond and certificates of insurance in the statutory amounts for public liability and workers compensation insurance at the time of signing the contract.

Any agreement entered into as a result of this invitation to bid shall be construed under the laws of the State of Oklahoma, and the venue for enforcement of the agreement shall be Payne County in the State of Oklahoma.

The SUA may issue addenda as may be necessary in the best interest of the public and the SUA. Addenda may amend the date and/or time for receipt of bids or any specification, item, document, or requirement in the Bidding Documents upon notice to all prospective bidders who signed the sign-in sheet at the Pre-Bid Conference.

This project is to be financed by a loan from the Oklahoma Water Resources Board through the Department of Environmental Quality Drinking Water State Revolving Fund (DWSRF) and shall be referred to as DWSRF Project No. P40-1021220-05.

- A. "Equal Opportunity in Employment: All qualified applicants will receive consideration for employment without regard to race, color, religion, sex, national origin, age or handicap. Bidders on this work will be required to comply with the President's Executive Order No. 11246, as amended. The requirements for bidders and contractors under this order are explained in the specifications."
- B. "Each bidder must fully comply with the requirements, terms and conditions of the Oklahoma Department of Environmental Quality (DEQ), Small, Minority, Women's Businesses Requirements including affirmative steps to contract with small, minority and women's businesses during the performance of this contract. The bidder commits itself to the affirmative steps to contract with small, minority and women's businesses

contained herein and all other requirements, terms and conditions of these bid conditions by submitting a properly signed bid. Requirements are contained in Oklahoma Department of Environmental Quality Guidance and Procedures, DW-700."

- C. "All bidders must comply with the Anti-Kickback Act and the Contract Work Hours Standards Act."
- D. "Davis Bacon Act wage rules shall apply. All laborers and mechanics employed by contractors and sub contractors on projects funded directly by or assisted in whole or in part by and through the Federal Government shall be paid wages at rates not less than those prevailing on projects of a character similar in the locality as determined by the Secretary of Labor in accordance with subchapter IV of Chapter 31 of Title 40, United States Code. The Department of Labor provides all pertinent information related to compliance with labor standards, including prevailing wage rates and instructions for reporting. For more information, please refer to <http://www.wdol.gov> and <http://www.SAM.gov>."
- E. "American Iron and Steel provisions also apply to projects funded directly by or assisted in whole or in part by and through the Federal Government pursuant to the Safe Drinking Water Act, Section 1452(a)(4), requiring that all iron and steel products used for a project for the construction, alteration, maintenance or repair of a public water system are produced in the United States."
- F. "This project is subject to Build America, Buy America (BABA) Act requirements. The BABA Act requires none of the funds made available for a Federal financial assistance program for infrastructure, including each deficient program, may be obligated for a project unless all of the **iron, steel, manufactured products, and construction materials** used in the project are produced in the United States. The BABA Act requirement does not supersede the AIS requirement, and both provisions still apply and work in conjunction."
- G. **System for Award Management (SAM) registration is required** for all DWSRF program applicants and Awardees (Entities, prime contractors, subcontractors, vendors) in order to be awarded contracts by the DWSRF program. SAM replaces Central Contractor Registration/Federal Agency Registration, Online Representations and Certifications Application, and Excluded Parties List System. Applicants and awardees are required to complete a one-time free registration to provide basic information relevant to procurement and financial transactions. New Applicants and awardees please go to Sam.gov to complete the registration process.

Note: In order to register in SAM, a Unique Entity Identification (UEI) number will be required. A UEI is a 12-character (alpha-numeric) code that uniquely identifies all entities. Any entity registering to do business with the government in terms of contracts or grants and assistance awards is required to have one. Unique Entity IDs are issued by SAM.gov and are a part of an entity's record in the Entity Information section of SAM.gov.

A MANDATORY pre-bid conference will be held at 10:00 AM on Tuesday, August 22, 2023, in Room 2073 of the Norman McNickle Municipal Building, 723 South Lewis, Stillwater, Oklahoma. Anyone that intends to submit a bid is **REQUIRED** to attend this meeting.

Teresa Kadavy
City Clerk

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ARTICLE 1 - DEFINED TERMS

1.01 Terms used in these Instructions to Bidders have the meanings indicated in the General Conditions and Supplementary Conditions. Additional terms used in these Instructions to Bidders have the meanings indicated below:

A. Issuing Office: The bidding documents are available for free at <https://stillwater.ionwave.net>. The bidding procedures are to be administered at City Hall.

B. Invitation To Bid: Notice To Bidders.

ARTICLE 2 - COPIES OF BIDDING DOCUMENTS

2.01 Complete sets of the Bidding Documents in the number and for the sum, if any, stated in the Advertisement or Invitation to Bid may be obtained from <https://stillwater.ionwave.net>, ~~upon signing the Bidding Document Receipt List for the project.~~

2.02 Complete sets of Bidding Documents shall be used in preparing Bids; neither Owner nor Engineer assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

2.03 Owner and Engineer, in making copies of Bidding Documents available on the above terms, do so only for the purpose of obtaining Bids for the Work and do not confer a license or grant for any other use.

ARTICLE 3 - QUALIFICATIONS OF BIDDERS

3.01 The Stillwater Utilities Authority (SUA) may make such investigation as deemed necessary to determine the ability of the Bidder to complete the project and provide any warranty repairs that might be needed. The Bidder shall furnish all such information and data for this purpose as the SUA may request. The SUA reserves the right to reject any bid if the evidence submitted by or the investigation of, such a bidder fails to satisfy the SUA that the Bidder's properly qualified and able to carry out the obligations of the contract and to complete the project contemplated therein.

3.02 PREQUALIFICATION IS REQUIRED TO SUBMIT A BID.

A. The SUA will utilize a two-step bidding process to select a successful bidder for this project. Step 1: Prequalification of Prospective Bidders; Step 2: Prequalified Bidders Submit a Bid. To meet the prequalification requirement, prospective bidders must complete and submit a Statement of Qualifications for all work to be performed for the project. Statements of Qualifications must be submitted by the date and time set forth in the Notice to Bidders.

B. Statements of Qualifications will be referred to City Staff for evaluation. Statements of Qualifications will be evaluated based on the following criteria: (1) Meets or exceeds the minimum qualification requirements set forth in Special Provisions - Qualifications; (2) Contractor's specific experience and history of performance on projects similar in size and scope to this project; (3) Availability, experience, expertise, and education of Contractor's identified Project Personnel; Contractor's demonstrated safety performance; Contractor's past performance on any SUA projects including Contractor's ability to complete work on time; and Contractor's demonstrated financial stability.

C. Submission of a Statement of Qualifications indicates the prospective bidder's acceptance of the evaluation criteria and methodology.

D. Prospective bidders submitting Statements of Qualifications will be notified of SUA determination no later than 5:00 p.m. CST on TBD, 2023. A list of all qualified Subcontractors will be included in the notice.

E. The determination by SUA that a Contractor is prequalified shall not deprive SUA of the right to reject any and all Bids.

3.03 QUALIFICATIONS

A. The Contractor shall have at least 3 projects in the last 10 years installing new water pump stations of at least 15 million gallons per day (mgd) firm capacity. At least one pump station must have included vertical turbine pumps in cans. Include documentation of the qualifications and experience as part of Item 10 in the Statement of Bidder's Qualifications. Also provide a resume for the Booster Pump Station Superintendent showing at least 3 years of experience on similar projects.

B. Instrumentation and Controls (I&C) Subcontractor shall provide documentation of experience and qualifications in Specification Section 00_45_14.11 – Instrumentation and Controls System Contractor (ICSC) Qualifications Form. Subcontractor shall provide all information requested in this specification section.

C. Documentation of qualifications shall include the following information:

1. Description of work completed including sizes, capacities, types of pumps, number of pumps, building and roof construction, etc.
2. Dates of construction.
3. Total construction cost.
4. Change orders (number, cost, and whether owner-directed).
5. Performance against schedule.
6. Owner references including phone numbers and email addresses for all projects.

ARTICLE 4 - EXAMINATION OF BIDDING DOCUMENTS, OTHER RELATED DATA, AND SITE

4.01 Subsurface and Physical Conditions

A. The General Conditions identify:

1. Those reports of explorations and tests of subsurface conditions at or contiguous to the Site that Engineer has used in preparing the Bidding Documents.

2. Those drawings of physical conditions in or relating to existing surface and subsurface structures at or contiguous to the Site (except Underground Facilities) that Engineer has used in preparing the Bidding Documents.

B. Copies of reports and drawings referenced in Paragraph 4.01.A. will be made available by Owner to any Bidder on request. Those reports and drawings are not part of the Contract Documents, but the "technical data" contained therein upon which Bidder is entitled to rely as provided in Paragraph 4.02 of the General Conditions has been identified. Bidder is responsible for any interpretation or conclusion Bidder draws from any "technical data" or any other data, interpretations, opinions or information contained in such reports or shown or indicated in such drawings.

4.02 Underground Facilities

A. Information and data shown or indicated in the Bidding Documents with respect to existing Underground Facilities at or contiguous to the Site is based upon information and data furnished to Owner and Engineer by owners of such Underground Facilities, including Owner, or others.

4.03 Hazardous Environmental Condition

A. The Supplementary Conditions identify those reports and drawings relating to a Hazardous Environmental Condition identified at the Site, if any, that Engineer has used in preparing the Bidding Documents.

B. Copies of reports and drawings referenced in Paragraph 4.03 will be made available by Owner to any Bidder on request. Those reports and drawings are not part of the Contract Documents, but the "technical data" contained therein upon which Bidder is entitled to rely as provided in Paragraph 4.06 of the General Conditions has been identified and established in Paragraph 4.06 of the Supplementary Conditions. Bidder is responsible for any interpretation or conclusion Bidder draws from any "technical data" or any other data, interpretations, opinions, or information contained in such reports or shown or indicated in such drawings.

4.04 Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to subsurface conditions, other physical conditions and Underground Facilities, and possible changes in the Bidding Documents due to differing or unanticipated conditions appear in Paragraphs 4.02, 4.03, and 4.04 of the General Conditions. Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to a Hazardous Environmental Condition at the Site, if any, and possible changes in the Contract Documents due to any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work appear in Paragraph 4.06 of the General Conditions.

4.05 On request, Owner will provide Bidder access to the Site to conduct such examinations, investigations, explorations, tests, and studies as Bidder deems necessary for submission of a Bid. Bidder shall fill all holes and clean up and restore the Site to its former condition upon completion of such explorations, investigations, tests, and studies. Bidder shall comply with all applicable Laws and Regulations relative to excavation and utility locates.

4.06 Reference is made to Article 7 of the General Conditions for the identification of the general nature of other work that is to be performed at the Site by Owner or others (such as utilities and other prime contractors) that relates to the Work contemplated by these Bidding Documents. On request, Owner will provide to each Bidder for examination access to or copies of Contract Documents (other than portions thereof related to price) for such other work.

4.07 It is the responsibility of each Bidder before submitting a Bid to:

A. examine and carefully study the Bidding Documents, the other related data identified in the Bidding Documents, and any Addenda;

B. visit the Site and become familiar with and satisfy Bidder as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work;

C. become familiar with and satisfy Bidder as to all federal, state, and local Laws and Regulations that may affect cost, progress, and performance of the Work;

D. carefully study all: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) which have been identified in the Supplementary Conditions as provided in Paragraph 4.02 of the General Conditions, and (2) reports and drawings of Hazardous Environmental Conditions at the Site which have been identified in the Supplementary Conditions as provided in Paragraph 4.06 of the General Conditions;

E. obtain and carefully study (or accept consequences of not doing so) all additional or supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including applying any specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents, and safety precautions and programs incident thereto;

F. agree at the time of submitting its Bid that no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of its Bid for performance of the Work at the price(s) bid and within the times and in accordance with the other terms and conditions of the Bidding Documents;

G. become aware of the general nature of the work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents;

H. correlate the information known to Bidder, information and observations obtained from visits to the Site, reports and drawings identified in the Bidding Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Bidding Documents;

I. promptly give Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder discovers in the Bidding Documents and confirm that the written resolution thereof by Engineer is acceptable to Bidder; and

J. determine that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work.

4.08 The submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article 4, that without exception the Bid is premised upon performing and furnishing the Work required by the Bidding Documents and applying any specific means, methods, techniques, sequences, and procedures of construction that may be shown or indicated or expressly required by the Bidding Documents, that Bidder has given Engineer written notice of all conflicts, errors, ambiguities, and discrepancies that Bidder has discovered in the Bidding Documents and the written resolutions thereof by Engineer are acceptable to Bidder, and that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performing and furnishing the Work.

ARTICLE 5 - PRE-BID CONFERENCE

5.01 A pre-Bid conference will be held at the time and place stated in the Notice to Bidders. Representatives of Owner and Engineer will be present to discuss the Project. Bidders MAY BE REQUIRED to attend and participate in the conference; see Notice to Bidders for attendance requirements. Engineer will transmit to all prospective Bidders of record such Addenda as Engineer considers necessary in response to questions arising at the conference. Oral statements may not be relied upon and will not be binding or legally effective.

ARTICLE 6 - SITE AND OTHER AREAS

6.01 The Site is identified in the Bidding Documents. Easements for permanent structures or permanent changes in existing facilities are to be obtained and paid for by Owner unless otherwise provided in the Bidding Documents. All additional lands and access thereto required for temporary construction facilities, construction equipment, or storage of materials and equipment to be incorporated in the Work are to be obtained and paid for by Contractor.

ARTICLE 7 - INTERPRETATIONS AND ADDENDA

7.01 All questions about the meaning or intent of the Bidding Documents are to be submitted to Engineer in writing. Interpretations or clarifications considered necessary by Engineer in response to such questions will be issued by Addenda mailed or delivered to all parties recorded by Engineer as having received the Bidding Documents. Questions received less than ten days prior to the date for opening of Bids may not be answered. Only questions answered by Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.

7.02 Addenda may be issued to clarify, correct, or change the Bidding Documents as deemed advisable by Owner or Engineer.

7.03 Addenda will be issued no later than 3 working days prior to the date set for the bid opening.

7.04 Addenda will be mailed by first class mail, faxed, and/or delivered only to those bidders who have signed the sign-in sheet at the Pre-Bid Conference.

ARTICLE 8 - BID SECURITY

8.01 A Bid must be accompanied by Bid security made payable to Owner in an amount of 5 percent of Bidder's maximum Bid price (or highest combination of the base bid plus the combination of alternate bids producing the highest amount) and in the form of a certified check or bank money order or a Bid bond issued by a surety meeting the requirements of Paragraphs 5.01 and 5.02 of the General Conditions.

8.02 The Bid security of the Successful Bidder will be retained until such Bidder has executed the Contract Documents, furnished the required contract security and met the other conditions of the Notice of Award, whereupon the Bid security will be returned. If the Successful Bidder fails to execute and deliver the Contract Documents and furnish the required contract security within the time described in the Notice to Bidders, Owner may annul the Notice of Award and the Bid security of that Bidder will be forfeited. The Bid security of other Bidders whom Owner believes to have a reasonable chance of receiving the award may be retained by Owner until the earlier of seven days after the Effective Date of the Agreement or 61 days after the Bid opening, whereupon Bid security furnished by such Bidders will be returned.

8.03 Bid security of other Bidders whom Owner believes do not have a reasonable chance of receiving the award will be returned within seven days after the Bid opening.

ARTICLE 9 - CONTRACT TIMES

9.01 The number of days within which, or the dates by which, milestones are to be achieved and the Work is to be substantially completed and ready for final payment are set forth in the Agreement.

ARTICLE 10 - ARTICLE 10 - LIQUIDATED DAMAGES

10.01 Provisions for liquidated damages, if any, are set forth in the Agreement.

ARTICLE 11 - SUBSTITUTE AND "OR-EQUAL" ITEMS

11.01 The Contract, if awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents, or those substitute or "or-equal" materials and equipment approved by Owner and identified by Addendum. The materials and equipment described in the Bidding Documents establish a standard of required type, function and quality to be met by any proposed substitute or "or-equal" item. No item of material or equipment will be considered by Owner as a substitute or "or-equal" unless written request for approval has been submitted by Bidder and has been received by Owner at least 15 days prior to the date for receipt of Bids. Each such request shall conform to the requirements of Paragraph 6.05 of the General Conditions. The burden of proof of the merit of the proposed item is upon Bidder. Owner's decision of approval or disapproval of a proposed item will be final. If Owner approves any proposed item, such approval will be set forth in an Addendum issued to all prospective Bidders. Bidders shall not rely upon approvals made in any other manner.

ARTICLE 12 - SUBCONTRACTORS, SUPPLIERS, AND OTHERS

12.01 If the Contract Documents require the identity of certain Subcontractors, Suppliers, individuals, or entities to be submitted to Owner in advance of a specified date prior to the Effective Date of the Agreement, the apparent Successful Bidder, and any other Bidder so requested, shall within five days after Bid opening, submit to Owner a list of all such Subcontractors, Suppliers, individuals, or entities proposed for those portions of the Work for which such identification is required. Such list shall be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor, Supplier, individual, or entity if requested by Owner. If Owner or Engineer, after due investigation, has reasonable objection to any proposed Subcontractor, Supplier, individual, or entity, Owner may, before the Notice of Award is given, request apparent Successful Bidder to submit a substitute, in which case apparent Successful Bidder shall submit an acceptable substitute, Bidder's Bid price will be increased (or decreased) by the difference in cost occasioned by such substitution, and Owner may consider such price adjustment in evaluating Bids and making the Contract award.

12.02 If apparent Successful Bidder declines to make any such substitution, Owner may award the Contract to the next lowest Bidder that proposes to use acceptable Subcontractors, Suppliers, individuals, or entities. Declining to make requested substitutions will not constitute grounds for forfeiture of the Bid security of any Bidder. Any Subcontractor, Supplier, individual, or entity so listed and against which Owner or Engineer makes no written objection prior to the giving of the Notice of Award will be deemed acceptable to Owner and Engineer subject to revocation of such acceptance after the Effective Date of the Agreement as provided in Paragraph 6.06 of the General Conditions.

12.03 Contractor shall not be required to employ any Subcontractor, Supplier, individual, or entity against whom Contractor has reasonable objection.

12.04 When prequalification of certain subcontractors is required, the process for prequalification shall be set forth in the Notice to Bidders and Article 3 of this Instructions to Bidders. Nothing in this Article 12 shall be construed as an exception to a prequalification requirement for certain subcontractors.

ARTICLE 13 - PREPARATION OF BID

13.01 The Bid Form is included with the Bidding Documents.

13.02 All blanks on the Bid Form shall be completed by typewriter or electronic text-entry and the Bid signed in ink. Font-style and size shall be clear and discernable. A Bid unit price shall be indicated for each Bid item listed therein, unless otherwise indicated on the Bid Form.

13.03 The Bid Form and all documents to be attached shall be signed in accordance with Article 24 - below.

13.04 The Bid shall contain an acknowledgment of receipt of all Addenda, the numbers of which shall be filled in on the Bid Form.

13.05 The address and telephone number for communications regarding the Bid shall be shown.

13.06 The Bid shall contain evidence of Bidder's authority and qualification to do business in the state where the Project is located or covenant to obtain such qualification prior to award of the Contract. Bidder's state contractor license number, if any, shall also be shown on the Bid Form.

ARTICLE 14 - BASIS OF BID; COMPARISON OF BIDS

14.01 Lump Sum

A. Bidders shall submit a Bid on a lump sum basis as set forth in the Bid Form.

14.02 Unit Price

A. Bidders shall submit a Bid on a unit price basis for each item of Work listed in the Bid Form.

B. The total of all estimated prices will be the sum of the products of the estimated quantity of each item and the corresponding unit price. The final quantities and Contract Price will be determined in accordance with Paragraph 11.03 of the General Conditions.

C. Discrepancies between the multiplication of units of Work and unit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum. Discrepancies between words and figures will be resolved in favor of the words.

14.03 Alternates (Unit Price or Lump Sum)

A. If not otherwise described on the Bid Form:

1. The price for each alternate will be the amount added to the base Bid, if Owner selects the alternate.
2. Alternates may be awarded in any combination and number, at the discretion of the Owner.

14.04 The Bid price shall include such amounts as the Bidder deems proper for overhead and profit on account of cash allowances, if any, named in the Contract Documents as provided in Paragraph 11.02 of the General Conditions.

ARTICLE 15 - SUBMITTAL OF BID

15.01 The SUA will conduct this qualifications and bids submittal electronically. Electronic submittals through the Owner's online portal shall be via Stillwater.ionwave.net.

15.02 A Bid shall be submitted no later than the date and time prescribed and at the place indicated in the Advertisement or Invitation to Bid. Electronic submittals are conducted through Stillwater.ionwave.net. Submittals shall be accompanied by the Bid security and other required documents through uploads to the online portal. The name of the individual, limited liability company, partnership, corporation or joint venture submitting the Bid must be typed or legibly printed in the space provided. The Bidding Documents must be signed in ink in accordance with the requirements of Article 24 - below. The name and title of each person who signed the Bidding Documents must be typed or legibly printed on the line below the signature line.

15.03 All blank spaces in the Bidding Documents, which require the provision of any information or any statement from the Bidder must be filled in.

15.04 All Affidavits must be signed and notarized. The notary must legibly: enter the date; enter the name of the person(s) sworn; sign as Notary Public; provide the date of commission expiration; and may impress his/her notary seal or stamp.

15.05 The Bid Bond must be scanned and uploaded to the online portal at Stillwater.ionwave.net.

15.06 The Bidder is responsible for reviewing the list of required documents, above, and any requirements contained within the Project Manual and assuring that each and every required document is properly completed, signed, and submitted with the Bid. Forms and Affidavits should be completed and submitted in accordance with Article 24 -Article 24 - below.

15.07 Failure to submit a required document may be cause for rejection of the Bid.

15.08 Forms Not in Packet: If an item is listed as being part of the Bidding Documents, and the form is not included in this packet, it is the Bidder's responsibility to obtain the form from the SUA or such other office noted in the Notice to Bidders.

15.09 Forms to be Used. Bidder shall use the forms in this Bid Package or shall photocopy the forms and complete them. No alterations can be made to the forms except to add additional signature lines as required. Bids submitted with any other alteration or amendment of these forms may be considered non-responsive.

ARTICLE 16 - MODIFICATION AND WITHDRAWAL OF BID

16.01 No sealed bid shall be altered, changed executed or otherwise revised in any manner by any bidder after it has been tendered to the City Clerk; nor may bids once submitted to the City Clerk, be withdrawn.

16.02 If within 24 hours after Bids are opened, any Bidder files a duly signed written notice with Owner and promptly thereafter demonstrates to the reasonable satisfaction of Owner that there was a material and substantial mistake in the preparation of its Bid, that the SUA may allow the Bidder to withdraw its Bid, and the Bid security will be returned. Thereafter, if the Work is rebid, that Bidder will be disqualified from further bidding on the Work.

ARTICLE 17 - OPENING OF BIDS

17.01 Bids will be opened at the time and place indicated in the Advertisement or Invitation to Bid and, unless obviously non-responsive, read aloud publicly. A tabulation of the bid information will be made available to Bidders within a reasonable time after the opening of Bids.

ARTICLE 18 - BIDS TO REMAIN SUBJECT TO ACCEPTANCE

18.01 All Bids will remain subject to acceptance for the period of time stated in the Bid Form, but Owner may, in its sole discretion, release any Bid and return the Bid security prior to the end of this period.

ARTICLE 19 - EVALUATION OF BIDS AND AWARD OF CONTRACT

19.01 Owner reserves the right to reject any or all Bids, or portions thereof, including without limitation, nonconforming, nonresponsive, unbalanced, or conditional Bids. Owner further reserves the right to reject the Bid of any Bidder whom it finds, after reasonable inquiry and evaluation, to not be responsible. Owner may also reject the Bid of any Bidder if Owner believes that it would not be in the best interest of the Project to make an award to that Bidder. Owner also reserves the right to waive all informalities not involving price, time, or changes in the Work and to negotiate contract terms with the Successful Bidder.

19.02 More than one Bid for the same Work from an individual or entity under the same or different names will not be considered. Reasonable grounds for believing that any Bidder has an interest in more than one Bid for the Work may be cause for disqualification of that Bidder and the rejection of all Bids in which that Bidder has an interest.

19.03 In evaluating Bids, Owner will consider whether or not the Bids comply with the prescribed requirements, and such alternates, unit prices and other data, as may be requested in the Bid Form or prior to the Notice of Award.

19.04 In evaluating Bidders, Owner will consider the qualifications of Bidders and may consider the qualifications and experience of Subcontractors, Suppliers, and other individuals or entities proposed for those portions of the Work for which the identity of Subcontractors, Suppliers, and other individuals or entities must be submitted as provided in the Supplementary Conditions. Bids will also be evaluated based upon the criteria set forth in the City of Stillwater Purchasing Manual.

19.05 Owner may conduct such investigations as Owner deems necessary to establish the responsibility, qualifications, and financial ability of Bidders, proposed Subcontractors, Suppliers, individuals, or entities to perform the Work in accordance with the Contract Documents.

19.06 If the Contract is to be awarded, Owner will award the Contract to the Bidder whose Bid is in the best interests of the Project. The best interests of the project include, but are not limited to cost, disruption of services, and long term operation and maintenance.

19.07 The award shall be made within 30 days after the opening of bids unless the Owner, by formal recorded action and for good cause shown, provides for a reasonable extension of that period not to exceed 15 days where state and local funds are involved or not to exceed 90 days where federal funds are involved.

ARTICLE 20 - CONTRACT SECURITY AND INSURANCE

20.01 Article 5 of the General Conditions, as may be modified by the Supplementary Conditions, sets forth Owner's requirements as to performance, maintenance and payment bonds and insurance. When the Successful Bidder delivers the executed Agreement to Owner, it shall be accompanied by such bonds and certificates.

ARTICLE 21 - SIGNING OF AGREEMENT

21.01 When Owner gives a Notice of Award to the Successful Bidder, it shall be accompanied by the required number of unsigned counterparts of the Agreement with the other Contract Documents which are identified in the Agreement as attached thereto. Within the number of days described in the Notice to Bidders thereafter, Successful Bidder shall sign and deliver the required number of counterparts of the Agreement and attached documents to Owner. Within ten days thereafter, Owner shall deliver one fully signed counterpart to Successful Bidder with a complete set of the Drawings with appropriate identification.

ARTICLE 22 - SALES AND USE TAXES

~~22.01 Title 68 Oklahoma Statutes (1991) Section 1365 exempts sales to municipalities and their contractors from sales tax. All bids shall be assumed to have been made based on such exemption.~~

ARTICLE 23 - RETAINAGE

23.01 Provisions concerning Contractor's rights to deposit securities in lieu of retainage are set forth in the City of Stillwater Purchasing Manual.

ARTICLE 24 - SIGNATURE REQUIREMENTS

24.01 Signature requirements are set forth in the section of the agreement titled "Signature and Submission Requirements for Bidding Documents."

LIST OF DOCUMENTS REQUIRED FOR THIS BID

Project Numbers: 24WT02

Description: Recovered Water Pump Station, Finished Water Pump Station, and Piping Improvements at the Stillwater Water Treatment Plant

The Bidder is responsible for reviewing this list of required documents and any requirements contained within the Project Manual and assuring that each and every required document is properly completed, signed, and submitted with the Bid. Forms and Affidavits should be completed and submitted in accordance with provisions of the "Signature Requirements for Bidding Documents."

Use Stillwater.lonwave.net to submit the following.

DOCUMENTS REQUIRED FOR STEP 1 of THIS BID:

Qualifications Statement
Additional supporting documentation, as required

DOCUMENTS REQUIRED FOR STEP 2 of THIS BID

Detailed Bid Form
Bid Bond (Bid Security)
Labor Standards Certificate for Bidding (DW-074A)
Statement Regarding Equal Opportunity Compliance (DW-211)
Certification of Non-Segregated Facilities (DW-212)
Business Relationship Affidavit (DW-413)
Non-Collusion Affidavit (DW-412)
Bidder's American Iron & Steel Certification (DW-501)
Bidder's Build America Buy America Certification (DW-502)
Certificate of Non Discrimination

For the purpose of determining that a Bid is properly submitted, Bidder should submit the properly completed and executed documents listed on this page. Failure to submit a required document may be cause for rejection of the Bid.

Forms Not in Packet. If an item is listed on this page and the form is not included in this packet, it is the Bidder's responsibility to obtain the form from the Stillwater Utilities Authority (SUA) or such other office noted in the Notice to Bidders.

Forms to be Used. Bidder shall use the forms in this Bid Package or shall photocopy the forms and complete them. No alterations can be made to the forms except to add additional signature lines as required. Bids submitted with any other alteration or amendment of these forms may be considered non-responsive.

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www.beta.SAM.gov

INSERT CURRENT WAGE DECISIONS THAT APPLY TO THE
CONSTRUCTION PROJECT HERE
IN CONTRACT SPECIFICATIONS

See Requirements in DW-185

DAVIS-BACON WAGE DECISION

(Reproduce on green colored paper)

Oklahoma Drinking Water State Revolving Fund
LABOR STANDARDS CERTIFICATE FOR BIDDING

I certify that all the Davis Bacon Act and Labor Standards Contract Provisions of the specifications will be complied with during construction of the drinking water treatment works known as Drinking Water State Revolving Fund Project Number P40-1021220-05.

I also certify that all laborers and mechanics employed by me and my subcontractors during construction of the project will be paid wages at rates not less than those listed on the prevailing wage rates contained in the contract documents.

Project Description:

Construction of a new recovered water pump station, a new finished water pump station, piping improvements associated with the lagoons, and manhole and piping improvements associated with the solids blowdown for the solids contact units (SCUs) at the Stillwater Water Treatment Plant.

Printed Name of Contractor's Authorized Representative

Signature of Contractor's Authorized Representative

Date

Oklahoma Drinking Water State Revolving Fund
LABOR STANDARDS CERTIFICATE FOR PROJECT CLOSE-OUT

I certify that all the Davis Bacon Act and Labor Standards Contract Provisions of the specifications have been fully complied with during construction of the drinking water treatment works known as Drinking Water State Revolving Fund Project Number P40-1021220-05.

Project Description:

Construction of a new recovered water pump station, a new finished water pump station, piping improvements associated with the lagoons, and manhole and piping improvements associated with the solids blowdown for the solids contact units (SCUs) at the Stillwater Water Treatment Plant.

Printed Name of Contractor's Authorized Representative

Signature of Contractor's Authorized Representative

Date

Oklahoma Drinking Water State Revolving Fund
**PROSPECTIVE PRIME CONTRACTOR'S
(BIDDER) STATEMENT ABOUT
EQUAL OPPORTUNITY CLAUSE**

- ☐ I have participated in previous contract(s) or subcontract(s) subject to the equal opportunity clause under Executive Orders 11246 and 11375 or preceding Executive Orders 10925 and 11114. I have filed all reports due under the requirements contained in 40 CFR, Part C, 8.11.
- ☐ I have not participated in previous contract(s) subject to the equal opportunity clause under Executive Orders 11246 and 11375 or preceding Executive Orders 10925 and 11114.

I will obtain a similar statement from any proposed subcontractor(s), when appropriate.

(Signature, Title of Prospective Prime Contractor or Subcontractor's Representative and Date)

(Printed or typed Name and Title of Prospective Prime Contractor or Subcontractor's Representative)

(Name and address of Prospective Prime Contractor or Subcontractor)

Oklahoma Drinking Water State Revolving Fund
**PROSPECTIVE PRIME CONTRACTOR'S
(BIDDER) CERTIFICATION OF
NONSEGREGATED FACILITIES**

I hereby certify that I do not and will not maintain any facilities provided for my employees in a segregated manner, or permit my employees to perform their services at any location under my control where segregated facilities are maintained; and that I will obtain a similar certification prior to the award of any federally assisted subcontract exceeding \$10,000 which is not exempted from the equal opportunity clause.

(Signature and Title of Prospective Prime Contractor's Representative)

(Printed or Typed Name and Title of Prospective Prime Contractor's Representative)

(Name and Address of Prospective Prime Contractor)

Oklahoma Drinking Water State Revolving Fund
SUB-CONTRACTOR'S
CERTIFICATION OF NONSEGREGATED FACILITIES
AND
INCORPORATION OF EQUAL OPPORTUNITY CLAUSES

I hereby certify that I do not and will not maintain any facilities provided for my employees in a segregated manner, or permit my employees to perform their services at any location under my control where segregated facilities are maintained; and that I will obtain a similar certification prior to the award of any federally assisted subcontract exceeding \$10,000 which is not exempted from the equal opportunity clause.

In addition, I hereby incorporate into my sub-agreement with the prime contractor the Equal Opportunity Clauses 1-7 as set forth in Executive Order No. 11246 and issued by the Secretary of Labor in Title 41 CFR Chapter 60-1.4 of the federal rules and regulations.

(Printed or Typed Name & Address of Sub-contractor)

(Signature of Sub-contractor's Representative)

(Printed or Typed Name and Title of Sub-contractor's Representative)

Note: EEO clauses are included in DW-185 in the contract specifications.

SIGNATURE AND SUBMISSION REQUIREMENTS FOR BIDDING DOCUMENTS

All Bid Documents and Contract Documents must be signed in ink by a person having the legal authority to bind the Bidder/Contractor and be completed in accordance with the rules listed below.

PART I. A. INSTRUCTIONS FOR SUBMISSION OF THE BID DOCUMENTS

- (1) All documents shown on the "List of Documents Required for this Bid" or in the Standard Specifications, Special Provisions or Special Provisions - Technical must be completed and submitted as provided herein.
- (2) The name of the individual, limited liability company, partnership, corporation or joint venture submitting the Bid must be typed or legibly printed in the space provided. The Bidding Documents must be signed in ink in accordance with the requirements of Part I.B. herein. The name and title of each person who signed the Bidding Documents must be typed or legibly printed on the line below the signature line.
- (3) All blank spaces in the Bidding Documents, which require the provision of any information or any statement from the Bidder must be filled in.
- (4) **All Affidavits must be signed and notarized.** The notary must legibly: enter the date; enter the name of the person(s) sworn; sign as Notary Public; provide the date of commission expiration; and may impress his/her notary seal or stamp.
- (5) The Bid Bond must be submitted in the sealed envelope with the Bid.
- (6) The Bid Form, Affidavits and Bid Security, and any other required documents, must be enclosed in a sealed envelope. Place the name of the Bidder and the words "**SEALED BID FOR PROJECT 24WT02 BID NUMBER: 55-2023 and BID DATE: OCTOBER 18, 2023**" on the envelope.

PART I. B. AUTHORIZED SIGNATURE AND MINIMUM REQUIREMENTS FOR BIDDING DOCUMENTS

- (1) Bids submitted by a Corporation: Bidding Documents must have the original ink signature of the President or Vice President of the corporation, or comply with Part I.B.(6).
- (2) Bids submitted by a Sole Proprietorship or Individual: Bidding Documents must have the original ink signature of the owner or individual, or comply with Part I.B.(6).
- (3) Bids submitted by a Partnership: Bidding Documents must have the original ink signature of a General Partner, or comply with Part I.B.(6).
- (4) Bids submitted as a Joint Venture: If two or more parties submit a joint Bid, the Bid Documents must have the original ink signatures of the appropriate representatives of each/all parties. Such Bidders should alter all Documents, but only to provide signature lines (name of Bidder, signature line, and name and title line) to meet this requirement, or comply with Part I.B.(6). Where notarization is required on the forms, each signature must be properly notarized.

- (5) Bids Submitted by a Limited Liability Company: Bidding Documents must have the original ink signature of an authorized agent having authority to bind the limited liability company, or comply with Part I.B.(6). Such Bids must be accompanied by the documentation required in Part II.B. (5) below.
- (6) Signature Requirements for Bidder's Authorized Agent: Some businesses may delegate the authority to sign the Bidding Documents to an authorized agent. In such cases, all documents requiring signature must have the original ink signature of the "authorized" agent. Attached to the Bidding Documents must be the documentation required in Part II.B. (6) below.
- (7) Additional Documentation: Additional documentation of signature and authority may be required on any authority issue or Contract issue.

PART II. A. INSTRUCTIONS FOR SUBMISSION OF THE CONTRACT DOCUMENTS

- (1) All documents listed on the "List of Contract Documents" must be submitted within the time frame as stated in the instructions to bidders and the bid notice following the Stillwater Utilities Authority's (SUA's) notification of award of the Contract, unless that time is extended by the SUA's Project Manager/Engineer (if the Bidder shows delays in returning the contract are beyond the Bidder's control).
- (2) The Contract and other forms must be signed and, if so provided on the form, notarized. Where notarization is required, the notary must legibly: enter the date; enter the name of the person(s) sworn; sign as Notary Public; provide the date of commission expiration; and may impress his/her notary seal or stamp.
- (3) Type or legibly print the name of the individual, Limited Liability Company, partnership, corporation or joint venture awarded the Contract on the line provided for this information. The name and title of each person who signed the Contract Documents must be typed or legibly printed on the line below the signature line.

PART II. B. MINIMUM SIGNATURE REQUIREMENTS FOR SUBMISSION OF THE CONTRACT AND BONDS

- (1) Contracts submitted by a Corporation: Contract Documents must have the original ink signature of the President or Vice President of the corporation. That signature must be witnessed by the Corporate Secretary or Assistant Corporate Secretary, and the firm's corporate seal, if any, must be affixed in accordance with 18 O.S. (1991) §1016. Should the corporation not have a seal or should the seal not be available, then the person signing must demonstrate authority to bind the corporation, as set forth in paragraph II.B.(6) below. The name and title of each person who signed the Contract or bond must be typed or legibly printed on the line below the signature line.
- (2) Contracts submitted by a Sole Proprietorship or Individual: Contract Documents must have the original ink signature of the owner or individual, respectively, on the signature line, or comply with Part II.B. (6). The name and title of each person who signed the Contract or bond must be typed or legibly printed on the line below the signature line.

- (3) Contracts submitted by a Partnership: Contract Documents must have the original ink signature of a General Partner on the signature line, or comply with Part II.B. (6). The name and title of each person who signed the Contract or bond must be typed or legibly printed on the line below the signature line.
- (4) Contracts submitted by a Joint Venture: If two or more parties submit a joint Bid, the Contract Documents must be signed in ink by the appropriate representatives of each/all parties. Any of the parties which are corporations must have the appropriate signature(s) and attestation(s) as provided above, or comply with Part II.B.(6). The Contract Documents should be altered, but only to add the signature lines (name of Contractor, signature line, name and title line, and attestation line) to meet this requirement. The name and title of each person who signed the Contract or bond must be typed or legibly printed on the line below the signature line.
- (5) Contracts Submitted by a Limited Liability Company: Contract Documents must have the original ink signature of an authorized agent having authority to sign contracts and bonds and to bind the limited liability company. Attached to the Contract Documents, signed by the authorized agent, must be a properly executed copy of the articles of organization; the operating agreement; and any bylaws, resolution or other document of the authorizing entity, specifically providing the authorized agent with the authority to execute the Contract Documents on behalf of and binding the authorizing entity. All documents designating and authorizing the agent to bind the limited liability company must be notarized by a Notary Public who will complete the required information and may affix his/her seal or stamp. The name and title of each person who signed the Contract Documents must be typed or legibly printed on the line below the signature line. Additional pages may be added, but each signature must be properly notarized.
- (6) Signature Requirements for Bidder's Authorized Agent: Some businesses may delegate the authority to sign the Contract Documents to an authorized agent. In such cases, all Contract Documents requiring signature must have the original ink signature of the "authorized" agent. Attached to the Contract Documents, signed by the authorized agent, must be a properly executed power of attorney or other document of the authorizing entity, specifically providing the "authorized" agent with the authority to execute the Contract Documents on behalf of and binding the authorizing entity. Each signature on the authorizing documents must be notarized by a Notary Public who will complete the required information and may affix his/her seal or stamp. The name and title of each person who signed the Contract, bond, or any authorizing document must be typed or printed on the line below the signature line. Additional pages may be added, but all signatures must be properly notarized.
- (7) Additional Documentation: Additional documentation may be required.

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BID FORM

Date: _____

Bidder: _____

Bidder's State Contractor License Number: _____

Project: 24WT02 – Recovered Water Pump Station and Finished Water Pump Station
(DWSRF Project No. P40-1021220-05)

Bid Summary:

Total Base Bid

\$ _____
in figures

ARTICLE 1 - BID RECIPIENT

1.01 This bid is submitted to:

Office of the City Clerk, or	Office of the City Clerk
City of Stillwater	City of Stillwater
PO Box 1449	723 S. Lewis Street
Stillwater, OK 74074	Stillwater, OK 74076

1.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with the Stillwater Utilities Authority (SUA) in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

ARTICLE 2 - BIDDER ACKNOWLEDGEMENTS

2.01 Bidder accepts all of the terms and conditions of the Notice to Bidders or Invitation to Bid and Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. The Bid will remain subject to acceptance for 45 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

ARTICLE 3 - BIDDER'S REPRESENTATIONS

3.01 In submitting this Bid, Bidder represents, as set forth in the Agreement, that:

A. Bidder has examined and carefully studied the Bidding Documents, the other related data identified in the Bidding Documents, and the following Addenda, receipt of all which is hereby acknowledged.

Addendum Number

Addendum Date

3.02 Bidder has visited the Site and become familiar with and is satisfied as to the general, local and Site conditions that may affect cost, progress, and performance of the Work.

3.03 Bidder is familiar with and is satisfied as to all federal, state and local Laws and Regulations that may affect cost, progress and performance of the Work.

3.04 Bidder has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) which have been identified in the Supplementary Conditions as provided in paragraph 4.02 of the General Conditions, and (2) reports and drawings of a Hazardous Environmental Condition, if any, which has been identified in the Supplementary Conditions as provided in paragraph 4.06 of the General Conditions.

3.05 Bidder has obtained and carefully studied all additional or supplementary examinations, investigations, explorations, tests, studies and data concerning conditions (surface, subsurface and Underground Facilities) at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including applying the specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents to be employed by Bidder, and safety precautions and programs incident thereto.

3.06 Bidder does not consider that any further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the price(s) bid and within the times and in accordance with the other terms and conditions of the Bidding Documents.

3.07 Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.

3.08 Bidder has correlated the information known to Bidder, information and observations obtained from visits to the Site, reports and drawings identified in the Bidding Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Bidding Documents.

3.09 Bidder has given Owner written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and the written resolution thereof by Owner is acceptable to Bidder.

3.10 The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work for which this Bid is submitted.

ARTICLE 4 - FURTHER REPRESENTATIONS

4.01 Bidder further represents that:

A. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any agreement or rules of any group, association, organization, or corporation.

B. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid.

C. Bidder has not solicited or induced any individual or entity to refrain from bidding.

D. Bidder has not sought by collusion to obtain for itself any advantage over any other Bidder or over Owner.

E. Davis Bacon Act:

1. By submitting a bid/proposal under this solicitation, the Bidder understands that the bid/proposal is subjected to the Davis-Bacon Act including prevailing wage rates and the Contract Work Hours and Safety Standards Act.

F. American Iron and Steel Certification

1. By submitting a bid/proposal under this solicitation, the Bidder certifies that all Iron and Steel used in the project are produced in the United States in accordance with the "Safe Drinking Water Act, Section 1452(a)(4).

2. By submitting a bid/proposal under this solicitation, the Bidder shall submit American Iron and Steel Certification Form DW-501 with the bid.

G. Buy America Build America

1. By submitting a bid/proposal under this solicitation, the Bidder certifies that all iron, steel, manufactured products, and construction materials for the project will meet the BABA requirements in the United States in accordance with the "Infrastructure Investment and Jobs Act, H.R. 3684."

ARTICLE 5 - BASIS OF BID

5.01 Bidder will complete the Work in accordance with the Contract Documents for the following price(s):

Item	Base Bid Quantity	Unit	Item	Unit Price	Extension
1	1	LS	Mobilization, Demobilization, General Conditions, Bonds, and Insurance.	\$ _____ <i>in figures</i>	\$ _____ <i>in figures</i>
<i>unit price in words</i>					
2	2	LS	Recovered Water Pump Station	\$ _____ <i>in figures</i>	\$ _____ <i>in figures</i>
<i>unit price in words</i>					
3	1	LS	Finished Water Pump Station	\$ _____ <i>in figures</i>	\$ _____ <i>in figures</i>
<i>unit price in words</i>					
4	1	LS	Piping Demolition/Relocation and Temporary Piping for Construction of Finished Water Pump Station	\$ _____ <i>in figures</i>	\$ _____ <i>in figures</i>
<i>unit price in words</i>					
5	1	LS	Lagoon Piping Improvements	\$ _____ <i>in figures</i>	\$ _____ <i>in figures</i>
<i>unit price in words</i>					

6 1 LS SCU Manhole and Piping Improvements

\$ _____ \$ _____
in figures in figures

unit price in words

7 1 LS Existing Recovered Water Pump Station and Finished
Water Pump Station Electrical Demolition

\$ _____ \$ _____
in figures in figures

unit price in words

8 200 CY Additional Flowable Fill

\$ _____ \$ _____
in figures in figures

unit price in words

9 200 CY Additional ODOT Type A Aggregate Base Course

\$ _____ \$ _____
in figures in figures

unit price in words

10 200 CY Additional Rock Excavation

\$ _____ \$ _____
in figures in figures

unit price in words

11 200 CY Additional Imported Structural Fill

\$ _____ \$ _____
in figures in figures

unit price in words

12 3 EA Temporary Generator Mobilization/Demobilization

\$ _____ \$ _____
in figures in figures

unit price in words

13 3 EA Temporary Generator Rental Cost

\$ _____ \$ _____
in figures in figures

unit price in words

14 120 HR Temporary Generator to XFMR-4394 or XFMR-4395
Operating Cost:

\$ _____ \$ _____
in figures in figures

unit price in words

Total Base Bid: Sum of all Base Bid Items

\$ _____
in figures

Amounts are to be shown in both words and figures. In case of discrepancy, the amount shown in words for unit prices will govern. The above unit prices shall include all labor, materials, overhead, profit, insurance, etc., to cover the finished work of the several kinds called for.

Unit Prices have been computed in accordance with paragraph 11.03.B of the General Conditions.

Bidder acknowledges that estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all Unit Price Bid items will be based on actual quantities provided, determined as provided in the Contract Documents.

ARTICLE 6 - TIME OF COMPLETION

6.01 Bidder agrees that the Work will be completed in accordance with the Contract Documents.

6.02 Bidder agrees to pay Liquidated Damages as provided for in the Contract Documents.

ARTICLE 7 - ATTACHMENTS TO THIS BID

7.01 Refer to Section H of the contract documents for a list of documents required for this bid.

ARTICLE 8 - DEFINED TERMS

8.01 The terms used in this Bid with initial capital letters have the meanings indicated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

ARTICLE 9 - BID SUBMITTAL

9.01 This Bid is submitted by:

☐ An Individual

Name (typed or printed): _____

By: _____
(SEAL) (Individual's Signature)

doing business as _____

Business address _____

Telephone number _____ FAX number _____

SS# or FED I.D.# _____

☐ A Partnership

Partnership Name (typed or printed): _____

By _____
(Signature of General Partner- attach evidence of authority to sign)

Business address _____

Telephone number _____ FAX number _____

SS# or FED I.D.# _____

☐ A Corporation

By _____
(SEAL)(Corporate Name)

(State of incorporation)

Type: _____
(General Business, Professional, Service, Limited Liability)

By _____
(SEAL)(Signature - attach evidence of authority to sign)

(Corporate seal)(Title of person authorized to sign)

Attest _____
(Secretary)

Business address _____

Telephone number _____ FAX _____

FED I.D.# _____

☐ A Joint Venture

By _____
(SEAL)(Name)

(Address)

By _____
(SEAL)(Name)

(Address)

SS# or FED I.D.# _____

(Each joint venturer must sign. The manner of signing for each individual, partnership and corporation that is a party to the joint venture should be in the manner indicated above.)

All Bidders:

Address and telephone number for receipt of official communications:

Contact Person: _____

Address: _____

Telephone: _____

Email: _____

FAX: _____

BID BOND

Any singular reference to Bidder, Surety, Owner, or other party shall be considered plural where applicable.

BIDDER (Name and Address): _____

SURETY (Name and Address of Principal Place of Business): _____

OWNER (Name and Address): Stillwater Utilities Authority
PO Box 1449
Stillwater, OK 74076

BID

Bid Due Date: _____

Project (Brief Description Including Location): _____

BOND

Bond Number: _____

Date (Not later than Bid due date): _____

Penal sum _____

(Words)

(Figures)

Surety and Bidder, intending to be legally bound hereby, subject to the terms printed on the reverse side hereof, do each cause this Bid Bond to be duly executed on its behalf by its authorized officer, agent, or representative.

BIDDER

SURETY

(Seal
)

(Seal)

Bidder's Name and Corporate Seal

Surety's Name and Corporate Seal

By: _____
Signature and Title

By: _____
Signature and Title
(Attach Power of Attorney)

Attest: _____
Signature and Title

Attest: _____
Signature and Title

Note: Above addresses are to be used for giving required notice.

1. Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to pay to Owner upon default of Bidder the penal sum set forth on the face of this Bond. Payment of the penal sum is the extent of Surety's liability.
2. Default of Bidder shall occur upon the failure of Bidder to deliver within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents.
3. This obligation shall be null and void if:
 - 3.1. Owner accepts Bidder's Bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents, or
 - 3.2. All Bids are rejected by Owner, or
 - 3.3. Owner fails to issue a Notice of Award to Bidder within the time specified in the Bidding Documents (or any extension thereof agreed to in writing by Bidder and, if applicable, consented to by Surety when required by Paragraph 5 hereof).
4. Payment under this Bond will be due and payable upon default by Bidder and within 30 calendar days after receipt by Bidder and Surety of written notice of default from Owner, which notice will be given with reasonable promptness, identifying this Bond and the Project and including a statement of the amount due.
5. Surety waives notice of any and all defenses based on or arising out of any time extension to issue Notice of Award agreed to in writing by Owner and Bidder, provided that the total time for issuing Notice of Award including extensions shall not in the aggregate exceed 120 days from Bid due date without Surety's written consent.
6. No suit or action shall be commenced under this Bond prior to 30 calendar days after the notice of default required in Paragraph 4 above is received by Bidder and Surety and in no case later than one year after Bid due date.
7. Any suit or action under this Bond shall be commenced only in a court of competent jurisdiction located in the state in which the Project is located.
8. Notices required hereunder shall be in writing and sent to Bidder and Surety at their respective addresses shown on the face of this Bond. Such notices may be sent by personal delivery, commercial courier, or by United States Registered or Certified Mail, return receipt requested, postage pre-paid, and shall be deemed to be effective upon receipt by the party concerned.
9. Surety shall cause to be attached to this Bond a current and effective Power of Attorney evidencing the authority of the officer, agent, or representative who executed this Bond on behalf of Surety to execute, seal, and deliver such Bond and bind the Surety thereby.
10. This Bond is intended to conform to all applicable statutory requirements. Any applicable requirement of any applicable statute that has been omitted from this Bond shall be deemed to be included herein as if set forth at length. If any provision of this Bond conflicts with any applicable statute, then the provision of said statute shall govern and the remainder of this Bond that is not in conflict therewith shall continue in full force and effect.
11. The term "Bid" as used herein includes a Bid, offer, or proposal as applicable.

Oklahoma Drinking Water State Revolving Fund
BUSINESS RELATIONSHIPS AFFIDAVIT

STATE OF _____) ss.
COUNTY OF _____)

_____, of lawful age, being first duly sworn, on oath says that (s)he is the agent authorized by the bidder to submit the attached bid. Affiant further states that the nature of any partnership, joint venture, or other business relationship presently in effect or which existed within one (1) year prior to the date of this statement with the architect, engineer, or other party to the project is as follows:

Affiant further states that any such business relationship presently in effect or which existed within one (1) year prior to the date of this statement between any officer or director of the bidding company and any officer or director of the architectural or engineering firm or other party to the project is as follows:

Affiant further states that the names of all persons having any such business relationships and the positions they hold with their respective companies or firms are as follows:

(If none of the business relationships hereinabove mentioned exist, affiant should so state.)

Subscribed and sworn to before me this _____ day of _____, 20____.

Notary Public

My Commission Expires:

Oklahoma Drinking Water State Revolving Fund
NONCOLLUSION AFFIDAVIT

STATE OF _____) ss.
COUNTY OF _____)

_____, of lawful age, being first duly sworn, on oath says that (s)he is the agent authorized by the bidder to submit the attached bid. Affiant further states that the bidder has not been a party to any collusion among bidders in restraint of freedom of competition by agreement to bid at a fixed price or to refrain from bidding; or with any government official or employee as to quantity, quality, or price in the prospective contract, or any other terms of said prospective contract; or in any discussions between bidders and any government official concerning exchange of money or other value for special consideration in the letting of a contract; that the bidder/contractor had not paid, given or donated or agreed to pay, give or donate to any officer or employee of the _____ (or other entity) any money or other thing of value, either directly or indirectly in the procurement of a contract or pursuant to this bid.

Subscribed and sworn to before me this _____ day of _____, 20____.

Notary Public

My Commission Expires:

Oklahoma Drinking Water State Revolving Fund

CERTIFICATION REGARDING LOBBYING FOR CONTRACTS OR SUBAGREEMENTS UNDER FEDERAL CONTRACTS, GRANTS OR LOANS

The undersigned certifies, to the best of his or her knowledge and belief, that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form - LLL, "Disclosure Form to Report Lobbying," in accordance with the instructions on that form.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans and cooperative agreement and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by Section 1352, Title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

DATE:_____ BY:_____

Typed Name and Title

Grantee

P40-1021220-05

_____ Lien or Claimant (Company Name) _____ Description of Work or Materials _____ Amount _____ Signature _____ Typed or Printed Name _____ Date	_____ Lien or Claimant (Company Name) _____ Description of Work or Materials _____ Amount _____ Signature _____ Typed or Printed Name _____ Date
_____ Lien or Claimant (Company Name) _____ Description of Work or Materials _____ Amount _____ Signature _____ Typed or Printed Name _____ Date	_____ Lien or Claimant (Company Name) _____ Description of Work or Materials _____ Amount _____ Signature _____ Typed or Printed Name _____ Date
_____ Lien or Claimant (Company Name) _____ Description of Work or Materials _____ Amount _____ Signature _____ Typed or Printed Name _____ Date	_____ Lien or Claimant (Company Name) _____ Description of Work or Materials _____ Amount _____ Signature _____ Typed or Printed Name _____ Date

BIDDER'S AMERICAN IRON AND STEEL CERTIFICATION

This is a certification that I, the bidder, _____ (Name and Title) of _____ (Company Name, Partnership, LLC, Inc., etc.) hereby certify and is aware that none of the funds appropriated or otherwise made available by the Safe Drinking Water Act, Section 1452(a)(4), requiring that all iron and steel products used for a project for the construction, alteration, maintenance or repair of a public water system are produced in the United States."

The Bidder is aware that all iron and steel products used for this project must be produced in the United States per Section 1452(a)(4) of the Safe Drinking Water Act, and incorporated into this project Recovered Water Pump Station and Finished Water Pump Station (Insert Name of Project), DWSRF Project #: P40-1021220-05 (Insert DWSRF Project Number), and furthermore certifies as follows.

1. The bidder understands the term "iron and steel products" applies to all projects for the construction, alteration, maintenance, or repair of publically owned treatment works or public water systems.
2. The bidder understands the term "iron and steel products" refers to the following products made primarily of iron or steel, lined or unlined pipes and fittings, manhole covers and other municipal castings, hydrants, tanks, flanges, pipe clamps and restraints, valves, structural steel, reinforced precast concrete, and construction materials. Additional information, including any published waivers, is posted on the EPA Website, http://water.epa.gov/grants_funding/aisrequirement.cfm.
3. The bidder further states that this requirement applies to all portions of the project that are subcontracted.
4. This "Bidder's American Iron and Steel Certification" is to be submitted by Bidder as a part of this bid and proposal.
5. Iron and steel of unknown origin are considered to have been produced or manufactured outside the United States.
6. Identification of American-produced Iron and Steel Goods: Consistent with the terms of the Owner's bid solicitation and the provisions of Use of American Iron and Steel Section 1452(a)(4) of the Safe Drinking Water Act, the Bidder certifies that this bid reflects the Bidder's best, good faith effort to identify domestic sources of iron and steel goods in the bid solicitation where such American-made goods are available on the schedule and consistent with the deadlines prescribed in or required by the bid solicitation.
7. Verification of U.S. Production: The bidder certifies that all iron and steel products contained in the bid solicitation that are American-made have been so identified, and if this bid is accepted, the Bidder agrees that it will provide reasonable, sufficient, and timely verification to the Owner of the U.S. production of each component so identified.
8. Documentation Regarding Non-American-made Iron and Steel Goods: The Bidder certifies that for any iron and steel products that are not American-made and are so identified in this bid, the Bidder has included in or attached to this bid one or both of the following, as applicable:
9. Identification of and citation to a categorical waiver published by the U.S. Environmental Protection Agency in the Federal Register that is applicable to such component or components, and an analysis that supports its applicability to the component or components; If the Administrator of the Environmental Protection Agency (EPA) receives a request for a waiver under this section, the Administrator shall make available to the public on an informal basis a copy of the request and information available to the Administrator concerning the request, and shall allow for informal public input on the request for at least 15 days prior to making a finding based on the

request. The Administrator shall make the request and accompanying information available by electronic means, including on the official public Internet Website of the Environmental Protection Agency.

10. Verifiable documentation sufficient to the Owner, as required in the bid solicitation or otherwise, that the Bidder has sought to secure American-produced goods but has determined that such goods are not available on the schedule and consistent with the deadlines prescribed in the bid solicitation, with assurance adequate for the Bidder under the applicable conditions stated in the bid solicitation or otherwise.
11. Information and Detailed Justification Regarding Non-American-produced Iron and Steel Goods: The Bidder certifies that for any such product or products that are not so available, the Bidder has also provided in or attached to this bid certification, including but not limited to the verifiable documentation and a full description of the bidder's efforts to secure any such American-produced iron and steel goods, that the Bidder believes are sufficient to provide and as far as possible constitute the detailed justification required for a waiver under Use of American Iron and Steel with respect to such product or products.
12. If use of a noncompliant iron and/or steel product is permanently incorporated into a project, one or more of the following can occur: 1) Request a waiver where appropriate. 2) Require the removal of the non-domestic item. 3) Payment for all or part of the project will be withheld.
13. The Bidder further agrees that, if this bid is accepted, it will assist the Owner in amending, supplementing, or further supporting such information as required by the Owner to request and, as applicable, implement the terms of a waiver with respect to any such product or products. The EPA strongly recommends the use of a step certification, similar to the one used by the Federal Highway Administration. The final manufacturer can also certify that the manufacturing process occurred in the United States.

Name of Construction Company

Signed _____
Signature of Authorized Official

By _____
Type Name of Authorized Official

Title _____
Title of Authorized Official

BIDDER'S BUILD AMERICA BUY AMERICA CERTIFICATION

This is a certification that I, the Bidder, _____ (Name and Title) of _____ (Company Name, Partnership, LLC, Inc., etc.) hereby certify that funds for this project must comply with all federal requirements applicable to the assistance received (including those imposed by the Infrastructure Investment and Jobs Act ("IIJA"), Public Law No. 117-58) which the Bidder understands includes, but is not limited to, the following requirements: that all of the iron and steel, manufactured products, and construction materials used in the project are to be produced in the United States ("Build America, Buy America [BABA] Requirements") unless (i) the Bidder has requested and obtained a waiver from the cognizant Agency pertaining to the project or the project is otherwise covered by a general applicability waiver; or (ii) all of the contributing Agencies have otherwise advised the Bidder in writing that the BABA Requirements are not applicable to the project.

The Bidder is aware that all iron and steel, manufactured projects, and construction materials used for this project must be produced in the United States per BABA requirements and incorporated into this project Recovered Water Pump Station and Finished Water Pump Station (Insert Name of Project), DWSRF Project #: P40-1021220-05 (Insert DWSRF Project Number), and furthermore certifies as follows.

1. The Bidder understands the term "iron and steel, manufactured products, and construction materials" applies to all projects for the construction, alteration, maintenance, or repair of publically owned treatment works or public water systems. The Bidder understands the term "iron and steel, manufactured products, and construction materials" refers to the following:
 - a) To establish standards defining the term "all manufacturing processes" in the case of construction materials, Office of Management and Budget ("OMB") must first determine to which materials the standards will apply.
 - b) The IIJA finds that "construction materials" include an article, material, or supply—other than an item of primarily iron or steel; a manufactured product; cement and cementitious materials; aggregates such as stone, sand, or gravel; or aggregate binding agents or additives—that is or consists primarily of: Non-ferrous metals, plastic and polymer-based products (including polyvinylchloride, composite building materials, and polymers used in fiber optic cables), glass (including optic glass), lumber, and drywall.
2. The Bidder further states that this requirement applies to all portions of the project that are subcontracted.
3. This "Bidder's Build America Buy America Certification" is to be submitted by the Bidder as a part of this bid and proposal.
4. Iron and steel, manufactured products, and construction materials of unknown origin are considered to have been produced or manufactured outside the United States.
5. Identification of American-produced Iron and Steel, Manufactured Products, and Construction Materials: Consistent with the terms of the Owner's bid solicitation and the provisions of BABA, the Bidder certifies that this bid reflects the Bidder's best, good faith effort to identify domestic sources of iron and steel, manufactured products, and construction materials in the bid solicitation where such American-made goods are available on the schedule and consistent with the deadlines prescribed in or required by the bid solicitation.
6. Verification of U.S. Production: The Bidder certifies that all iron and steel, manufactured products, and construction materials contained in the bid solicitation that are American-made have been so identified, and if this

bid is accepted, the Bidder agrees that it will provide reasonable, sufficient, and timely verification to the Owner of the U.S. production of each component so identified.

7. Documentation Regarding Non-American-made Iron and Steel Goods: The Bidder certifies that for any iron and steel, manufactured products, and construction material that are not American-made and are so identified in this bid, the Bidder has included in or attached to this bid one or both of the following, as applicable:
 - a. Identification of and citation to a categorical waiver published by the U.S. Environmental Protection Agency ("EPA") in the Federal Register that is applicable to such component or components, and an analysis that supports its applicability to the component or components. If the Administrator of EPA receives a request for a waiver under this section, the Administrator shall make available to the public on an informal basis a copy of the request and information available to the Administrator concerning the request and shall allow for informal public input on the request for at least 15 days prior to making a finding based on the request. The Administrator shall make the request and accompanying information available by electronic means, including on the official public Internet Website of EPA.
 - b. Verifiable documentation sufficient to the Owner, as required in the bid solicitation or otherwise, that the Bidder has sought to secure American-produced goods but has determined that such goods are not available on the schedule and consistent with the deadlines prescribed in the bid solicitation, with assurance adequate for the Bidder under the applicable conditions stated in the bid solicitation or otherwise.
8. Information and Detailed Justification Regarding Non-American-produced Iron and Steel, Manufactured products, and Construction Materials: The Bidder certifies that for any such product or products that are not so available, the Bidder has also provided in or attached to this bid certification, including but not limited to the verifiable documentation and a full description of the Bidder's efforts to secure any such American-produced iron and steel, manufactured products, and construction materials, that the Bidder believes are sufficient to provide and as far as possible constitute the detailed justification required for a waiver under Use of American Iron and Steel with respect to such product or products.
9. If use of a noncompliant iron and steel, manufactured products, and construction materials is permanently incorporated into a project, one or more of the following can occur: 1) Request a waiver where appropriate. 2) Require the removal of the non-domestic item. 3) Payment for all or part of the project will be withheld.
10. The Bidder further agrees that, if this bid is accepted, it will assist the Owner in amending, supplementing, or further supporting such information as required by the Owner to request and, as applicable, implement the terms of a waiver with respect to any such product or products. EPA strongly recommends the use of a step certification, similar to the one used by the Federal Highway Administration. The final manufacturer can also certify that the manufacturing process occurred in the United States.

Name of Construction Company

Signed _____
Signature of Authorized Official

By _____
Type Name of Authorized Official

Title _____
Title of Authorized Official

Oklahoma Drinking Water State Revolving Fund Disadvantaged Business Enterprise (DBE) Program Guidance

The Oklahoma Drinking Water State Revolving Fund (DWSRF) receives federal funds from the U.S. Environmental Protection Agency (EPA) to provide low interest rate loans to finance water infrastructure projects. As a condition of federal grant awards, EPA regulations require that loan recipients and sub-recipients (i.e., prime contractors and subcontractors) make a good-faith effort to award a fair share of work to DBE's who are minority business enterprises (MBE's) and women's business enterprises (WBE's). DBE requirements can be found in 40 CFR Part 33.

To ensure compliance with EPA's DBE requirements, both **Project Owners (Loan Recipients)** and **Prime Contractors must** undertake the good faith efforts to provide opportunities for DBE companies to participate in procurements. EPA regulations require evidence of the demonstration of the six good faith efforts in trying to achieve the DBE participation goals. DWSRF negotiated DBE participation goals with EPA of 11.25% for MBEs and 7.41% for WBEs. The DBE goals are not a quota.

Good Faith Efforts – 40 CFR 33.301

The following good faith efforts which apply to the procurement categories involving EPA financial assistance funds can be found in **40 CFR, Subpart C, Part 33** of EPA's Disadvantaged Business Enterprise Program Rule.

1. Ensure DBE's are made aware of contracting opportunities to the fullest extent practicable through outreach and recruitment activities.
2. Search DBE lists for potential subcontracts/suppliers.
 - a. The DBE lists are updated frequently, so search on-line for the most current list.
 - b. Contact at least one DBE for each subcontract/supplier needed.
3. Provide notice to DBE organizations of opportunities to bid.
4. Arrange time frames for contracts and establish delivery schedules in a way that encourages and facilitates participation by DBEs in the competitive process.
5. Divide total requirements into smaller tasks or quantities and using DBE prime contractors and subcontractors when feasible to permit maximum DBE participation.
6. Encourage contracting with a consortium of DBEs when a contract is too large for one of these firms to handle individually.
7. Use the services and assistance of the Small Business Administration (SBA), Department of Transportation (DOT) and Minority Business Development Agency of the U. S. Department of Commerce.
8. If the Prime Contractor awards subcontracts, require the subcontractor to take these same Good Faith Efforts.

TO PROVIDE PROCUREMENT OPPORTUNITIES TO DBE FIRMS, THE PROJECT OWNER SHOULD:

- Conduct pre-bid meetings to inform potential bidders/contractors about DBE requirements and provide guidance in undertaking the required good faith efforts found at 40 CFR 33.301.
- When appropriate invite DBE companies to meetings, conferences, etc., to inform them of procurement opportunities.

- Use databases of certified DBEs from the U.S. Small Business Administration (SBA), Oklahoma Department of Transportation (ODOT), etc, to solicit DBE companies as prime contractors whenever they are potential.
- The SBA maintains a list that can be found at the following link http://dsbs.sba.gov/dsbs/search/dsp_dsbs.cfm
- The ODOT maintains a database which can be found at the following link <https://okdot.gob2g.com/?TN=okdot>
- Cherokee Nation Tribal Employment Rights Office (TERO) maintains a list which can be found at <http://www.cherokeetero.com/>

Procurement, Recordkeeping and Reporting

I. PROJECT OWNERS ARE REQUIRED TO:

- A. Ensure all prime contractors apply the Good Faith Efforts.
- B. Project Owners must require its prime contractor to pay its subcontractor for satisfactory performance no more than 30 days from the prime contractor's receipt of payment from the project owner/recipient.
40 CFR 33.302(a)
- C. Maintain copies of all DBE documentation.

2. PRIME CONTRACTORS ARE REQUIRED TO:

- A. Notify the loan recipient in writing prior to any termination of a DBE subcontractor by the prime contractor. 40 CFR 33.302(b)
- B. Follow the six good faith efforts if soliciting a replacement subcontractor after a DBE subcontractor fails to complete work under the subcontract for any reason. 40 CFR 33.302(c)
- C. Follow the six good faith efforts for all subcontract and/or supplier procurements even if the prime contractor has achieved its fair share objectives. 40 CFR 33.302(d)
- D. Provide documentation of solicitation of DBEs within three days of being declared the apparent low bidder:

3. **All DWSRF loan recipients are required to create and maintain a bidders list in accordance with 40 CFR, Subpart E, Part 33** of EPA's Disadvantaged Business Enterprise Program rule, (40 CFR 33.501(b)). The bidder's list must include **all** companies that bid/quote on prime contracts and/or bid/quote on subcontracts and supplies for DWSRF funded projects (including DBEs and non-DBEs). The bidder's list must include the following prime and subcontractor information (40 CFR 33.501): entity's name and the name of the person contacted; entity's mailing address, telephone number, and e-mail address; the task or material on which the entity bid/quoted, the amount and date of bid/quote; and the entity's status as an MBE/WBE or non-MBE/WBE.

Please submit all information to:

**Kristi Roy, DBE Coordinator, DWSRF, P.O. Box 1677, Oklahoma City, OK 73101
Phone: 405 702-8144; FAX: 405 702-8101; Email: Kristi.Roy@DEQ.OK.GOV**

EPA Form 6100-2 (DBE Subcontractor Participation Form)
Disadvantaged Business Enterprise Program

Instructions

This form is to be provided to all prime contractors at the Pre-Construction Conference.

The prime contractor is responsible to provide a copy of the form to all disadvantaged (MBE/WBE) businesses utilized during the project. It does not need to be provided to non-DBE businesses.

The purpose of this form is to provide DBE subcontractor/suppliers with a venue to grieve to EPA if they feel they have been unjustly terminated or are not receiving timely payments (within 30 days of the prime contractor receiving payment from the owner). This form is only to be utilized if the DBE Subcontractor/Supplier would like to file a complaint with EPA concerning unfair or biased treatment.

Questions concerning the form can be directed to:

Leandra "Andy" Callaway
DWSRF DBE Coordinator
ODEQ-WQD
PO Box 1677
Oklahoma City, OK 73101-1677
(405) 702-8114

Completed forms must be mailed to:

Debora Bradford, DBE Coordinator
USEPA Region 6
1445 Ross Avenue, Suite 1200
Mail code: 6MDCP
Dallas, TX 75202-2733
(214) 665-7406



Disadvantaged Business Enterprise Program DBE Subcontractor Participation Form

NAME OF SUBCONTRACTOR¹	PROJECT NAME
ADDRESS	CONTRACT NO.
TELEPHONE NO.	E-MAIL ADDRESS
PRIME CONTRACTOR NAME	

Please use the space below to report any concerns regarding the above EPA-funded project (e.g., reason for termination by prime contractor, late payment, etc.).

CONTRACT ITEM NO.	ITEM OF WORK OR DESCRIPTION OF SERVICES RECEIVED FROM THE PRIME CONTRACTOR	AMOUNT SUBCONTRACTOR WAS PAID BY PRIME CONTRACTOR

Subcontractor Signature
Title/Date

¹Subcontractor is defined as a company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services pursuant to an EPA award of financial assistance.

Disadvantaged Business Enterprise Program DBE Subcontractor Participation Form

The public reporting and recordkeeping burden for this collection of information is estimated to average fifteen (15) minutes. Burden means the total time, effort, or financial resources expended by persons to generate, maintain, retain, or disclose or provide information to or for a Federal agency. This includes the time needed to review instructions; develop, acquire, install, and utilize technology and systems for the purposes of collecting, validating, and verifying information, processing and maintaining information, and disclosing and providing information; adjust the existing ways to comply with any previously applicable instructions and requirements; train personnel to be able to respond to a collection of information; search data sources; complete and review the collection of information; and transmit or otherwise disclose the information. An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number.

Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including the use of automated collection techniques to the Director, Collection Strategies Division, U.S. Environmental Protection Agency (2822), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460. Include the OMB control number in any correspondence. Do not send the completed EPA DBE Subcontractor Participation Form to this address.



Disadvantaged Business Enterprise Program DBE Subcontractor Performance Form

NAME OF SUBCONTRACTOR ¹		PROJECT NAME	
ADDRESS		BID/PROPOSAL NO.	
TELEPHONE NO.		E-MAIL ADDRESS	
PRIME CONTRACTOR NAME			
CONTRAC ITEM NO.	ITEM OF WORK OR DESCRIPTION OF SERVICES BID TO PRIME	PRICE OF WORK SUBMITTED TO PRIME CONTRACTOR	
Currently certified as an MBE or WBE under EPA's DBE Program? _____ Yes _____ No _____ Signature of Prime Contractor _____ Print Name _____ Signature of Subcontractor _____ Print Name _____ Date _____ Title _____ Date _____ Title			

¹Subcontractor is defined as a company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services pursuant to an EPA award of financial assistance.



**Disadvantaged Business Enterprise Program
DBE Subcontractor Utilization Form**

BID/PROPOSAL NO.	PROJECT NAME
NAME OF PRIME BIDDER/PROPOSER	E-MAIL ADDRESS
ADDRESS	
TELEPHONE NO.	FAX NO.

The following subcontractors¹ will be used on this project:			
COMPANY NAME, ADDRESS, PHONE NUMBER, AND E-MAIL ADDRESS	TYPE OF WORK TO BE PERFORMED	ESTIMATED DOLLAR AMOUNT	CURRENTLY CERTIFIED AS AN MBE OR WBE?
I certify under penalty of perjury that the forgoing statements are true and correct. In the event of a replacement of a subcontractor, I will adhere to the replacement requirements set forth in 40 CFR Part 33 Section 33.302(c).			
_____ Signature Of Prime Contractor		_____ Date	
_____ Print Name		_____ Title	

¹Subcontractor is defined as a company, firm, joint venture, or individual who enters into an agreement with a contractor to provide services pursuant to an EPA award of financial assistance

United States Environmental Protection Agency Washington, DC 20460 Pre-award Compliance Review Report For All Applicants Requesting Federal Financial Assistance		FORM Approved OMB No. 2090-0014 Expires 4-30-99
Note: Read instructions on reverse side before completing form.		
I. A. Applicant (Name, City, State)	B. Recipient (Name City, State)	C. EPA Project No.
II. Brief description of proposed project, program or activity.		
III. Are any civil rights lawsuits or complaints pending against applicant and/or recipient? If ☒ Yes, ☒ list those complaints and the disposition of each complaint. ☐ Yes ☐ No		
IV. Have any civil rights compliance reviews of the applicant and/or recipient been conducted by any Federal agency during the two years prior to this application for activities which would receive EPA assistance? If ☒ Yes, ☒ list those compliance reviews and status of each review. ☐ Yes ☐ No		
V. Is any other Federal financial assistance being applied for or is any other Federal financial assistance being applied to any portion of this project, program or activity? If ☒ Yes, ☒ list the other Federal Agency(ies), describe the associated work and the dollar amount of assistance ☐ Yes ☐ No		
VI. If entire community under the applicant's jurisdiction is not served under the existing facilities/services, or will not be served under the proposed plan, give reasons why.		
VII. Population Characteristics		Number of People
1.A. Population of Entire Service Area		
B. Minority Population of Entire Service Area		
2.A. Population Currently Being Served		
B. Minority Population Currently Being Served		
3.A. Population to be Served by Project, Program or Activity		
B. Minority Population to be Served by Project, Program or Activity		
4.A. Population to Remain Without Service		
B. Minority Population to Remain Without Service		
VIII. Will all new facilities or alterations to existing facilities financed by these funds be designed and constructed To be readily accessible to and usable by handicapped persons? If ☒ No, ☒ explain how a regulatory exception (40 CFR 7.70) applies. ☐ Yes ☐ No		
IX. Give the schedule for future projects, programs or activities (or of future plans), by which service will be provided to all beneficiaries within applicant's jurisdiction. If there is no schedule, explain why.		
X. I certify that the statements I have made on this form and all attachments thereto are true, accurate and complete. I acknowledge that any knowingly false or misleading statement may be punishable by fine ore imprisonment or both under applicable law.		
A. Signature of Authorized Official	B. Title of Authorized Official	C. Date
For the U.S. Environmental Protection Agency		
9 Approved	Authorized EPA Official	Date
9 Disapproved		

Instructions

General

Recipients of Federal financial assistance from the U.S. Environmental Protection Agency must comply with the following statutes.

Title VI of the Civil Rights Act of 1964 provides that no person in the United States shall, on the grounds of race, color or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance. The Act goes on to explain that the title shall not be construed to authorize action with respect to any employment practice of any employer, employment agency, or labor organization (except where the primary objective of the Federal financial assistance is provided employment).

Section 13 of the 1972 Amendments to the Federal Water Pollution Control Act provides that no person in the United States shall on the ground of sex, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under the Federal Water Pollution Control Act, as amended. Employment discrimination on the basis of sex is prohibited in all such programs or activities.

The Age Discrimination Act of 1975 provides that no person on the basis of age shall be excluded from participation under any program or activity receiving Federal financial assistance. Employment discrimination is not covered. Age discrimination in employment is prohibited by the Age Discrimination in Employment Act administered by the Equal Employment Opportunity Commission.

Title IX of the Education Amendments of 1972 provides that no person on the basis of sex shall be excluded from participation in, be denied the benefit of, or be subjected to discrimination under any education program or activity receiving Federal financial assistance. Employment discrimination on the basis of sex is prohibited in all such education programs or activities. Note: an education program or activity is not limited to only those conducted by a formal institution.

The information on this form is required to enable the U.S. Environmental Protection Agency to determine whether applicants and prospective recipients are developing projects, programs and activities on a nondiscriminatory basis as required by the above statutes.

Submit this form with the original and required copies of applications, requests for extensions, requests for increase of funds, etc. Updates of information are all that are required after the initial application submission.

If any item is not relevant to the project for which assistance is requested, write "NA" for "Not Applicable."

In the event applicant is uncertain about how to answer certain questions, EPA program officials should be contacted for clarification.

ITEMS

- IA. "Applicant" means any entity that files an application or unsolicited proposal or otherwise requests EPA assistance.
- IB. "Recipient" means any entity, other than applicant, which will actually receive EPA assistance.
- IC. Self-explanatory.
- II. Self-explanatory.
- III. "Civil rights lawsuits" means any lawsuit or complaint alleging discrimination on the basis of race, color, national origin, sex, age or handicap pending against the applicant and/or entity which actually benefits from the grant. For example, if a city is the named applicant but the grant will actually benefit the Department of Sewage, civil rights lawsuits involving both the city and the Department of Sewage should be listed.
- IV. "Civil rights compliance review" means any review assessing the applicant's and/or recipient's compliance with laws prohibiting discrimination on the basis of race, color, national origin, sex, age or handicap. If any part of the review covered the entity which will actually benefit from the grant, it should be listed.
- V. Self-explanatory.
- VI. The word "community" refers to the area under the applicant's and/or recipient's jurisdiction. The "community" might be a university or laboratory campus, or a community within a large city. If there is a significant disparity between minority and nonminority populations to receive service, not otherwise satisfactorily explained, the Regional office may require a map which indicates the minority and non minority population served by this project, program or activity.
- VII. This information is required so that reviewers may determine if a disparity in the proposed provision of services will exist in the event the application is approved for funding. Give population of recipient's jurisdiction, broken out by categories as specified.
- VIII. Self-explanatory.
- IX. "Jurisdiction" means the geographical area over which application has the authority to provide service.
- X. Self-explanatory.

"Burden Disclosure Statement"

EPA estimates public reporting burden for the preparation of this form to average 30 minutes per response. This estimate includes the time for reviewing instructions, gathering and maintaining the data needed and completing and reviewing the form. Send comments regarding the burden estimate, including suggestions for reducing this burden, to Chief, Information Policy Branch, PM-223, U.S. Environmental Protection Agency, 401 M Street, S.W., Washington, D.C. 20460; and the Office of Information and Regulatory Affairs, Office of Management and Budget, Washington, D.C. 20503.

**REVISIONS TO EPA REGULATIONS
ON DEBARMENT AND SUSPENSION
EXECUTIVE ORDER 12549**

The certification regarding Debarment, Suspension, and other responsible matters applies to all loans from the DWSRF. Loan Recipients, Prime Contractors, and Subcontractors with contracts for \$25,000 or more are required to complete this certification.

The attached Form 5700-49 may be duplicated for use by the loan recipient, the consulting engineer, the prime contractors and its subcontractors. All executed certifications must be kept on file by the loan recipient. All contractors (both A/E and construction) must keep certifications of subcontractors on file. Certifications by the loan recipient, prime contractors (both A/E and construction) and any MBE/WBE subcontractors must be submitted to DEQ as follows:

- Loan Recipient, Submit Form 5700-49 with loan application.
- A/E and Consulting MBE/WBE Subcontracts, Submit Form 5700-49 with executed contract.
- Prime Construction Contractor and MBE/WBE Subcontracts, Submit with bid proposal (prime) and letters of intent (MBE/WBE subcontracts).

Attachment: EPA Form 5700-49



EPA Project Control Number

United States Environmental Protection Agency
Washington, DC 20480

Certification Regarding Debarment, Suspension, and Other Responsibility Matters

The prospective participant certifies to the best of its knowledge and belief that it and its principles:

- (a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;**
- (b) Have not within a three year period preceding this proposal been convicted of or had a civil judgement rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;**
- (c) Are not presently indicted for or otherwise criminally or civilly charged by a government entity (Federal, State, or local) with commission of any of the offenses enumerated in paragraph (1)(b) of this certification; and**
- (d) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State, or local) terminated for cause or default.**

I understand that a false statement on this certification may be grounds for rejection of this proposal or termination of the award. In addition, under 18 USC Sec. 1001, a false statement may result in a fine of up to \$10,000 or imprisonment for up to 5 years, or both.

Typed Name, Company, & Title of Authorized Representative

Address of Company Representing

Signature of Authorized Representative

☐

I am unable to certify to the above statements. My explanation is attached.

Instructions

Under Executive Order 12549, an individual or organization debarred or excluded from participation in Federal assistance or benefit programs may not receive any assistance award under a Federal program, or a subagreement thereunder for \$25,000 or more.

Accordingly, each prospective recipient of an EPA grant, loan, or cooperative agreement and any contract or subagreement participant thereunder must complete the attached certification or provide an explanation why they cannot. For further details, see 40 CFR 32-510. Participants responsibilities, in the attached regulation.

Where to Submit:

The prospective EPA grant, loan, or cooperative agreement recipient must return the signed certification or explanation with its application to the appropriate EPA Headquarters or Regional office, as required in the application instructions.

A prospective prime contractor must submit a completed certification or explanation to the individual or organization awarding the contract.

Each prospective subcontractor must submit a completed certification or explanation to the prime contractor for the project.

How to Obtain Forms:

EPA includes the certification form, instructions, and a copy of its implementing regulation (40 CFR Part 32) in each application kit. Applicants may reproduce these materials as needed and provide them to their prospective prime contractor, who, in turn, may reproduce and provide them to prospective subcontractors.

Additional copies/assistance may be requested from:

Compliance Branch
Grants Administration Division (P-216F)
U.S. Environmental Protection Agency
401 M Street, SW
Washington, DC 20460
(Telephone: 202/475-8025)

CERTIFICATE OF NON-DISCRIMINATION

In connection with the performance of work under this Contract, the Contractor agrees as follows:

A. The Contractor agrees not to discriminate against any employee or applicant for employment because of race, creed, color, sex, national origin, or ancestry. The Contractor shall take affirmative action to insure that employees are treated without regard to their race, creed, color, national origin, sex, or ancestry. Such actions shall include, but not be limited to the following: Employment, upgrading, demotion or transfer, recruiting or recruitment advertising, layoff or termination, rates of pay or other forms of compensation and selection for training, including apprenticeship. The Contractor and subcontractor shall agree to post in a conspicuous place, available to employees and applicants for employment, notices to be provided by the Owner setting forth provisions of this section.

B. In the event of the Contractor's non-compliance with this non-discrimination clause, the Contract may be canceled or terminated by the Owner. The Owner may declare the Contractor ineligible for further contracts with the said agency until satisfactory proof of intent to comply shall be made by the Contractor.

C. The Contractor agrees to include this non-discrimination clause in any subcontracts connected with the performance of this Agreement.

I have read the above stated clause and agree to abide by its requirements.

(company name)

_____, PRESIDENT

(seal)

Secretary

STATE OF _____)
COUNTY OF _____) §

On this _____ day of _____, 20____, before me, the undersigned, a Notary Public in and for the County and State aforesaid, personally appeared _____, to me known to be the identical person who signed the name of the maker thereof to the within and foregoing instrument as its _____ and acknowledged to me that _____ executed the same as _____ free and voluntary act and deed, and as the free and voluntary act and deed of said corporation, for the uses and purposes therein set forth.

Given under my hand and seal the day and year last above written.

Notary Public

My Commission Expires: _____

My Commission No.: _____

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CONTRACTOR'S STATEMENT OF QUALIFICATIONS
(CONTRACTOR: THIS FORM IS ALSO REQUIRED FOR EACH SUBCONTRACTOR
WITH 10% OR MORE OF THE CONTRACT WORK BY PRICE.)

1. Submitting Firm

Official Name of Firm:			
Address:			
City, State, Zip:			
Primary Contact Person:			
Title:			
Phone:			
Email:			
Date of Firm's Establishment:			

2. List all past names under which the firm has previously operated

3. Proposed Subcontractor(s) with 10% or more of the fee

Company Name:		
Contact Person:		
Title:		
Phone:		
Email:		
Type of Work:		

Include additional Subcontractors, if any, as an Attachment. Contractor must include all Subcontractor Statement of Qualifications in the Bid Package.

4. Licensing

Jurisdiction:		
Type of License:		
License Number:		
Jurisdiction:		
Type of License:		
License Number:		

Has firm listed in Section 1 ever been fined or suspended by a Contractor's licensing board?

☐ YES

☐ NO

If YES, attach details including where and why.

5. Bonding Information

Bonding Company:			
Address:			
City, State, Zip:			
Bonding Agent:			
Address:			
City, State, Zip:			
Contact Name:			
Phone:			
Aggregate Bonding Capacity:			
Available Bonding Capacity as of date of this submittal:			
Largest Project Completed to date:			
Owner Name, City, State:			
Construction Fee:			
Contact Person for Reference:			

6. Project Qualifications and History

Has this firm, or any officer or partner of this firm, ever failed to complete a construction contract operating as this firm or any other firm?

☐ YES ☐ NO

If yes, identify who and when, and give details:

Are there any judgments, claims, arbitration proceedings, or lawsuits pending, outstanding, or threatened to which this firm, or an officer or partner in this firm, has been a party?

☐ YES ☐ NO

If yes, describe:

Has this firm, or an officer or partner of this firm, filed any lawsuits, or requested arbitration proceedings with regard to any work performed in the last five years?

☐ YES ☐ NO

If yes, describe:

Does the firm's Project Manager and construction crew, or subcontractors, have the required experience and qualifications to perform the work of the project?

☐ YES ☐ NO

If requested by the owner, can the firm provide references for a minimum of five (5) projects that support the firm's or subcontractor's ability to competently perform each individual work component included in the contract?

☐ YES ☐ NO

List the projects (including the owner name, city, and state) for which the firm has had late starts or late completions per the contracted schedule in the last five (5) years:

Does the contractor have previous experience with projects contracted with a municipality?

☐ YES ☐ NO

7. Construction Experience

Project Manager (PM) for this project:			
PM's Three (3) Current or Most Recent Projects:			
Project Name, City, State:		Cost:	
Reference Name:		PhoneNumber:	
Project Name, City, State:		Cost:	
Reference Name:		PhoneNumber:	
Project Name, City, State:		Cost:	
Reference Name:		PhoneNumber:	

Project Superintendent (PS) for this project:			
PS's Three (3) Current or Most Recent Projects:			
Project Name, City, State:		Cost:	
Reference Name:		PhoneNumber:	
Project Name, City, State:		Cost:	
Reference Name:		PhoneNumber:	
Project Name, City, State:		Cost:	
Reference Name:		Phone Number:	

Current Experience:

List on **Schedule A** all projects currently under contract (if Joint Venture, list each participant's projects separately). Note which projects are a direct contract with a municipality.

Previous Experience:

List on **Schedule B** all projects completed within the last 5 Years (if Joint Venture, list each participant's projects separately). Note which projects are a direct contract with a municipality.

Has firm listed in Section 1 ever failed to complete a construction contract awarded to it?

☐ YES ☐ NO If yes, attach details including Project Owner's contact information.

Has any Corporate Officer, Partner, Joint Venture participant or Proprietor ever failed to complete a construction contract awarded to them in their name or when acting as a principal of another entity?

☐ YES ☐ NO If yes, attach details including Project Owner's contact information.

Are there any judgments, claims, disputes or litigation pending or outstanding involving the firm listed in Section 1 or any of its officers (or any of its partners if a partnership or any of the individual entities if a joint venture)?

☐ YES ☐ NO If yes, attach details including Project Owner's contact information.

Has firm listed in Section 1 ever been subject to Liquidated Damages with the City of Stillwater?

☐ YES ☐ NO If yes, attach details including project name and number.

Has firm listed in Section 1 ever been subject to Liquidated Damages with other municipality/owner?

☐ YES ☐ NO If yes, attach details including Project Owner's contact information.

8. Safety Program

Name of Contractor's Safety Officer:	
Describe firm's safety program:	
List all safety incidents in the past 5 years (Attach additional details if necessary):	

9. Major Equipment

List on **Schedule C** all pieces of major equipment available for use on Owner's Project.

10. Subcontractor Qualification Statement (Subcontractors performing less than 10% of Work)

List on **Schedule D** all projects currently under contract (if Joint Venture, list each participant's projects separately). Note which projects are a direct contract with a municipality.

I HEREBY CERTIFY THAT THE INFORMATION SUBMITTED HERewith, INCLUDING ANY ATTACHMENTS, IS TRUE TO THE BEST OF MY KNOWLEDGE AND BELIEF.

NAME OF FIRM:

FIRM'S AUTHORIZED SIGNATORY:

TITLE:

SIGNATURE:

DATE:

NOTARY ATTEST:

SUBSCRIBED AND SWORN TO BEFORE ME THIS _____ DAY OF _____, 20____

NOTARY PUBLIC - STATE OF _____

MY COMMISSION EXPIRES: _____

REQUIRED ATTACHMENTS

1. Schedule A (Current Experience).
2. Schedule B (Previous Experience).
3. Schedule C (Major Equipment).
4. Schedule D (Subcontractor Qualification Statement)
5. Evidence of authority for individuals listed in Section 1 to bind organization to an agreement.
6. Resumes of officers and key individuals (including Safety Officer) of firm named in Section 1.

This space intentionally blank.

SCHEDULE A -CURRENT EXPERIENCE

Project Name: PM/PS:	Contract Date:	Type of Work:	Contract Cost:
Owner's Name: Address: Telephone:	Design Engineer Name: Company: Telephone:		
Project Name: PM/PS:	Contract Date:	Type of Work:	Contract Cost:
Owner's Name: Address: Telephone:	Design Engineer Name: Company: Telephone:		
Project Name: PM/PS:	Contract Date:	Type of Work:	Contract Cost:
Owner's Name: Address: Telephone:	Design Engineer Name: Company: Telephone:		
Project Name: PM/PS:	Contract Date:	Type of Work:	Contract Cost:
Owner's Name: Address: Telephone:	Design Engineer Name: Company: Telephone:		
Project Name: PM/PS:	Contract Date:	Type of Work:	Contract Cost:
Owner's Name: Address: Telephone:	Design Engineer Name: Company: Telephone:		
Project Name: PM/PS:	Contract Date:	Type of Work:	Contract Cost:
Owner's Name: Address: Telephone:	Design Engineer Name: Company: Telephone:		

Note: Copy form and attach if additional space is needed.

SCHEDULE B -PREVIOUS EXPERIENCE

(Include ALL Projects Completed within the last 5 years)

Project Name: PM/PS:	Contract Date:	Type of Work:	Original Contract Cost:
Owner's Name: Address: Telephone:	Design Engineer Name: Company: Telephone:		Total Change Orders:
Project Name: PM/PS:	Contract Date:	Type of Work:	Original Contract Cost:
Owner's Name: Address: Telephone:	Design Engineer Name: Company: Telephone:		Total Change Orders:
Project Name: PM/PS:	Contract Date:	Type of Work:	Original Contract Cost:
Owner's Name: Address: Telephone:	Design Engineer Name: Company: Telephone:		Total Change Orders:
Project Name: PM/PS:	Contract Date:	Type of Work:	Original Contract Cost:
Owner's Name: Address: Telephone:	Design Engineer Name: Company: Telephone:		Total Change Orders:
Project Name: PM/PS:	Contract Date:	Type of Work:	Original Contract Cost:
Owner's Name: Address: Telephone:	Design Engineer Name: Company: Telephone:		Total Change Orders:

Note: Copy form and attach if additional space is needed.

SCHEDULE C - LIST OF MAJOR EQUIPMENT AVAILABLE

[illegible]

This space intentionally blank.

SCHEDULE D - SUBCONTRACTOR QUALIFICATIONS STATEMENT

Project Name: _
Project Numbers: _

We (_____), propose to utilize the following subcontractor to perform a portion of the work under this contract. The selected Subcontractor must be qualified and shall have sufficient experience and successful history in performing to assigned tasks.

A. Subcontractor Name:

B. Subcontractor Qualifications and Experiences (attached Supporting Documents as Needed):

1. _
2. _
3. _
4. _
5. _
6. _
7. _
8. _
9. _
10. _

C. Subcontractor References (attached Supporting Documents as Needed):

1. -
2. -
3. -
4. -
5. -
6. -
7. -
8. -
9. -
10. -

END OF CONTRACTORS QUALIFICATION STATEMENT

NOTICE OF NO BID

This sheet is provided for the convenience of vendors submitting a no bid response to solicitations. Request for bid (RFB) number and company name must be indicated by vendor.

REASON FOR NO BID:

- ☐ 1. Cannot comply with specifications
☐ 2. Cannot meet delivery requirements
☐ 3. Cannot identify the item(s)
☐ 4. Do not regularly manufacture or sell the type of item(s) involved
☐ 5. Other (Specify) _____
☐ We do ☐ We do not desire to be retained on the bidder list for future procurements of the type of item(s) involved.

Name and Address of firm (include zip code)

Signature

Title

FOLD/STAMP/MAIL

Notice of No Bid for Project 24WT02 (SUA Bid No. 55-2023,
DWSRF Project No. P40-1021220-05)
Bids Open October 18, 2023

FOLD/STAMP/MAIL

PLEASE
AFFIX
STAMP

CITY CLERK
CITY OF STILLWATER
P.O. BOX 1449
STILLWATER, OK 74076

AGREEMENT BETWEEN OWNER AND CONTRACTOR FOR CONSTRUCTION CONTRACT

Prepared by

ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

and

Issued and Published Jointly By



PROFESSIONAL ENGINEERS IN PRIVATE PRACTICE
a practice division of the
NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS

AMERICAN COUNCIL OF ENGINEERING COMPANIES

AMERICAN SOCIETY OF CIVIL ENGINEERS

This document has been approved and endorsed by

The Associated General Contractors of America

Construction Specifications Institute



Knowledge for Creating
and Sustaining
the Built Environment

EJCDC
AGREEMENT BETWEEN OWNER AND CONTRACTOR FOR
CONSTRUCTION CONTRACT

THIS AGREEMENT is by and between Stillwater Utilities Authority (Owner) and <to be filled out after bidding> (Contractor).

OWNER and CONTRACTOR, in consideration of the mutual covenants set forth herein, agree as follows:

ARTICLE 1 - WORK

1.01 Contractor shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows:

The Base Bid scope of work of this Contract consists of the construction of a new recovered water pump station, a new finished water pump station, piping improvements associated with the lagoons, and manhole and piping improvements associated with the solids blowdown for the solids contact units (SCUs) at the Stillwater Water Treatment Plant.

ARTICLE 2 - THE PROJECT

2.01 The Project for which the Work under the Contract Documents may be the whole or only a part is generally described as follows:

Recovered Water Pump Station, Finished Water Pump Station, and Piping Improvements at the Stillwater Water Treatment Plant

ARTICLE 3 - ENGINEER

3.01 The Project has been designed by Carollo Engineers, Inc. (Engineer) who is to act as Owner's representative, assume all duties and responsibilities, and have the rights and authority assigned to Engineer in the Contract Documents in connection with the completion of the Work in accordance with the Contract Documents.

ARTICLE 4 - CONTRACT TIMES

4.01 Time of the Essence

- A. All time limits for Milestones, if any, Substantial Completion, and completion and readiness for final payment as stated in the Contract Documents are of the essence of the Contract.

4.02 Days to Achieve Substantial Completion and Final Payment

- A. The Work will be substantially completed as provided in the General Conditions and Special Provisions, and completed and ready for final payment in accordance with the General Conditions and Special Provisions.

4.03 Liquidated Damages

- A. Contractor and Owner recognize that time is of the essence of this Agreement and that Owner will suffer financial loss if the Work is not completed within the times specified in Paragraph 4.02 above, plus any extensions thereof allowed in accordance with Article 12 of the General Conditions. The parties also recognize the delays, expense, and difficulties involved in proving in a legal ~~or arbitration~~ proceeding the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty), Contractor shall pay Owner as specified in the Special Provisions for each day that expires after the time specified in Paragraph 4.02 for Substantial Completion until the Work is substantially complete. After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Time or any proper extension thereof granted by Owner, Contractor shall pay Owner as

specified in the Special Provisions for each day that expires after the time specified in Paragraph 4.02 for completion and readiness for final payment until the Work is completed and ready for final payment.

ARTICLE 5 - CONTRACT PRICE

5.01 Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents an amount in current funds equal to the sum of the amounts determined pursuant to Paragraph 5.01.A below:

- A. For all Work, at the prices stated in the Contractor's Bid, attached hereto as an exhibit and summarized below:

\$ _____ (\$ _____)

ARTICLE 6 - PAYMENT PROCEDURES

6.01 Submittal and Processing of Payments

- A. Contractor shall submit Applications for Payment in accordance with Article 14 of the General Conditions. Applications for Payment will be processed by Engineer as provided in the General Conditions.

6.02 Progress Payments; Retainage

- A. Owner shall make progress payments on account of the Contract Price on the basis of Contractor's Applications for Payment on or about the same day of each month during performance of the Work as provided in Paragraphs 6.02.A.1 and 6.02.A.2 below. All such payments will be measured by the schedule of values established as provided in Paragraph 2.07.A of the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no schedule of values, as provided in the General Requirements. Five (5) percent of each partial payment will be withheld as retainage. When the work of the Contractor has been determined by the Owner to be at least 50 percent complete, the retainage amount will be reduced to 2.5 percent of the partial payment.

6.03 Final Payment

1. Upon final completion and acceptance of the Work in accordance with Paragraph 14.07 of the General Conditions, Owner shall pay the remainder of the Contract Price as recommended by Engineer as provided in said Paragraph 14.07.

ARTICLE 7 - INTEREST

7.01 All moneys not paid when due as provided in Article 14 of the General Conditions shall bear interest at the rate of three-fourths of one percent (0.0075) percent per month with the following provisions:

7.02 Lump Sum Contract: The interest shall commence thirty (30) days after the work under the contract has been completed and accepted and all required material certifications and other documentation required by the contract has been furnished to Owner by Contractor and shall run until the final payment or estimate is remitted to the contractor. When contract quantities or the final payment amount is in dispute, the interest bearing period shall be suspended until the settlement of the dispute.

7.03 Contracts Bid by Unit Price: The interest shall commence sixty (60) days after the work under the contract has been completed and accepted and all required material certifications and other documentation required of the Contractor has been furnished to Owner by Contractor and shall run until the final payment or estimate is remitted to Contractor. When contract quantities or the final payment amount is in dispute, the interest bearing period shall be suspended until the settlement of the dispute.

ARTICLE 8 - CONTRACTOR'S REPRESENTATIONS

8.01 In order to induce Owner to enter into this Agreement Contractor makes the following representations:

- A. Contractor has examined and carefully studied the Contract Documents and the other related data identified in the Bidding Documents.
- B. Contractor has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
- C. Contractor is familiar with and is satisfied as to all federal, state, and local Laws and Regulations that may affect cost, progress, and performance of the Work.
- D. Contractor has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) which have been identified in the Supplementary Conditions as provided in Paragraph 4.02 of the General Conditions and (2) reports and drawings of a Hazardous Environmental Condition, if any, at the Site which has been identified in the Supplementary Conditions as provided in Paragraph 4.06 of the General Conditions.
- E. Contractor has obtained and carefully studied (or assumes responsibility for doing so) all additional or supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, including any specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents, and safety precautions and programs incident thereto.
- F. Contractor does not consider that any further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract Documents.
- G. Contractor is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Contract Documents.
- H. Contractor has correlated the information known to Contractor, information and observations obtained from visits to the Site, reports and drawings identified in the Contract Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Contract Documents.
- I. Contractor has given Owner and Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and the written resolution thereof by Owner and Engineer is acceptable to Contractor.
- J. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.
- K. The Contractor acknowledges to and for the benefit of the Owner and the Oklahoma Drinking Water State Revolving Fund (the "State") that it understands the goods and services under this Agreement are being funded with monies made available by the Clean Water State Revolving Fund and/or Drinking Water State Revolving Fund that have statutory requirements commonly known as "American Iron and Steel;" that requires all of the iron and steel products used in the project to be produced in the United States ("American Iron and Steel Requirement") including iron and steel products provided by the Contractor pursuant to this Agreement. The Contractor hereby represents and warrants to and for the benefit of the Owner and the State that (a) the Contractor has reviewed and understands the American Iron and Steel Requirement, (b) all of the iron and steel products used in the project will be and/or have been produced in the United States in a manner that complies with the American Iron and Steel Requirement, unless a waiver of the requirement is approved, and (c) the Contractor will provide any further verified information, certification or assurance of compliance with this paragraph, or information necessary to support a waiver of the American Iron and Steel Requirement, as may be requested by the Owner or the State. Notwithstanding any other provision of this Agreement, any failure to comply with this paragraph by the Contractor shall permit the Owner or State to recover as damages against the Contractor any loss, expense, or cost (including without limitation attorney's fees) incurred by the Owner or State resulting from any such failure (including without limitation any impairment or loss of funding, whether in whole or in part,

from the State or any damages owed to the State by the Owner). While the Contractor has no direct contractual privity with the State, as a lender to the Owner for the funding of its project, the Owner and the Contractor agree that the State is a third-party beneficiary and neither this paragraph (nor any other provision of this Agreement necessary to give this paragraph force or effect) shall be amended or waived without the prior written consent of the State.

- L. The Contractor acknowledges to and for the benefit of the Owner and the Oklahoma Drinking Water State Revolving Fund (the "Funding Authority") that it understands the goods and services under this Agreement are being funded with federal monies and have statutory requirements commonly known as "Build America, Buy America;" that requires all of the iron and steel, manufactured products, and construction materials used in the project to be produced in the United States ("Build America, Buy America Requirements") including iron and steel, manufactured products, and construction materials provided by the Contractor pursuant to this Agreement. The Contractor hereby represents and warrants to and for the benefit of the Owner and Funding Authority (a) the Contractor has reviewed and understands the Build America, Buy America Requirements, (b) all of the iron and steel, manufactured products, and construction materials used in the project will be and/or have been produced in the United States in a manner that complies with the Build America, Buy America Requirements, unless a waiver of the requirements is approved, and (c) the Contractor will provide any further verified information, certification or assurance of compliance with this paragraph, or information necessary to support a waiver of the Build America, Buy America Requirements, as may be requested by the Owner or the Funding Authority. Notwithstanding any other provision of this Agreement, any failure to comply with this paragraph by the Contractor shall permit the Owner or Funding Authority to recover as damages against the Contractor any loss, expense, or cost (including without limitation attorney's fees) incurred by the Owner or Funding Authority resulting from any such failure (including without limitation any impairment or loss of funding, whether in whole or in part, from the Funding Authority or any damages owed to the Funding Authority by the Owner). If the Contractor has no direct contractual privity with the Funding Authority, as a lender or awardee to the Owner for the funding of its project, the Owner and the Contractor agree that the Funding Authority is a third-party beneficiary and neither this paragraph (nor any other provision of this Agreement necessary to give this paragraph force or effect) shall be amended or waived without the prior written consent of the Funding Authority.
- M. Davis Bacon Act wages rules shall apply. All laborers and mechanics employed by contractors and sub-contractors on projects funded directly by or assisted in whole or in part by the through the Federal Government shall be paid wages at rates not less than those prevailing on projects of a character similar in the locality as determined by the Secretary of Labor in accordance with subchapter IV of Chapter 31 of Title 40, United States Code and the DW-185 Supplemental Conditions (Pink Sheets). The Department of Labor provides all pertinent information related to compliance with labor standards and including prevailing wage rates and for reporting. For more information, please refer to <http://www.wdol.gov/> and <http://www.SAM.gov>.

ARTICLE 9 - CONTRACT DOCUMENTS

9.01 Contents

- A. The Contract Documents consist of the following:
1. This Agreement (pages A-1 to A-9, inclusive).
 2. Performance bond (pages B-1 to B-4, inclusive).
 3. Statutory bond (pages B-5 to B-6, inclusive).
 4. Maintenance bond (pages B-7 to B-8, inclusive).
 5. Standard General Conditions (pages C-1 to C-42, inclusive).
 6. Supplementary Conditions (pages D-1 to D-2, inclusive).
 7. Special Provisions (pages E-1 to E-11, and Exhibits 1 to 3, inclusive).

8. Supplementary Specifications (pages 1 to TBD, inclusive).
9. Drawings consisting of 239 sheets with each sheet bearing the following general title: Recovered Water Pump Station and Finished Water Pump Station
10. The most recent version of the City of Stillwater Standards (Design and Construction) are incorporated herein as if fully set forth and are on file with the City of Stillwater (723 South Lewis, Stillwater, Oklahoma 74076) or available through accessing the City's website. Not attached to the Agreement.
11. Addenda (numbers to , inclusive).
12. Exhibits to this Agreement (enumerated as follows):
 - a. List of Document Required (page H-1, inclusive).
 - b. Signature and Submission Requirements for Bidding Documents (pages I-1 to I-3, inclusive).
 - c. Bid Form (pages J-1 to J-9, inclusive).
 - d. Bid Bond (page K-1, inclusive).
 - e. Business Relationships Affidavit (page 1, inclusive).
 - f. Non-Collusion Affidavit (page 1, inclusive).
 - g. Release by Claimants (pages 1 to 2, inclusive).
 - h. Bidder's American Iron & Steel Certification (pages 1 to 2, inclusive).
 - i. Bidder's Build America Buy American Certification (pages 1 to 2, inclusive).
 - j. DBE Subcontractor Participation Form (pages 1 to 2, inclusive).
 - k. DBE Subcontractor performance Form (page 1, inclusive).
 - l. DBE Subcontractor Utilization Form (page 1, inclusive).
 - m. Pre-award Compliance Review Report (pages 1 to 2, inclusive).
 - n. Debarment and Suspension (pages 1 to 3, inclusive).
 - o. Certificate of Nondiscrimination Form (page N-1, inclusive).
 - p. Qualification Statement (pages O-1 through O-10, inclusive).
 - q. Certificates of Insurance.
 - r. Notice of Award (page 1, inclusive).
 - s. Notice to Proceed (page 1, inclusive).
 - t. Claim or Invoice Affidavit (page 1, inclusive).
 - u. Certificate of Approval of Contract and Bonds (page 1, inclusive).

13. The following which may be delivered or issued on or after the Effective Date of the Agreement and are not attached hereto:

- a. Work Change Directives.
 - b. Change Orders.
- B. The documents listed in Paragraph 9.01.A are attached to this Agreement (except as expressly noted otherwise above).
- C. There are no Contract Documents other than those listed above in this Article 9.
- D. The Contract Documents may only be amended, modified, or supplemented as provided in Paragraph 3.04 of the General Conditions.

ARTICLE 10 - MISCELLANEOUS

10.01 Terms

- A. Terms used in this Agreement will have the meanings stated in the General Conditions and the Supplementary Conditions.

10.02 Assignment of Contract

- A. No assignment by a party hereto of any rights under or interests in the Contract will be binding on another party hereto without the written consent of the party sought to be bound; and, specifically but without limitation, moneys that may become due and moneys that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.

10.03 Successors and Assigns

- A. Owner and Contractor each binds itself, its partners, successors, assigns, and legal representatives to the other party hereto, its partners, successors, assigns, and legal representatives in respect to all covenants, agreements, and obligations contained in the Contract Documents.

10.04 Severability

- A. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation shall be deemed stricken, and all remaining provisions shall continue to be valid and binding upon Owner and Contractor, who agree that the Contract Documents shall be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.

10.05 Other Provisions

- A. None.

IN WITNESS WHEREOF, Owner and Contractor have signed this Agreement in duplicate. One counterpart each has been delivered to Owner and Contractor. All portions of the Contract Documents have been signed or identified by Owner and Contractor or on their behalf.

This Agreement will be effective on _____, _____ (which is the Effective Date of the Agreement).

OWNER:

Stillwater Utilities Authority

By: _____

Name/Title: General Manager

CONTRACTOR:

By: _____

Name/Title: _____

[CORPORATE SEAL]

Address for giving notices:

PO Box 1449

Stillwater, OK 74076

Attest: _____

Title: _____

Address for giving notices:

APPROVED AS TO FORM AND LEGALITY THIS

_____ DAY OF _____, 20_____.

KIMBERLY CARNLEY - City Attorney

License Number: _____
(where applicable)

Agent for service or process: _____

(If Contractor is a corporation or a partnership, attach evidence of authority to sign.)

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS:

That on this _____ day of _____, 20_____,
we, _____ as Principal, and
_____ as Surety, a
corporation organized and existing under the laws of the State of _____,
and duly authorized to transact business in the State of Oklahoma, are held and firmly
bound unto the STILLWATER UTILITIES AUTHORITY, a public trust, established under
the constitution and laws of the State of Oklahoma, in the penal sum of _____

(\$ _____),

in lawful money of the United States of America, such sum being equal to one hundred
percent (100%) of the contract price as set forth herein, well and truly to be made, we bind
ourselves and each of us, our heirs, executors, administrators, trustees, successors, and
assigns, jointly and severally, firmly by these presents:

THE CONDITION OF THE FOREGOING OBLIGATION IS SUCH THAT WHEREAS,
said Principal has entered into a written contract with the Stillwater Utilities Authority for
the construction of **Recovered Water Pump Station, Finished Water Pump Station,
and Piping Improvements at the Stillwater Water Treatment Plant** (general nature of
work), said project being specifically titled **Project No. 24WT02 (DWSRF Project
No. P40-1021220-05) – Recovered Water Pump Station and Finished Water Pump
Station, SUA Bid No. 55-2023** reference to which is made here, and said contract, plans,
specifications and all attachments or appendices thereto, are hereby incorporated by
reference thereto and made a part of this instrument.

If said Principal shall, fully and faithfully execute the work and perform said contract in full
accordance with its terms, conditions and covenants of said contract, plans, specifications
and all attachments or appendices thereto, this obligation shall become null and void;
otherwise it shall remain in full force and effect.

Surety hereby waives notice of any alteration or extension of time made by the Stillwater Utilities Authority.

Whenever Contractor shall be, and declared by the Stillwater Utilities Authority to be in default under the contract, the Stillwater Utilities Authority having performed Stillwater Utilities Authority's obligations thereunder, the Surety may promptly remedy the default, or shall promptly

- (1) Complete the contract in accordance with its terms and conditions, or
- (2) Obtain a bid or bids for completing the contract in strict accordance with its terms and conditions, and upon determination by Surety, of the lowest responsible bidder, or, if the Stillwater Utilities Authority elects, upon determination by the Stillwater Utilities Authority and the Surety jointly of the lowest responsible bidder, arrange for a contract between such bidder and Stillwater Utilities Authority, and make available as work progresses (even though there should be a default or a succession of defaults under the contract or contracts of completion arranged under this paragraph) sufficient funds to pay the cost of completion less the balance of the contract price; but not exceeding, including other costs and damages for which the Surety may be liable hereunder, the amount set forth in the first paragraph hereof. The term "balance of the contract price," as used in this paragraph, shall mean the total amount payable by the Stillwater Utilities Authority to Contractor under the contract and any amendments thereto, less the amount properly paid by Stillwater Utilities Authority to Contractor.

No right of action shall accrue on this bond to or for the use of any person or corporation other than the Stillwater Utilities Authority named herein or the heirs, executors, administrators or successors of the Stillwater Utilities Authority.

It is further expressly agreed and understood by the parties hereto that no changes or alterations to said contract and no deviations from the plan or mode of procedure herein

fixed shall have the effect of releasing the Surety, or any of them, from the obligations of this bond.

IN WITNESS WHEREOF, the said Principal has caused these presents to be executed in its name and its corporate seal to be hereunto affixed by its duly authorized officer, and the said Surety has caused these presents to be executed in its name, and its corporate seal to be hereunto affixed by its Attorney-in-Fact, duly authorized so to do, the day and year first above written.

PRINCIPAL

ATTEST:

(name)

Secretary

(authorized representative/title)

SURETY

(name)

Attorney-in-Fact

(Accompany this bond with Attorney-in-fact's Authority from the Surety Company certified to include the date of the bond.)

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STATUTORY BOND

KNOW ALL MEN BY THESE PRESENTS:

That on this _____ day of _____, 20_____,
We, _____ as Principal, and
_____ as Surety, a
corporation organized and existing under the laws of the State of _____,
and duly authorized to transact business in the State of Oklahoma, are held and firmly
bound unto the STILLWATER UTILITIES AUTHORITY, a public trust, established under
the constitution and laws of the State of Oklahoma, in the penal sum of _____

(\$ _____),

in lawful money of the United States of America, such sum being equal to one hundred
percent (100%) of the contract price as set forth herein, well and truly to be made, we bind
ourselves and each of us, our heirs, executors, administrators, trustees, successors, and
assigns, jointly and severally, firmly by these presents:

THE CONDITION OF THE FOREGOING OBLIGATION IS SUCH THAT WHEREAS,
said Principal has entered into a written contract with the Stillwater Utilities Authority for
the construction of **Recovered Water Pump Station, Finished Water Pump Station,
and Piping Improvements at the Stillwater Water Treatment Plant** (general nature
of work), said project being specifically titled **Project No. 24WT02 (DWSRF Project
No. P40-1021220-05) – Recovered Water Pump Station and Finished Water Pump
Station, SUA Bid No. 55-2023** reference to which is made here, and said contract, plans,
specifications and all attachments or appendices thereto, are hereby incorporated by
reference thereto and made a part of this instrument.

If said Principal shall fail or neglect to pay all indebtedness incurred by said Principal or
Subcontractors and or Suppliers of said Principal who perform work in the performance of
such contract, for labor and materials, rental of machinery and equipment, and repairs to
and parts for equipment used and consumed in the performance of said contract within

thirty (30) days after the same becomes due and payable, the person, firm or corporation entitled thereto may sue and recover on this bond, the amount so due and unpaid. Should said Principal pay all such indebtedness, this obligation shall become null and void; otherwise, it shall remain in full force and effect.

It is further expressly agreed and understood by the parties hereto that no changes or alterations to said contract and no deviations from the plan or mode of procedure herein fixed shall have the effect of releasing the Surety, or any of them, from the obligations of this bond.

IN WITNESS WHEREOF, the said Principal has caused these presents to be executed in its name, and its corporate seal to be hereunto affixed, by its duly authorized officers, and the said Surety has caused these presents to be executed in its name, and its corporate seal to be hereunto affixed by its Attorney-in-Fact, duly authorized thereunto so to do, the day and year first above written.

PRINCIPAL

ATTEST:

(name)

Secretary

(authorized representative/title)

SURETY

(name)

Attorney-in-Fact

(Accompany this bond with Attorney-in-fact's Authority from the Surety Company certified to include the date of the bond.)

MAINTENANCE BOND

KNOW ALL MEN BY THESE PRESENTS:

That on this _____ day of _____, 20_____,
we, _____ as Principal, and
_____ as Surety, a
corporation organized and existing under the laws of the State of _____,
and duly authorized to transact business in the State of Oklahoma, are held and firmly
bound unto the STILLWATER UTILITIES AUTHORITY, a public trust, established under
the constitution and laws of the State of Oklahoma, in the penal sum of _____

(\$ _____),
in lawful money of the United States of America, such sum being equal to one hundred
percent (100%) of the contract price as set forth herein, well and truly to be made, we bind
ourselves and each of us, our heirs, executors, administrators, trustees, successors, and
assigns, jointly and severally, firmly by these presents:

THE CONDITION OF THE FOREGOING OBLIGATION IS SUCH THAT WHEREAS,
said Principal has, pursuant to a written contract with the Stillwater Utilities Authority for
the construction of **Recovered Water Pump Station, Finished Water Pump Station,
and Piping Improvements at the Stillwater Water Treatment Plant** (general nature of
work), said project being specifically titled **Project No. 24WT02 (DWSRF Project
No. P40-1021220-05) – Recovered Water Pump Station and Finished Water Pump
Station, SUA Bid No. 55-2023** reference to which is made here, and said contract, plans,
specifications and all attachments or appendices thereto, are hereby incorporated by
reference thereto and made a part of this instrument.

Principal is obligated to protect the Stillwater Utilities Authority against any and all
defects in said construction resulting from faulty materials or workmanship for a period
of 1 (one) year from the date of acceptance of said project by the Stillwater Utilities
Authority.

Should Principal protect the Stillwater Utilities Authority against any and all defects in said construction resulting from faulty materials or workmanship for a period of 1 (one) year from the date of acceptance of said project by the Stillwater Utilities Authority, this obligation shall become null and void; otherwise, it shall remain in full force and effect.

It is further expressly agreed and understood by the parties hereto that no changes or alterations to said contract and no deviations from the plan or mode of procedure herein fixed shall have the effect of releasing the Surety, or any of them, from the obligations of this bond.

IN WITNESS WHEREOF, the said Principal has caused these presents to be executed in its name, and its corporate seal to be hereunto affixed, by its duly authorized officers, and the said Surety has caused these presents to be executed in its name and its corporate seal to be hereunto affixed by its attorney-in-fact, duly authorized so to do, the day and year first above written.

PRINCIPAL

ATTEST:

(name)

Secretary

(authorized representative/title)

SURETY

(name)

Attorney-in-Fact

(Accompany this bond with Attorney-in-fact's Authority from the Surety Company certified to include the date of the bond.)

Oklahoma Drinking Water State Revolving Fund NOTICE OF AWARD

To: _____ (Contractor)

Project Description: Construction of a new recovered water pump station, a new finished water pump station, piping improvements associated with the lagoons, and manhole and piping improvements associated with the solids blowdown for the solids contact units (SCUs) at the Stillwater Water Treatment Plant.

The OWNER has considered the BID submitted by you for the above described WORK in response to its Advertisement for Bids dated August 12, 2023, and Information for Bidders.

You are hereby notified that your BID has been accepted for items in the amount of _____ (\$_____).

You are required by the Information for Bidders to execute the Agreement and furnish the required CONTRACTOR's Performance Bond and Certificate of Insurance within ten (10) calendar days from the date of this Notice to you.

If you fail to execute said Agreement and to furnish said BONDS within ten (10) days from the date of this Notice, said OWNER will be entitled to consider all your rights arising out of the OWNER's acceptance of your BID as abandoned and as a forfeiture of your Bid Bond. The OWNER will be entitled to such other rights as may be granted by law.

You are required to return an acknowledged copy of the NOTICE OF AWARD to the OWNER.

Dated this ____ day of _____, _____.

OWNER

BY

TITLE

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE OF AWARD is hereby acknowledged by _____
_____ this _____ day of _____,
and hereby certify that this firm does not appear on the List of Parties Excluded from Federal Procurement Programs, i.e., list of Debarred Contractors.

BY

TITLE

Oklahoma Drinking Water State Revolving Fund
NOTICE TO PROCEED

TO: _____ (Contractor)

DATE: _____

PROJECT DESCRIPTION: Construction of a new recovered water pump station, a new finished
water pump station, piping improvements associated with the lagoons, and manhole and
piping improvements associated with the solids blowdown for the solids contact units
(SCUs) at the Stillwater Water Treatment Plant

You are hereby notified to commence WORK in accordance with the Agreement dated:

_____, _____, on or before _____, _____, and you are
to complete the WORK within _____ consecutive calendar days thereafter. The date of
completion of all WORK is, therefore, _____, _____.

OWNER

BY

TITLE

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE TO PROCEED is hereby acknowledged by _____
_____ this _____ day of _____, _____.

BY

TITLE

Oklahoma Drinking Water State Revolving Fund
CLAIM OR INVOICE AFFIDAVIT

STATE OF _____) ss.
COUNTY OF _____)

The undersigned (contractor or supervisory official), certifies that this (invoice, claim or contract) is true and correct. Affiant further states the work, services or materials as shown by this invoice or claim have been completed or supplied in accordance with the plans, specifications, orders, or requests furnished to the affiant. Affiant further states that (s)he has made no payment, given, donated or agreed to pay, give or donate either directly or indirectly, to any elected official, officer, or employee of the State of Oklahoma, of money or any other thing of value to obtain payment or the award of this contract.

Signed: _____

Subscribed and sworn to before me this _____ day of _____, 20__.

Notary Public

My Commission Expires:

Oklahoma Drinking Water State Revolving Fund
**CERTIFICATE OF APPROVAL
OF CONTRACT AND BONDS**

I, the undersigned _____, being duly authorized and
acting legal representative of _____,
County, State of Oklahoma, do certify as follows:

I have examined the construction contract between the contractor, _____
_____, and the above named entity, and the
surety bonds given by the contractor in connection with the performance of said contract, and the
manner of execution of the contract and surety bonds; and I am of the opinion that each of the
aforesaid agreements has been duly executed by the proper parties thereto, acting through their
duly authorized representatives; that said representatives have full power and authority to
execute said agreements on behalf of the respective parties named therein; and that the
foregoing contract and surety bonds constitute valid and legally binding obligations upon the
parties executing the same in accordance with the terms, conditions, and provisions thereof.

Dated this _____ day of _____.

ATTORNEY

_____ County

State of Oklahoma

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared by

ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

and

Issued and Published Jointly By



PROFESSIONAL ENGINEERS IN PRIVATE PRACTICE
a practice division of the
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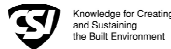
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Construction Specifications Institute

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GENERAL CONDITIONS

ARTICLE 1 - DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

A. Wherever used in the Bidding Requirements or Contract Documents and printed with initial capital letters, the terms listed below will have the meanings indicated which are applicable to both the singular and plural thereof. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.

1. *Addenda*--Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.

2. *Agreement*--The written instrument which is evidence of the agreement between Owner and Contractor covering the Work.

3. *Application for Payment*--The form acceptable to Owner which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

4. *Asbestos*--Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.

5. *Bid*--The offer or proposal of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

6. *Bidder*--The individual or entity who submits a Bid directly to Owner.

7. *Bidding Documents*--The Bidding Requirements and the proposed Contract Documents (including all Addenda).

8. *Bidding Requirements*--The Advertisement or Invitation to Bid, Instructions to Bidders, bid security of acceptable form, if any, and the Bid Form with any supplements.

9. *Change Order*--A document which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the

Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement.

10. *Claim*--A demand or assertion by Owner or Contractor seeking an adjustment of Contract Price or Contract Times, or both, or other relief with respect to the terms of the Contract. A demand for money or services by a third party is not a Claim.

11. *Contract*--The entire and integrated written agreement between the Owner and Contractor concerning the Work. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.

12. *Contract Documents*-- Those items so designated in the Agreement. Only printed or hard copies of the items listed in the Agreement are Contract Documents. Approved Shop Drawings, other Contractor's submittals, and the reports and drawings of subsurface and physical conditions are not Contract Documents.

13. *Contract Price*--The moneys payable by Owner to Contractor for completion of the Work in accordance with the Contract Documents as stated in the Agreement (subject to the provisions of Paragraph 11.03 in the case of Unit Price Work).

14. *Contract Times*--The number of days or the dates stated in the Agreement to: (i) achieve Milestones, if any, (ii) achieve Substantial Completion; and (iii) complete the Work so that it is ready for final payment ~~as evidenced by Engineer's written recommendation of final payment.~~

15. *Contractor*--The individual or entity with whom Owner has entered into the Agreement.

16. *Cost of the Work*--See Paragraph 11.01.A for definition.

17. *Drawings*--That part of the Contract Documents prepared or approved by Engineer which graphically shows the scope, extent, and character of the Work to be performed by Contractor. Shop Drawings and other Contractor submittals are not Drawings as so defined.

18. *Effective Date of the Agreement*--The date indicated in the Agreement on which it becomes effective, but if no such date is indicated, it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.

19. *Engineer* --The individual or entity named as such in the Agreement as the "Engineer of Record". For purposes of this Agreement, Owner is the Engineer. Whenever Engineer is used it shall be interpreted to mean Owner.

20. *Field Order*--A written order issued by Engineer/Owner which requires minor changes in the Work but which does not involve a change in the Contract Price or the Contract Times.

21. *General Requirements*--Sections of Division 1 of the Specifications. The General Requirements pertain to all sections of the Specifications.

22. *Hazardous Environmental Condition*--The presence at the Site of Asbestos, PCBs, Petroleum, Hazardous Waste, or Radioactive Material in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto in connection with the Work.

23. *Hazardous Waste*--The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.

24. *Laws and Regulations; Laws or Regulations*--Any and all applicable laws, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.

25. *Liens*--Charges, security interests, or encumbrances upon Project funds, real property, or personal property.

26. *Milestone*--A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.

27. *Notice of Award*--The written notice by Owner to the Successful Bidder stating that upon timely compliance by the Successful Bidder with the conditions precedent listed therein, Owner will sign and deliver the Agreement.

28. *Notice to Proceed*--A written notice given by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work under the Contract Documents.

29. *Owner*--The individual or entity with whom Contractor has entered into the Agreement and for whom the Work is to be performed.

30. *PCBs*--Polychlorinated biphenyls.

31. *Petroleum*--Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Waste and crude oils.

32. *Progress Schedule*--A schedule, prepared and maintained by Contractor, describing the sequence and

duration of the activities comprising the Contractor's plan to accomplish the Work within the Contract Times.

33. *Project*--The total construction of which the Work to be performed under the Contract Documents may be the whole, or a part.

34. *Project Manual*--The bound documentary information prepared for bidding and constructing the Work. A listing of the contents of the Project Manual, which may be bound in one or more volumes, is contained in the table(s) of contents.

35. *Radioactive Material*--Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.

36. *Related Entity* -- An officer, director, partner, employee, agent, consultant, or subcontractor.

37. *Resident Project Representative*--The authorized representative of Engineer and/or Owner who may be assigned to the Site or any part thereof.

38. *Samples*--Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.

39. *Schedule of Submittals*--A schedule, prepared and maintained by Contractor, of required submittals and the time requirements to support scheduled performance of related construction activities.

40. *Schedule of Values*--A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

41. *Shop Drawings*--All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work.

42. *Site*--Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements for access thereto, and such other lands furnished by Owner which are designated for the use of Contractor.

43. *Specifications*--That part of the Contract Documents consisting of written requirements for materials, equipment, systems, standards and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable thereto.

44. *Subcontractor*--An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work at the Site.

45. *Substantial Completion*--The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Owner, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof. The Work shall not be considered substantially complete unless damages to all third party assets and/or services including, but not limited to utilities and utility services, landscaping, fences, driveways, walkways, structures, buildings, facilities, improvements and/or appurtenances of any kind have been repaired and restored to the satisfaction of the third party and/or Owner and no reasonable (in the opinion of Owner) claim or potential claim against the Contractor and/or Owner for Contractor damages remains outstanding.

46. *Successful Bidder*--The Bidder submitting a responsive Bid to whom Owner makes an award.

47. *Supplementary Conditions*--That part of the Contract Documents which amends or supplements these General Conditions.

48. *Supplier*--A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or any Subcontractor.

49. *Underground Facilities*--All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.

50. *Unit Price Work*--Work to be paid for on the basis of unit prices.

51. *Work*--The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.

52. *Work Change Directive*--A written statement to Contractor issued on or after the Effective Date of the Agreement and signed by Owner and recommended by Engineer (if review is requested by Owner) ordering an addition, deletion, or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is to be performed or to emergencies. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the change ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times.

1.02 Terminology

A. The following words or terms are not defined but, when used in the Bidding Requirements or Contract Documents, have the following meaning.

B. Intent of Certain Terms or Adjectives

1. The Contract Documents include the terms "as allowed," "as approved," "as ordered," "as directed" or terms of like effect or import to authorize an exercise of professional judgment by Engineer and/or Owner. In addition, the adjectives "reasonable," "suitable," "acceptable," "proper," "satisfactory," or adjectives of like effect or import are used to describe an action or determination of Engineer and/or Owner as to the Work. It is intended that such exercise of professional judgment, action or determination will be solely to evaluate, in general, the Work for compliance with the requirements of and information in the Contract Documents and conformance with the design concept of the completed Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility contrary to the provisions of Paragraph 9.09 or any other provision of the Contract Documents.

C. Day

1. The word "day" means a calendar day of 24 hours measured from midnight to the next midnight.

D. Defective

1. The word "defective," when modifying the word "Work," refers to Work that is unsatisfactory, faulty, or deficient in that it:

a. does not conform to the Contract Documents, or

b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents, or

c. has been damaged prior to Owner's approval of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 14.04 or 14.05).

E. *Furnish, Install, Perform, Provide*

1. The word "furnish," when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.

2. The word "install," when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.

3. The words "perform" or "provide," when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.

4. When "furnish," "install," "perform," or "provide" is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of Contractor, "provide" is implied.

F. Unless stated otherwise in the Contract Documents, words or phrases which have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2 - PRELIMINARY MATTERS

2.01 *Delivery of Bonds and Evidence of Insurance*

A. When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.

B. *Evidence of Insurance:* Within 15 days of Notice of Award, Contractor shall deliver to Owner, Engineer, and any other additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance which may be reasonably requested) which Contractor is required to purchase and maintain in accordance with Article 5.

2.02 *Copies of Documents*

A. Owner shall furnish to Contractor up to ten printed or hard copies of the Drawings and Project Manual. Additional copies will be furnished upon request at the cost of reproduction.

2.03 *Commencement of Contract Times; Notice to Proceed*

A. The Contract Times will commence to run on the ~~thirtieth day after the Effective Date of the Agreement or, if a Notice to Proceed is given, on the~~ day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time ~~within 30 days~~ after the Effective Date of the Agreement. ~~In no event will the Contract Times commence to run later than the sixtieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Agreement, whichever date is earlier.~~

2.04 *Starting the Work*

A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work shall be done at the Site prior to the date on which the Contract Times commence to run.

2.05 *Before Starting Construction*

A. *Preliminary Schedules:* Within 10 days after the Effective Date of the Agreement (unless otherwise specified in the General Requirements), Contractor shall submit to Owner for timely review:

1. a preliminary Progress Schedule; indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract Documents;

2. a preliminary Schedule of Submittals; and

3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.06 *Preconstruction Conference*

A. Before any Work at the Site is started, a conference attended by Owner, Contractor, including the project superintendent, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.05.A, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, and maintaining required records. The Owner will designate the time and location of the conference.

2.07 *Initial Acceptance of Schedules*

A. At least 10 days before submission of the first Application for Payment a conference attended by Contractor, Engineer, and others as appropriate will be held to review for acceptability to Owner as provided below the schedules submitted in accordance with Paragraph 2.05.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Owner.

1. The Progress Schedule will be acceptable to Owner if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Owner responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work nor interfere with or relieve Contractor from Contractor's full responsibility therefore.

2. Contractor's Schedule of Submittals will be acceptable to Owner if it provides a workable arrangement for reviewing and processing the required submittals.

3. Contractor's Schedule of Values will be acceptable to Owner as to form and substance if it provides a reasonable allocation of the Contract Price to component parts of the Work.

ARTICLE 3 - CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

3.01 *Intent*

A. The Contract Documents are complementary; what is required by one is as binding as if required by all.

B. It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents. Any labor, documentation, services, materials, or equipment that may reasonably be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the intended result will be provided whether or not specifically called for at no additional cost to Owner.

C. Clarifications and interpretations of the Contract Documents shall be issued by Engineer and/or Owner as provided in Article 9.

3.02 *Reference Standards*

A. Standards, Specifications, Codes, Laws, and Regulations

1. Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard, specification, manual, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Agreement if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.

2. No provision of any such standard, specification, manual or code, or any instruction of a Supplier shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees from those set forth in the Contract Documents. No such provision or instruction shall be effective to assign to Owner, or Engineer, or any of, their Related Entities, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

3.03 *Reporting and Resolving Discrepancies*

A. Reporting Discrepancies

1. *Contractor's Review of Contract Documents Before Starting Work:* Before undertaking each part of the Work, Contractor shall carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. Contractor shall promptly report in writing to Owner any conflict, error, ambiguity, or discrepancy which Contractor may discover and shall obtain a written interpretation or clarification from Owner before proceeding with any Work affected thereby.

2. *Contractor's Review of Contract Documents During Performance of Work:* If, during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents or between the Contract Documents and any provision of any Law or Regulation applicable to the performance of the Work or of any standard, specification, manual or code, or of any instruction of any Supplier, Contractor shall promptly report it to Owner in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 6.16.A) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in Paragraph 3.04.

3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor knew or reasonably should have known thereof.

B. Resolving Discrepancies

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and:

- a. the provisions of any standard, specification, manual, code, or instruction (whether or not specifically incorporated by reference in the Contract Documents); or
- b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 Amending and Supplementing Contract Documents

A. The Contract Documents may be amended to provide for additions, deletions, and revisions in the Work or to modify the terms and conditions thereof by either a Change Order or a Work Change Directive.

B. The requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Work may be authorized, by one or more of the following ways:

1. A Field Order;
2. Engineer's approval of a Shop Drawing or Sample; (Subject to the provisions of Paragraph 6.17.D.3); or
3. Engineer's written interpretation or clarification.

3.05 Reuse of Documents

A. Contractor and any Subcontractor or Supplier or other individual or entity performing or furnishing all of the Work under a direct or indirect contract with Contractor, shall not:

1. have or acquire any title to or ownership ~~rights~~ in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or Engineer's consultants, including electronic media editions; or
2. reuse any of such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaption by Engineer.

B. The prohibition of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

3.06 Electronic Data

A. Copies of data furnished by Owner or Engineer to Contractor or Contractor to Owner or Engineer that may be relied upon are limited to the printed copies (also known as hard copies). Files in electronic media format of text, data, graphics, or other types are furnished only for the convenience of the receiving party. Any conclusion or information obtained or derived from such electronic files will be at the user's sole risk. If there is a discrepancy between the electronic files and the hard copies, the hard copies govern.

B. Because data stored in electronic media format can deteriorate or be modified inadvertently or otherwise without authorization of the data's creator, the party receiving electronic files agrees that it will perform acceptance tests or procedures within 60 days, after which the receiving party shall be deemed to have accepted the data thus transferred. Any errors detected within the 60-day acceptance period will be corrected by the transferring party.

C. When transferring documents in electronic media format, the transferring party makes no representations as to long term compatibility, usability, or readability of documents resulting from the use of software application packages, operating systems, or computer hardware differing from those used by the data's creator.

ARTICLE 4 - AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS; REFERENCE POINTS

4.01 Availability of Lands

A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work. Owner will obtain in a timely manner and pay for easements for permanent structures or permanent changes in existing facilities. If Contractor and Owner are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, as a result of any delay in Owner's furnishing the Site or a part thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.

BC. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

4.02 Subsurface and Physical Conditions

A. *Reports and Drawings*: The Supplementary Conditions identify:

1. those reports of explorations and tests of subsurface conditions at or contiguous to the Site that Engineer has used in preparing the Contract Documents; and

2. those drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) that Engineer has used in preparing the Contract Documents.

B. *Limited Reliance by Contractor on Technical Data Authorized*: Contractor may rely upon the general accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their Related Entities with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or

2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or

3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions, or information.

4.03 *Differing Subsurface or Physical Conditions*

A. *Notice*: If Contractor believes that any subsurface or physical condition at or contiguous to the Site that is uncovered or revealed either:

1. is of such a nature as to establish that any "technical data" on which Contractor is entitled to rely as provided in Paragraph 4.02 is materially inaccurate; or

2. is of such a nature as to require a change in the Contract Documents; or

3. differs materially from that shown or indicated in the Contract Documents; or

4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except as aforesaid) until receipt of written order to do so.

B. *Engineer's Review*: After receipt of written notice as required by Paragraph 4.03.A, Engineer will promptly review the pertinent condition, determine the necessity of Owner's obtaining additional exploration or tests with respect thereto, and advise Owner in writing (with a copy to Contractor) of Engineer's findings and conclusions.

C. Possible Price and Times Adjustments

1. The Contract Price and Contract Time may only be changed by a Change Order. Any claim for an adjustment in the Contract Price or Contract Time shall be based on written notice by Contractor to the Owner submitted in accordance with the provisions of Paragraph 10.05. The Contract Price or the Contract Times, or both, may be adjusted to the extent that the existence of such differing subsurface or physical condition causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

a. such condition must meet any one or more of the categories described in Paragraph 4.03.A; and

b. with respect to Work that is paid for on a Unit Price Basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 11.03.

2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times if:

a. Contractor knew of the existence of such conditions at the time Contractor made a final commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract; or

b. the existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such final commitment; or

c. Contractor failed to give the written notice as required by Paragraph 4.03.A.

3. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or

both, a Claim may be made therefor as provided in Paragraph 10.05. However, Owner and Engineer, and any of their Related Entities shall not be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.

4.04 *Underground Facilities*

A. *Shown or Indicated:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:

1. Owner and Engineer shall not be responsible for the accuracy or completeness of any such information or data; and

2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:

- a. reviewing and checking all such information and data,
- b. locating all Underground Facilities shown or indicated in the Contract Documents,
- c. coordination of the Work with the owners of such Underground Facilities, including Owner, during construction, and
- d. the safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.

B. *Not Shown or Indicated*

1. If an Underground Facility is uncovered or revealed at or contiguous to the Site which was not shown or indicated, or not shown or indicated with reasonable accuracy in the Contract Documents, Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer. Engineer will promptly review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the consequences of the existence or location of the Underground Facility. During such time, Contractor shall be

responsible for the safety and protection of such Underground Facility.

2. If Engineer concludes that a change in the Contract Documents is required, a Work Change Directive or a Change Order will be issued to reflect and document such consequences. An equitable adjustment shall be made in the Contract Price or Contract Times, or both, to the extent that they are attributable to the existence or location of any Underground Facility that was not shown or indicated or not shown or indicated with reasonable accuracy in the Contract Documents and that Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated. [Contractor shall make such request for an adjustment in Contract Price or Contract Time in accordance with provisions of Article 12.](#) If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment in Contract Price or Contract Times, Owner or Contractor may make a Claim therefor as provided in Paragraph 10.05.

4.05 *Reference Points*

A. Engineer shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Owner whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel under the direct supervision of a Professional Land Surveyor, Licensed to practice in the State of Oklahoma."

4.06 *Hazardous Environmental Condition at Site*

A. *Reports and Drawings:* Reference is made to the Supplementary Conditions for the identification of those reports and drawings relating to a Hazardous Environmental Condition identified at the Site, if any, that have been utilized by the Engineer in the preparation of the Contract Documents.

B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the general accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their Related Entities with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or

2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or

3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions or information.

C. Contractor shall not be responsible for any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work. Contractor shall be responsible for a Hazardous Environmental Condition created with any materials brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible.

D. If Contractor encounters a Hazardous Environmental Condition or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, Contractor shall immediately: (i) secure or otherwise isolate such condition; (ii) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 6.16.A); and (iii) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any.

E. Contractor shall not be required to resume Work in connection with such condition or in any affected area until after Owner has obtained any required permits related thereto and delivered to Contractor written notice: (i) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work; or (ii) specifying any special conditions under which such Work may be resumed safely. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, either party may make a Claim therefor as provided in Paragraph 10.05.

F. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of an adjustment in

Contract Price or Contract Times as a result of deleting such portion of the Work, then either party may make a Claim therefor as provided in Paragraph 10.05. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 7.

GH. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify, defend and hold harmless Owner and Engineer, and the officers, directors, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.H shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

HI. The provisions of Paragraphs 4.02, 4.03, and 4.04 do not apply to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 5 - BONDS AND INSURANCE

5.01 *Performance, Payment, and Other Bonds*

A. Contractor shall furnish performance, maintenance, and payment bonds, each in an amount at least equal to the Contract Price as security for the faithful performance and payment of all of Contractor's obligations under the Contract Documents. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 13.07, whichever is later, except as provided otherwise by Laws or Regulations or by the Contract Documents. Contractor shall also furnish such other bonds as are required by the Contract Documents.

B. All bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. All bonds signed by an agent must be accompanied by a certified copy of the agent's authority to act.

C. If the surety on any bond furnished by Contractor is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of

the Project is located or it ceases to meet the requirements of Paragraph 5.01.B, Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the requirements of Paragraphs 5.01.B and 5.02.

5.02 *Licensed Sureties and Insurers*

A. All bonds and insurance required by the Contract Documents to be purchased and maintained by Owner or Contractor shall be obtained from surety or insurance companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds or insurance policies for the limits and coverages so required. Such surety and insurance companies shall also meet such additional requirements and qualifications as may be provided in the Supplementary Conditions.

5.03 *Certificates of Insurance*

A. Contractor shall deliver to Owner/Engineer, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Owner, Engineer, or any other additional insured) which Contractor is required to purchase and maintain.

5.04 *Contractor's Liability Insurance*

A. Contractor shall purchase and maintain such liability and other insurance as is appropriate for the Work being performed and as will provide protection from claims set forth below which may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable:

1. claims under workers' compensation, disability benefits, and other similar employee benefit acts;

2. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees;

3. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees;

4. claims for damages insured by reasonably available personal injury liability coverage which are sustained:

a. by any person as a result of an offense directly or indirectly related to the employment of such person by Contractor, or

b. by any other person for any other reason;

5. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom; and

6. claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.

B. The policies of insurance required by this Paragraph 5.04 shall:

1. with respect to insurance required by Paragraphs 5.04.A.3 through 5.04.A.6 inclusive, include as additional insured (subject to any customary exclusion regarding professional liability) Owner and Engineer, and any other individuals or entities identified in the Supplementary Conditions, all of whom shall be listed as additional insureds, and include coverage for the respective officers, directors, partners, employees, agents, consultants and subcontractors of each and any of all such additional insureds, and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby;

2. include at least the specific coverages and be written for not less than the limits of liability provided in the Supplementary Conditions or required by Laws or Regulations, whichever is greater;

3. include completed operations insurance;

4. include contractual liability insurance covering Contractor's indemnity obligations under Paragraphs 6.11 and 6.20;

5. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other additional insured identified in the Supplementary Conditions to whom a certificate of insurance has been issued (and the certificates of insurance furnished by the Contractor pursuant to Paragraph 5.03 will so provide);

6. remain in effect at least until final payment and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work in accordance with Paragraph 13.07; and

7. with respect to completed operations insurance, and any insurance coverage written on a claims-made basis, remain in effect for at least two years after final payment.

a. Contractor shall furnish Owner and each other additional insured identified in the Supplementary

Conditions, to whom a certificate of insurance has been issued, evidence satisfactory to Owner and any such additional insured of continuation of such insurance at final payment and one year thereafter.

C. The limits of liability for the insurance required by paragraph 5.04 of the General Conditions shall provide coverage for not less than the following amounts or greater where required by Laws and Regulations:

1. Workers' Compensation, and related coverages under paragraphs 5.04.A.1 and A.2 of the General Conditions:

a. State:	Statutory
b. Applicable Federal (e.g., Longshoreman's):	Statutory
c. Employer's Liability:	\$500,000.00
Aggregate Comprehensive	\$1,000,000.00

2. Contractor's General Liability under paragraphs 5.04.A.3 through A.6 of the General Conditions which shall include completed operations and product liability coverages:

a. General Aggregate	\$1,000,000.00
b. Products - Completed Operations Aggregate	\$1,000,000.00
c. Personal and Advertising Injury	\$1,000,000.00
d. Each Occurrence (Bodily Injury and Property Damage)	\$500,000.00
e. Property Damage liability insurance will provide Explosion, Collapse, and Underground coverages where applicable.	
f. Excess or Umbrella Liability	
General Aggregate	\$1,000,000.00
Each Occurrence	\$1,000,000.00

3. Automobile Liability under paragraph 5.04.A.6. of the General Conditions:

a. Bodily Injury:	
Each person	\$300,000.00
Each Accident	\$1,000,000.00
b. Property Damage:	
Each Accident	\$500,000.00
c. Combined Single Limit of	\$1,000,000.00

4. The Contractual Liability coverage required by paragraph 5.04.B.4 of the General Conditions shall provide coverage for not less than the following amounts:

a. Bodily Injury:	
Each accident	\$500,000.00

Annual Aggregate \$1,000,000.00

b. Property Damage:

Each Accident \$500,000.00

Annual Aggregate \$1,000,000.00

5. The following entities are to be included on the policy as additional insureds and also be certificate holders:

City of Stillwater, Oklahoma

Stillwater Utilities Authority

6. Owner, the City of Stillwater, Oklahoma, is a municipal corporation and notwithstanding any insurance coverage contained herein, does not waive any of the defenses or protection afforded it under the Oklahoma Governmental Tort Claims Act, Title 51 Oklahoma State Statutes, Section 151 et seq. Owner shall be included on ~~Engineer's~~ Contractor's insurance policies as an additional insured and shall be a certificate holder provided, however, that the amount of coverage for Owner on the said insurance policies for any liability on claims that are within the scope of the Oklahoma Governmental Tort Claims Act shall not exceed:

- Twenty-five thousand dollars (\$25,000) for any claim or to any claimant who has more than one claim for loss of property arising out of a single act, accident, or occurrence;
- One hundred twenty-five thousand dollars (\$125,000) to any claimant for a claim for any other loss arising out of a single act, accident, or occurrence;
- One million dollars (\$1,000,000) for any number of claims arising out of a single act, accident, or occurrence.

Contractor shall, prior to commencement of work, furnish Owner certificates of insurance which shall include a provision that such insurance shall not be cancelled without at least thirty days' written notice to Owner.

5.05 Owner's Liability Insurance

A. In addition to the insurance required to be provided by Contractor under Paragraph 5.04, Owner, at Owner's option, may purchase and maintain at Owner's expense Owner's own liability insurance as will protect Owner against claims which may arise from operations under the Contract Documents.

5.06 Property Insurance

A. Contractor shall purchase and maintain property insurance upon the Work at the Site and the amount of the full replacement cost thereof. This insurance shall:

- include the interests of Owner, Contractor, Subcontractors, Engineer, Engineer's Consultants and any other individuals or entities identified in the

Supplementary Conditions, and the officers, directors, partners, employees, agents and other consultants and subcontractors of any of them each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured;

2. be written on a Builder's Risk "all-risk" or open peril or special causes of loss policy form that shall at least include insurance for physical loss and damage to the Work, temporary buildings, falsework, and materials and equipment in transit and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage, and such other perils or causes of loss as may be specifically required by the Supplementary Conditions;

3. include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects);

4. cover materials and equipment stored at the Site or at another location that was agreed to in writing by Owner prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment recommended by Engineer;

5. allow for partial utilization of the Work by Owner;

6. include testing and startup; and

7. be maintained in effect until final payment is made unless otherwise agreed to in writing by Owner, Contractor and Engineer with 30 days written notice to each other additional insured to whom a certificate of insurance has been issued.

B. Whenever the aggregate amount of equipment such as pumps, compressors, process equipment, motors, switchgear, transformers, panel board, control equipment, valves, fittings, pipe, or similar equipment may exceed \$10,000 the Contractor shall obtain insurance which shall protect Contractor, Owner, Engineer, and any other additional insureds from all insurable risks of physical loss or damage to materials and equipment not otherwise covered under builder's risk (if obtained), while in warehouses or storage areas, during installation, during testing, and after the Work is completed. It shall be of the "all risks" type, with coverages designed for the circumstances which may occur in the particular Work included in this Contract. The coverage shall be for an amount not less than the insurable value of the Work at completion, less the value of the materials and equipment insured under builder's risk insurance. The value shall include the aggregate value of the Owner-furnished equipment and materials to be erected or installed by Contractor.

C. All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with Paragraph 5.06 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other additional insured to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with Paragraph 5.07.

D. Owner shall not be responsible for purchasing and maintaining any property insurance specified in this Paragraph 5.06 to protect the interests of Contractor, Subcontractors, or others in the Work to the extent of any deductible amounts that are identified in the Supplementary Conditions. The risk of loss within such identified deductible amount will be borne by Contractor, Subcontractors, or others suffering any such loss, and if any of them wishes property insurance coverage within the limits of such amounts, each may purchase and maintain it at the purchaser's own expense.

E. Installation floater insurance shall provide for losses to be payable to Contractor, Owner, Engineer, and any other additional insureds as their interests may appear. The policy shall contain a provision that in the event of payment for any loss under the coverage provided, the insurance company shall have no rights of recovery against the Contractor, Owner, and Engineer.

F. Certificates of insurance covering installation floater insurance shall quote the insuring agreement and all exclusions as they appear in the policy; or in lieu of certificates, copies of the complete policy may be submitted.

G. All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained by Contractor in accordance with paragraphs 5.04 and 5.06 will contain a provision or endorsement that the coverage afforded will not be cancelled or materially changed or renewal refused until at least thirty days' prior written notice has been given to Owner and Contractor and to each other additional insured to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with paragraph 5.07.

H. Property insurance will be in the completed value form and will provide coverage to the full limit. The deductible amount for either the builders risk and installation floater property insurance policies shall not exceed \$500 and the Contractor shall be responsible for any deductible or self-insured retention. Property insurance to be purchased by the Contractor shall remain in effect until final payment.

5.07 *Waiver of Rights*

A. Owner and Contractor intend that all policies purchased in accordance with Paragraph 5.06 will protect

Owner, Contractor, Subcontractors, and Engineer, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds (and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them) in such policies and will provide primary coverage for all losses and damages caused by the perils or causes of loss covered thereby. All such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any of the insureds or additional insureds thereunder. Owner and Contractor waive all rights against each other and their respective officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them for all losses and damages caused by, arising out of or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Subcontractors, and Engineer, and all other individuals or entities identified in the Supplementary Conditions to be listed as insured or additional insured (and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them) under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner as trustee or otherwise payable under any policy so issued.

B. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them for:

1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other perils whether or not insured by Owner; and

2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial utilization pursuant to Paragraph 14.05, after Substantial Completion pursuant to Paragraph 14.04, or after final payment pursuant to Paragraph 14.07.

5.08 *Receipt and Application of Insurance Proceeds (Not Used)*

5.09 *Acceptance of Bonds and Insurance; Option to Replace (Not Used)*

5.10 *Partial Utilization, Acknowledgment of Property Insurer*

A. If Owner finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 14.05, no such use or occupancy shall commence before the insurers providing the property insurance pursuant to Paragraph 5.06 have acknowledged notice thereof and in writing effected any changes in coverage necessitated thereby. The insurers providing the property insurance shall consent by endorsement on the policy or policies, but the property insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy.

ARTICLE 6 - CONTRACTOR'S RESPONSIBILITIES

6.01 *Supervision and Superintendence*

A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction. Contractor shall not be responsible for the negligence of Owner or Engineer in the design or specification of a specific means, method, technique, sequence, or procedure of construction which is shown or indicated in and expressly required by the Contract Documents.

B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner except under extraordinary circumstances. The superintendent will be Contractor's representative at the Site and shall have authority to act on behalf of Contractor. All communications given to or received from the superintendent shall be binding on Contractor.

C. Until formal written acceptance by Owner, the work shall be under the charge and care of Contractor. Contractor shall take every necessary precaution to prevent injury or damage to the work or any part thereof by the action of the elements or any other cause whatsoever, whether arising from the execution or non-execution of the work. Contractor shall at his own expense rebuild, repair, restore, and make good all injuries or damage to any portion of the work occasioned by any of the forgoing causes before formal acceptance of the work by Owner.

6.02 *Labor; Working Hours*

A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.

B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours. Contractor will not permit the performance of Work on a Saturday, Sunday, or any legal holiday without Owner's written consent given after prior written notice to Owner.

6.03 *Services, Materials, and Equipment*

A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start-up, and completion of the Work.

B. All materials and equipment incorporated into the Work shall be as specified or, if not specified, shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Owner, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.

C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

6.04 *Progress Schedule*

A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.07 as it may be adjusted from time to time as provided below.

1. Contractor shall submit to Owner for acceptance (to the extent indicated in Paragraph 2.07) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times. Such adjustments will comply with any provisions of the General Requirements applicable thereto.

2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 12. Adjustments in Contract Times may only be made by a Change Order.

6.05 *Substitutes and "Or-Equals"*

A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is

intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or-equal" item or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be submitted to Engineer for review under the circumstances described below.

1. "*Or-Equal*" Items: If in Engineer's sole discretion an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by Engineer as an "or-equal" item, in which case review and approval of the proposed item may, in Engineer's sole discretion, be accomplished without compliance with some or all of the requirements for approval of proposed substitute items. For the purposes of this Paragraph 6.05.A.1, a proposed item of material or equipment will be considered functionally equal to an item so named if:

a. in the exercise of reasonable judgment Engineer determines that:

1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;

2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole,

3) it has a proven record of performance and availability of responsive service; and

b. Contractor certifies that, if approved and incorporated into the Work:

1) there will be no increase in cost to the Owner or increase in Contract Times, and

2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.

2. Substitute Items

a. If in Engineer's sole discretion an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item under Paragraph 6.05.A.1, it will be considered a proposed substitute item.

b. Contractor shall submit sufficient information as provided below to allow Engineer to determine that the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefor. Requests for review of proposed substitute items of material or equipment

will not be accepted by Engineer from anyone other than Contractor.

c. The requirements for review by Engineer will be as set forth in Paragraph 6.05.A.2.d, as supplemented in the General Requirements and as Engineer may decide is appropriate under the circumstances.

d. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:

1) shall certify that the proposed substitute item will:

- a) perform adequately the functions and achieve the results called for by the general design,
- b) be similar in substance to that specified, and
- c) be suited to the same use as that specified;

2) will state:

- a) the extent, if any, to which the use of the proposed substitute item will prejudice Contractor's achievement of Substantial Completion on time;
- b) whether or not use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item; and
- c) whether or not incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty;

3) will identify:

- a) all variations of the proposed substitute item from that specified, and
- b) available engineering, sales, maintenance, repair, and replacement services;

4) and shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and claims of other contractors affected by any resulting change,

B. Substitute Construction Methods or Procedures: If a specific means, method, technique, sequence, or procedure of construction is expressly required by the Contract Documents, Contractor may furnish or utilize a substitute means, method, technique, sequence, or procedure of construction approved by Engineer. Contractor shall submit sufficient information to allow Engineer, in Engineer's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. The requirements for review by Engineer will be similar to those provided in Paragraph 6.05.A.2.

C. Engineer's Evaluation: Engineer will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to Paragraphs 6.05.A and 6.05.B. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No "or equal" or substitute will be ordered, installed or utilized until Engineer's review is complete, which will be evidenced by either a Change Order for a substitute or an approved Shop Drawing for an "or equal." Engineer will advise Contractor in writing of any negative determination.

D. Special Guarantee: Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.

E. Engineer's Cost Reimbursement: Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor pursuant to Paragraphs 6.05.A.2 and 6.05.B. Whether or not Engineer approves a substitute item so proposed or submitted by Contractor, Contractor shall reimburse Owner for the charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.

F. Contractor's Expense: Contractor shall provide all data in support of any proposed substitute or "or-equal" at Contractor's expense.

6.06 *Concerning Subcontractors, Suppliers, and Others*

A. Contractor shall not employ any Subcontractor, Supplier, or other individual or entity (including those acceptable to Owner as indicated in Paragraph 6.06.B), whether initially or as a replacement, against whom Owner may have reasonable objection. Contractor shall not be required to employ any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against whom Contractor has reasonable objection.

B. If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, or other

individuals or entities to be submitted to Owner in advance for acceptance by Owner by a specified date prior to the Effective Date of the Agreement, and if Contractor has submitted a list thereof in accordance with the Supplementary Conditions, Owner's acceptance (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the Bidding Documents or the Contract Documents) of any such Subcontractor, Supplier, or other individual or entity so identified may be revoked on the basis of reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity, and the Contract Price will be adjusted by the difference in the cost occasioned by such replacement, and an appropriate Change Order will be issued. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of any right of Owner or Engineer to reject defective Work.

C. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions. Nothing in the Contract Documents:

1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier or other individual or entity, nor

2. shall anything in the Contract Documents create any obligation on the part of Owner or Engineer to pay or to see to the payment of any moneys due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

D. Contractor shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work under a direct or indirect contract with Contractor.

E. Contractor shall require all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work to communicate with Engineer and/or Owner through Contractor.

F. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.

G. All Work performed for Contractor by a Subcontractor or Supplier will be pursuant to an appropriate agreement between Contractor and the

Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer. Whenever any such agreement is with a Subcontractor or Supplier who is listed as an additional insured on the property insurance provided in Paragraph 5.06, the agreement between the Contractor and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against Owner, Contractor, and Engineer, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds (and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them) for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, Contractor will obtain the same.

6.07 *Patent Fees and Royalties*

A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if to the actual knowledge of Owner or Engineer its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents.

B. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify, defend and hold harmless Owner and Engineer, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

6.08 *Permits*

A. Unless otherwise provided in the Supplementary Conditions, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution

of the Work which are applicable at the time of opening of Bids, or, if there are no Bids, on the Effective Date of the Agreement. Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

6.09 *Laws and Regulations*

A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work, including those which may be enacted during the course of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.

B. If Contractor performs any Work contrary to Laws or Regulations, Contractor shall bear all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work. However, it shall not be Contractor's primary responsibility to make certain that the Specifications and Drawings are in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.

C. Changes in Laws or Regulations not known at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids) having an effect on the cost or time of performance of the Work shall be the subject of an adjustment in Contract Price or Contract Times. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

6.10 *Taxes*

A. Unless otherwise provided, Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

~~B. Owner is exempt from Oklahoma sales and use tax. An Appointment of Agent letter stating such will be given to the Contractor upon return of executed contract documents to the Contractor~~

6.11 *Use of Site and Other Areas*

A. Limitation on Use of Site and Other Areas

1. Contractor shall confine construction equipment, the storage of materials and equipment, and the operations of workers to the Site and other areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and other areas with construction equipment or other

materials or equipment. Contractor shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof, or of any adjacent land or areas resulting from the performance of the Work.

2. Should any claim be made by any such owner or occupant because of the performance of the Work, Contractor shall promptly settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law.

3. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify, defend and hold harmless Owner and Engineer, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused by or based upon Contractor's performance of the Work.

B. *Removal of Debris During Performance of the Work:* During the progress of the Work Contractor shall keep the Site and other areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.

C. *Cleaning:* Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

D. *Loading Structures:* Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

6.12 *Record Documents*

A. Contractor shall maintain in a safe place at the Site one record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, and written interpretations and clarifications in good order and annotated to show changes made during construction. These record documents together with all approved Samples and a counterpart of all approved Shop Drawings will be available to Owner and/or Engineer for reference. Upon completion of the Work, these record documents, Samples, and Shop Drawings will be delivered to Engineer for Owner.

6.13 *Safety and Protection*

A. Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work, including but not limited to the requirements of the United States Occupational Safety and Health Administration. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

1. all persons on the Site or who may be affected by the Work;

2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and

3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.

B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify owners of adjacent property and of Underground Facilities and other utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property.

C. All damage, injury, or loss to any property referred to in Paragraph 6.13.A.2 or 6.13.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer, or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).

D. Contractor's duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed and Owner has issued a notice to Contractor in accordance with Paragraph 14.07.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

6.14 *Safety Representative*

A. Contractor shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

6.15 *Hazard Communication Programs*

A. Contractor shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.

6.16 *Emergencies*

A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent threatened damage, injury, or loss. Contractor shall give Owner prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby or are required as a result thereof. If Owner determines that a change in the Contract Documents is required because of the action taken by Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

6.17 *Shop Drawings and Samples*

A. Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the acceptable Schedule of Submittals (as required by Paragraph 2.07). Each submittal will be identified as Engineer may require.

1. Shop Drawings

a. Submit number of copies specified in the General Requirements.

b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide and to enable Engineer to review the information for the limited purposes required by Paragraph 6.17.D.

2. *Samples*: Contractor shall also submit Samples to Engineer for review and approval in accordance with the acceptable schedule of Shop Drawings and Sample submittals.

a. Submit number of Samples specified in the Specifications.

b. Clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 6.17.D.

B. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.

C. Submittal Procedures

1. Before submitting each Shop Drawing or Sample, Contractor shall have determined and verified:

a. all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;

b. the suitability of all materials with respect to intended use, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work;

c. all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto; and

d. shall also have reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents.

2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review and approval of that submittal.

3. With each submittal, Contractor shall give Engineer specific written notice of any variations, that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be both a written communication separate from the Shop Drawing's or Sample Submittal; and, in addition, by a specific notation made on each Shop Drawing or Sample submitted to Engineer for review and approval of each such variation.

D. Engineer's Review

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or

incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.

2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction (except where a particular means, method, technique, sequence, or procedure of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

3. Engineer's review and approval shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 6.17.C.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer's review and approval shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 6.17.C.1.

E. Resubmittal Procedures

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous submittals.

6.18 *Continuing the Work*

A. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as permitted by Paragraph 15.04 or as Owner and Contractor may otherwise agree in writing.

6.19 *Contractor's General Warranty and Guarantee*

A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Owner and its Related Entities shall be entitled to rely on representation of Contractor's warranty and guarantee.

B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:

1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or

2. normal wear and tear under normal usage.

C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:

1. observations by Engineer;
2. recommendation by Engineer or payment by Owner of any progress or final payment;
3. the issuance of a certificate of Substantial Completion by Owner or any payment related thereto by Owner;
4. use or occupancy of the Work or any part thereof by Owner;
5. any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by Engineer;
6. any inspection, test, or approval by others; or
7. any correction of defective Work by Owner.

6.20 Indemnification See Supplementary Conditions

A. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify, defend and hold harmless Owner and Engineer, and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable.

B. In any and all claims against Owner or Engineer or any of their respective consultants, agents, officers, directors, partners, or employees by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification

obligation under Paragraph 6.20.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

C. The indemnification obligations of Contractor under Paragraph 6.20.A shall not extend to the liability of Engineer and Engineer's officers, directors, partners, employees, agents, consultants and subcontractors arising out of:

1. the preparation or approval of, or the failure to prepare or approve, maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or
2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

6.21 *Delegation of Professional Design Services*

A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable law.

B. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.

C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.

D. Pursuant to this Paragraph 6.21, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations

and design drawings) will be only for the purpose stated in Paragraph 6.17.D.1.

E. Contractor shall not be responsible for the adequacy of the performance or design criteria required by the Contract Documents.

ARTICLE 7 - OTHER WORK AT THE SITE

7.01 *Related Work at Site*

A. Owner may perform other work related to the Project at the Site with Owner's employees, or via other direct contracts therefor, or permit other work performed by utilities, existing right-of-way or easement users, or adjacent property owners.

1. written notice thereof will be given to Contractor prior to starting any such other work; and

2. if Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times that should be allowed as a result of such other work, a Claim may be made therefor as provided in Paragraph 10.05.

B. Contractor shall afford each other contractor who is a party to such a direct contract, each utility owner and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work, and shall properly coordinate the Work with theirs. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering their work and will only cut or alter their work with the written consent of Owner and the others whose work will be affected. The duties and responsibilities of Contractor under this Paragraph are for the benefit of such utility owners and other contractors to the extent that there are comparable provisions for the benefit of Contractor in said direct contracts between Owner and such utility owners and other contractors.

C. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 7, Contractor shall inspect such other work and promptly report to Owner in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

7.02 *Coordination*

A. If Owner intends to contract with others for the performance of other work on the Project at the Site, the following will be set forth in Supplementary Conditions:

1. the individual or entity who will have authority and responsibility for coordination of the activities among the various contractors will be identified;

2. the specific matters to be covered by such authority and responsibility will be itemized; and

3. the extent of such authority and responsibilities.

B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

7.03 *Legal Relationships*

A. Paragraphs 7.01.A and 7.02 are not applicable for utilities not under the control of Owner.

B. Each other direct contract of Owner under Paragraph 7.01.A shall provide that the other contractor is liable to Owner and Contractor for the reasonable direct delay and disruption costs incurred by Contractor as a result of the other contractor's actions or inactions.

C. Contractor shall be liable to Owner and any other contractor for the reasonable direct delay and disruption costs incurred by such other contractor as a result of Contractor's action or inactions.

ARTICLE 8 - OWNER'S RESPONSIBILITIES

8.01 *Communications to Contractor (Not Used)*

8.02 *Replacement of Engineer*

A. In case of termination of the employment of Engineer, Owner shall appoint an engineer whose status under the Contract Documents shall be that of the former Engineer.

8.03 *Furnish Data*

A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

8.04 *Pay When Due*

A. Owner shall make payments to Contractor when they are due as provided in Paragraphs 14.02.C and 14.07.C.

8.05 *Lands and Easements; Reports and Tests*

A. Owner's duties in respect of providing lands and easements and providing engineering surveys to establish reference points are set forth in Paragraphs 4.01 and 4.05. Paragraph 4.02 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of subsurface conditions and drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site that have been utilized by Engineer in preparing the Contract Documents.

8.06 *Insurance (Not Used)*

8.07 *Change Orders*

A. Owner is obligated to execute Change Orders as indicated in Paragraph 10.03.

8.08 *Inspections, Tests, and Approvals*

A. Owner's responsibility in respect to certain inspections, tests, and approvals is set forth in Paragraph 13.03.B.

8.09 *Limitations on Owner's Responsibilities*

A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

8.10 *Undisclosed Hazardous Environmental Condition*

A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 4.06.

8.11 *Evidence of Financial Arrangements*

A. If and to the extent Owner has agreed to furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents, Owner's responsibility in respect thereof will be as set forth in the Supplementary Conditions.

ARTICLE 9 - ENGINEER'S STATUS DURING CONSTRUCTION

9.01 *Owner's Representative*

A. The duties and responsibilities and the limitations of authority of Engineer during construction are set forth

in the Contract Documents and will not be changed without written consent of Owner and Engineer.

9.02 *Visits to Site*

A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.

B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 9.09. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

9.03 *Project Representative*

A. If Owner and Engineer agree, Engineer will furnish a Resident Project Representative to assist Engineer in providing more extensive observation of the Work. The authority and responsibilities of any such Resident Project Representative and assistants will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in Paragraph 9.09. If Owner designates another representative or agent to represent Owner at the Site who is not Engineer's consultant, agent or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions.

9.04 *Authorized Variations in Work*

A. Engineer may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. These may be accomplished by a Field Order and will be binding, with

concurrence by Owner, on Contractor, who shall perform the Work involved promptly. If Owner or Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, and the parties are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

9.05 *Rejecting Defective Work*

A. Owner and/or Engineer will have authority to reject Work which Owner and/or Engineer believes to be defective, or that Owner and/or Engineer believes will not produce a completed Project that conforms to the Contract Documents or that will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Owner and/or Engineer will also have authority to require special inspection or testing of the Work as provided in Paragraph 13.04, whether or not the Work is fabricated, installed, or completed.

9.06 *Shop Drawings, Change Orders and Payments*

A. In connection with Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, see Paragraph 6.17.

B. In connection with Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, see Paragraph 6.21.

C. In connection with Engineer's authority as to Change Orders, see Articles 10, 11, and 12.

D. In connection with Engineer's authority as to Applications for Payment, see Article 14.

9.07 *Determinations for Unit Price Work*

A. Owner will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Owner will review with Contractor Owner's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Owner's written decision thereon will be final and binding (except as modified by Owner to reflect changed factual conditions or more accurate data) upon Contractor, subject to the provisions of Paragraph 10.05.

9.08 *Decisions on Requirements of Contract Documents and Acceptability of Work*

A. All matters in question and other matters between Owner and Contractor arising prior to the date final payment is due relating to the acceptability of the Work, and the interpretation of the requirements of the Contract Documents pertaining to the performance of the Work, will be referred initially to Engineer in writing within 30

days of the event giving rise to the question. At the request of Owner, Engineer shall serve as interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work thereunder.

B. Engineer will, with reasonable promptness, render a written decision on the issue referred. If Owner or Contractor believes that any such decision entitles them to an adjustment in the Contract Price or Contract Times or both, a Claim may be made under Paragraph 10.05. The date of Engineer's decision shall be the date of the event giving rise to the issues referenced for the purposes of Paragraph 10.05.B.

C. Engineer's written decision on the issue referred will be final and binding on Contractor, subject to the provisions of Paragraph 10.05.

D. When functioning as interpreter and judge under this Paragraph 9.08, Engineer will not show partiality to Owner or Contractor and will not be liable in connection with any interpretation or decision rendered in good faith in such capacity.

9.09 *Limitations on Engineer's Authority and Responsibilities*

A. Neither Engineer's authority or responsibility under this Article 9 or under any other provision of the Contract Documents nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

B. Engineer/Owner will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer/Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

C. Engineer/Owner will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.

D. Engineer's review (if requested by Owner) of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 14.07.A will only be to determine generally that their content complies with

the requirements of, and in the case of certificates of inspections, tests, and approvals that the results certified indicate compliance with the Contract Documents.

E. The limitations upon authority and responsibility set forth in this Paragraph 9.09 shall also apply to, the Resident Project Representative, if any, and assistants, if any.

ARTICLE 10 - CHANGES IN THE WORK; CLAIMS

10.01 *Authorized Changes in the Work*

A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work by a Change Order, or a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).

B. If Owner and Contractor are unable to agree on entitlement to, or on the amount or extent, if any, of an adjustment in the Contract Price or Contract Times, or both, that should be allowed as a result of a Work Change Directive, a Claim may be made therefor as provided in Paragraph 10.05.

10.02 *Unauthorized Changes in the Work*

A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents as amended, modified, or supplemented as provided in Paragraph 3.04, except in the case of an emergency as provided in Paragraph 6.16 or in the case of uncovering Work as provided in Paragraph 13.04.B.

10.03 *Execution of Change Orders*

A. Owner and Contractor shall execute appropriate Change Orders covering:

1. changes in the Work which are: (i) ordered by Owner pursuant to Paragraph 10.01.A, (ii) required because of acceptance of defective Work under Paragraph 13.08.A or Owner's correction of defective Work under Paragraph 13.09, or (iii) agreed to by the parties; and

2. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive;

~~3. changes in the Contract Price or Contract Times which embody the substance of any written decision rendered by Engineer pursuant to Paragraph 10.05;~~

~~provided that, in lieu of executing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws and Regulations, but during any such appeal, Contractor shall carry on the Work and adhere to the Progress Schedule as provided in Paragraph 6.18.A.~~

10.04 *Notification to Surety*

A. If notice of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times) is required by the provisions of any bond to be given to a surety, the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

10.05 *Claims*

A. *Engineer's Decision:* Any Claim, except those waived pursuant to Paragraph 14.09, may be referred to the Engineer for decision at Owner's discretion.

B. *Notice:* Written notice stating the general nature of each Claim, shall be delivered by the Contractor to Owner promptly (but in no event later than 7 days) after the start of the event giving rise thereto. The responsibility to substantiate a Claim shall rest with the Contractor. Notice of the amount or extent of the Claim, with supporting data shall be delivered to Owner within 30 days after the start of such event (unless Owner allows additional time for claimant to submit additional or more accurate data in support of such Claim). A Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of Paragraph 12.01.B. A Claim for an adjustment in Contract Time shall be prepared in accordance with the provisions of Paragraph 12.02.B. Each Claim shall be accompanied by claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant believes it is entitled as a result of said event.

C. *Owner's Action:* Owner will review each Claim and, within 30 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any, take one of the following actions in writing:

1. deny the Claim in whole or in part,

2. approve the Claim, or

3. notify the Contractor that the Owner is unable to resolve the Claim if, in the Owner's sole discretion, it would be inappropriate for the Owner to do so. For purposes of further resolution of the Claim, such notice shall be deemed a denial.

D. In the event that Owner does not take action on a Claim within said 30 days, the Claim shall be deemed denied.

E. Owner's written action under Paragraph 10.05.C or denial pursuant to Paragraphs 10.05.C.3 or 10.05.D will be final and binding upon Contractor.

F. No Claim for an adjustment in Contract Price or Contract Times will be valid if not submitted in accordance with this Paragraph 10.05.

ARTICLE 11 - COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

11.01 *Cost of the Work*

A. *Costs Included:* The term Cost of the Work means the sum of all costs, except those excluded in Paragraph 11.01.B, necessarily incurred and paid by Contractor in the proper performance of the Work. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, the costs to be reimbursed to Contractor will be only those additional or incremental costs required because of the change in the Work or because of the event giving rise to the Claim. Except as otherwise may be agreed to in writing by Owner, such costs shall be in amounts no higher than those prevailing in the locality of the Project, shall include only the following items, and shall not include any of the costs itemized in Paragraph 11.01.B.

1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time at the Site. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.

2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates and refunds and

returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.

3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer (if requested by Owner), which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 11.01.

4. Costs of special consultants (including but not limited to Engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.

5. Supplemental costs including the following:

a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.

b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.

c. Rentals of all construction equipment and machinery, and the parts thereof whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer (if requested by Owner), and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.

d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, imposed by Laws and Regulations.

e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.

f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by

insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 5.06.D), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.

g. The cost of utilities, fuel, and sanitary facilities at the Site.

h. Minor expenses such as telegrams, long distance telephone calls, telephone service at the Site, expresses, and similar petty cash items in connection with the Work.

i. The costs of premiums for all bonds and insurance Contractor is required by the Contract Documents to purchase and maintain.

B. Costs Excluded: The term Cost of the Work shall not include any of the following items:

1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 11.01.A.1 or specifically covered by Paragraph 11.01.A.4, all of which are to be considered administrative costs covered by the Contractor's fee.

2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.

3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.

4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.

5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraphs 11.01.A and 11.01.B.

C. Contractor's Fee: When all the Work is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 12.01.C.

D. Documentation: Whenever the Cost of the Work for any purpose is to be determined pursuant to Paragraphs 11.01.A and 11.01.B, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Owner an itemized cost breakdown together with supporting data.

11.02 Allowances

A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner.

B. Cash Allowances

1. Contractor agrees that:

a. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and

b. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.

C. Contingency Allowance

1. Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.

D. Prior to final payment, an appropriate Change Order will be issued to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

11.03 Unit Price Work

A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price

Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.

B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by Contractor will be made by Owner subject to the provisions of Paragraph 9.07.

C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.

D. Owner or Contractor may make a Claim for an adjustment in the Contract Price in accordance with Paragraph 10.05 if:

1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and

2. there is no corresponding adjustment with respect any other item of Work; and

3. Contractor believes that Contractor is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price and the parties are unable to agree as to the amount of any such increase or decrease.

ARTICLE 12 - CHANGE OF CONTRACT PRICE; CHANGE OF CONTRACT TIMES

12.01 *Change of Contract Price*

A. The Contract Price may only be changed by a Change Order. Any Claim for an adjustment in the Contract Price shall be based on written notice submitted by the Contractor to the Owner in accordance with the provisions of Paragraph 10.05.

B. The value of any Work covered by a Change Order or of any Claim for an adjustment in the Contract Price will be determined as follows:

1. where the Work involved is covered by unit prices contained in the Contract Documents, by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 11.03); or

2. where the Work involved is not covered by unit prices contained in the Contract Documents, by a

mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 12.01.C.2); or

3. where the Work involved is not covered by unit prices contained in the Contract Documents and agreement to a lump sum is not reached under Paragraph 12.01.B.2, on the basis of the Cost of the Work (determined as provided in Paragraph 11.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 12.01.C).

C. *Contractor's Fee:* The Contractor's fee for overhead and profit shall be determined as follows:

1. a mutually acceptable fixed fee; or

2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:

a. for costs incurred under Paragraphs 11.01.A.1 and 11.01.A.2, the Contractor's fee shall be 15 percent;

b. for costs incurred under Paragraph 11.01.A.3, the Contractor's fee shall be five percent;

c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraph 12.01.C.2.a is that the Subcontractor who actually performs the Work, at whatever tier, will be paid a fee of 15 percent of the costs incurred by such Subcontractor under Paragraphs 11.01.A.1 and 11.01.A.2 and that any higher tier Subcontractor and Contractor will each be paid a fee of five percent of the amount paid to the next lower tier Subcontractor;

d. no fee shall be payable on the basis of costs itemized under Paragraphs 11.01.A.4, 11.01.A.5, and 11.01.B;

e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and

f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 12.01.C.2.a through 12.01.C.2.e, inclusive.

12.02 *Change of Contract Times*

A. The Contract Times may only be changed by a Change Order. Any Claim for an adjustment in the Contract Times shall be based on written notice submitted

by the Contractor to the Owner in accordance with the provisions of Paragraph 10.05.

B. Any adjustment of the Contract Times covered by a Change Order or any Claim for an adjustment in the Contract Times will be determined in accordance with the provisions of this Article 12.

12.03 Delays

A. Where Contractor is prevented from completing any part of the Work within the Contract Times due to delay beyond the control of Contractor, the Contract Times will be extended in an amount equal to the time lost due to such delay if a Claim is made therefore as provided in Paragraph 12.02.A. If abnormal weather conditions, as described in paragraph 12.03D, have prevented progression of work, Contractor must submit to Owner a written request for a change to the contract times within seven days of the end of that month (rather than within 7 days of the delaying event, as required in Paragraph 10.05). Owner reserves the right to deny such requests not submitted within the specified time. Delays beyond the control of Contractor shall include, but not be limited to, acts or neglect by Owner, acts or neglect of utility owners or other contractors performing other work as contemplated by Article 7, fires, floods, epidemics, abnormal weather conditions, or acts of God.

~~BE~~. Compensation for delays shall not exceed five hundred (\$500.00) dollars per day and shall be strictly limited to equipment on site and deemed necessary by Owner for execution of PROJECT at the time of the delay. Rates of equipment claim shall not exceed FEMA's Schedule of Equipment Rates as published on the following web-site on the day of bid opening:

<https://www.fema.gov/assistance/public/schedule-equipment-rates>

~~CD~~. If Contractor is delayed in the performance or progress of the Work by fire, flood, epidemic, abnormal weather conditions, acts of God, acts or failures to act of utility owners not under the control of Owner, or other causes not the fault of and beyond control of Owner and Contractor, then Contractor shall be entitled to an equitable adjustment in Contract Times, if such adjustment is essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays described in this Paragraph 12.03.D. Abnormal weather conditions shall be as defined as those days or partial days meeting one or more of the four criteria described in **1999 ODOT Standard Specifications Section 108.07(b).**

~~DE~~. Owner, Engineer and the Related Entities of each of them shall not be liable to Contractor for any claims, costs, losses, or damages (including but not

limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.

~~EE~~. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delays within the control of Contractor. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of Contractor.

~~EG~~. Owner and Contractor recognize that time is of the essence for this Agreement and that Owner will suffer financial loss if the work is not substantially complete with the time specified in the Agreement and any extensions thereof allowed in accordance with Article 12 of the General Conditions. They also recognize the delays, expense and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by Owner if the Work is not substantially complete on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay but not as penalty, Contractor shall pay Owner liquidated damages at the rates set forth in the Special Provisions of the contract documents for each day that expires after the time specified in the ~~Contract Documents Agreement~~ and any extensions allowed in accordance with Article 12.

ARTICLE 13 - TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

13.01 Notice of Defects

A. Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor. All defective Work may be rejected, corrected, or accepted as provided in this Article 13.

13.02 Access to Work

A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and governmental agencies with jurisdictional interests will have access to the Site and the Work at all times for their observation, inspecting, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's Site safety procedures and programs so that they may comply therewith as applicable.

13.03 Tests and Inspections

A. Contractor shall give Owner timely notice of readiness of the Work for all required inspections, tests, or approvals and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.

B. Owner shall employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or approvals required by the Contract Documents except:

1. for inspections, tests, or approvals covered by Paragraphs 13.03.C and 13.03.D below;

2. that costs incurred in connection with tests or inspections conducted pursuant to Paragraph 13.04.B shall be paid as provided in said Paragraph 13.04.C; and

3. as otherwise specifically provided in the Contract Documents.

C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Owner the required certificates of inspection or approval.

D. Contractor shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests, or approvals required for Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work; or acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work. Such inspections, tests, or approvals shall be performed by organizations acceptable to Owner.

E. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Owner, it must, if requested by Owner, be uncovered for observation.

F. Uncovering Work as provided in Paragraph 13.03.E shall be at Contractor's expense unless Contractor has given Owner timely notice of Contractor's intention to cover the same and Owner has not acted with reasonable promptness in response to such notice.

13.04 *Uncovering Work*

A. If any Work is covered contrary to the written request of Owner, it must, if requested by Owner, be uncovered for Owner's observation and replaced at Contractor's expense.

B. If Owner considers it necessary or advisable that covered Work be observed by Owner or inspected or tested by others, Contractor, at Owner's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Owner may require, that portion of the Work in question, furnishing all necessary labor, material, and equipment.

C. If it is found that the uncovered Work is defective, Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05.

D. If, the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.

13.05 *Owner May Stop the Work*

A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work shall not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

13.06 *Correction or Removal of Defective Work*

A. Promptly after receipt of notice, Contractor shall correct all defective Work, whether or not fabricated, installed, or completed, or, if the Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or removal (including but not limited to all costs of repair or replacement of work of others).

B. When correcting defective Work under the terms of this Paragraph 13.06 or Paragraph 13.07, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

13.07 *Correction Period*

A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents) or by any specific provision of the Contract Documents, any Work is found to be defective, or if the repair of any damages to the land or areas made available for Contractor's use by Owner or permitted by Laws and Regulations as contemplated in Paragraph 6.11.A is found to be defective, Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:

1. repair such defective land or areas; or

2. correct such defective Work; or

3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and

4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others or other land or areas resulting therefrom.

B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by Contractor.

C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.

D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this Paragraph 13.07, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

E. Contractor's obligations under this Paragraph 13.07 are in addition to any other obligation or warranty. The provisions of this Paragraph 13.07 shall not be construed as a substitute for or a waiver of the provisions of any applicable statute of limitation or repose.

13.08 *Acceptance of Defective Work*

A. If, instead of requiring correction or removal and replacement of defective Work, Owner prefers to accept it, Owner may do so. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) attributable to Owner's evaluation of and determination to accept such defective Work and the diminished value of the Work to the extent not otherwise paid by Contractor pursuant to this sentence. If any such acceptance occurs prior to Owner's approval of final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work, and Owner shall be entitled to an appropriate decrease in the Contract Price, reflecting the diminished value of Work so accepted. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05. If the acceptance occurs after such recommendation, an appropriate amount will be paid by Contractor to Owner.

13.09 *Owner May Correct Defective Work*

A. If Contractor fails within a reasonable time after written notice from Owner to correct defective Work or to remove and replace rejected Work as required by Owner in accordance with Paragraph 13.06.A, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, Owner may, after seven days written notice to Contractor, correct or remedy any such deficiency.

B. In exercising the rights and remedies under this Paragraph 13.09, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, take possession of Contractor's tools, appliances, construction equipment and machinery at the Site, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this Paragraph.

C. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 13.09 will be charged against Contractor, and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount of the

adjustment, Owner may make a Claim therefor as provided in Paragraph 10.05. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.

D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 13.09.

ARTICLE 14 - PAYMENTS TO CONTRACTOR AND COMPLETION

14.01 *Schedule of Values*

A. The Schedule of Values established as provided in Paragraph 2.07.A will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Owner. Progress payments on account of Unit Price Work will be based on the number of units completed.

14.02 *Progress Payments*

A. Applications for Payments

1. At least 30 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Owner for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.

3. The amount of retainage with respect to progress payments will be as provided in Oklahoma state law. will be as stipulated in the Agreement.

B. Review of Applications

1. Owner will, within 10 days after receipt of each Application for Payment, either approve payment or return the Application to Contractor indicating in writing Owner's reasons for refusing to approve payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.

23. By recommending any such payment Engineer/Owner will not thereby be deemed to have represented that:

a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract Documents; or

b. that there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.

34. Neither Engineer's nor Owner's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation and/or Owner's approval of any payment, including final payment, will impose responsibility on Engineer and/or Owner:

a. to supervise, direct, or control the Work, or

b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or

c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or

d. to make any examination to ascertain how or for what purposes Contractor has used the moneys paid on account of the Contract Price, or

e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.

45. Owner may refuse to approve payment or, because of subsequently discovered evidence or the results of subsequent inspections or tests, revise or revoke any such payment recommendation previously made, to such extent as may be necessary in Owner's opinion to protect Owner from loss because:

a. the Work is defective, or completed Work has been damaged, requiring correction or replacement;

b. the Contract Price has been reduced by Change Orders;

c. Owner has been required to correct defective Work or complete Work in accordance with Paragraph 13.09;

d. Owner has actual knowledge of the occurrence of any of the events enumerated in Paragraph 15.02.A.; or

e. liability for liquidated damages has been incurred by Contractor;

f. Surety has not provided written authorization to Owner/Engineer to reduce retainage;

g. Engineer or Owner has received instructions from Surety regarding payments; or

h. If in the opinion of the Owner the work is substantially behind the Contractor's initial progress schedule or it is the opinion of the Owner that it is unlikely that Contractor can complete the work within the time specified in the contract documents, then the Owner may refuse to reduce ~~recommend reduction of retainage below 10%, or if it has been reduced below 10% the Owner may recommend that the retainage be increased to 10%.~~

C. Payment Becomes Due

1. Thirty days after presentation of the Application for Payment to Owner the amount recommended will (subject to the provisions of Paragraph 14.02.D) become due, and when due will be paid by Owner to Contractor.

D. Reduction in Payment

1. Owner may refuse to make payment of the full amount because:

a. claims have been made against Owner on account of Contractor's performance or furnishing of the Work;

b. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;

c. there are other items entitling Owner to a set-off against the amount recommended; or

d. Owner has actual knowledge of the occurrence of any of the events enumerated in Paragraphs 14.02.B.5.a through 14.02.B.5.c or Paragraph 15.02.A.

2. If Owner refuses to make payment of the full amount, Owner will give Contractor immediate written

notice stating the reasons for such action and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, when Contractor corrects to Owner's satisfaction the reasons for such action.

3. If it is subsequently determined that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 14.02.C.1.

14.03 Contractor's Warranty of Title

A. Contractor warrants and guarantees that title to all Work, materials, and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to Owner no later than the time of payment free and clear of all Liens.

14.04 Substantial Completion

A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete (except for items specifically listed by Contractor as incomplete) and request that Owner issue a certificate of Substantial Completion.

B. Promptly after Contractor's notification, Owner and Contractor shall make an inspection of the Work to determine the status of completion. If Owner does not consider the Work substantially complete, Owner will notify Contractor in writing giving the reasons therefor.

C. If Owner considers the Work substantially complete, Owner will deliver to Contractor a tentative certificate of Substantial Completion which shall fix the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before final payment.

~~D~~E. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to complete or correct items on the tentative list.

14.05 Partial Utilization

A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions.

1. Owner at any time may request Contractor in writing to permit Owner to use or occupy any such part of the Work which Owner believes to be ready for its intended use and substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor will certify to Owner and Engineer that such part of the Work is substantially complete and request Owner to issue a certificate of Substantial Completion for that part of the Work.

2. Contractor at any time may notify Owner and Engineer in writing that Contractor considers any such part of the Work ready for its intended use and substantially complete and request Owner to issue a certificate of Substantial Completion for that part of the Work.

3. Within a reasonable time after either such request, Owner and Contractor shall make an inspection of that part of the Work to determine its status of completion. If Owner does not consider that part of the Work to be substantially complete, Owner will notify Contractor in writing giving the reasons therefor. If Owner considers that part of the Work to be substantially complete, the provisions of Paragraph 14.04 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 5.10 regarding property insurance.

14.06 *Final Inspection*

A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Owner will promptly make a final inspection with Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

14.07 *Final Payment*

A. Application for Payment

1. After Contractor has, in the opinion of Owner, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance certificates of inspection, marked-up record documents (as provided in Paragraph 6.12), and other documents, Contractor may make application for final payment following the procedure for progress payments.

2. The final Application for Payment shall be accompanied (except as previously delivered) by:

a. all documentation called for in the Contract Documents, including but not limited to the evidence of insurance required by Paragraph 5.04.B.7;

b. consent of the surety, if any, to final payment;

c. a list of all Claims against Owner that Contractor believes are unsettled; and

d. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of or Liens filed in connection with the Work.

3. In lieu of the releases or waivers of Liens specified in Paragraph 14.07.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (i) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (ii) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner or Owner's property might in any way be responsible have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien.

B. Owner's Review of Application and Acceptance

1. If, on the basis of Owner's observation of the Work during construction and final inspection, and Owner's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Owner is satisfied that the Work has been completed and Contractor's other obligations under the Contract Documents have been fulfilled, Owner will, within ten days after receipt of the final Application for Payment, approve the final application for payment. At the same time Owner will also give written notice to Contractor that the Work is acceptable subject to the provisions of Paragraph 14.09. Otherwise, Owner will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to approve final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

C. Payment Becomes Due

1. Thirty days after the Owner's approval of the Application for Payment and accompanying documentation, the amount approved, less any sum Owner is entitled to set off against Contractor's application, including but not limited to liquidated damages, will become due and , will be paid by Owner to Contractor.

14.08 *Final Completion Delayed*

A. If, through no fault of Contractor, final completion of the Work is significantly delayed, and if Owner so

confirms, Owner shall, upon receipt of Contractor's final Application for Payment (for Work fully completed and accepted) and recommendation of Engineer with Owner's approval thereof, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by Owner for Work not fully completed or corrected is less than the retainage stipulated in the Agreement, and if bonds have been furnished as required in Paragraph 5.01, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by Contractor to Owner with the Application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

14.09 *Waiver of Claims*

A. The making and acceptance of final payment will constitute:

1. a waiver of all Claims by Owner against Contractor, except Claims arising from unsettled Liens, from defective Work noted after final inspection pursuant to Paragraph 14.06, from failure to comply with the Contract Documents or the terms of any special guarantees specified therein, or from Contractor's continuing obligations under the Contract Documents; and

2. a waiver of all Claims by Contractor against Owner other than those previously made in accordance with the requirements herein and expressly acknowledged by Owner in writing as still unsettled.

ARTICLE 15 - SUSPENSION OF WORK AND TERMINATION

15.01 *Owner May Suspend Work*

A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by notice in writing to Contractor which will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be granted an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension if Contractor makes a Claim therefor as provided in Paragraph 10.05.

15.02 *Owner May Terminate for Cause*

A. The occurrence of any one or more of the following events will justify termination for cause:

1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including,

but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule established under Paragraph 2.07 as adjusted from time to time pursuant to Paragraph 6.04);

2. Contractor's disregard of Laws or Regulations of any public body having jurisdiction;

3. Contractor's disregard of the authority of Owner and/or Engineer; or

4. Contractor's violation in any substantial way of any provisions of the Contract Documents.

B. If one or more of the events identified in Paragraph 15.02.A occur, Owner may, after giving Contractor (and surety) seven days written notice of its intent to terminate the services of Contractor:

1. exclude Contractor from the Site, and take possession of the Work and of all Contractor's tools, appliances, construction equipment, and machinery at the Site, and use the same to the full extent they could be used by Contractor (without liability to Contractor for trespass or conversion),

2. incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and

3. complete the Work as Owner may deem expedient.

C. If Owner proceeds as provided in Paragraph 15.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Owner arising out of or relating to completing the Work, such excess will be paid to Contractor. If such claims, costs, losses, and damages exceed such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be incorporated in a Change Order. When exercising any rights or remedies under this Paragraph Owner shall not be required to obtain the lowest price for the Work performed.

D. Notwithstanding Paragraphs 15.02.B and 15.02.C, Contractor's services will not be terminated if Contractor begins within seven days of receipt of notice of intent to terminate to correct its failure to perform and proceeds diligently to cure such failure within no more than 30 days of receipt of said notice.

E. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue. Any retention or

payment of moneys due Contractor by Owner will not release Contractor from liability.

F. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 5.01.A, the termination procedures of that bond shall supersede the provisions of Paragraphs 15.02.B, and 15.02.C.

15.03 *Owner May Terminate For Convenience*

A. Upon seven days written notice to Contractor, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):

1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;

2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses;

3. all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred in settlement of terminated contracts with Subcontractors, Suppliers, and others; and

4. reasonable expenses directly attributable to termination.

B. Contractor shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

15.04 *Contractor May Stop Work or Terminate*

A. If, through no act or fault of Contractor, (i) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (ii) Owner fails to act on any Application for Payment within 30 days after it is submitted, or (iii) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner, and provided Owner does not remedy such suspension or failure within that time, terminate the Contract and recover from Owner payment on the same terms as provided in Paragraph 15.03.

B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Owner has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days

to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this Paragraph 15.04 are not intended to preclude Contractor from making a Claim under Paragraph 10.05 for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this Paragraph.

ARTICLE 16 - DISPUTE RESOLUTION (NOT USED)

ARTICLE 17 - MISCELLANEOUS

17.01 *Giving Notice*

A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:

1. delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended, or

2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.

17.02 *Computation of Times*

A. When any period of time is referred to in the Contract Documents by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

17.03 *Cumulative Remedies*

A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract Documents. The provisions of this Paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

17.04 *Survival of Obligations*

A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract Documents, as well as all continuing obligations indicated in the Contract Documents, will survive final payment, completion, and acceptance of the Work or termination or completion of the Contract or termination of the services of Contractor.

17.05 *Controlling Law*

A. This Contract ~~shall is to~~ be governed by the law of the State ~~of Oklahoma in which the Project is located.~~ Venue for any legal action shall be in Payne County, Oklahoma.

17.06 *Headings*

A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

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OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY
Supplemental Conditions
for
Projects funded from the
Drinking Water State Revolving Loan Fund

REPRODUCTION OF THIS GUIDANCE SHOULD
BE ON COLORED PAPER, PREFERABLY PINK

RULES AND REGULATIONS
TITLE 41 - PUBLIC CONTRACT AND PROPERTY MANAGEMENT
CHAPTER 60 - OFFICE OF FEDERAL CONTRACT COMPLIANCE PROGRAMS,
EQUAL EMPLOYMENT OPPORTUNITY, DEPARTMENT OF LABOR
COMPLIANCE RESPONSIBILITY FOR EQUAL EMPLOYMENT OPPORTUNITY

60-1.4 Equal opportunity clause.

(b) Federally assisted construction contracts.

(1) Except as otherwise provided, each administering agency shall require the inclusion of the following language as a condition of any grant, contract, loan, insurance, or guarantee involving federally assisted construction which is not exempt from the requirements of the equal opportunity clause:

The applicant hereby agrees that it will incorporate or cause to be incorporated into any contract for construction work, or modification thereof, as defined in the regulations of the Secretary of Labor at 41 CFR Chapter 60, which is paid for in whole or in part with funds obtained from the Federal Government or borrowed on the credit of the Federal Government pursuant to a grant, contract, loan insurance, or guarantee, or undertaken pursuant to any Federal program involving such grant, contract, loan, insurance, or guarantee, the following equal opportunity clause:

During the performance of this contract, the contractor agrees as follows:

(1) The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, or national origin. such action shall include, but not be limited to the following: Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.

(2) The contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive considerations for employment without regard to race, color, religion, sex, or national origin.

(3) The contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representatives of the contractor's commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(4) The contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

(5) The contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the administering agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

(6) In the event of the contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated, or suspended in whole or in part and the contractor may be declared ineligible for further Government contracts or federally assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and

such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

- (7) The contractor will include the portion of the sentence immediately preceding paragraph (1) and the provisions of paragraphs (1) through (7) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The contractor will take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provisions, including sanctions for noncompliance: Provided, however, That in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the administering agency the contractor may request the United States to enter into such litigation to protect the interests of the United States.

The applicant further agrees that it will be bound by the above equal opportunity clause with respect to its own employment practices when it participates in federally assisted construction work: Provided, That if the applicant so participating is a State or local government, the above equal opportunity clause is not applicable to any agency, instrumentality or subdivision of such government which does not participate in work on or under the contract.

The applicant agrees that it will assist and cooperate actively with the administering agency and the Secretary of Labor in obtaining the compliance of contractors and subcontractors with the equal opportunity clause and the rules, regulations, and relevant orders of the Secretary of Labor, that it will furnish the administering agency and the Secretary of Labor such information as they may require for the supervision of such compliance, and that it will otherwise assist the administering agency in the discharge of the agency's primary responsibility for securing compliance.

The applicant further agrees that it will refrain from entering into any contract or contract

modification subject to Executive Order 11246 of September 24, 1965, with a contractor debarred from, or who has not demonstrated eligibility for, Government contracts and federally assisted construction contracts pursuant to the Executive order and will carry out such sanctions and penalties for violation of the equal opportunity clause as may be imposed upon contractors and subcontractors by the administering agency or the Secretary of Labor pursuant to Part II, Subpart D of the Executive order. In addition, the applicant agrees that if it fails or refuses to comply with these undertakings, the administering agency may take any or all of the following actions: Cancel, terminate, or suspend in whole or in part this grant (contract, loan, insurance, guarantee); refrain from extending any further assistance to the applicant under the program with respect to which the failure or refund occurred until satisfactory assurance of future compliance has been received from such applicant; and refer the case to the Department of Justice for appropriate legal proceedings.

- (c) Subcontracts. Each nonexempt prime contractor or subcontractor shall include the equal opportunity clause in each of its nonexempt subcontracts.
- (d) Incorporation by reference. The equal opportunity clause may be incorporated by reference in all Government contracts and subcontracts, including Government bills of lading, transportation requests, contracts for deposit of Government funds, and contracts for issuing and paying U.S. savings bonds and notes, and such other contracts and subcontracts as the Deputy Assistant Secretary may designate.
- (e) Incorporation by operation of the order. By operation of the order, the equal opportunity clause shall be considered to be a part of every contract and subcontract required by the order and the regulations in this part to include such a clause whether or not it is physically incorporated in such contracts and whether or not the contract between the agency and the contractor is written.
- (f) Adaptation of language. Such necessary changes in language may be made in the equal opportunity clause as shall be appropriate to identify properly the parties and their undertakings.
[43 FR 49240, Oct. 20, 1978, as amended at 62 FR 66971, Dec. 22, 1997]

60-4.2 Solicitations.

- (a) All Federal contracting officers and all applicants shall include the notice set forth in paragraph (d) of this section and the Standard Federal Equal Employment Opportunity Construction Contract Specifications set forth in § 60-4.3 of this part in all solicitations for offers and bids on all Federal and federally assisted construction contracts or subcontracts to be performed in geographical areas designated by the Director pursuant to § 60-4.6 of the part. Administering agencies shall require the inclusion of the notice set forth in paragraph (d) of this section and the specifications set forth in § 60-4.3 of this part as a condition of any grant, contract, subcontract, loan, insurance or guarantee involving federally assisted construction covered by this Part 60-4.
- (b) All nonconstruction contractors covered by Executive Order 11246 and the implementing regulations shall include the notice in paragraph (d) of this section in all construction agreements which are necessary in whole or in part to the performance of the covered nonconstruction contract.
- (c) Contracting officers, applicants and nonconstruction contractors shall give written notice to the Director within 10 working days of award of a contract subject to these provisions. The notification shall include the name, address and telephone number of the contractor; employer identification number; dollar amount of the contract, estimated starting and completion dates of the contract; the contract number; and geographical area in which the contract is to be performed.
- (d) The following notice shall be included in, and shall be a part of, all solicitations for offers and bids on all Federal and federally assisted construction contracts or subcontracts in excess of \$10,000 to be performed in geographical areas designated by the Director pursuant to § 60-4.6 of this part (see 41 CFR 60-4.2(a)):

Notice of Requirement for Affirmative Action To Ensure Equal Employment Opportunity (Executive Order 11246)

1. The Offeror's or Bidder's attention is called to

the "Equal Opportunity Clause" and the "Standard Federal Equal Employment Specifications" set forth herein.

2. The goals and timetables for minority and female participation, expressed in percentage terms for the Contractor's aggregate workforce in each trade on all construction work in the covered area, are as follows:

Goals for minority participation in each trade	Goals for female participation in each trade
11.25%	7.41%

These goals are applicable to all the Contractor's construction work (whether or not it is Federal or federally assisted) performed in the covered area. If the contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for such geographical area where the work is actually performed. With regard to this second area, the contractor also is subject to the goals for both its federally involved and nonfederally involved construction.

The Contractor's compliance with the Executive Order and the regulations in 41 CFR Part 60-4 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in 41 CFR 60-4.3(a), and its efforts to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade, and the contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting the Contractor's goals shall be a violation of the contract, the Executive Order and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

2. The Contractor shall provide written notification to the Director of the Office of Federal Contract Compliance Programs within 10 working days of award of any construction subcontract in excess of \$10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the name, address and telephone number of the

subcontractor; employer identification number of the subcontractor; estimated dollar amount of the subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the subcontract is to be performed.

4. As used in this Notice, and in the contract resulting from this solicitation, the "covered area" is (insert description of the geographical areas where the contract is to be performed giving the state, county and city, if any).

[43 FR 49254, Oct. 20, 1978; 43 FR 51401, Nov. 3, 1978, as amended at 45 FR 65977, Oct. 3, 1980]

60-4.3 Equal opportunity clauses.

- (a) The equal opportunity clause published at 41 CFR 60-1.4(a) of this chapter is required to be included in, and is part of, all nonexempt Federal contracts and subcontracts, including construction contracts and subcontracts. The equal opportunity clause published at 41 CFR 60-1.4(b) is required to be included in, and is a part of, all nonexempt federally assisted construction contracts and subcontracts. In addition to the clauses described above, all Federal contracting officers, all applicants and all nonconstruction contractors, as applicable, shall include the specifications set forth in this section in all Federal and federally assisted construction contracts in excess of \$10,000 to be performed in geographical areas designated by the Director pursuant to § 60-4.6 of this part and in construction subcontracts in excess of \$10,000 necessary in whole or in part to the performance of nonconstruction Federal contracts and subcontracts covered under the Executive order.

Standard Federal Equal Employment Opportunity Construction Contract Specifications (Executive Order 11246)

1. As used in these specifications:
 - a. "Covered area" means the geographical area described in the solicitation from which this contract resulted;
 - b. "Director" means Director, Office of Federal Contract Compliance Programs, United States Department of Labor, or any person to whom the Director delegates authority;
 - c. "Employer identification number" means the Federal Social Security

number used on the Employer's Quarterly Federal Tax Return, U.S. Treasury Department Form 941.

- d. "Minority" includes:
 - (i) Black (all persons having origins in any of the Black African racial groups not of Hispanic origin);
 - (ii) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish Culture or origin, regardless of race);
 - (iii) Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands); and
 - (iv) American Indian or Alaskan Native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).

2. Whenever the Contractor, or any Subcontractor at any tier, subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract in excess of \$10,000 the provisions of these specifications and the Notice which contains the applicable goals for minority and female participation and which is set forth in the solicitations from which this contract resulted.
3. If the Contractor is participating (pursuant to 41 CFR 60-4.5) in a Hometown Plan approved by the U.S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the Plan area (including goals and timetables) shall be in accordance with that Plan for those trades which have unions participating in the Plan. Contractors must be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each Contractor or Subcontractor participating in an approved Plan is individually required to comply with its obligations under the EEO clause, and to make a good faith effort to achieve each goal under the Plan in each trade in

which it has employees. The overall good faith performance by other Contractors or Subcontractors toward a goal in an approved Plan does not excuse any covered Contractor's or Subcontractor's failure to take good faith efforts to achieve the Plan goals and timetables.

4. The Contractor shall implement the specific affirmative action standards provided in paragraphs 7 a through p of these specifications. The goals set forth in the solicitation from which this contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the Contractor should reasonably be able to achieve in each construction trade in which it has employees in the covered area. Covered Construction contractors performing construction work in geographical areas where they do not have a Federal or federally assisted construction contract shall apply the minority and female goals established for the geographical area where the work is being performed. Goals are published periodically in the Federal Register in notice form, and such notices may be obtained from any Office of Federal Contract Compliance Programs office or from Federal procurement contracting officers. The Contractor is expected to make substantially uniform progress in meeting its goals in each craft during the period specified.
5. Neither the provisions of any collective bargaining agreement, nor the failure by a union with whom the Contractor has a collective bargaining agreement, to refer either minorities or women shall excuse the Contractor's obligations under these specifications, Executive Order 11246, or the regulations promulgated pursuant thereto.
6. In order for the nonworking training hours of apprentices and trainees to be counted in meeting the goals, such apprentices and trainees must be employed by the Contractor during the training period, and the Contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees must be trained pursuant to training programs approved by the U.S.

Department of Labor.

7. The Contractor shall take specific affirmative actions to ensure equal employment opportunity. The evaluation of the Contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The Contractor shall document these efforts fully, and shall implement affirmative action steps at least as extensive as the following:
 - a. Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and in all facilities at which the Contractor's employees are assigned to work. The Contractor, where possible, will assign two or more women to each construction project. The Contractor shall specifically ensure that all foremen, superintendents, and other on-site supervisory personnel are aware of and carry out the Contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at such sites or in such facilities.
 - b. Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations when the Contractor or its unions have employment opportunities available, and maintain a record of the organizations' responses.
 - c. Maintain a current file of the names, addresses and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment source or community organization and of what action was taken with respect to each such individual. If such individual was sent to the union hiring hall for referral and was not referred back to the Contractor by the union or, if referred, not employed by the Contractor, this shall be documented in the file with the reason therefore, along with whatever additional

- actions the Contractor may have taken.
- d. Provide immediate written notification to the Director when the union or unions with which the Contractor has a collective bargaining agreement has not referred to the Contractor a minority person or woman sent by the Contractor, or when the Contractor has other information that the union referral process has impeded the Contractor's efforts to meet its obligations.
 - e. Develop on-the-job training opportunities and/or participate in training programs for the area which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the Contractor's employment needs, especially those programs funded or approved by the Department of Labor. The Contractor shall provide notice of these programs to the sources compiled under 7b above.
 - f. Disseminate the Contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the Contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc.; by specific review of the policy with all management personnel and with all minority and female employees at least once a year; and by posting the company EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.
 - g. Review, at least annually, the company's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination or other employment decisions including specific review of these items with onsite supervisory personnel such as Superintendents, General Foremen, etc., prior to the initiation of construction work at any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.
 - h. Disseminate the Contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to and discussing the Contractor's EEO policy with other Contractors and Subcontractors with whom the Contractor does or anticipates doing business.
 - i. Direct its recruitment efforts, both oral and written, to minority, female and community organizations, to schools with minority and female students and to minority and female recruitment and training organizations serving the Contractor's recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment source, the Contractor shall send written notification to organizations such as the above, describing the openings, screening procedures, and tests to be used in the selection process.
 - j. Encourage present minority and female employees to recruit other minority persons and women and, where reasonable, provide after school, summer and vacation employment to minority and female youth both on the site and in other areas of a Contractor's work force.
 - k. Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR Part 60-3.
 - l. Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel for promotional opportunities and

- encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.
- m. Ensure that seniority practices, job classifications, work assignments and other personnel practices, do not have a discriminatory effect by continually monitoring all personnel and employment related activities to ensure that the EEO policy and the Contractor's obligations under these specifications are being carried out.
 - m. Ensure that all facilities and company activities are nonsegregated except that separate or single-user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.
 - n. Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.
 - o. Conduct a review, at least annually, of all supervisors' adherence to and performance under the Contractor's EEO policies and affirmative action obligations.
8. Contractors are encouraged to participate in voluntary associations which assist in fulfilling one or more of their affirmative action obligations (7a through p). The efforts of a contractor association, joint contractor-union, contractor-community, or other similar group of which the contractor is a member and participant, may be asserted as fulfilling any one or more of its obligations under 7a through p of these Specifications provided that the contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the Contractor's minority and female workforce participation, makes a good faith effort to meet its individual goals and timetables, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the Contractor. The obligation to comply, however, is the Contractor's and failure of such a group to fulfill an obligation shall not be a defense for the Contractor's noncompliance.
- 9. A single goal for minorities and a separate single goal for women have been established. The Contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority. Consequently, the Contractor may be in violation of the Executive Order if a particular group is employed in a substantially disparate manner (for example, even though the Contractor has achieved its goals for women generally, the Contractor may be in violation of the Executive Order if a specific minority group of women is underutilized).
 - 10. The Contractor shall not use the goals and timetables or affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.
 - 11. The contractor shall not discriminate on the basis of race, color, national origin or sex in the performance of this contract. The contractor shall carry out applicable requirements of 40 CFR Part 33 in the award and administration of contracts awarded under EPA financial assistance agreements. Failure by the contractor to carry out these requirements is a material breach of this contract which may result in the termination of this contract."
 - 12. The Contractor shall not enter into any Subcontract with any person or firm debarred from Government contracts pursuant to Executive Order 11246.
 - 13. The Contractor shall carry out such sanctions and penalties for violation of these specifications and of the Equal Opportunity Clause, including suspension, termination and cancellation of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations, by the Office of Federal Contract Compliance Programs. Any Contractor who fails to

carry out such sanctions and penalties shall be in violation of these specifications and Executive Order 11246, as amended.

14. The Contractor, in fulfilling its obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph 7 of these specifications, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the Contractor fails to comply with the requirements of the Executive Order, the implementing regulations, or these specifications, the Director shall proceed in accordance with 41 CFR 60-4.8.

15. The Contractor shall designate a responsible official to monitor all employment related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as may be required by the Government and to keep records. Records shall at least include for each employee the name, address, telephone numbers, construction trade, union affiliation if any, employee identification number when assigned, social security number, race, sex, status (e.g., mechanic, apprentice trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, contractors shall not be required to maintain separate records.

16. Nothing herein provided shall be construed as a limitation upon the application of other laws which establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).

- (b) The notice set forth in 41 CFR 60-4.2 and the specifications set forth in 41 CFR 60-4.3 replace the New Form for Federal Equal Employment Opportunity Bid Conditions for

Federal and Federally Assisted Construction published at 41 FR 32482 and commonly known as the Model Federal EEO Bid Conditions, and the New Form shall not be used after the regulations in 41 CFR Part 60-4 become effective.

[43 FR 49254, Oct. 20, 1978; 43 FR 51401, Nov. 3, 1978, as amended at 45 FR 65978, Oct. 3, 1980]

DAVIS BACON ACT REQUIREMENTS (29 CFR 5.5)

The Project or Program to which the construction work covered by this contract pertains is being assisted by the United States of America and the following Federal Labor Standards Provisions are included in this contract pursuant to the provisions applicable to such assistance.

Regarding the following text: a **subrecipient** typically refers to a municipal or other local governmental entity that manages funds and are eligible to receive subgrant or loans from the **recipient**, which refers to the Oklahoma Drinking Water State Revolving Fund (DWSRF).

1. Applicability of the Davis-Bacon (DB) prevailing wage requirements. DB prevailing wage requirements apply to the construction, alteration, and repair of treatment works carried out in whole or in part with assistance made available by a State drinking water treatment revolving loan fund. If a subrecipient encounters a unique situation at a site that presents uncertainties regarding DB applicability, the subrecipient must discuss the situation with the recipient State [DWSRF] before authorizing work on that site.

2. Obtaining Wage Determinations.

(a) Subrecipients shall obtain the wage determination for the locality in which a covered activity subject to DB will take place prior to issuing requests for bids, proposals, quotes or other methods for soliciting contracts (solicitation) for activities subject to DB. These wage determinations shall be incorporated into solicitations and any subsequent contracts. Prime contracts must contain a provision requiring that subcontractors follow the wage determination incorporated into the prime contract.

(i) While the solicitation remains open, the subrecipient shall monitor www.SAM.gov weekly to ensure that the wage determination contained in the solicitation remains current. The

subrecipients shall amend the solicitation if the Department of Labor issues a modification more than 10 days prior to the closing date (i.e., bid opening) for the solicitation. If the Department of Labor modifies or supersedes the applicable wage determination less than 10 days prior to the closing date, the subrecipients may request a finding from the State recipient [DWSRF] that there is not a reasonable time to notify interested contractors of the modification of the wage determination. The State recipient will provide a report of its findings to the subrecipient.

(ii) If the subrecipient does not award the contract within 90 days of the closure of the solicitation, any modifications or supersedes the Department of Labor makes to the wage determination contained in the solicitation shall be effective unless the State recipient [DWSRF], at the request of the subrecipient, obtains an extension of the 90 day period from the Department of Labor pursuant to 29 CFR 1.6(c)(3)(iv). The subrecipient shall monitor www.SAM.gov on a weekly basis if it does not award the contract within 90 days of closure of the solicitation to ensure that wage determinations contained in the solicitation remain current.

(b) If the subrecipient carries out activity subject to DB by issuing a task order, work assignment or similar instrument to an existing contractor (ordering instrument) rather than by publishing a solicitation, the subrecipient shall insert the appropriate Department of Labor wage determination from www.SAM.gov into the ordering instrument.

(c) Subrecipients shall review all subcontracts subject to DB entered into by prime contractors to verify that the prime contractor has required its subcontractors to include the applicable wage determinations.

(d) As provided in 29 CFR 1.6(f), DOL may issue a revised wage determination applicable to a subrecipient's contract after the award of a contract or the issuance of an ordering instrument if the Department of Labor determines that the subrecipient has failed to incorporate a wage determination or has used a wage determination that clearly does not apply to the contract or ordering instrument. If this occurs, the subrecipient shall either terminate the contract or ordering instrument and issue a revised solicitation or ordering instrument or incorporate the Department of Labor's wage determination retroactive to the beginning of the contract or ordering instrument by change order. The subrecipient's contractor must be compensated

for any increases in wage resulting from the use of the Department of Labor's revised wage determination.

3. Contracts and Subcontract provisions.

(a) Any contract in excess of \$2,000 which is entered into for the actual construction, alteration and/or repair, including painting and decorating, of a construction project under the DWSRF financed in whole or in part from Federal funds or in accordance with guarantees of a Federal agency or financed from funds obtained by pledge of any contract of a Federal agency to make a loan, grant or annual contribution (except where a different meaning is expressly indicated), and which is subject to the labor standards provisions of any of the acts listed in §5.1 or the FY 2013 Full-Year Continuing Resolution, shall include the following clauses **[(1) – (10)]**:

(1) Minimum wages.

(i) All laborers and mechanics employed or working upon the site of the work will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (a)(1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in §5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided that the

employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph (a)(1)(ii) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers. Subrecipients may obtain wage determinations from the U.S. Department of Labor's web site, www.SAM.gov.

(ii)(A) The subrecipient, on behalf of EPA, shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The State award official [DWSRF] shall approve a request for an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(2) The classification is utilized in the area by the construction industry; and

(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(B) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the subrecipient agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), documentation of the action taken and the request, including the local wage determination shall be sent by the subrecipient to the State award official [DWSRF]. The State award official [DWSRF] will transmit the request to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210 and to the EPA DB Regional Coordinator concurrently. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification request within 30 days of receipt and so advise the State award official [DWSRF] or will notify the State award official [DWSRF] within the 30-day period that additional time is necessary.

(C) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the recipient [DWSRF] do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the State award official [DWSRF] shall refer the request and the local wage determination, including the views of all interested parties and the recommendation of the State award official [DWSRF], to the Administrator for determination. The request shall be sent to the EPA DB Regional Coordinator concurrently. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt of the request and so advise the contracting officer [DWSRF] or will notify the contracting officer [DWSRF] within the 30-day period that additional time is necessary.

(D) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs (a)(1)(ii)(B) or (C) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

(2) Withholding. The subrecipient shall upon written request of the EPA Award Official or an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements,

which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the (Agency) may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

(3) Payrolls and basic records.

(i) Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii)(A) The contractor shall submit weekly, for each week in which any contract work is performed, a copy of all payrolls to the subrecipient, that is, the entity that receives the

sub-grant or loan from the State capitalization grant recipient. Such documentation shall be available on request of the State recipient [DWSRF] or EPA. As to each payroll copy received, the subrecipient shall provide written confirmation in a form satisfactory to the State indicating whether or not the project is in compliance with the requirements of 29 CFR 5.5(a)(1) based on the most recent payroll copies for the specified week. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on the weekly payrolls. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at <http://www.dol.gov/esa/whd/forms/wh347instr.htm> or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the subrecipient for transmission to the State [DWSRF] or EPA if requested by EPA, the State [DWSRF], the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the subrecipient(s).

(B) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) That the payroll for the payroll period contains the information required to be provided under §5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under §5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

(2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate,

either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph (a)(3)(ii)(B) of this section.

(D) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

(iii) The contractor or subcontractor shall make the records required under paragraph (a)(3)(i) of this section available for inspection, copying, or transcription by authorized representatives of the State [DWSRF], EPA or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the Federal agency or State [DWSRF] may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

(4) Apprentices and trainees.

(i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program,

but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site

shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

(5) Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

(6) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR 5.5(a)(1) through (10) and such other clauses as the EPA determines may by appropriate [instructions require], and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

(7) Contract termination; debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

(8) Compliance with Davis-Bacon and Related Act requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

(9) Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and Subrecipient(s), State, EPA, the U.S. Department of Labor, or the employees or their representatives.

(10) Certification of eligibility.

(i) By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

4. Contract Provision for Contracts in Excess of \$100,000

(a) Contract Work Hours and Safety Standards Act. The subrecipient shall insert the following clauses set forth in paragraphs (a)(1), (2), (3), and (4) of this section in full in any contract in an amount in excess of \$100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by Item 3, above, or 29 CFR 4.6. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

(1) Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

(2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (a)(1) of this section the contractor and any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (a)(1) of this section, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (a)(1) of this section.

(3) Withholding for unpaid wages and liquidated damages. The subrecipient, upon written request of the EPA Award Official or an authorized representative of the Department of Labor, shall withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (a)(2) of this section.

(4) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (a)(1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor

shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (a)(1) through (4) of this section.

(b) In addition to the clauses contained in Item 3, above, in any contract subject only to the Contract Work Hours and Safety Standards Act and not to any of the other statutes cited in 29 CFR 5.1, the Subrecipient shall insert a clause requiring that the contractor or subcontractor shall maintain payrolls and basic payroll records during the course of the work and shall preserve them for a period of three years from the completion of the contract for all laborers and mechanics, including guards and watchmen, working on the contract. Such records shall contain the name and address of each such employee, social security number, correct classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid. Further, the Subrecipient shall insert in any such contract a clause providing that the records to be maintained under this paragraph shall be made available by the contractor or subcontractor for inspection, copying, or transcription by authorized representatives of the DWSRF and the Department of Labor, and the contractor or subcontractor will permit such representatives to interview employees during working hours on the job.

5. Compliance Verification

(a) The subrecipient shall periodically interview a sufficient number of employees entitled to DB prevailing wages (covered employees) to verify that contractors or subcontractors are paying the appropriate wage rates. As provided in 29 CFR 5.6(a)(6), all interviews must be conducted in confidence. The subrecipient must use Standard Form 1445 (SF 1445) or equivalent to memorialize the interviews. Copies of the SF 1445 are available from EPA on request.

(b) The subrecipient shall establish and follow an interview schedule based on its assessment of the risks of noncompliance with DB posed by contractors or subcontractors and the duration of the contract or subcontract. At a minimum, the subrecipient should conduct interviews with a representative group of covered employees within two weeks of each contractor or subcontractor's submission of its initial weekly payroll data and two weeks prior to the estimated completion date for the contract or subcontract. Subrecipients must conduct more frequent

interviews if the initial interviews or other information indicates that there is a risk that the contractor or subcontractor is not complying with DB. Subrecipients shall immediately conduct necessary interviews in response to an alleged violation of the prevailing wage requirements. All interviews shall be conducted in confidence.

(c) The subrecipient shall periodically conduct spot checks of a representative sample of weekly payroll data to verify that contractors or subcontractors are paying the appropriate wage rates. The subrecipient shall establish and follow a spot check schedule based on its assessment of the risks of noncompliance with DB posed by contractors or subcontractors and the duration of the contract or subcontract. At a minimum, if practicable, the subrecipient should spot check payroll data within two weeks of each contractor or subcontractor's submission of its initial payroll data and two weeks prior to the completion date [of] the contract or subcontract. Subrecipients must conduct more frequent spot checks if the initial spot check or other information indicates that there is a risk that the contractor of subcontractor is not complying with DB. In addition, during the examinations the subrecipient shall verify evidence of fringe benefit plans and payments thereunder by contractors and subcontractors who claim credit for fringe benefit contributions.

(d) The subrecipient shall periodically review contractor's and subcontractor's use of apprentices and trainees to verify registration and certification with respect to apprenticeship and training programs approved by either the U.S. Department of Labor or a state, as appropriate, and the contractors and subcontractors are not using disproportionate numbers of, laborers, trainees and apprentices. These reviews shall be conducted in accordance with the schedules for spot checks and interviews described in Item 5(b) and (c) above.

(e) Subrecipients must immediately report potential violations of the DB prevailing wage requirements to the EPA DB contact listed above and to the appropriate DOL Wage and Hour District Office listed at <https://www.dol.gov/agencies/whd/contact/local-offices>

AMERICAN IRON AND STEEL

(a) Definitions. (1) In this section, the term "iron and steel products" means the following products made primarily of iron or steel: lined or unlined pipes and fittings, manhole covers and other

municipal castings, hydrants, tanks, flanges, pipe clamps and restraints, valves, structural steel, reinforced precast concrete, and construction materials.

(2) Steel means an alloy that includes at least 50 percent iron, between 0.02 of 2 percent carbon, and may include other elements.

(b) Domestic Preference.

(1) This award term and condition implements the Safe Drinking Water Act, Section 1452(a)(4), by requiring that all iron and steel products used for a project for the construction, alteration, maintenance or repair of a public water system are produced in the United States except as provided in paragraph (b)(2) of this section and condition.

(2) This requirement shall not apply in any case or category of cases in which the Administrator of the environment Protection Agency finds that:

(i) Applying the requirement would be inconsistent with the public interest;

(ii) iron and steel products are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality; or

(iii) inclusion of iron and steel products produced in the United States will increase the cost of the overall project by more than 25 percent.

(c) Request for a Waiver under (b)(2) of this section

(1) Any recipient request to use foreign iron or steel products in accordance with paragraph (b)(2) of this section shall include adequate information for Federal Government evaluation of the request, including—

(A) A description of the foreign and domestic iron, steel, and/or manufactured goods;

(B) Unit of measure;

(C) Quantity;

(D) Cost

(E) Time of delivery or availability;

(F) Location of the project;

(G) Name and address of the proposed supplier; and

(H) A detailed justification of the reason for use of foreign iron or steel products cited in accordance with paragraph (b)(2) of this section.

(2) If the Administrator receives a request for a waiver under this section, the waiver request shall be made available to the public for at least 15 days prior to making a finding based on the request.

(3) Unless the Administrator issues a waiver of this term, use of foreign iron and steel products is noncompliant with the Safe Drinking Water Act, section 1452(a)(4).

(d) This term and condition shall be applied in a manner consistent with United States obligations under international agreements.

BUILD AMERICA, BUY AMERICA

Build America, Buy America (BABA) Act requirements may apply. The BABA Act requires none of the funds made available for a Federal financial assistance program for infrastructure, including each deficient program, may be obligated for a project unless all of the **iron, steel, manufactured products, and construction materials** used in the project are produced in the United States. The BABA Act requirement does not supersede the AIS requirement, and both provisions still apply and work in conjunction.

OTHER SUPPLEMENTAL CONDITIONS

Small, Minority and Women's Business

40 CFR 31.36(e) Contracting with small and minority firms, women's business enterprise and labor surplus area firms.

1. The SRF loan recipient and subcontractors will take all necessary affirmative steps to assure that minority firms, women's business enterprises, and labor surplus area firms are used when possible.

2. Affirmative Steps shall include:

(i) Placing qualified small and minority businesses and women's business enterprises on solicitation lists;

(ii) Assuring that small and minority businesses, and women's business enterprises are solicited whenever they are potential sources;

(iii) Dividing total requirements, when economically feasible, into smaller tasks or quantities to permit maximum participation by small and minority business, and women's business enterprises;

(iv) Establishing delivery schedules, where the requirement permits, which encourage participation by small and minority business, and women's business enterprises;

(v) Using the services and assistance of the Small Business Administration, and the Minority Business Development Agency of the Department of Commerce; and

(vi) Requiring the prime contractor, if subcontracts are to be let, to take the affirmative steps listed in paragraphs (e)(2)(i) through (v) of this section.

Completion Date

If not stated elsewhere in these specifications, the contractor shall complete work under this contract within _____ working days or _____ calendar days. Time for completion shall begin on the 10th day after issuance of the work order, which shall consist of a written request by the engineer for the contractor to proceed with the construction of the project.

Contractor's Liability and Builders All Risk Insurance

The contractor shall furnish the following insurance when the contract is awarded:

(A) Workmen's Compensation: The contractor shall carry on his work in accordance with the requirements of the Workmen's Compensation Law of the State of Oklahoma, and shall not reject the provisions thereof during the life of the contract. A certificate of coverage must be returned with the contract.

(B) Public Liability and Property Damage: He shall also protect himself by liability insurance against any and all claims for damages to persons or property which may arise out of operations under this contract, whether such operations be by himself or a subcontractor or by anyone directly employed by either of them. Certificates of such insurance shall be file with the Owner and shall be subject to its approval as to adequacy of protection. The public liability insurance shall have limits of not less than \$100,000/\$300,000 and Property Damage insurance of not less than \$50,000/\$100,000 shall be carried by the contractor during the life of the contract. A certificate of such coverage must be returned with the contract.

(C) Builder's Risk: Provide Builders Risk Insurance only if called for in other sections of the specifications.

Bonds

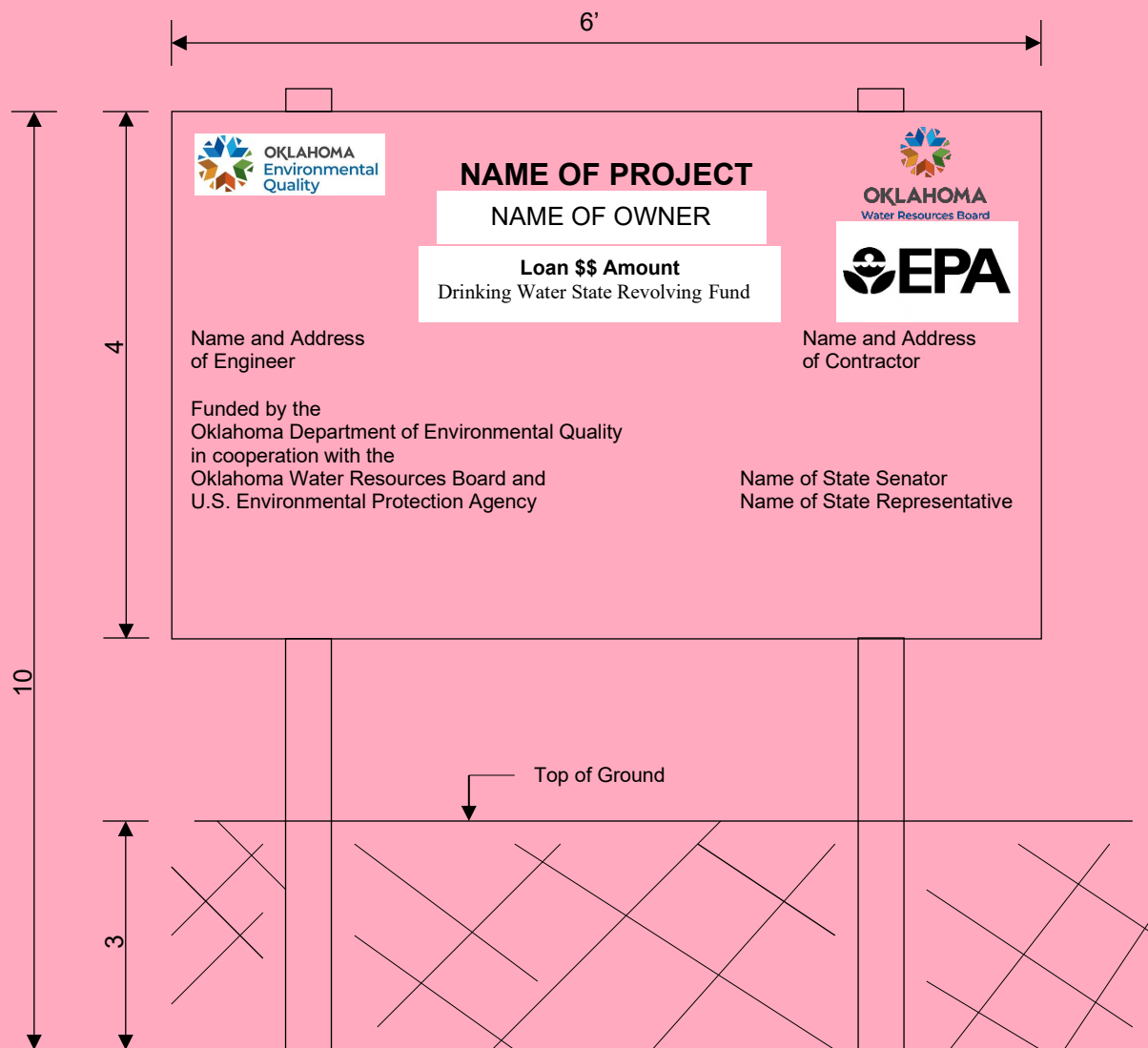
All bonds are for the full value of the contract and must be issued by a surety company authorized by the Oklahoma Insurance Commission to do business in the State of Oklahoma. They will be required after the award of the contact.

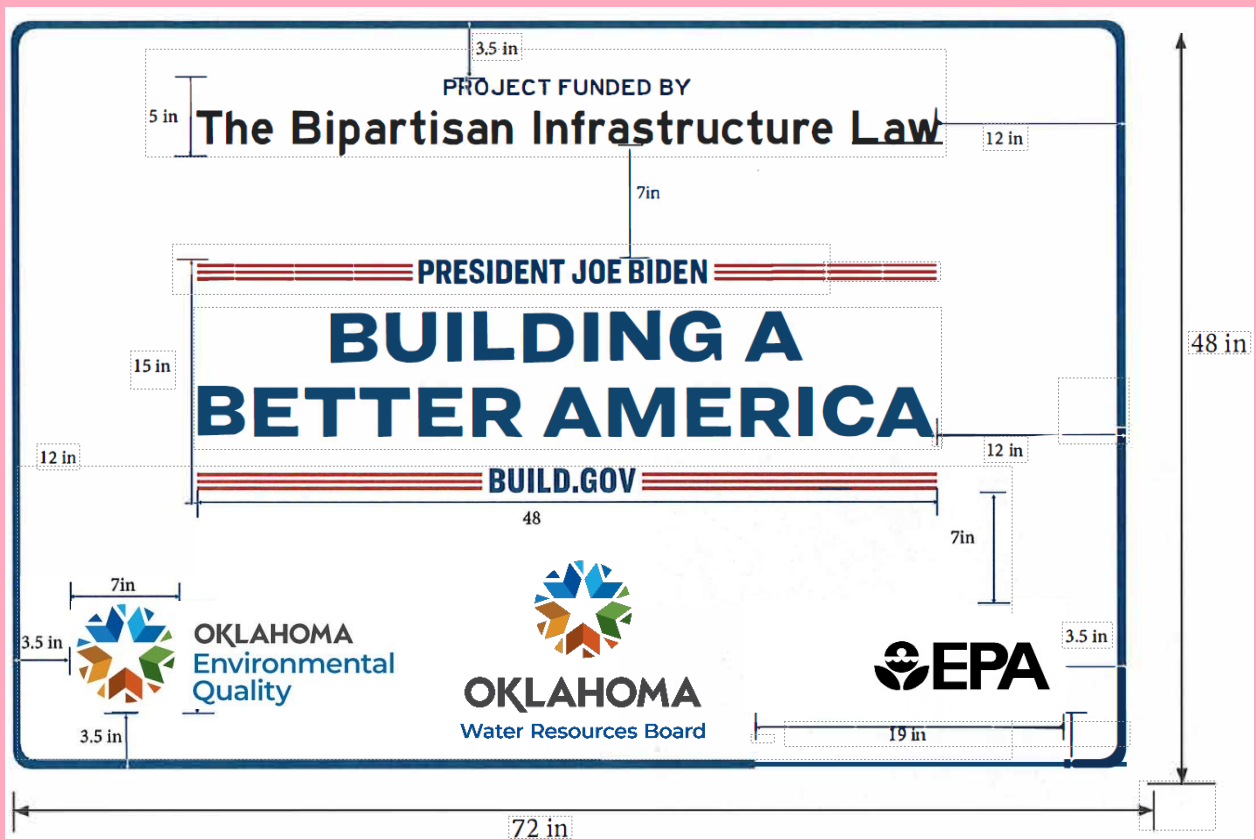
Three bonds are required for all contracts with a value exceeding Seven Thousand Five Hundred Dollars (\$7,500.00) They are : (1.) Performance Bond to insure the completion of the work in accordance with the contract documents in the time stipulated; (2.) Maintenance Bond to provide for defects in construction or materials for a period of one (1) year from the date of acceptance of the completed work; and (3.) Statutory Bond to assure the Owner is protected from the action of subcontractors, suppliers and employees for unpaid debts of the contractor.

Irrevocable Letters of Credit may be used as a substitute for bonds on contracts One Hundred Thousand Dollars (\$100,000.00) or less. The letters of credit must be issued by a financial institution insured by the Federal Deposit Insurance Corporation or the Federal Savings and Loan Insurance Corporation on forms obtained from the Owner.

PROJECT SIGN

- The general contractor shall erect and maintain for the life of the construction contract a suitable sign, 4' x 6' in size, and detailed hereon, lettered black on white background.
- Sign shall be professionally painted.
- Lettering to be appropriate size.
- Posts shall be 4" x 4" x 10' buried securely a minimum of 3 feet below ground.
- Sign face shall be constructed of 3/4" x 4' x 6' – 5 ply Dura-plywood board & mounted to Posts with four (4) 5/8" x 6" Carriage Bolts.
- Sign shall be the general obligation of the Contractor. The Contractor must provide maintenance to prevent deterioration or provide repairs for damage caused during the construction period.





SUPPLEMENTARY CONDITIONS

These Supplementary Conditions are included in and are a part of the Bidding Documents and the Agreement/Contract Documents for this project.

1. Nondiscrimination. Neither CONTRACTOR nor any subcontractors employed on this project may discriminate against any employee or applicant for employment because of race, religion, creed, sex, color, national origin, ancestry, age, or disability as defined by the Americans with Disabilities Act. A Certification of Nondiscrimination must be properly signed and submitted with the Agreement. The requirements of the Certificate must be included in any subcontracts connected with the performance of the Agreement. The Agreement may be canceled by OWNER for noncompliance with the provisions of the Certificate and CONTRACTOR may be declared to be ineligible for further contracts until satisfactory proof of intent to comply shall be made by CONTRACTOR and/or any subcontractors.

2. CONTRACTOR'S Responsibility for the Work. Until formal written acceptance by OWNER, the work shall be under the charge and care of CONTRACTOR. CONTRACTOR shall take every necessary precaution to prevent injury or damage to the work or any part thereof by the action of the elements or any other cause whatsoever, whether arising from the execution or non-execution of the work. CONTRACTOR shall at his own expense rebuild, repair, restore, and make good all injuries or damage to any portion of the work occasioned by any of the forgoing causes before formal acceptance of the work by OWNER.

3. Inspection. OWNER and his representatives and the consulting engineer and his representatives shall at all times have access to the work. CONTRACTOR will provide proper and safe access for inspection. OWNER may maintain inspectors on the job site for the purpose of inspecting materials, workmanship, and conditions of work and equipment. CONTRACTOR shall notify OWNER twenty-four (24) hours prior to placing concrete and at any other times required in the Special Provisions. CONTRACTOR shall notify OWNER twenty-four (24) hours prior to performing work relating to exposing, supporting, adjusting, connecting or relocating waterlines.

In addition to the above inspections, CONTRACTOR shall provide proper and safe access for all inspections required by City of Stillwater Ordinances and Codes and any other inspections required by Federal or State laws or regulations.

It is CONTRACTOR's responsibility to arrange for and have conducted any and all inspections required by the City of Stillwater's Building, Plumbing, Electrical, Mechanical, Fire, and Zoning Codes and to comply with all the provisions of said Code.

4. Street Closings and Lane Restrictions and Detours. Street Closings and/or Lane Restrictions and Detours must be in accordance with a Traffic Control Plan (TCP). A project-wide TCP in compliance with MUTCD (Manual of Uniform Traffic Control Devices), ATSSA must be submitted to the City/Transportation Department prior to the pre-construction meeting. Upon approval of the plan, CONTRACTOR is required to provide written notice by 12 PM on Wednesday of the week prior to the week each individual closing or restriction planned. Notification by email is preferred. Notification shall be made to the following:

City of Stillwater
Transportation Department

Email: mstephenson@stillwater.org

Questions please contact: Michael Stephenson at 405-742-8263

Street Closings and Lane Restrictions shall also conform to the requirements set forth for Barricades and Warning Signs set forth below.

5. Barricades and Warning Signs. Where work is carried on, in, or adjacent to, any street, alley or public place, CONTRACTOR shall, at his own expense, furnish, erect and maintain such barricades, fences, lights, warning signs and danger signals and shall provide such watchmen and take such other precautionary measures for the protection of persons or property and of the work as may be necessary. In addition, a sufficient number of barricades shall be erected to keep pedestrians and vehicles from entering on or into any work zone(s). From sunset to sunrise, CONTRACTOR shall furnish and maintain at least one light on each barricade. All devices shall be in conformance with MUTCD Standards. CONTRACTOR shall provide an "after hours" phone number to the City of Stillwater's Emergency Operations Center and to the Police and Fire Dispatch to be used for notification to CONTRACTOR of the need to repair signs, barricades, or other warning or control devices. Failure to comply with these requirements may result in the issuance of a Stop Work Order to remain in effect until the deficiencies are corrected. The issuance of a Stop Work Order shall not act to defer or suspend the counting of the working days for the project.

6. Reserved.

7. Patents/Copyrights. No reports, maps or other documents produced in whole or in part under this contract shall be the subject of an application for patent or copyright by or on behalf of the Contractor.

SPECIAL PROVISIONS

These Special Provisions are included in and are a part of the Bidding Documents, Agreement and Contract Documents for this Project.

Section 1. Project Milestones

The following project milestones shall apply for computation payment/charges stipulated in Table 0100-A:

TABLE 0100-A Contract Times and Liquidated Damages		
Description	Contract Time	Liquidated Damages ^(1, 2)
Substantial Completion – Lagoon Piping Improvements	180 calendar days	\$500 calendar day
Substantial Completion – SCU Manhole and Piping Improvements	180 calendar days	\$500 calendar day
Substantial Completion – Recovered Water Pump Station	540 calendar days	\$500 calendar day
Substantial Completion – Finished Water Pump Station	720 calendar days	\$500 calendar day
Substantial Completion – Existing Recovered Water Pump Station and Finished Water Pump Station Electrical Demolition	780 calendar days	\$500 calendar day
Final Completion	Whichever occurs first: • 160 calendar days, beginning with the date of Notice to Proceed • 30 days, beginning with the date Substantial Completion for the Existing Recovered Water Pump Station and Finished Water Pump Station Electrical Demolition is achieved	\$1,000 per calendar day
(1) Liquidated Damages (LDs) shall be assessed starting with the first day after a Contract Time expires. Example: if NTP is issued on June 1 and the Contract Time for Substantial Completion is 30 days, then 1 day of LDs would be assessed if substantial completion is achieved on July 1. (2) Substantial LDs end when Final LDs begin. (3) LDs will not be combined. Owner will apply the single highest applicable LD.		

Section 2. Videographic and Photographic Documentation of Existing Project Site

At the pre-construction meeting and prior to commencement of any work on site, Contractor shall provide Owner with digital video of the project area (and photos as necessary) to document the existing condition of the project site. Refer to Specification Section 01_32_34 - Photographic and Videographic Documentation. Video and photos MUST be submitted to the Owner in digital format/DVD disc along with a 3-ring binder of geographically organized, individually labeled photos (or color prints thereof).

Among other uses, the documentation may be used by Owner as the basis to approve or deny claims by property owners, and/or other parties against Contractor and/or Owner.

The cost of providing Videographic/Photographic Documentation shall be considered as incidental and included in the cost of other work.

Section 3. Critical Path Schedule (CPS) Requirements

Contractor shall be responsible for planning, scheduling, and reporting the progress of the work as to ensure timely completion of the work called for in the Agreement.

Contractor shall submit a preliminary schedule in accordance with Article 2 of the Standard General Conditions. The preliminary schedule shall be submitted within 10 days of the Effective Date of the Agreement and prior to mobilization.

The Owner-accepted Preliminary Schedule is a resource that will be used by the Owner, Contractor and Engineer to determine if satisfactory progress is being made by the Contractor in order to complete the work within the Contract Times. Critical path(s) will be used by the Owner and Contractor to estimate contract time changes and overall impacts to the schedule, but will not relieve the Contractor of its responsibility to meet the Contract Times. The Owner will rely on actual and documented work progress, rather than the Contractor's estimated schedule, to establish time changes due to changes in scope.

In addition, the schedule shall meet the requirements as outlined herein and as specified in Specification Section 01_32_21 - Schedules and Reports.

A Critical Path Schedule (CPS), preferably using Primavera or Microsoft Project, incorporating the sequence of construction as shown on the plans or in the Special Provisions is preferred. The CPS shall be based on the Contract Times provided for in the Agreement.

The approved CPS shall include the following features:

1. It shall be time-scaled in calendar days and shall include any non-working days. All tasks shall be plotted showing their early start and finish dates. The CPS shall show the order and interdependence of tasks and the sequence of work. The critical activities shall be prominently distinguished.
2. In addition to all construction tasks, the CPS shall include mobilization, demobilization, submittal process, approval of samples of materials and shop drawings, procurement of significant materials and equipment, fabrication of special items as well as installation, testing and interfacing with other projects.

3. The tasks shall be sufficiently detailed so that a reviewer can follow the sequence of events. For example, the tasks shall show forming, reinforcing and placement of concrete on the calendar day that each is scheduled to be performed.
4. The tasks shall be organized and described so as to conform to the bid items. Task descriptions shall be unique and specific with respect to type of work and location. The CPS shall show the preceding and following task numbers for each task, the task description, total float, duration of each task in calendar days and the costs associated with each task based on the bid items in the Agreement.
5. If, in the opinion of Owner, the CPS requires any revisions, subtractions, or additions in whole or in part, Owner shall so direct Contractor and Contractor shall update and re-submit same to Owner within five (5) calendar days.

Updates to CPS. Contractor shall prepare CPS and report updates under the following conditions:

1. Contractor shall submit a monthly report of actual construction progress during the monthly Construction Progress meeting. Contractor shall update the CPS to reflect all complete and in progress tasks during that reporting period.
2. The report shall be accompanied by a narrative description of the job progress, problem areas, current and anticipated delay factors and their anticipated effect and any corrective actions proposed or taken.
3. If the Contractor falls behind schedule, the Contractor shall prepare and submit for Owner approval a plan to meet the Contract Time requirements.
4. See Specification Section 01_32_21 - Schedules and Reports.

Section 4. Construction Sequence and Continuous Progress

Contractor is responsible for developing and submitting for Owner's approval a construction sequence that reduces nuisances and inconveniences to the public, minimizes impacts to the area and completes the Work designated in the Contract Documents within the Contract Times and constraints. Once the sequence is approved by the Owner, subsequent changes must be submitted to Owner for approval or rejection.

Continuous Progress. Contractor shall provide sufficient materials, equipment, and labor necessary for the completion of the project in accordance with the Contract Documents and Project Manual. Execution of the work shall be continuous and uninterrupted from Notice to Proceed until the project has been accepted by Owner in writing as substantially complete. Except in Emergencies (as defined and in accordance with the stipulations of the General Conditions), the Contractor shall submit notice in writing to Owner a minimum of twenty-four (24) hours in advance of Contractor's intent to suspend work for more than twenty-four (24) contiguous hours in duration. Should the prosecution of the work for any reason be suspended, Contractor shall notify Owner at least twenty-four (24) hours in advance of resuming operations, and submit a revised CPS schedule, to be reviewed by Owner for comparison to Contract Documents. Suspension of work not approved by Owner shall result in the loss of the equivalent number of days from Contract Times.

Once NTP is issued by the Owner, Contractor must have a daily, staff-working presence at the Project site. Equipment and supplies onsite do not constitute a working presence. Owner may choose to terminate the contract if the Project Site is abandoned by the Contractor.

See Specification Section 01_14_00 - Work Restrictions for construction sequence requirements.

Section 5. Traffic Control

The Traffic Control Plan (TCP) must be prepared by an American Traffic Safety Service Association certified Traffic Control Supervisor or sealed by a licensed Professional Engineer in the State of Oklahoma.

Each individual closure shall be updated/revised weekly through City Engineering. Email Notification or written notification is required to be submitted by 12:00PM on Wednesdays to Ethan Mattox at Ethan.Mattox@stillwater.org. New closures can be requested but a status update of all previously approved closed areas must also be provided. For traffic control on or adjacent to Oklahoma Department of Transportation (ODOT) facilities, Contractor shall contact/coordinate and notify both ODOT and Owner 1) as required by any site specific utility permit provisions and 2) whenever ODOT facilities are involved.

For traffic control on or adjacent to Payne County facilities, Contractor shall contact/coordinate/notify both Payne County and Owner 1) as required by any site specific utility permit provisions and 2) whenever Payne County facilities are involved.

Full closure of one or both directions of traffic on arterials is not permitted. Multi-lane arterials may support multiple lane closures that maintain two-way traffic as a part of an approved TCP.

School Zones require special coordination between Owner and Contractor.

Traffic Control devices shall be kept in acceptable condition per Manual of Uniform Traffic Control Devices (MUTCD) guidelines. Devices in marginal condition shall be cleaned or replaced within the same business day.

Section 6. Work Area Access, Driveway Access and Pedestrian Safety

At all times, Contractor shall provide all-weather access to emergency vehicles for accessing Project facilities and for passing through Project sites and areas for local emergency response.

Section 7. Pavement Restoration – Not Used

Section 8. Bus Transit and Special Event Coordination

Contractor must coordinate with Owner and OSU and must provide Owner- and OSU-approved sign and other appurtenances in order to provide temporary bus stops while bus stops are not accessible.

OSU Home Games. This section primarily applies to football games although not exclusive to football. Throughout the City, starting at 5:00 PM on the day prior to a weekend home game or 4 hours prior to the start time of a scheduled game or event occurring on a weekday, no construction activities will be permitted without prior approval from Owner. All excavations shall be backfilled. Open excavations that may not be backfilled due to specific site conditions must be approved by Owner on a case by case basis with special conditions conducted by Contractor as requested by Owner to accommodate safe vehicular and pedestrian traffic.

Thanksgiving, Christmas and New Year's Day. Water service interruptions or treatment plant down-time will not be allowed during the week of Thanksgiving or during December 21 through January 1 of any year.

Special Events. Contractor shall mitigate/reschedule any conflicts (street driveway restrictions/closures, scheduling water service interruptions or other construction activities) that could adversely impact special events occurring in or near the City of Stillwater. Contractor shall request additional information from the Owner for events that may conflict with the Contractor's work. Contractor shall work cooperatively to mitigate conflicts with other events not listed. Known events which are recurring in or near the City include the following:

- Remember the Ten Marathon, March or April. <http://remembertheten.com/>
- Stillwater Arts Festival, April.
- Land Run 100, Vendor Expo, Finish Line Party, March or April. <https://landrun100.com/>
- Boomer Blast, July 4th.
- Krazy Days, July.
- Stilly Half Marathon, October.
- Juke Joint Jog, October.
- OSU Graduation/Commencement, May and December.
- OSU Homecoming, October.
- Cowboy Strong Run, October.
- Downtown Halloween Festival, October.
- Bike Night & Food Trucks and Tunes: varies, May – November.
- Christmas Parade, Santa Downtown, Carriage Rides: December.
- <https://www.visitstillwater.org/events/>

Section 9. Water Service Interruptions – Not Used

Section 10. Fire Service Line Connections – Not Used

Section 11. Use of Site and Site Maintenance

- a. Contractor may be permitted to use available land and rights-of-way belonging to Owner on or near the work, for construction purposes and for the storage of materials and equipment around the work area. Areas must be fully restored prior to Final Completion.
- b. Contractor shall immediately move stored material or equipment if any occasion arises, as determined by Owner, requiring access to the storage area. Materials or equipment shall not be placed on the property of Owner until Owner has agreed to the location to be used for storage.
- c. Off-site storage arrangements shall be acceptable to Owner for all materials and equipment required but not incorporated into the Work. Such off-site storage arrangements shall be presented in writing, and shall afford adequate and satisfactory security and protection (including insurance coverage). Off-site storage facilities shall be accessible to Owner/Engineer.
- d. Owner shall not be responsible for the protection of items and equipment stored on or off-site including, but not limited to, the damage inflicted by natural causes, theft, vandalism, collisions, etc.

- e. Any areas used by Contractor, whether public or private, shall be kept mown and adequately edged (weed-eater) during construction so as to maintain a neat and tidy appearance.
- f. Contractor shall keep the premises free at all times from accumulations of waste materials and rubbish. Contractor shall provide adequate trash receptacles about the site(s), and shall promptly empty the containers when filled.
- g. Construction materials such as pipe fittings, etc. shall be neatly stacked and organized by Contractor so as to be easily accessible for inspection.
- h. Contractor shall protect surfaces and promptly remove splattered concrete, asphalt, oil, paint, corrosive liquids, etc. from surfaces to prevent marring or other damage.
- i. Volatile wastes shall be properly stored in covered metal containers and removed daily.
- j. Wastes shall not be buried or burned on the site or disposed of into storm drains, sanitary sewers, streams, or waterways. All wastes shall be removed from the site and disposed of in a manner complying with local ordinances and State and Federal antipollution laws.
- k. See also all provisions in Section 5 – Demolition, Earth Work, and Restoration in the most recent version of the City of Stillwater Construction Standards
- l. Adequate cleanup of both the Work and Contractor's storage site will be a condition for recommendation of progress payment applications.

Section 12. Erosion and Sedimentation Control

- a. Contractor shall prepare and maintain throughout the Project the Storm Water Pollution Prevention Plan (SWPPP), attached hereto as Exhibit 1. The SWPPP shall be submitted for review by the City and Engineer ahead of Contractor mobilization.
- b. Contractor shall prevent erosion of soil on the site and to adjacent property resulting from project activities. Effective measures shall be initiated prior to the commencement of clearing, grading, excavation or other operation that will disturb the natural cover.
- c. Work shall be scheduled to expose areas subject to erosion for the shortest possible time, and natural vegetation shall be preserved to the greatest extent practical.
- d. Erosion Control devices and best management practices will be necessary and shall be provided by the Contractor. All devices and practices must be regularly inspected, maintained and replaced or corrected as needed to ensure effectiveness.
- e. No spoils shall be placed within paved streets or apparent paved or unpaved drainage ways. Contractor must sweep the street and scrape up any soil or aggregate tracked onto the road at the end of each day.
- f. By the end of the next work day after a precipitation event, the Contractor shall clean up soil or aggregate washed off-site and correct the cause of any sediment transport.
- g. Contractor shall provide a contained area for Concrete Truck washout.
- h. Contractor shall minimize dust from saw cutting activities by wet cutting or waiting for appropriate conditions that allow for minimal drift.
- i. Contractor shall complete and document inspections of Erosion Control devices by a competent person every 14 days and on the next business day following ½-inch

precipitation events. Documentation must be kept on site and shall be made available for review by the Owner and the Engineer.

- j. See also all provisions in the most recent version of the City of Stillwater Construction Standards.

Section 13. Water Meters in Paved Areas – Not Used

Section 14. Curb Lines and ADA Ramps – Not Used

Section 15. Contractor Performance Evaluation

At project completion and post-warranty phase, the Owner will complete an evaluation of the Contractor's performance. The Contractor will have an opportunity to submit comments regarding the evaluation results. The form used for this evaluation is attached hereto as Exhibit 2.

Section 16. Subletting of Work

Contractor must self-perform a minimum of 25 percent of the overall project, by cost. Contractor must provide a superintendent for each geographically-separated work area of the Project.

Contractor's Subcontractors/Suppliers

- a. Contractor shall provide Owner with a list of all selected subcontractor(s) who will be performing work prior to being issued a Notice to Proceed. Owner may at its discretion refuse to approve any subcontractor(s) or request removal of a subcontractor(s) for any reason. Owner's refusal or removal of subcontractor(s) shall not be considered as justifiable reason for either affecting the Contract Amount and/or Schedule of Work. Contractor's decision to subcontract work shall not relieve Contractor from any liability or obligation under this Agreement.
- b. Contractor shall be held solely responsible for its subcontractors. Contractor shall be liable to Owner for the acts and omissions of Contractor's subcontractors and the employees and agents of these subcontractors.
- c. Nothing contained in this Agreement (or any other contract documents), shall create any contractual relationship between Owner and any of Contractor's subcontractors or suppliers. Contractor shall protect, indemnify, and hold harmless Owner, their officers, agents, and employees from damages, lawsuits, expenses, demands, claims, and causes arising against Owner, their officers, agents, and employees, and their other subcontractors, their officers, agents, and employees, or other persons, firms, or corporations whatsoever, arising out of the payment or non-payment of any funds to any subcontractor or supplier.
- d. Contractor shall require each of its subcontractors, to the extent of the Work to be performed by each subcontractor, to comply with the terms of this Agreement and any and all applicable contract documents.

Contractor's Authorized Representative required to be on site at all times.

- a. Contractor shall designate and assign to the Work a person or persons employed directly by the Contractor who shall be Contractor's authorized representative.

Contractor's authorized representative shall be in full charge of the Work. All instructions, orders, or directions given by Owner's authorized representative to Contractor's authorized representative shall be binding upon Contractor. Contractor's authorized representative shall be experienced in performing at the Superintendent level or higher, and should have performed such on similar construction projects. Contractor's authorized representative assigned to the Work shall not be changed without written notice to, and consent of, Owner.

- b. Contractor's authorized representative shall be on the Site at all times when Contractor's workforce is performing any Work under this Agreement until written final acceptance of the Work has been obtained from Owner. This includes any and all work being performed by Contractor's subcontractors.

Contractor responsible for Subcontractors compliance with safety precautions and procedures.

- a. Contractor shall be held responsible for its subcontractors' compliance with the safety precautions and procedures, and all applicable rules, Laws, Regulations and policies, and this Agreement. Owner may request and Contractor agrees to the removal from the Project of any Contractor's or its subcontractor's personnel, management, supervision, equipment, tools, or craft for noncompliance with safety precautions and procedures or non-correction of hazards. Owner shall not be liable for any damages experienced by Contractor due to removal of Contractor's or its subcontractor's personnel, management, supervision, equipment, tools, or craft from the Site.

Section 17. Restoration and Performance Requirements

Complete restoration as indicated on the Drawings and in accordance with the City of Stillwater Design and Construction Standards (latest edition), Section 5, Demolition, Earth Work, and Restoration. For water and sewer line work, within 21 days of trench backfilling and compaction, full restoration to original or better conditions, including fences, must be completed.

Contractor is responsible for disposal of all items/materials removed during construction (i.e. fencing, culverts, trees, etc.) unless specifically noted to be provided to the Owner.

Eight (8) weeks after sodding is complete and on written notice from the Contractor, Owner will, within 15 days of receipt of notification, determine if satisfactory stand has been established. Satisfactory stand is defined as meeting the following criteria:

- No bare or dead spots larger than 3 square feet.
- Not more than 10 percent of total area with bare or dead spots larger than 1 square foot.
- Not more than 15 percent of total area with bare or dead spots larger than 6 square inches.

In certain conditions, and by explicit written notice to the Contractor, the City may allow for seed, hydromulch, or other methods of grass restoration.

Section 18. Order of Precedence

The following documents are essential to the contract and a requirement occurring in one is binding as though occurring in all. They are complementary and provide and describe the complete contract. If there is a discrepancy, the governing ranking is:

1. Executed Change Orders (later dated, higher governance)
2. Field Orders / Contract Modification Requests (later date, higher governance)
3. Notice to Proceed
4. Signed Agreement
5. Addenda
6. Supplementary Conditions
7. General Conditions
8. Special Provisions
9. Plan Details
10. Plan Drawings and Notes
11. Technical Specifications
12. Measurement and Payment
13. Bid Form
14. Instructions to Bidders
15. Stillwater Construction Standards and Details
16. Environmental, Geotechnical, and other Investigational Reports
17. Performance Bonds
18. Payment Bonds
19. Maintenance Bonds

The Contractor may not take advantage of any apparent contract error or omission. The Contractor shall notify the Owner promptly of any errors or omissions so that necessary corrections and interpretations can be made.

Section 19. Permits and Pre-Construction Submittals

Contractor shall acquire all necessary City of Stillwater permits for Fire Alarms, Fire Sprinklers, Fire Suppression, Earth Change, Grading & Floodplain Development, Electrical, Plumbing, and HVAC/Mechanical. City of Stillwater permits will be provided at no cost to the Contractor.

Within 10 days of the date of Contract execution by the City, the following Contractor submittals are due to the Owner:

1. Submittals Registry
2. Schedule of Values (Lump Sum Bids)
3. Critical Path Schedule & Construction Sequencing

4. SWPPP for >1 acre sites (and NOI filed with ODEQ as applicable)
5. Pre-Construction Video &/or photos

Owner will not issue Notice to Proceed until Pre-Construction Submittals are Owner-approved.

Section 20. Submittals

See Specification Section 01_33_00 - Submittal Procedures for construction sequence requirements.

Section 21. Change Management

For Contract Modification Requests and/or Change Orders, the Contractor shall use the template presented as Exhibit 3. As indicated in the template, all required support documentation must be provided in order to receive Owner approval of Contractor's proposed pricing.

Section 22. Conditions for Contractor Payments

In addition to requirements set out in the General Conditions and other Contract Documents, payments to the Contractor by Owner shall be contingent on the following:

1. Before first application for payment is processed, the following must be approved by Owner:
 - Construction Progress Schedule
 - Submittal Register
 - Schedule of Values
 - Procurement Schedule (as required)
 - Proposed erosion and sediment control measures and SWPPP provisions
 - Pre-construction video and photos
2. Applications for Payment should be submitted to the City of Stillwater monthly. With each Pay Claim, the following are conditions for payment:
 - Pay item quantities must be verified by Inspector.
 - Up-to-date Record Drawings must be verified by Inspector.
 - SWPPP is updated by Contractor and reviewed by Inspector, as applicable, and site conditions are compliant with all local, county and state codes and regulations.
 - Adequate cleanup of both the Work area and Contractor's staging site is provided.
 - Construction schedule and construction progress reports are up to date.
 - Flushing volume estimates have been provided to Owner.
 - Compliant traffic control measures are installed and in good working order.
 - Non-Collusion Affidavit for invoices greater than \$25,000 is provided.

Section 23. Water Service Line Material Inspection – Not Used

Section 24. Waste Management

Contractor to work with City of Stillwater Waste Management Director, Matt Faulkner, 405-533-8439, and Republic Services, 405-377-3880, to determine location of temporary dumpster(s). Notifications shall be delivered to affected buildings/businesses 48 hours prior to temporary conditions being implemented.

Section 25. Record Drawings

Contractor must keep an accurate record of any modifications to the original drawings including elevation, alignment, materials, etc. These records must be reflected on a mark-up set of drawings maintained on site during construction. Surveyed elevations by laser, GPS or other Owner-approved method prior to burying shall be obtained for top of pipe at least every 100 feet and for all bends (horizontal and vertical), tees, crosses, and valves shall be indicated on the mark-up set of plans.

Section 26. Testing Frequencies

Contractor shall adhere to the testing frequencies specified in the Technical Specifications.

List of Exhibits

1. Storm Water Pollution Prevention Plan
2. Contractor Performance Evaluation
3. Change Order Request Template

City of Stillwater Oklahoma Stormwater Pollution Prevention Plan (SWPPP)

For Construction Activities At:

Recovered Water Pump Station and Finished Water Pump Station
Stillwater Water Treatment Plant
1022 Yost Road
Stillwater, OK 74075

SWPPP Prepared By:

City of Stillwater, Oklahoma
David Barth, P.E.
723 S. Lewis Street
Stillwater OK 74074
(405) 742-8261
david.barth@stillwater.org

SWPPP Preparation Date:

____/____/____

Estimated Project Dates:

Project Start Date: ____/____/____
Project Completion Date: ____/____/____

Note: Use of this SWPPP template is only applicable to municipal construction projects and activities governed by the OKR04 permit and should not be used for construction projects and activities governed by the OKR10 permit.

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Appendix A – Site Maps

Appendix B – Copy of Oklahoma State Operating Permit

Appendix C – Inspection Form & Corrective Action Report

Appendix D – SWPPP Amendment Log

Appendix E – Subcontractor Certifications/Agreements

Appendix F – Grading and Stabilization Activities Log

Appendix G – Delegation of Authority

Appendix H – Stillwater Erosion & Sediment Control Manual

SECTION 1: CONTACT INFORMATION/RESPONSIBLE PARTIES

1.1 *Property Owner / Contractor(s)*

Instructions:

- City of Stillwater Code Section 35-136 requires any person effecting an earth change to obtain a permit from the City Engineer.
- List the general contractor and subcontractors expected to work on-site. Notify contractors of stormwater requirements applicable to their work.
- The general contractor and subcontractors must sign the Contractor Agreement included in Appendix E.

Property Owner:

City of Stillwater, Oklahoma
City Manager
723 South Lewis
Stillwater, OK 74074
405-742-8260

Alternate Owner Contacts – By Project Type:

Roadway and Storm Drainage Improvements

Mark White – Director, Public Works
723 South Lewis
Stillwater, OK 74074
405-742-8351
mark.white@stillwater.org

Existing Channel and Pavement Maintenance

Mark White – Director, Public Works
723 South Lewis
Stillwater, OK 74074
405-742-8351
mark.white@stillwater.org

Water and Sewer Improvement Projects

David Barth, PE – Deputy Director, City Engineering
723 South Lewis
Stillwater, OK 74074
405-742-8261
david.barth@stillwater.org

General Contractor: (If Applicable) Attach signed Contractor Agreement (see Appendix E)

1.2 Stormwater Team

City contact responsible for environmental matters:

Chris Franks – Environmental Programs Manager
405-533-8482
chris.franks@stillwater.org

Designated Inspector - by City of Stillwater function:

INSERT COMPANY OR ORGANIZATION NAME

INSERT NAME

INSERT ADDRESS

INSERT CITY, STATE, ZIP CODE

INSERT TELEPHONE NUMBER

INSERT FAX/EMAIL

INSERT AREA OF CONTROL

Subcontractor (s): Attach signed Contractor Agreement for each (see Appendix E)

Excavation/Trenching Subcontractor

INSERT COMPANY OR ORGANIZATION NAME

INSERT TELEPHONE NUMBER

INSERT EMAIL

Responsible for Excavation and Trenching

INSERT COMPANY OR ORGANIZATION NAME

INSERT TELEPHONE NUMBER

INSERT AREA OF CONTROL

Emergency 24-Hour Contact:

INSERT COMPANY OR ORGANIZATION NAME

INSERT CONTACT NAME

Roadway and Storm Drainage Improvement Projects

Kevin Crew

Transportation Construction Inspector

405-564-3614

kevin.crew@stillwater.org

Water and Sewer Improvement Projects

Steven Fair

Water Construction Inspector

405-533-8423

steven.fair@stillwater.org

SECTION 2: SITE EVALUATION, ASSESSMENT, AND PLANNING

2.1 Discharge Information

Instructions:

- A listing of all outfalls and receiving waters associated with the project is required.
 - ✓ List the name of the first surface water that receives discharges from your site.
 - ✓ If your site has discharges to multiple surface waters, indicate the names of all such waters.
 - ✓ Contact [Zack Henson](mailto:zack.henson@stillwater.org) for assistance with identifying project receiving waters. zack.henson@stillwater.org - Phone - 405.533.8436
- Article XVIII, Section 23 of the Stillwater Municipal Code requires a Floodplain Development Permit (Earth Change) for all grading activities that are proposed within a FEMA special flood hazard area (mapped floodplain).
- Any grading or filling that is proposed within a USGS mapped blue line stream, an incised channel, or waterway otherwise deemed to be jurisdictional waters of the United States may also require a (404) or (401) permit from the U.S. Army Corps of Engineers.
- The only allowable non-stormwater discharges covered by this SWPPP and (Part VIII.B.2 of OKR04 Permit):
 - ✓ waters used to wash vehicles where detergents are not used;
 - ✓ water used to control dust;
 - ✓ routine external building wash-down which does not use detergents;
 - ✓ pavement wash-waters where spills or leaks of toxic or hazardous materials have not occurred (unless all spilled material has been removed) and where detergents are not used;
 - ✓ un-contaminated flows from excavation de-watering activities will be allowed if operational and structural controls are used to reduce any pollutant releases in order to avoid or minimize the impacts on water quality. These controls must be included in your SWPPP.

Names of Receiving Waters

Outfall #	Name(s) of the first surface water that receives stormwater directly from your site and/or from the MS4 (note: multiple rows provided where your site has more than one point of discharge that flows to different surface waters)
	1.
	2.
	3.
	4.
	5.
	6.

Floodplain

Will land disturbance activities take place within the Special Flood Hazard Area (mapped floodplain)?

YES ☐ NO ☐

If yes, a Stillwater Floodplain Development Permit (Earth Change Permit) will also be required. Contact Floodplain Administrator Tom Coots at 405.533.8443.

Corps of Engineers

Will this project require a permit from the Corps of Engineers?

YES ☐ NO ☐

If yes, a copy of the Corps permit must be submitted with this SWPPP.

2.2 Nature of the Construction Activity

Instructions:

- A description of the function of the project is required. Also provide:
 - ✓ Estimates of the total area expected to be disturbed by excavation, grading, or other construction activities, including, but not limited to, off-site borrow and fill areas.
 - ✓ Provide a general description of the nature of the construction activities at your project.
 - ✓ Describe the size of the property (in acres) and the total area expected to be

General Description of Project

This SWPPP Template has been prepared for use by City of Stillwater operations and maintenance crews and contractors involved in City facility maintenance operations throughout the City. Its application is for linear utility and roadway maintenance operations not exceeding 5000 feet in length or more than 3.0 acres in disturbed or exposed soil. Larger activities will be required to prepare a separate SWPPP and apply for a separate NOI with the Department of Environmental Quality.

For each unique improvement project provide an additional general information describing the construction/maintenance project:

Project type:

- | | |
|--|---|
| ☐ Storm water | ☐ Channel Repair/Maint |
| | ☐ Culvert/Pipe |
| | ☐ Detention Basin Maint. |
| ☐ Street/Pavement | ☐ Pavement Repair/Patch |
| | ☐ Pavement Removal/Replacement |
| ☐ Water/Sewer Utility | ☐ Utility Line Extension/Replacement |
| | ☐ Utility Line Repair |
| | ☐ Pump Station |

Size of Construction Project

What is the size of the property (in acres), the total area expected to be disturbed by the construction activities (in acres), and the maximum area expected to be disturbed at any one time?

Size of Property: INSERT NUMBER OF ACRES OR LINEAL FEET OF LINE.

Area to Be Disturbed: INSERT NUMBER OF ACRES

Maximum Area to be Disturbed At Any One Time: INSERT MAX NUMBER OF ACRES (CANNOT EXCEED 2 ACRE).

[Repeat as necessary for individual project phases.]

Construction Support Activities (only provide if applicable)

Describe any construction support activities for the project (e.g., concrete or asphalt batch plants, equipment staging yards, material storage areas, excavated material disposal areas, borrow areas)

INSERT DESCRIPTION OF CONSTRUCTION SUPPORT ACTIVITY

INSERT CONTACT INFORMATION FOR CONSTRUCTION SUPPORT ACTIVITY (Name, Telephone No., Email Address)

INSERT LOCATION INFORMATION FOR CONSTRUCTION SUPPORT ACTIVITY (Address and/or Latitude/Longitude)

[Repeat as necessary.]

2.3 Sequence and Estimated Dates of Construction Activities

Instructions:

- **The City of Stillwater Project Manager shall provide the following for each construction project and or major maintenance project.**
- A description of the intended sequence and timing of activities that disturb soils at the site is required.
- For each phase of construction, include the following information:
 - ✓ Installation of stormwater controls, and when they will be made operational;
 - ✓ Commencement and duration of earth-disturbing activities, including clearing and grubbing, mass grading, site preparation (i.e., excavating, cutting and filling), final grading, and creation of soil and vegetation stockpiles requiring stabilization;
 - ✓ Cessation, temporarily or permanently, of construction activities on the site, or in designated portions of the site.

Phase	Construction activities	Best Management Practices installed	Estimated Start & End Dates	Actual Dates (Complete in field.)
Pre-construction/ Maintenance	Installation of BMPS.	- Inlet protection (Graveled Bags) - Channel Checks (Gravel or Geo wedge) - Silt Fence/Silt Sox - Site Construction Entrances	START DATE END DATE	START DATE: _____ END DATE: _____
Phase – Construction and Maintenance Activities	- Installation of Linear Utility, Storm or Roadway. - See Note 1. - See Note 2.	- Maintain Construction Entrances – see Note 2. - Initiate intermediate installation of soil stabilization measures during lulls in construction – see Note 1. - Soil Stockpile protection - Installation of Diversion Dikes - Maintain Channel Checks. - Maintain Vegetative buffer zones. - Schedule regular street sweeper	START DATE END DATE	START DATE: _____ END DATE: _____
[Project Manager: add phases as needed.]	LIST ACTIVITIES	LIST BMPS LIST BMPS	START DATE END DATE	START DATE: _____ END DATE: _____
Final Stabilization	Placement of Permanent BMP's and cleanup	- Driving Pavement Replacement - Removal of Temporary BMP's - Seeding and Mulching - Sod Placement Other(s)	START DATE END DATE	START DATE: _____ END DATE: _____

Note 1: Operator must initiate stabilization measures **immediately** whenever earth-disturbing activities have **temporarily or permanently** ceased on any portion of the site and will not resume for a period exceeding 14 calendar days. Both temporary and permanent stabilization activities must begin **as soon**

as practicable but **no later than 7 calendar days** after earth-disturbing activities have ceased. See Section 4.5 for more details. Log all intermediate grading and stabilization activities. (See appendix F.)

Note 2: You must remove the deposited sediment by the **end of the same work day** in which the track-out occurs, or by the end of the next work day if track-out occurs on a non-work day. There are possibilities of sediment being tracked-out from your site onto the surface of this street, paved areas, and sidewalks. You must include the provision to remove the track-out by sweeping, shoveling, or vacuuming these surfaces, or by using other similarly effective means of sediment removal. You are prohibited from hosing or sweeping tracked-out sediment into any stormwater conveyance (unless it is connected to a sediment basin, sediment trap, or similarly effective control), storm drain inlet, or surface water.

2.4 Site Maps

Instructions:

- The City of Stillwater project manager shall provide at least two maps for each construction project and major maintenance projects. Project manager will provide additional maps as the scale and scope of the project requires.
 - ✓ Topographic Map(s):
 - Project boundary and planned disturbed area;
 - Existing vegetative cover (e.g. forest, pasture, pavement, structures);
 - Drainage pattern(s) of stormwater indicating the flowpath across construction site;
 - Authorized non-stormwater flow onto, over, and from the site property before and after major grading activities;
 - Locations of all waters of the state within one mile of the site including wetlands.
 - ✓ Site Erosion and Sediment Control Plan Map(s) with Specific Features:
 - Boundaries of the site and locations of construction activities -- provide an aerial map to scale showing the limits of construction and construction phasing;
 - Labeled outfall(s);
 - Locations of all roadway entrances from the site;
 - Direction(s) of stormwater flow and approximate slopes before grading and anticipated after grading activities – note areas of steep slopes greater than 40%;
 - Identify areas of soil disturbance and areas that will not be disturbed;
 - Location of major structural and non-structural BMPs identified in the SWPPP including concrete wash-out pits as required;
 - Locations where stabilization practices are expected to occur;
 - Locations of off-site material, waste, borrow or equipment storage areas;
 - Locations of all waters of the State (including wetlands);
 - Areas where final stabilization has been accomplished and no further construction-phase permit requirements apply;
 - The boundary lines of any natural buffers (i.e., either the 100 foot or other buffer areas retained on site);
 - Locate stormwater and allowable non-stormwater discharge locations, including locations where stormwater or allowable non-stormwater will be discharged to waters of the state on or near the site.
- Attach maps in Appendix A of the Template. For more complicated sites, a series of maps showing the major phases of development is recommended. If all required information is on the construction plan sheets, no attachment will be required for Appendix A of this SWPPP.

SECTION 3: DOCUMENTATION OF COMPLIANCE WITH OTHER FEDERAL REQUIREMENTS

3.1 Endangered Species Protection

Instructions:

- This permit does not supersede compliance with the Endangered Species Act.
- If there are listed species in Payne County or the City of Stillwater, check to see if critical habitat has been designated and if that area overlaps or is near the project area. Critical habitat designations and associated requirements may also be found at 50 CFR Parts 17 and 226. Use the map view tool at <http://criticalhabitat.fws.gov/crithab/> to find data specific to your project.

Are there any endangered species or critical habitat on or near the project?

YES ☐ NO ☐

If YES, please describe the species and/or critical habitat:

If YES, describe steps taken to address the impact of construction:

3.2 Historic Preservation

Instructions:

- NPDES permittees must be in compliance with the Historic Preservation Act.
- To view National Register Listings for Payne County, please visit the Oklahoma Historical Society website <http://nr.shpo.okstate.edu>
- You may also contact the State Historic Preservation Office (SHPO) at 405-521-6249.

Are there any historic sites on or near the construction site? YES ☐ NO ☒

If YES, describe steps taken to address the impact of construction:

☐ Other:

SECTION 4: EROSION AND SEDIMENT CONTROLS

Instructions:

- Development of the SWPPP requires the use of the minimum selected temporary and permanent structural and non-structural BMPs indicated below.
- The City of Stillwater Project Manager shall select and provide descriptions of all additional BMP's that will be utilized on the site.

Erosion Control BMPs:

- | | |
|---|---|
| ☒ Scheduling | ☒ Preservation of Existing Vegetation |
| ☒ Dust (Wind Erosion) Control | ☐ Hydraulic Mulch/Bonded Fiber Matrix |
| ☒ Seeding | ☐ Soil Binders |
| ☒ Sodding | ☐ Hydroseeding |
| ☐ Turf Reinforcement Mat | ☒ Erosion Control Blankets |
| ☐ Outlets/Velocity Dissipation Devices | ☐ Geotextiles and Plastic Covers |
| ☐ Temporary Stream Crossing | ☐ Streambank Stabilization |
| ☒ Mulching | |

Sediment Control BMPs:

- | | |
|--|--|
| ☒ Vegetated Filter Strips | ☒ Silt Fencing |
| ☐ Compost Filter Sock | ☐ Compost Filter Berms |
| ☐ Sediment Basins | ☐ Sediment Traps |
| ☐ Sediment Filters/Chambers | ☒ Inlet Protection |
| ☒ Street Sweeping/Cleaning | |

Runoff Management BMPs:

- | | |
|---|--|
| ☒ Check Dams | ☐ Earth Berms and Drainage Swales |
| ☐ Water Diversions | ☐ Terracing |
| ☐ Grass Lined Channel | ☐ Slope Drains |
| ☒ Gravel Bags | ☐ Level Spreaders |
| ☐ Soil Roughening | ☒ Fiber Wattles |
| ☐ Dewatering Operations | |

Tracking Control BMPs:

- | | |
|--|---|
| ☒ Construction Entrance/Exit | ☐ Construction Parking |
| ☐ Stabilized Construction Roadway | ☐ Tire Wash Down Station |

Pollution Prevention BMPs:

- | | |
|---|--|
| ☒ Concrete Washout | ☒ Non-Sediment Pollution Control |
| ☐ Vehicle Maintenance | ☐ Solid Waste/Trash Management |
| ☐ Other (Specify in description below) | |

4.1 BMP Descriptions

☐ Check box if control is Not Applicable.

- Detailed descriptions of the common structural and non structural BMPs anticipated for the majority of City of Stillwater construction and facility operations are presented below.
- Each of the principal BMPs checked on page 8 are described below.
- Stillwater project managers are responsible for adding additional BMP's as required for their project efficacy.
- See Stillwater Erosion and Sediment Control Manual in Appendix H for additional BMP's and details

BMP Descriptions

BMP# 1

BMP Description - Scheduling

- TYPE OF BMP: PERMANENT ☐ TEMPORARY ☒
- DEFINITION & PURPOSE
Phasing involves developing a schedule that includes the sequencing of construction activities with the implementation of construction site BMPs. The purpose of phasing is to reduce the amount and duration of soil exposed to erosion and to implement and maintain BMPs in coordination with the sequence of construction activities.
- CONDITIONS FOR EFFECTIVE USE
A schedule of the sequence and timing of construction activities is a requirement for all sites that disturb 1 acre or greater and must be provided in - Sequencing and Estimated Dates of Construction Activities in the City's SWPPP template. Projects should be phased when possible to reduce the amount and duration of soil exposed at any one time. The phasing plan should be developed during project design. Disturbed areas in one phase should be stabilized before disturbing subsequent phases. When possible, land disturbance and construction in and around waterways should be scheduled during dry weather.

BMP# 2**BMP Description - Dust (Wind Erosion) Control**

- TYPE OF BMP: PERMANENT ☐ TEMPORARY ☒
- DEFINITION & PURPOSE
Dust control involves prevention of wind erosion of the soil and includes phasing, maintenance of existing vegetation, mulching, watering, and provision of wind barriers. consistently maintaining a minimum moisture content on exposed soil to prevent wind erosion of the soil.
- CONDITIONS FOR EFFECTIVE USE
Phase work to the extent practical to minimize the amount of area disturbed at one time (see Phasing/Sequencing). Preservation of grass and trees and the use of solid board fences may also serve as wind barriers. For areas not subjected to traffic, vegetation provides the most practical method of dust control and should be established as early as possible. Effectiveness of application of water, adhesives, and chemical treatment depends on soil, temperature, humidity and wind velocity
- CONSTRUCTION PROCEDURES
Use dust control when clearing and grading activities create blowing dust, especially during periods of dry weather. Water shall be applied by means of pressure-type distributors or pipelines equipped with a spray system or hoses and nozzles that will ensure even distribution. Place barriers at right angles to prevailing wind at intervals of about 10 times their height to control soil blowing. Paved areas that have soil on them from construction sites should be cleaned with street sweeper. Mulching offers a fast and effective means of controlling dust when properly applied. Binders and tackifiers should be used on organic mulches.
- MAINTENANCE REQUIREMENTS
Check the site regularly and reapply as required.

BMP# 3**BMP Description - Seeding**

- TYPE OF BMP: PERMANENT ☒ TEMPORARY ☒
- DEFINITION & PURPOSE
Seeding is used to establish temporary or permanent vegetation in order to protect exposed soil from erosion.
- CONDITIONS FOR EFFECTIVE USE
The exposed areas should be prepared for the application of the seed and or sodding.
- INSTALLATION/CONSTRUCTION PROCEDURES - Seeding
Seeding should be done immediately after completion of a phase of grading, or in areas where construction activity has ceased for 14 days. Use the following seeding specification.

Stillwater Seeding SpecificationMaterials:

- A. Seed: Provide seed from the most recent season's crop meeting the requirements of Oklahoma state seed law, including the testing and labeling for Pure Live Seed (PLS = Purity x Germination). Furnish seed of the designated species, in the labeled unopened bags or containers to the jobsite and retain seed tags for Engineer or Owners Representative's review and approval before planting. Seed must be used within 12 months from the date of the analysis.

Typical Native Seed Mix and Rates for Warm and Cool Seeding

Common Name	Botanical Name	Variety	#Pure Live Seed/ Acre	Live Seed/ Square Foot	Growth Rate
Western Wheatgrass	<i>Agropyron smithii</i>	VNS	2.00	5.05	Rapid
Sideoats Grama	<i>Bouteloua curtipendula</i>	El Reno	5.00	21.92	Moderate
Hairy Grama	<i>Bouteloua hirsuta</i>	VNS	2.00	5.34	Moderate
Buffalograss	<i>Buchloe dactyloides</i>	VNS	12.00	11.57	Slow
Partridge Pea	<i>Cassia fasciculata</i>	VNS	4.00	5.88	Rapid
Virginia Wildrye	<i>Elymus virginicus</i>	VNS	2.00	3.67	Moderate
Green Sprangletop	<i>Leptochloa dubia</i>	VNS	1.00	12.35	Rapid

Cold Season Native Seed Mix and Rates (In Addition to Typical Native Seed Mix and Rates)

Common Name	Botanical Name	Variety	#Pure Live Seed/ Acre	Live Seed/ Square Foot	Growth Rate
Virginia Wildrye	<i>Elymus virginicus</i>	VNS	6.00	10.00	Moderate
Indian Woodoats	<i>Chasmanthium Latifolium</i>	VNS	0.25	0.50	Moderate
Illinois Bundleflower	<i>Desmanthus illinoensis</i>	VNS	0.25	0.50	Moderate

*Contractor may submit alternate seed mix design for Engineer or Owners approval.

- B. Fertilizer: Provide soil samples to the Payne County Extension Office or other testing facility for Nitrogen, Phosphorus, Potassium, and pH. If necessary provide fertilizer in accordance with recommendations, and retain testing facility reports and labels for Engineer or Owners Representative's review.

- C. Vegetative Watering: Water shall be clean and free of industrial wastes and other substances harmful to the growth of vegetation.
- D. Cellulose Fiber Mulch: Wood fiber/ recycled paper blend "Second Nature-Wood Fiber Blend" manufactured by Central Fiber Corporation, 1525 Waynesburg Drive SE, Canton OH 44707, (888) 454-2630 or approved equal. Manufacturer's literature for alternate mulches shall be submitted for approval prior to hydro mulching operations. Mulch shall remain dry until applied. Molded or rotted material shall not be applied.
 - a. Mulch Application Rate:
 - i. Slopes less than 3:1 – 2400 lbs./ acre (dry weight of mulch)
 - ii. Slopes greater than 3:1 – 3000 lbs./ acre (dry weight of mulch)
- E. Tacking Methods: A water-soluble tacking agent shall be used and applied in accordance with manufacturer's recommendations.
- F. Erosion Control Blanket: Propex Landlok Supergro Erosion Control Blanket or approved equal. Manufacturer's literature for alternate erosion control blanket shall be submitted for approval prior to installation.

Construction:

- A. Temporary Native Seeding
 - a. Contractor shall begin Temporary Seeding operations no later than the twentieth day of soil exposed during construction.
 - b. Fertilizer may be placed simultaneously to hydro seeding operations (per Recommended Rates)
 - c. Hydroseeding: For areas of 200 square feet or greater; mix seed, fertilizer, and fiber mulch at the specified application rates and apply uniformly as a homogeneous slurry to soil exposed during construction. Apply seed within 4 hours of the placement of components in the tank. Apply with a machine specifically designed and manufactured for mixing and applying hydro mulch.
 - d. Broadcast Seeding: For areas of 200 square feet or less; distribute the seed mixture uniformly over exposed areas manually or by mechanical distribution or by hydroseeding. Cover with erosion control blanket and secure per manufacturer's recommendations.
- B. Permanent Native Seeding
 - a. Cultivate the area to be planted along contour lines to a depth of four inches (4") prior to placing seed unless the area is approved as having a stand of established designated cover by the Engineer or Owners Representative.
 - b. Fertilizer may be placed simultaneously to hydro seeding operations (per Recommended Rates)
 - c. Hydroseeding: Mix seed, fertilizer, and fiber mulch at the specified application rates and apply uniformly as homogeneous slurry to soil exposed during construction. Apply seed within 4 hours of the placement of components in the tank. Apply with a machine specifically designed and manufactured for mixing and applying hydro mulch. Areas approved by the Engineer or Owners Representative as having a stand of established designated cover will not need to be hydroseeded.
- OPERATION & MAINTENANCE PROCEDURES

Inspect every week and within 48 hours after every rain event that causes stormwater runoff to occur on-site. Protect seeded areas from vehicular and foot traffic. Reseed and mulch areas that have not sprouted within 21 days of planting. Repair damaged or eroded areas and reseed/mulch as needed. Do not mow until 4 inches of growth occurs. During the first 4 months, mow no more than 1/3 the grass height. Seeded areas should be repaired and reseeded/mulched for one year following permanent seeding to ensure successful establishment.

BMP# 4**BMP Description - Sodding**

- TYPE OF BMP: PERMANENT ☒ TEMPORARY ☐
- DEFINITION & PURPOSE
Sod is a mat of grass with an established root system used to provide immediate vegetation for erosion control.
- CONDITIONS FOR EFFECTIVE USE
Sod is an effective way to achieve immediate erosion protection in areas of sheet flow and low concentrated flows with velocities less than 5 feet/second. A soil test should be performed to determine if soil amendments are needed. Fertilizer should only be applied if a soil test indicates it is needed.
- INSTALLATION/CONSTRUCTION PROCEDURES
Install immediately after finish grading. Remove debris larger than 1 inch in diameter and concentrated areas of smaller debris. Level and roll soil lightly to provide an even grade and firm the surface. Soil should not be excessively wet or dry. Lay first row of sod perpendicular to the slope or direction of flow. Lay subsequent rows tightly against previous rows with joints staggered in a brick-like pattern. Fill minor gaps with good soil and roll entire surface to ensure contact. Stake, staple and/or net corners and centers of sod strips as required, especially in areas of concentrated flow. Water the sod immediately after installation, enough to soak 4 inches into the soil without causing runoff.
- OPERATION & MAINTENANCE PROCEDURES
Inspect every week and within 48 hours after every rain event that causes stormwater runoff to occur on-site. Water the sod as often as necessary to maintain moist soil to a depth of at least 4 inches. Reposition areas of sod that have moved along the slope. Remove sediment accumulations, and replace sod if necessary. Repair and replace sod in eroded areas as needed. Do not mow sod until 3 inches of new growth occurs. During the first 4 months, mow no more than 1/3 the grass height.

BMP# 5**BMP Description - Mulching**

- TYPE OF BMP: PERMANENT ☐ TEMPORARY ☒
- DEFINITION & PURPOSE

A layer of organic material designed to protect exposed soil or freshly seeded areas from erosion by eliminating direct impact of precipitation and slowing overland flows. Mulch materials include grass, hay, straw, wood chips, wood fibers, and shredded bark.
- CONDITIONS FOR EFFECTIVE USE

Mulching can be used in areas of sheet flow for temporary soil stabilization on disturbed areas and applied to seeded areas to protect the seed and retain moisture for plant establishment. It is essential to seeding success in most conditions. In landscape areas, mulch is installed for permanent use. Where slopes are 3:1 or greater, hydraulic mulch-bonded fiber matrix, erosion control blankets, or turf reinforcement mats should be used.
- INSTALLATION/CONSTRUCTION PROCEDURES

Install immediately after grading landscaped areas or after seeding in other areas. Grade area and remove all debris larger than 1 inch if area is to be vegetated and mowed in the future, larger than 2 inches if area is to be permanently mulched. If area is to be seeded, follow requirements of seeding. Spread mulch evenly and anchor by crimping it into the ground or using netting.
- OPERATION & MAINTENANCE PROCEDURES

Inspect every week and within 48 hours after every rain event that causes stormwater runoff to occur on-site until adequate vegetation is established. For permanent mulch, inspect annually. Protect from vehicular and foot traffic. Repair damaged or eroded areas, and reseed and replace mulch as needed.

BMP# 6**BMP Description - Erosion Control Blankets**

- TYPE OF BMP: PERMANENT ☒ TEMPORARY ☒
- DEFINITION & PURPOSE

An erosion control blanket (ECB) is a blanket of synthetic or natural fibers to protect soil from the erosive impact of precipitation and overland flow, typically on slopes and in channels. ECBs also retain moisture and facilitate establishment of vegetation. Erosion control blankets are also sometimes referred to as Rolled Erosion Control Products (RECPs).
- CONDITIONS FOR EFFECTIVE USE

Factors in the selection of ECB include soil conditions, steepness and length of slope, shear stress, and type and duration of protection needed to establish desired vegetation. Products are available for a variety of uses and longevity, typically from 3 months to 36 months. Manufacturer's specifications should be followed.
- INSTALLATION/CONSTRUCTION PROCEDURES

The type of ECB shown on the plans should be installed immediately after completion of a phase of grading and/or seeding. Follow manufacturer's specifications for installation, particularly noting requirements for check slots, fastening devices (staples), and the need for firm contact with soil. See Manufacturer's Detail or Typical Detail.
- OPERATION & MAINTENANCE PROCEDURES

Inspect every week and within 48 hours after every rain event that causes stormwater runoff to occur on-site until adequate vegetation is established. Repair erosion and/or undermining at top of slope. Repair undermining beneath blankets. Pull back the blankets, fill and compact eroded area, re-seed and then firmly secure the blankets. Reposition or replace blankets that have moved along the slope or have been damaged.

BMP# 7**BMP Description - Street Sweeping/Cleaning**

- TYPE OF BMP: PERMANENT ☐ TEMPORARY ☒
- DEFINITION & PURPOSE
Street cleaning includes shoveling, brooming, sweeping and/or vacuuming to remove track-out of sediment from paved public roads.
- CONDITIONS FOR EFFECTIVE USE
Shoveling should be used to remove mud layers and large dirt clods. Sweeping and vacuuming may not be effective when paved roads are wet or muddy.
- INSTALLATION/CONSTRUCTION PROCEDURES
If track out is present, street cleaning should be performed as soon as possible, at the end of the work day, and before rain events. If not mixed with debris or trash, consider incorporating the removed sediment back into the project. Otherwise, sweeper waste should be disposed in a solid waste dumpster on or off-site. Do not wash any sediment or debris down the storm drain.
- OPERATION & MAINTENANCE PROCEDURES
Inspect ingress/egress access points daily, and clean tracked sediment as needed and/or required.

BMP# 8

BMP Description - Silt Fencing

- TYPE OF BMP: PERMANENT ☐ TEMPORARY ☒
- DEFINITION & PURPOSE

A silt fence consists of a run of filter fabric, stretched, trenched in the ground and attached to anchored posts. Silt fence used as a perimeter control BMP encourages ponding of runoff and settling of sediment from stormwater.
- CONDITIONS FOR EFFECTIVE USE

Install silt fence along slopes, at bases of slopes, and around the perimeter of a site as a final barrier to sediment being carried off site. Silt fence should follow level contour lines with ends turned upslope in a J-Hook. Silt fence should never be used in areas of concentrated flow. **Common industry practice is that drainage areas should not exceed 0.25 acres per 100 feet of fence length.**
- INSTALLATION/CONSTRUCTION PROCEDURES

Install silt fence prior to disturbance and at intervals during construction of fill slopes. Follow Manufacturer's Specifications. See Typical Detail.
- OPERATION & MAINTENANCE PROCEDURES

Inspect every week and within 48 hours after every rain event that causes stormwater runoff to occur on-site. Remove sediment buildup once it accumulates to 6 inches. Replace torn/clogged fabric, and repair loose fabric and broken stakes.

BMP# 9**BMP Description - Inlet Protection**

- TYPE OF BMP: PERMANENT ☐ TEMPORARY ☒
- DEFINITION & PURPOSE
A temporary sediment control barrier placed around an inlet that minimizes sediment from entering the storm drain.
- CONDITIONS FOR EFFECTIVE USE
All functional inlets that drain disturbed areas should have inlet protection. The type of inlet protection should be determined based on the type of inlet, drainage area, slope, and whether the inlet is in a high traffic area. Types of inlet protection include gravel bags and proprietary inserts and covers. Compost filter sock or silt fence can be used for protection of area inlets where the sock and fence can be properly staked into the ground. Compost filter sock may also be used on pavement for curb inlet protection but gravel bags may be a better choice in high traffic areas because of their higher flow rate.
- INSTALLATION/CONSTRUCTION PROCEDURES
Install before land disturbing activities begin on existing inlets, or immediately after installation of a new inlet. Gravel bags may be placed either as a j-hook on the upstream end of the inlet or as a full barrier, sometimes stacked 2 bags high, across the entire opening of the inlet). Create an overflow bypass in the inlet protection structure so that excessive ponding of water around the inlet will not become a safety issue.
- OPERATION & MAINTENANCE PROCEDURES
Inspect every week and within 48 hours after every rain event that causes stormwater runoff to occur on-site. Inspect inlet protection to ensure integrity and effectiveness every week or 48 hour after every rain event that causes stormwater runoff to occur on-site. Remove sediment and construction debris that impedes flow to the inlet, and replace or repair nonfunctional inlet protection.

BMP# 10**BMP Description - Check Dams**

- TYPE OF BMP: PERMANENT ☐ TEMPORARY ☒
- DEFINITION & PURPOSE

Check dams reduce flow velocity, allowing sediment to settle out. A check dam is a device constructed of rock, rock bags, or proprietary products placed across a natural or man-made channel or swale. They are similar to ditch checks but designed to be more robust. Not to be constructed from silt fence.
- CONDITIONS FOR EFFECTIVE USE

Check dams should be designed by a registered design professional and consists of one or more dams placed at intervals in channels and swales to slow velocities, reducing erosion and allowing sediment to settle out. They can also be used as an alternative to a sediment basin for sites with a drainage area of 20 acres or less. They can also be used as a secondary sediment control measure in streams but should be combined with water diversion and other BMPs.
- INSTALLATION/CONSTRUCTION PROCEDURES

Install before disturbing vegetation in contributing drainage area and immediately following excavation of channels or swales. Check dams must be placed perpendicular to flow of water. Install geotextile filter fabric below rock. When using rock bags, no geotextile is needed. Check dam must be long enough to assure that center mass is lower than outside edge so that water will run over the middle and not undermine outside edges.
- OPERATION & MAINTENANCE PROCEDURES

Inspect every week and within 48 hours after every rain event that causes stormwater runoff to occur on-site. Remove accumulation of trash and leaves. Remove sediment when depth reaches one-half of the check dam height. Repair/restore dam structure, if necessary, to original configuration.

BMP# 11**BMP Description - Gravel Bags**

- TYPE OF BMP: PERMANENT ☐ TEMPORARY ☒
- DEFINITION & PURPOSE
Open mesh nylon or burlap bags of gravel designed to pond water and cause sediment to settle out.
- APPROPRIATE APPLICATIONS
Gravel bags may be implemented on a project-by-project basis with other BMPs.
- CONDITIONS FOR EFFECTIVE USE
Type of Flow: Sheet flow and concentrated flow. Gravel bags can be used alone or with other BMPs. They can be used as inlet protection, check dams in streams and channels, outfall protection, for water diversions, to create temporary sediment basins, and as barriers.
- INSTALLATION/CONSTRUCTION PROCEDURES
Time of installation is dependent upon the function gravel bags are intended to perform. When used as a linear control for sediment removal, install along a level contour and turn ends of gravel bag row up slope (j-hook style) to prevent flow around the ends. When used for concentrated flows, stack gravel bags to required height using a pyramid approach. The upper rows of gravel bags should overlap joints in lower rows.
- OPERATION & MAINTENANCE PROCEDURES
Inspect every week and within 48 hours after every rain event that causes stormwater runoff to occur on-site. Replace or stabilize any damaged bags or bags that have moved out of place. Repair wash-outs or other damages as needed. Inspect gravel bags for sediment accumulations, and remove sediment when accumulation reaches $\frac{1}{2}$ the height of the structure.

BMP# 12**BMP Description - Fiber Wattles**

- TYPE OF BMP: PERMANENT ☐ TEMPORARY ☒
- DEFINITION & PURPOSE

Fiber rolls or straw wattles are a rolled erosion control product filled with straw, flax, rice, coconut fiber material, or composted material. Each roll is wrapped with UV-degradable polypropylene netting or with biodegradable materials like burlap or jute. These devices are slope dissipaters that reduce velocity of runoff as sheet flow and catch sediment on steep slopes.
- CONDITIONS FOR EFFECTIVE USE

Fiber rolls can be used in areas of low shear stress including: along the toe, top, face, and at grade breaks on exposed and erodible slopes to shorten slope length and spread runoff as sheet flow, at the end of a downward slope where it transitions to a steeper slope, along the perimeter of a project (less than 1/3 acre) or down-slope of a stockpile, and down-slope of other exposed soil areas.
- INSTALLATION/CONSTRUCTION PROCEDURES

Install fiber roll immediately after rough grading and prior to seeding or mulching. On slopes, install fiber rolls along the contour with a slight downward angle at the end of each row to prevent ponding at the midsection. Turn the ends of each fiber roll upslope (like a j-hook) to prevent runoff from flowing around the roll. Determine using manufacturer's specification the vertical spacing for slope installations. Straw wattles can float or move if not properly staked and trenched in.
- OPERATION & MAINTENANCE PROCEDURES

Inspect every week and within 48 hours after every rain event that causes stormwater runoff to occur on site. Remove sediment accumulation when it reaches ½ the height of the roll/wattle. Repair or replace split, torn, unraveled, or slumping fiber rolls.

BMP# 13**BMP Description - Construction Entrance/Exit**

- TYPE OF BMP: PERMANENT ☐ TEMPORARY ☒
- DEFINITION & PURPOSE

A stabilized exit to a construction site is designed to minimize the amount of sediment tracked from the site on vehicles and equipment. Mud and sediment fall off of tires as they bounce along the stabilized entrance.
- CONDITIONS FOR EFFECTIVE USE

Limit the number of points of ingress/egress and locate them where it is safe for construction vehicles and equipment to access public road. Avoid placing construction exit in low areas, where stormwater can accumulate and discharge off site. If possible, locate where permanent roads will eventually be constructed.
- INSTALLATION/CONSTRUCTION PROCEDURES

Install prior to the start of construction. Properly grade and compact each construction entrance/exit to prevent runoff from leaving the site. Install culvert under entrance if needed to maintain positive drainage. Install woven geotextile fabric and cover with 3 to 6" aggregate to a depth of 6". Construction exit should have a length of 50' and a turn radius of 25' or full width of roadway. All contractors, subcontractors, and suppliers should be instructed to utilize construction entrance/exit before entering or exiting unstable areas.
- OPERATION & MAINTENANCE PROCEDURES

Inspect every week and within 48 hours after every rain event that causes stormwater runoff to occur on-site. Add a new lift of rock, or turn stones when voids become inundated with sediment and pad becomes smooth. Keep all temporary roadway ditches clear. Immediately remove any mud, rock or debris tracked onto paved surfaces. Use a street sweeper adjacent with the construction exit to reduce track out from site.

BMP# 14**BMP Description - Non-Sediment Pollution Control**

- TYPE OF BMP: PERMANENT ☐ TEMPORARY ☒
- SPILL PREVENTION CONTROLS
Keep a spill kit on-site with equipment necessary for spill clean-up. Equipment and materials include, but are not limited to: brooms, dust pans, mops, rags, gloves, goggles, kitty litter, sawdust, oil-absorbent booms, and trash containers.
- FUELING, MAINTENANCE OF EQUIPMENT & VEHICLES
No fueling, servicing, maintenance or repair of equipment or machinery should be done within 100 feet of a stream, or within 150 feet of a classified stream, losing stream, or sinkhole. Tarps or drop cloths and drip pads should be used when servicing, repairing, or performing maintenance on construction equipment in the field. When work is complete, the contaminated materials should be disposed of appropriately.
- WASHING OF EQUIPMENT & VEHICLES
No wash water is allowed to discharge into storm drains or drainage way without proper treatment.
- PESTICIDES, HERBICIDES, INSECTICIDES, FERTILIZERS & LANDSCAPE MATERIALS
Exposure of these chemicals to precipitation and stormwater on-site should be minimized.
- DIESEL FUEL, OIL, HYDRAULIC FLUIDS, OTHER PETROLEUM PRODUCTS & CHEMICALS
All fueling facilities present on the site shall adhere to applicable federal and state regulations concerning underground storage, above ground storage, and dispensers. All fuel, oil, and other fluids exposed to precipitation shall be stored in watertight, structurally sound, closed containers. Minimize the discharge of fluids from spills and leaks by implementing chemical spill and leak prevention and response procedures, including, but not limited to, installation of containment berms and use of drip pans. Machinery should be kept out of the waterway as much as possible.
- HAZARDOUS OR TOXIC WASTE
Post guidelines for proper handling, storage and disposal of materials, and emergency spill cleanup on site. An accurate, up-to-date inventory of materials delivered and stored on-site should be kept. Retain original labels and material safety data sheets. All paint, solvents, petroleum products, petroleum waste products and storage containers such as drums, cans, or cartons shall be stored using best management practices. Materials exposed to precipitation shall be stored in watertight, structurally sound, closed containers with proper labels. Store bagged and boxed materials on pallets. Cover bagged and boxed materials during nonworking days and prior to rain events. Incompatible materials, such as ammonia and chlorine, must not be stored in the same temporary containment facility. Containers for proper disposal of waste paints, solvents, and cleaning compounds shall be provided.

BMP# 15**BMP Description - Concrete Wash-Out Pit**

- TYPE OF BMP: PERMANENT ☐ TEMPORARY ☒
- DEFINITION & PURPOSE
Concrete wash-out pits are used to contain concrete wash-out when truck chutes, drums and/or hoses are rinsed out after delivery to construction site. Disposal can occur when concrete wash-out becomes a solid. Concrete wash-out water is a pollutant because of the high pH level and chemical additives in the wash-out. Concrete wash-out management prevents the contamination of stormwater with high pH and additives that may cause adverse impact to water quality.
- CONDITIONS FOR EFFECTIVE USE
Concrete wash-out pits must be implemented on construction projects where concrete slurries are generated. Wash-out should be located a minimum of 50 feet from storm drains, ditches, and 100 feet from classified streams, losing streams or sinkholes. Design concrete wash-out pits to sufficiently hold all liquid and concrete waste. Plastic liner should be a minimum of 20 mil. polyethylene sheeting.
- INSTALLATION/CONSTRUCTION PROCEDURES
Install concrete wash-out pits prior to concrete pouring activities.
- OPERATION & MAINTENANCE PROCEDURES
Inspect every week and within 48 hours after a rain event that causes stormwater runoff to occur on-site. Remove and dispose of solid concrete material. Wash-out facilities must be cleaned when volume reaches 75% of capacity. Cover the concrete wash-out pit before predicted rain events to prevent overflow.
- SITE CONDITIONS FOR REMOVAL
Remove concrete wash-out pit when concrete wash-out activity ceases.
- ALTERNATIVES
Return unwanted concrete back to concrete batch plant to wash-out, proprietary disposal boxes, roll-off dumpster.

BMP# 16**BMP Description - Preservation of Existing Vegetation**

- TYPE OF BMP: PERMANENT ☒ TEMPORARY ☐
- DEFINITION & PURPOSE
Permanent preservation of existing vegetation and topsoil minimizes the area of disturbance, reducing the need for erosion and sediment control BMPs and the potential for violations. It also provides a financial benefit by reducing the cost of grading, BMPs, topsoil, and seeding. Preserved areas can provide long-term stormwater benefits through increased absorption of rainfall compared to turf grass areas with compacted soil.
- CONDITIONS FOR EFFECTIVE USE
Preservation of existing vegetation requires planning and should be the first step in the design process. The site should be surveyed to identify high quality soils, trees, vegetation, and steep slopes to be preserved. The site improvements, including any temporary roadways, should be designed around these features and follow existing contours to reduce cutting and filling. Sediment control BMPs such as compost filter sock or silt fence may be desirable to protect the preservation area from significant sediment accumulation.
- INSTALLATION/CONSTRUCTION PROCEDURES
Protection of preservation areas with temporary construction fencing and any sediment control BMPs shall be provided prior to the commencement of clearing and grubbing operations or other soil-disturbing activities.
Construction materials, equipment storage, and parking areas should be located outside of protected areas where they will not cause root compaction.
- OPERATION & MAINTENANCE PROCEDURES
During weekly and rain event inspections, verify that temporary construction fencing and any sediment control BMPs to protect preservation areas are still in place and operational. If the area to be preserved is adjusted during construction, update the site plan and document the update in Appendix D – SWPPP Amendment Log.
- SITE CONDITIONS FOR REMOVAL
Temporary fencing and any sediment control BMPs shall be removed after final stabilization of the site has occurred.

BMP# 17**BMP Description - Vegetated Filter Strips**

- TYPE OF BMP: PERMANENT ☒ TEMPORARY ☐
- DEFINITION & PURPOSE
Vegetated filter strips are areas of vegetation that are used as sediment control practices during construction. Vegetation slows down stormwater runoff and filters out sediment.
- CONDITIONS FOR EFFECTIVE USE
Vegetated filter strips are appropriate where a strip of existing vegetation can be left in place in downhill areas to provide sediment control in place of or in addition to other sediment control BMPs. They should be used in areas of sheet flow only. Level spreaders may be needed to ensure sheet flow. Filter strip width and length should be determined based on the size and slope of the drainage area and type of vegetation. If the vegetated filter strip is part of a preservation area (see Preservation of Existing Vegetation), additional sediment control BMPs may be desired to protect the preservation area from excessive sediment deposition. Vegetated filter strips installed as a permanent stormwater quality control measure should not be used as a sediment control BMP.
- INSTALLATION/CONSTRUCTION PROCEDURES
Existing vegetation that will be used as a vegetated filter strip should be marked the width and length shown on the plans prior to construction and designated as no disturbance. It may be desirable to fence off the filter strip to protect it from construction activities.
- OPERATION & MAINTENANCE PROCEDURES
Inspect every week and within 48 hours after every rain event that causes stormwater runoff to occur on-site. Verify that the vegetated filter strip has not been removed or damaged by construction activities. Remove excessive sediment accumulation if needed for functionality. Seed areas of erosion or dead vegetation as needed. Install additional BMPs if the vegetated filter strip becomes ineffective, and update the site plan and Appendix D – SWPPP Amendment Log.
- SITE CONDITIONS FOR REMOVAL
The vegetated filter strip should remain in place until the drainage area is stabilized, at which point it is typically replaced with permanent vegetation or, in the case of a phased site, replaced with improvements. The SWPPP should provide site-specific information on removal/replacement of the vegetated filter strip.

4.2 Natural Buffers or Equivalent Sediment Controls ☐ Check box if control is Not Applicable.

Instructions:

- Existing vegetation is to be preserved everywhere practical. A minimum of a 50-foot buffer of undisturbed natural vegetation shall be provided between disturbed portions of the site and surrounding surface waters.
- On the site map(s), label any surface waters on or adjacent to the project and indicate the area to be dedicated as a buffer.
- Where the minimum buffer cannot be maintained, project manager shall provide locations and design of equivalent structural controls to supplement and augment the available buffer.

Are there any surface waters within 100 feet of your project's earth disturbances? ☐ YES ☐ NO
(Note: If no, no further documentation is required for the SWPPP Template.)

Check the compliance alternative that you have chosen:

- ☐ Project will maintain a minimum 50-foot undisturbed natural buffer.

(Note (1): Show the 50-foot boundary line of the natural buffer on site map.)

- ☐ It is infeasible to provide and maintain an undisturbed natural buffer of 50-ft.

- INSERT RATIONALE FOR CONCLUDING THAT IT IS INFEASIBLE TO PROVIDE AND MAINTAIN A NATURAL BUFFER OF ANY SIZE

(Note (2): Project manager must show on site map how all discharges from construction disturbances, through the natural buffer area, will first be treated by the site's erosion and sediment controls. Also, show on the site map any velocity dissipation devices used to prevent erosion within the natural buffer area.)

- ☐ Buffer disturbances are authorized as part of in-stream work under a CWA Section 404 permit.

- INSERT DESCRIPTION OF ANY EARTH DISTURBANCES THAT WILL OCCUR WITHIN THE BUFFER AREA

(Note (3): If this exception applies, no further documentation is required.)

(Note (4): This exception only applies to the limits of disturbance authorized under the Section 404 permit, and does not apply to any upland portion of the construction project.)

4.3 Minimize the Disturbance of Steep Slopes

☐

Check box if control is Not Applicable.

Definitions:

- Steep Slopes: A steep slope is defined as being greater than 5:1 (five feet horizontal to one foot vertical) or greater than 20% AND greater than 150 feet in length.

Steep Slope Controls

Steep Slope Control # 1

Steep Slope Control Description

- Install jute erosion control mat on all exposed steep slopes
 - See BMP Description.

Steep Slope Control # 2

Steep Slope Control Description

- Install sod lining on all exposed steep slopes
 - See BMP Description.
 - Stake sod as required.

Steep Slope Control #3

Steep Slope Control Description

- Install hydroseeding and mulch with a diversion channel along the top of the exposed slope.
 - See BMP Description.
 - Place seeding and mulch within 7 days of exposure of the slope.

4.4 Sediment Basins

☐

Check box if control is Not Applicable.

Instructions:

- A sedimentation basin shall be provided for each drainage area with 2 or more acres disturbed at one time. The basin shall be sized to contain a volume of at least 3,600 cubic feet per each disturbed acre draining thereto. Include design specifications for each basin, including volume, dimensions, and outlet structure.
- Sediment ponds must utilize outlet structures that withdraw water from the surface, unless infeasible.
- Temporary and permanent sedimentation basins must have a stabilized spillway to minimize the potential for erosion of the spillway or basin embankment.
- Accumulated sediment shall be removed from the basin when the basin is 50% full. The basin shall be maintained until final stabilization of the disturbed area served by the basin.

Sediment Basin Controls

Sediment Basin Control # 1

Sediment Basin Control Description

- See project specific engineered site plans for sediment basin locations and dimensions.

Installation

- See engineered plans for the sediment basin specifications.
- Project managers shall identify phase in which the BMP will be installed.

4.5 Site Stabilization

Instructions:

- Interim stabilization must be initiated immediately and completed within 7 calendar days where soil disturbing activities have temporarily ceased on any portion of the site and will not resume for a period exceeding 14 calendar days. Interim stabilization shall consist of well-established and maintained BMPs. Final stabilization of disturbed areas must be initiated immediately and completed within 7 calendar days whenever any clearing, grading, excavating or other earth disturbing activities have permanently ceased on any portion of the site. Log phased/intermediate and permanent grading and stabilization activities in Appendix F.
- Allowances to the 7 day completion period for temporary and final stabilization may be made due to weather and equipment malfunctions. Use of allowances shall be documented in the SWPPP.
- Describe the specific vegetative and/or non-vegetative practices that will be used to stabilize exposed soils where construction activities have temporarily or permanently ceased.

Site Stabilization Practice

☒ Vegetative ☐ Non-Vegetative
☒ Temporary ☒ Permanent

Description of Practice

- Provide seeding and mulch or sodding as indicated and as required. See BMPs.
- Provide steep slope protection in accordance with Section 4.3.
- See project specifications.

SECTION 5: POLLUTION PREVENTION STANDARDS

5.1 Potential Sources of Pollution

Instructions:

- Pollution prevention BMPs shall be installed to minimize the risk potential for non-sediment pollutants (including, but not limited to: wheel wash water, trash, fertilizers, pesticides, sanitary waste, and petroleum products leaving the site in stormwater runoff)
 - ✓ Wash waters must be treated in a sediment basin or alternative control that provides equivalent or better treatment prior to discharge;
 - ✓ Minimize exposure of any materials which may contribute pollution to precipitation and stormwater;
 - ✓ Implement chemical spill and leak prevention and response procedures. These procedures include but are not limited to maintenance of spill kits, installation of containment berms, and use of drip pans at petroleum product and liquid storage tanks and containers.

Construction Site Pollutants

Project Manager to Insert a listing of all anticipated site pollutants.

Pollutant-Generating Activity	Pollutants or Pollutant Constituents (that could be discharged if exposed to stormwater)	Location on Site (or reference SWPPP site map where this is shown)

[Include additional rows as necessary.]

There shall be no pollutants stored on site. All pollutants shall be secured in watertight containers on municipal vehicles and shall be stored at City facilities until required. A separate spill kit will be maintained for each substance and shall be transported with each substance delivered to the site. Spill kits will include absorption materials, booms, and containment systems specifically designed for each potential pollutant. Operators shall follow all manufacturer's storage and handling instructions for each substance used.

5.2 Storage, Handling, and Disposal of Construction Products, Materials, and Wastes

☐ Check box if control is Not Applicable.

Instructions:

- For any of the types of construction products, materials, and wastes that are expected to be used or stored at your site, provide the specific practices that will be employed.
- Solid waste and hazardous waste shall be managed using trash containers and regular site clean-up for proper disposal of solid waste (scrap metal, shipping waste, food containers, etc.). Containers for proper disposal of waste paints, solvents and cleaning compounds shall be provided. Portable toilets for proper disposal of sanitary sewage and the storage of construction materials should be kept away from drainage courses and low areas.
- All fueling facilities present on site shall adhere to applicable federal and state regulations concerning underground storage, above ground storage and dispensers.
- All paint, solvents, petroleum waste products and storage containers such as drums, cans, or cartons shall be stored according to BMPs. Materials exposed to precipitation shall be stored in watertight, structurally sound, closed containers. All containers shall be inspected for leaks or spillage during the once per week inspection of BMPs.
- From the list below, check all potentially hazardous waste that will be present on your site.

Materials Present Include:

- | | |
|---|---|
| ☐ Pesticides | ☐ Herbicides |
| ☐ Insecticides | ☐ Fertilizers |
| ☐ Diesel Fuel | ☐ Oil |
| ☐ Hydraulic Fluid | ☐ Other Petroleum Products |
| ☐ Paint | ☐ Solvents |
| ☐ Acid | ☐ Curing Compounds |
| ☐ Portable Toilets | ☐ Solid Waste |
| ☐ Other | |

General

- City of Stillwater project managers and Operations Team Leaders will be responsible for identifying any waste or hazardous materials on the job site. City operations personnel will police the area daily for project related waste material prior to completion of daily operations. All solid waste, and other environmentally noxious/hazardous waste will be collected and removed from the job site daily. No material, fuels, supplies, chemicals or other non-stable material will be allowed to remain exposed to the elements on the jobsite, but shall be secured in water tight containers on the municipal vehicles.

SECTION 6: INSPECTION AND CORRECTIVE ACTION

6.1 *Inspection Personnel and Procedures*

City contact responsible for environmental matters:

Chris Franks – Environmental Programs Manager
405-533-8482
cfranks@stillwater.org

Designated Inspector by Discipline for City of Stillwater programs and projects:

Water and Sewer Lines

Steven Fair
405-533-8423
steven.fair@stillwater.org

Transportation and Stormwater Services Inspector

Kevin Crew
405-564-3614
kevein.crew@stillwater.org

Inspection Schedule

Inspections will be performed by City Inspectors at least once per seven calendar days. Contractors shall monitor and inspect project site and BMP's on a daily basis (work day). If a rainfall of 0.5 inches occurs or a snow melt causes storm water runoff to occur on-site, the BMPs must be inspected within a 24 hour period after the rainfall event has ceased. These inspections must occur within 24 hours after the rain event has ceased during a normal work day and within 72 hours if the rain event ceases during a non-work day such as a weekend or holiday. Areas on-site that have been finally stabilized must be inspected at least once per month.

Rain Gauge Location (if applicable)
City of Stillwater Rain gauge system

Rain gauge locations and rainfall data can be found by contacting:

Rob Hill - Stillwater Emergency Management
rob.hill@stillwater.org

See Appendix C for Inspection Report Forms and Corrective Action Forms

6.2 Corrective Action

Personnel Responsible for Corrective Actions

City of Stillwater Project Managers, Operations Team Leaders and City contractors will be responsible for working with project inspectors, taking corrective actions, and submitting reports. All reports must be submitted to the appropriate superintendent or director, as listed below.

City of Stillwater Water Utilities Director
James Driskel
405-533-8452
james.driskel@stillwater.org

City of Stillwater Director of Public Works
Mark White
405-742-8351
mark.white@stillwater.org

City of Stillwater Deputy Director, City Engineering
David Barth, PE
405-742-8261
david.barth@stillwater.org

Corrective Action Schedule

Once an inspection has identified a BMP failure or an unauthorized stormwater discharge, the inspector, with the project manager and the contractor will identify corrective actions to immediately address the discharge or failure. Any structural or maintenance problems shall be noted in the inspection report and corrected within seven calendar days of the inspection. If weather conditions prevent correction of BMPs within 7 calendar days, the reasons for the delay must be documented (including pictures) and there must be a narrative explaining why the work cannot be accomplished within the 7 day time period. The documentation must be filed with the regular inspection reports, and the problem shall be corrected as soon as weather conditions allow.

Corrective Action Results and Documentation

Record all corrective actions taken for the project. Prepare a report identifying the condition requiring the correction, the scope of the correction and the date the correction was completed and put into service. (See Appendix C)

Any corrective action requiring an addition or change to the project SWPPP must be documented with a SWPPP amendment log entry by the project manager. (See Appendix D).

SECTION 7: CERTIFICATION AND NOTIFICATION

I certify under penalty of law that this document template and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

SWPPP Template Preparation:

Name: <Name> Title: <Title>

Signature: _____ Date: _____

Project Manager : (To Sign for Each Project Application)

Name: <Name> Title: <Title>

Signature: _____ Date: _____

SWPPP APPENDICES

Attach the following documentation to the SWPPP:

Appendix A – Site Maps

Appendix B – Copy of Oklahoma State Operating Permit

Appendix C – Inspection Form & Corrective Action Report

Appendix D – SWPPP Amendment Log

Appendix E – Subcontractor Certifications/Agreements

Appendix F – Grading and Stabilization Activities Log

Appendix G – Delegation of Authority

Appendix H – Stillwater Erosion & Sediment Control Manual

Appendix A – Site Maps

INSERT PROJECT SITE MAPS

Appendix B – Copy of Oklahoma Stormwater Permit

Insert Oklahoma Stormwater Permit

Appendix C – Inspection Form & Corrective Action Report

Instructions:

- Create a log here of corrective Actions. You may use the table below to track these modifications. Expand to additional sheets as required.
- Corrective actions are required when any of the following conditions exist:
 - ✓ Required Stormwater BMP or control was never installed, installed improperly, or not in accordance with OKR04 Parts VIII.B.3 and or VIII.B.6; or
 - ✓ The installed stormwater controls are not effective enough to meet applicable stormwater quality standards in accordance with OKR04 Part VIII.B.4.; or
 - ✓ Discharge from the site includes one of the prohibited discharges in OKR04 Parts 1.C and VIII.B.3.c.

Corrective Action Log:

No.	Description of the Corrective Action Taken	Date of Correction	Follow up Inspection of Correction [Name(s) and Date]

Corrective Action Form

Appendix D – Stillwater SWPPP Amendment Log

Instructions:

- Create a log here of changes and updates to the SWPPP. You may use the table below to track these modifications.
- SWPPP modifications are required whenever the:
 - ✓ Design, operation, or maintenance of BMPs is changed;
 - ✓ Design of the construction project is changed that could significantly affect the quality of the stormwater discharges;
 - ✓ Permittee's inspections indicate deficiencies in the SWPPP;
 - ✓ SWPPP is determined to be ineffective in minimizing or controlling erosion and sedimentation (e.g., there is visual evidence of excessive site erosion or excessive sediment deposits in streams or lakes); and

No.	Description of the Amendment	Date of Amendment	Amendment Prepared by [Name(s) and Title]

Appendix E – Contractor Certification/Agreements

CONTRACTOR/SUBCONTRACTOR CERTIFICATION STORMWATER POLLUTION PREVENTION PLAN

Project Number: _____

Project Title: _____

Operator(s): _____

As a contractor/subcontractor, you are required to comply with the Stormwater Pollution Prevention Plan (SWPPP) for any work that you perform on-site. Any person or group who violates any condition of the SWPPP may be subject to substantial penalties or loss of contract. You are encouraged to advise each of your employees working on this project of the requirements of the SWPPP. A copy of the SWPPP is available for your review at the office trailer.

Each subcontractor engaged in activities at the construction site that could impact stormwater must be identified and sign the following certification statement:

I certify under the penalty of law that I have read and understand the terms and conditions of the SWPPP for the above designated project and agree to follow the practices described in the SWPPP.

This certification is hereby signed in reference to the above named project:

Company Name: _____

Address: _____

Telephone Number: _____

Type of construction service to be provided: _____

Signature: _____

Title: _____

Date: _____

Appendix F – Grading and Stabilization Activities Log

Date Grading Activity Initiated	Description of Stabilization Measure and Location	Date Grading Activity Ceased (Indicate Temporary or Permanent)	Date When Stabilization Measures Initiated

Appendix G – Delegation of Authority Form – To be filled out by the General Contractor.

Delegation of Authority

I, _____ (name), hereby designate the person or specifically described position below to be a duly authorized representative for the purpose of overseeing compliance with environmental requirements, including the Construction General Permit, at the _____ construction site. The designee is authorized to sign any reports, stormwater pollution prevention plans and all other documents required by the permit.

(name of person or position)
(company)
(address)
(city, state, zip)
(phone)

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name: _____

Company: _____

Title: _____

Signature: _____

Date: _____

Appendix H – City of Stillwater Erosion and Sediment Control Manual



**SPECIAL PROVISIONS
EXHIBIT 2
CONTRACTOR EVALUATION
Recovered Water Pump Station and
Finished Water Pump Station at
Stillwater WTP**

Department of City Engineering
723 S. Lewis St./P.O. Box 1449
Stillwater, OK 74076-1449

Office: 405.742.8325
Web: stillwater.org

To be completed by City Engineering staff, led by the Project Manager, on each Contractor upon final payment/project closeout.

PERFORMANCE LEVELS DEFINED AND RATED		
1. Displays unacceptable performance levels. 2. Displays marginal performance levels. 3. Consistently meets performance levels. 4. Consistently exceeds performance levels. 5. Displays outstanding performance levels.		
		<u>All ratings except “3 - Meets” require a comment.</u>
EVALUATION CRITERIA	RATING	COMMENTS
A. Complied with all applicable federal, state, and local laws and regulations, including SWPPP.	1 2 3 4 5	
B. Provided quality workmanship and a finished product meeting specifications and standards.	1 2 3 4 5	
C. Provided competent superintendent and qualified personnel.	1 2 3 4 5	
D. Provided and protected materials and equipment as specified by the supplier.	1 2 3 4 5	
E. Obtained and paid for all applicable permits prior to start of work.	1 2 3 4 5	
F. Maintained up-to-date and annotated Record Documents throughout the project.	1 2 3 4 5	
G. Maintained environment suitable for owner inspection of work.	1 2 3 4 5	
H. Kept work site and other areas free from accumulations of waste, rubbish, and other debris.	1 2 3 4 5	
I. Submitted clear and complete Applications for Payment not more often than once per month.	1 2 3 4 5	
J. Complied with street closing and lane restriction requirements.	1 2 3 4 5	
K. Provided clear, complete, and timely Submittal Register and subsequent Submittals.	1 2 3 4 5	
L. Coordinated water service interruptions in accordance with SOP.	1 2 3 4 5	
M. Adhered to project schedule and submitted changes in accordance with the contract.	1 2 3 4 5	
N. Maintained proper access and use of property during construction.	1 2 3 4 5	
Summation of Ratings Total ➔	xx	

COMMENTS AND GOALS**City of Stillwater Comments:**

<comments by PM, director, inspector, field services, transportation, etc.>

Contractor's Comments:**EVALUATION SUMMARY***Any exceptions to the overall scoring brackets should be noted below in the Exceptions Section.***Overall Score:** XX

- 42 to 70 ☐ would recommend Contractor for future work with COS (no rating of 1 or 2 accepted in this category)
- 36 to 49 ☐ would recommend Contractor for future work with COS under certain conditions (as specified below)
- 1
 - 2
- 0 to 35 ☐ would not recommend Contractor for future work with COS

Exceptions:**GENERAL PROJECT INFORMATION****Project Description:**

Brief description of project

Amount (per final CO): \$xx,xxx.00**Time:** XX calendar days**Contract Substantial Completion:** xx/xx/xxxx**Contract Final Completion:** xx/xx/xxxx**Actual Substantial Completion:** <date>**Actual Final Complete:** <date>**City of Stillwater****<Company Name>**

_____ Date _____

_____ Date _____

<Name>, Project Manager

<Name>, Project Superintendent

_____ Date _____

_____ Date _____

David Barth, PE, Deputy Director, City Engineering

<Name>, Project Manager

OPTIONAL: Post-Warranty Phase
City of Stillwater Comments: <comments by PM, director, inspector, field services, transportation, etc.>
Contractor's Comments:

City of Stillwater

<Company Name>

_____ Date _____
<Name>, Project Manager

_____ Date _____
<Name>, Project Superintendent

_____ Date _____
David Barth, P.E., Deputy Director, City Engineering

_____ Date _____
<Name>, Project Manager

EXHIBIT 3- CHANGE ORDER FORM SPECIAL PROVISIONS

Cost Itemization Summary for Change Order _____, CMR _____

Description of Work: _____

Allowed costs, per General Conditions Article 11.01.A, include payroll costs, material costs, equipment costs, subcontract costs, special consultants and supplemental costs.

Disallowed costs, per General Conditions Article 11.01.B, include administrative costs (salaries of officers, principals, clerks, etc.), office sites other than onsite, capital expenses and costs due to negligence.

Labor			
Job Title	Hourly Rate ^(a)	Hours	Amount
A	\$50.00	8.0	\$400.00
B	\$50.00	8.0	\$400.00
C	\$50.00	8.0	\$400.00
D	\$50.00	8.0	\$400.00
			\$0.00
			\$0.00
			\$0.00
			\$0.00
			\$0.00
			\$0.00
			\$0.00
Total			\$1,600.00

Equipment			
Item	Hourly Cost	Hours	Amount
A	\$20.00	1.0	\$20.00
B	\$30.00	1.5	\$45.00
C	\$40.00	2.0	\$80.00
D	\$50.00	2.5	\$125.00
			\$0.00
			\$0.00
			\$0.00
			\$0.00
			\$0.00
			\$0.00
			\$0.00
Total			\$270.00

Materials				
Items	Unit	Quantity	Cost / Unit	Amount
A	LF	20	\$10.00	\$200.00
B	EA	20	\$10.00	\$200.00
C	LS	1	\$10.00	\$10.00
D	GAL	20	\$10.00	\$200.00
				\$0.00
				\$0.00
				\$0.00
				\$0.00
				\$0.00
				\$0.00
Total				\$610.00

Subcontracts ^(b) Attach additional Cost Itemization Summary for each company.		
Company	Attachment	Amount
A	1.1	\$10,000.00
B	1.2	\$10,000.00
C	1.3	\$10,000.00
D	1.4	\$10,000.00
		\$0.00
		\$0.00
		\$0.00
		\$0.00
		\$0.00
		\$0.00
		\$0.00
Total		\$40,000.00

Supplemental Costs & Special Consultants ^(d) Attach receipts/invoices/documentation.				
Items	Unit	Quantity	Cost / Unit	Amount
A	LF	20	\$10.00	\$200.00
B	EA	20	\$10.00	\$200.00
C	LS	1	\$10.00	\$10.00
D	GAL	20	\$10.00	\$200.00
Bonds and Insurance	LS	1	\$500.00	\$500.00
				\$0.00
				\$0.00
				\$0.00
				\$0.00
				\$0.00
Total				\$1,110.00

Cost Itemization Summary ^(e)			
Category	Cost	Markup ^(c)	Amount
Labor	\$1,600.00	15%	\$1,840.00
Materials	\$610.00	15%	\$701.50
Equipment	\$270.00	15%	\$310.50
Subcontractors	\$40,000.00	5%	\$42,000.00
Supplemental & Special	\$1,110.00	0%	\$1,110.00
		0%	\$0.00
		0%	\$0.00
		0%	\$0.00
		0%	\$0.00
		0%	\$0.00
Total			\$45,962.00

Time Extension Requested for Work

_____ Calendar Days

Notes:

a) Hourly rates shall include salary, health insurance, vacation, sick leave, retirement, holidays, social security, unemployment/workers comp, etc.

b) Subcontractor fees shall be determined in the same manner as Contractor fees. Contractor shall attach additional summary sheets for each Subcontractor item.

c) Markup is per General Conditions, Article 12.01. This markup accounts for the fee allowed.

d) Allowed Supplemental Costs (11.01.A.5) include only the directly related and proportional increases due to the Work, supported by receipts, invoices or other Owner-approved documentation.

e) The reimbursement costs to Contractor/Subcontractor will be only those additional or incremental costs required because of the change in the Work. Such costs shall be in amounts no higher than those prevailing in the locality of the Project.

CITY OF STILLWATER, STILLWATER, OKLAHOMA
IMPROVEMENTS TO RWDS WTP AND DISTRIBUTION SYSTEM
RECOVERED WATER PUMP STATION AND FINISHED WATER PUMP STATION
PROJECT NO. 24WT02 **ISSUED FOR BID**
VOLUME 1 OF 3 **TECHNICAL SPECIFICATIONS**
DIVISIONS 00 THROUGH 23 **AUGUST 2023**

Digitally signed by Erika Katherine Cooper
Contact Info: Carollo Engineers, Inc.
Date: 2023.08.10 14:16:26 -0500



Divisions 00, 01, 22, 31, 32, 33, 41, 43, and 46;
Sections 09_96_01, 40_05_00.01, 40_05_00.03, 40_05_00.09,
40_05_06.01, 40_05_06.03, 40_05_07.01, 40_05_07.03,
40_05_19.01, 40_05_24.01, 40_05_24.02, 40_05_24.04,
40_05_31.14, 40_05_31.16, 40_05_31.17, 40_05_51.01,
40_05_57.13, 40_05_57.62, 40_05_62, 40_05_63, 40_05_64,
40_05_65.01, 40_05_65.24, 40_05_67.40

Digitally signed by Kwasi Duose
Contact Info: Carollo Engineers, Inc.
Date: 2023.08.09 21:45:33 -0500



Divisions 03, 04, 05, 07, 08, 10, and 13;
Sections 09_22_17, 09_29_00
and 09_91_00

Digitally signed by Chad A. Green
Contact Info: Carollo Engineers, Inc.
Date: 2023.08.09 08:52:32 -0500



Division 23

Digitally signed by Jeremy D. Brehm
Contact Info: Carollo Engineers, Inc.
Date: 2023.08.09 16:45:33 -0500



Division 26

Digitally signed by Kris E. Hansen
Contact Info: Carollo Engineers, Inc.
Date: 2023.08.09 10:47:15 -0500



Sections 40_61_00, 40_61_15, 40_61_16,
40_64_01, 40_64_21, 40_66_01, 40_67_01,
40_67_26, 40_71_15, 40_71_43, 40_71_79,
40_72_24, 40_72_76, 40_73_13, 40_73_23,
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40_75_23, 40_80_01, 40_96_15, 40_96_20



CITY OF STILLWATER
IMPROVEMENTS TO RWDS WTP AND DISTRIBUTION SYSTEM:
RECOVERED WATER PUMP STATION AND
FINISHED WATER PUMP STATION

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DOCUMENT 00_45_14.11

INSTRUMENTATION AND CONTROL SYSTEM CONTRACTOR (ICSC) QUALIFICATIONS FORM

ARTICLE 1 — QUALIFICATION DETERMINATION

1.01 SYSTEM DESCRIPTION:

A. General:

1. The Stillwater Water Treatment Plant (WTP) upgrades in this project generally consist of complete upgrades to Finished Water Pump Station (FWPS) and Recovered Water Pump Station (RPS).
2. This project encompasses implementation in phases including but not limited to mechanical, electrical, instrumentation and controls equipment as well submittals, programming development meetings, programming, integration, testing, commissioning, and training.

B. New System:

1. The new FWPS and RPS shall include one (1) PLC cabinet (PCM), each.
 - a. Each PCM cabinet shall be furnished with an Allen-Bradley/Rockwell Automation ControlLogix 5580, 1756-L8 series or CompactLogix 5380, 5069-L3 series depending on the programming requirements of the system. The PLC programming software shall be Studio 5000.
 - b. Each PCM shall be furnished with a front panel-mounted Maple Systems HMI Series Operator Interface terminal (OIT). Screens developed for the FWPS and RPS shall be incorporated into one (1) existing Maple Systems OIT located at the Admin Building. All existing Maple Systems OIT screens shall be incorporated into both of the new OITs located at the new FWPS and RPS. The new screens shall be programmed using Maple Systems EBPro HMI programming software.
 - c. Each PCM shall be furnished with Cisco IE2000 managed Ethernet switches, and other network equipment as required by the system. The new network connections shall be made to a new Ruckus ICX 7150 series managed Ethernet switch located in the existing network rack located at the Admin Bldg. Other network equipment may be needed to meet the needs of the system.
 - d. Each PCM shall be furnished with an uninterruptible power supply, 24VDC power supply, and other power equipment as needed to meet the needs of the system.
2. The existing SCADA system shall be modified to accept new signals from all new systems provided as part of this project. New graphic screens shall be developed for all new systems and integrated into the existing SCADA system. The existing SCADA graphic software is Aveva InTouch (formerly Wonderware).

1.02 ICSC QUALIFICATIONS:

- A. General information on the proposing company:
 - 1. Document that the ICSC Company has been actively involved in the instrumentation, PLC-based control systems business for a minimum of five years and has adequate facilities, organization structure, manpower, and technical and managerial expertise to properly perform the Work as specified in this Section.
 - 2. Submit a financial prospectus indicative of the corporation's financial state. This prospectus shall also include:
 - a. A letter from a financial institution indicating a current line of credit and bonding limit which can be applied to this Project.
 - b. Latest annual report or reviewed financial statement.
- B. Document that the ICSC has a qualified permanent service facility:
 - 1. Said facility shall be staffed with permanent employees and equipped with the tools and test equipment necessary to calibrate, test, and process start-up all of the instrumentation, control, telemetry, SCADA and control systems hardware and software as described in this Section, including remote diagnostic capability.
 - 2. Document in-house resource of permanent personnel experienced in the design and programming of equipment and systems as specified in this Section.
 - 3. Document the existence of a training program staffed by qualified instructors, to provide proper training in the operation and maintenance of equipment as specified in this Section.
 - 4. Document that the firm is a recognized or certified "system integrator partner" or similar designation for the control software and PLC system being supplied for this Project.
- C. Similar project experience of the company:
 - 1. Provide a list of at least 3 successfully completed projects for a water and/or wastewater system of similar scope and complexity in which the proposing firm used components the same as those intended for use on this Project as described in this Section. The proposing firm must have performed, for each listed project, system engineering, system fabrication and installation, documentation (including schematic, wiring and panel assembly drawings), software configuration and documentation, field testing, calibration and process start-up, operator instruction, and maintenance training. In addition, provide the following information for each project:
 - a. Name of plant or system owner, contact name, and current telephone number. Design engineer's name, address, and telephone number. Failure to provide current contact information may result in the listed project being disqualified for use in meeting the minimum requirements for prequalification.
 - b. Manufacturer and model number(s) of the PLC based control system and the computer-based SCADA system used for both hardware and software.
 - c. Brief description of the system.
 - d. Approximate number of input and output signals: analog, digital, and fieldbus.
 - e. Brief application software description.

- f. Contracted cost of the system, separate by base amount and any change orders for the completed projects.
 - g. Duration of the project and date of completion.
- D. Information on the proposed Project team members:
- 1. Provide the name and resume of the individual persons who will be responsible for each of the following:
 - a. Office engineering and management of this Project.
 - b. Lead for software configuration/programming.
 - c. Individual who will be responsible for the hardware and hardware interface design.
 - d. Individual who will be responsible for field testing, calibration, and process start-up.
 - e. Individual who will be responsible for operator training.
 - 2. All of these individuals must be permanent employees of the proposing firm.
- E. Determination of the proposed ICSC qualifications is at the sole discretion of the Engineer.

ARTICLE 2 — CONTACT AND OWNERSHIP INFORMATION

2.01 Provide contact information for the business:

Legal Name of Business:			
Corporate Office			
Name:		Phone number:	
Title:		Email address:	
Business address of corporate office:			
Local Office			
Name:		Phone number:	
Title:		Email address:	
Business address of local office:			

2.02 Provide information on the business's organizational structure:

Form of Business:	☐ Sole Proprietorship ☐ Partnership ☐ Corporation
☐ Limited Liability Company ☐ Joint Venture comprised of the following companies:	
1.	
2.	
3.	

Provide a separate Qualification Statement for each Joint Venturer.			
Date Business was formed:		State in which business was formed:	
Is this business authorized to operate in the Project location?		☐ Yes ☐ No ☐ Pending	

2.03 Identify all businesses that own Business in whole or in part (25 percent or greater), or that are wholly or partly (25 percent or greater) owned by Business:

Name of business:		Affiliation:	
Address:			
Name of business:		Affiliation:	
Address:			
Name of business:		Affiliation:	
Address:			

2.04 Provide information regarding the business's officers, partners, and limits of authority.

Name:		Title:	
Authorized to sign contracts: ☐ Yes ☐ No		Limit of Authority:	\$
Name:		Title:	
Authorized to sign contracts: ☐ Yes ☐ No		Limit of Authority:	\$
Name:		Title:	
Authorized to sign contracts: ☐ Yes ☐ No		Limit of Authority:	\$
Name:		Title:	

2.05 License requirements

A. Licensed in the state where the project is to be constructed continuously for minimum period of 5 years.

License Number:	
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ARTICLE 3 — FINANCIAL

3.01 Financial requirements:

A. The financial condition of the business cannot be such that its financial ability to complete the Project is in doubt, in the opinion of the Owner.

3.02 Provide the most recent audited financial statement, and if such audited financial statement is not current, also provide the most current financial statement.

3.03 Provide information regarding the business's financial stability.

Financial Institution:	
Business address:	

Date of business's most recent financial statement:		☐ Attached
Date of business's most recent audited financial statement:		☐ Attached
Financial indicators from the most recent financial statement		
Contractor's Current Ratio (Current Assets ÷ Current Liabilities)		
Contractor's Quick Ratio ((Cash and Cash Equivalents + Accounts Receivable + Short Term Investments) ÷ Current Liabilities)		
Is the business in bankruptcy?		

ARTICLE 4 — SAFETY

- 4.01 Must have a designated Safety Manager.
- 4.02 Submit a copy of the company's Safety Program.
- 4.03 Submit the company protocol for call-in of emergency work.
- A. Must have a 24-hour 7 day a week emergency on call service with a dedicated 1-800 number that is answered by a person and not a recording.
- 4.04 Submit a statement that all employees that perform work:
- A. Have completed the company safety training.
- 4.05 provide information regarding Business's safety organization and safety performance.

Name of Business's Safety		
Safety Certifications		
Certification Name	Issuing Agency	Expiration

- 4.06 Provide 3 years of data in the format below that includes Contractor's Worker's Compensation Insurance Experience Modification Rate (EMR), Total Recordable Injury Rate (TRIR) for incidents, and Total Number of Recorded Man Hours (MH) based on 29 CFR 1904 OSHA Recording and Reporting Occupational Injuries and Illness requirements. Bidder shall submit Worker's Compensation Insurance Experience Modification Rate (EMR) letter from insurance broker with signed Agreement.

Year									
Company	EMR	TRIR	MH	EMR	TRIR	MH	EMR	TRIR	MH

ARTICLE 5 — FACILITIES

5.01 Provide information regarding the facilities:

<u>REQUIREMENT</u>	<u>YES OR NO</u>
Does the business have a permanent service facility?	
Does the business have their own operating UL listed panel fabrication and testing facility?	
Does the business have a facility equipped with the tools and test equipment necessary to calibrate, test, and process start-up of the instrumentation, SCADA/HMI/PLC-based control systems, and wireless communications systems hardware and software furnished under this Contract, including remote diagnostic capability?	

ARTICLE 6 — EXPERIENCE AND RESOURCES

6.01 Provide information regarding the business:

<u>REQUIREMENT</u>	<u>YES OR NO</u>
Has the business been operating at least 5 years?	
Has the business been performing PCS system integration services for at least 5 years?	
Has the business been supplying PCS systems to the water and wastewater industries for at least 3 years?	
Has the business had at least \$3.0 million, annual gross revenue?	
Does the business or any of its officers have adverse criminal or legal records, such as criminal convictions, defaults, loss of licenses, etc.?	
Does the business have a poor project performance record, such as repeated claims, litigation, defaults, etc.?	
Does the business have a minimum of 15 permanent, full-time technical employees, all of whom must be regularly engaged in I&C/PCS design and implementation work?	
Does the business have a permanent local office within 200 miles of the Project Site that is staffed with at least 5 technical employees (excluding administrative staff) and has been so staffed for the past 12 months?	
Certifications and licenses:	
Studio 5000	
Aveva (Wonderware) InTouch or similar application by Aveva	
Other:	
Other:	

Does the business have a training program staffed by qualified instructors, to provide proper training in the operation and maintenance of equipment as specified in the Contract Documents?	
--	--

6.02 Provide information that will identify the overall size and capacity of the business.

Average number of full-time employees:	
Estimate of gross revenue for the current year:	
Estimate of gross revenue for the previous year:	

6.03 Provide information regarding the business's current workload.

- A. Submit all projects currently under contract using the form provided in Attachment A – Project Experience.

6.04 Provide information regarding the business's previous contracting experience.

Years of experience with projects similar to the proposed project:				
As an ICSC:		As a joint venturer:		
Has business, or a predecessor in interest, or an affiliate identified in Paragraph 1.03:				
Been disqualified as a bidder by any local, state, or federal agency within the last 5 years? ☐ Yes ☐ No				
Been barred from contracting by any local, state, or federal agency within the last 5 years? ☐ Yes ☐ No				
Been released from a bid in the past 5 years? ☐ Yes ☐ No				
Defaulted on a project or failed to complete any contract awarded to it? ☐ Yes ☐ No				
Refused to construct or refused to provide materials defined in the contract documents or in a change order? ☐ Yes ☐ No				
Been a party to any currently pending litigation or arbitration? ☐ Yes ☐ No				
Provide full details in a separate attachment if the response to any of these questions is Yes.				

- A. Submit completed projects in the last 6 years using the form provided in Attachment A – Project Experience.
1. Minimum of 3 projects.
 2. Maximum of 6 projects
 3. The ICSC must have performed at least the following services for each listed project: system engineering, system fabrication and installation, documentation (including schematic, wiring and panel assembly drawings), software

configuration and documentation, field testing, calibration, commissioning, and process start-up, operator instruction, and maintenance training.

- a. Note any exceptions of services provided in the Attachment A – Project Experience.
4. Project scope and complexity requirements:
 - a. Water or wastewater facility.
 - b. Project with similar scope and complexity to this Project
 - c. Same PLC hardware or PCS software as this Project.
5. “Completion” means the similar project is substantially complete.
6. Minimum experience requirements:
 - a. At least 3 systems designed, programmed, and successfully installed for a water and/or wastewater system of similar scope, value, and complexity in which the business used components the same as those intended for use on this Project.

ARTICLE 7 — PROJECT STAFFING

7.01 Provide resumes on key individuals whom business intends to assign to the Project.

- A. Key individuals must be permanent employees of the Business.
- B. Key individuals include the following:
 1. Project Manager.
 2. Project Superintendent.
 3. Quality Manager.
 4. Safety Manager.
 5. Programming Lead.
 6. Hardware Lead.
 7. Commissioning Lead.
- C. Resumes may be provided for Business’s key leaders as well.
- D. Minimum qualifications:
 1. Each of the key individuals each must have minimum of 10 years of experience in similar construction projects.
 2. Project Manager and Project Superintendent have served in similar roles on at least 2 comparable project(s) in the past 6 years.
 3. Safety Manager must have appropriate certification or license.
 4. Programming Lead and Hardware Lead must have minimum of 5 years of experience on similar projects.
 5. One of the key individuals shall have in-state registered electrical or control system engineer who will stamp and sign drawings produced by the business for this Project.
 6. The project team shall have individuals with certifications required for the installed products and systems.

ARTICLE 8 — REQUIRED ATTACHMENTS

8.01 Provide the following information with the Statement of Qualifications:

- A. If business is a joint venture, provide separate Qualifications Statements for each joint venturer as specified in this Document.
- B. Provide this Document with information filled out.
- C. Financial statements as specified in this Document.

- D. Current projects as specified in this Document.
- E. Previous experience with similar projects as specified in this Document.
- F. Resumes for the key individuals listed as specified in this Document.
- G. Attachments providing additional information as specified in this Document.

END OF DOCUMENT

ATTACHMENT A - PROJECT EXPERIENCE

PROJECT EXPERIENCE

PROJECT NAME:	DATE COMPLETED:
	PROJECT DURATION:
GENERAL CONTRACTOR NAME:	GENERAL CONTRACTOR ADDRESS:
GENERAL CONTRACTOR CONTACT PERSON:	GENERAL CONTRACTOR CONTACT PHONE NO. (Office and mobile number):
OWNER NAME:	OWNER ADDRESS:
OWNER CONTACT PERSON:	OWNER CONTACT PHONE NO. (Office and mobile number):
DESIGN FIRM NAME:	DESIGN FIRM ADDRESS:
DESIGN FIRM CONTACT PERSON:	DESIGN FIRM CONTACT PHONE NO. (Office and mobile number):
BRIEF DESCRIPTION OF THE SYSTEM:	
INITIAL PROJECT SUBCONTRACT COST:	
CHANGE ORDER COSTS FOR SUBCONTRACT:	
FINAL PROJECT SUBCONTRACT COST:	
COMMENTS OR EXCEPTIONS:	
BRIEF APPLICATION SOFTWARE DESCRIPTION:	
COMPUTER-BASED SCADA SYSTEM HARDWARE MANUFACTURER PLATFORM:	
COMPUTER-BASED SCADA SYSTEM SOFTWARE MANUFACTURER PLATFORM:	

PLC BASED CONTROL SYSTEM MANUFACTURER AND PLATFORM:	
WIRELESS EQUIPMENT MANUFACTURER AND PLATFORM:	
APPROXIMATE NUMBER OF PLCs:	
APPROXIMATE NUMBER OF INPUT AND OUTPUT SIGNALS:	CONTRACTED COST OF THE PCIS SYSTEM:
ANALOG:	BASE AMOUNT:
DIGITAL:	CHANGE ORDERS:
FIELDBUS:	TOTAL:
COMMENTS OR EXCEPTIONS:	

SECTION 01_11_00

SUMMARY OF WORK

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Detailed description of the Work.

1.02 THE WORK

- A. The Work consists of:
1. Construction of Recovered Water Pump Station and Finished Water Pump Station, including a new recovered water pump station with two submersible pumps; a new finished water pump station with five pumping systems and 14 vertical turbine pumps; architectural, structural, mechanical, HVAC, electrical, and instrumentation and controls (I&C) work, equipment, and improvements associated with the two pump stations; yard piping and connections to existing piping; residuals lagoon and solids blowdown piping modifications; site grading and paving; electrical connections; instrumentation communications; integration with the existing plant supervisory control and data acquisition (SCADA) system; repair and reconstruction of existing improvements affected by the Work; and incidentals for complete and usable facility.
 2. Commissioning of the Work.

1.03 LOCATION OF PROJECT

- A. The Work is located at Stillwater Water Plant, located at 1022 Yost Rd, Stillwater, Oklahoma, 74075.

1.04 OWNER FURNISHED EQUIPMENT

- A. Owner will furnish:
1. Two 2,500 kVA transformers for finished water pump station.
- B. Owner will:
1. Arrange for and deliver necessary shop drawings, product data, and samples to Contractor.
 2. Arrange and pay for product delivery to site in accordance with construction schedule.
 3. Deliver supplier's bill of materials to Contractor.
 4. Inspect deliveries jointly with Contractor.
 5. Submit claims for transportation damage.
 6. Arrange for replacement of damaged, defective, or missing items.
 7. Arrange for manufacturer's warranties, bonds, service, and inspections.
- C. Contractor's responsibility for Owner-furnished products:
1. Designating delivery date for each Owner-furnished product.

2. Reviewing shop drawings, product data, and samples.
 3. Submitting notification of discrepancies or anticipated problems.
 4. Receiving and unloading products at site.
 5. Promptly inspecting products jointly with Owner and recording shortages, and damaged or defective items.
 6. Handling products at site, including uncrating and storage.
 7. Protecting products from damage.
 8. Installing, including assembly, connections, adjustments, and commissioning in accordance with Contract Documents.
 9. Providing operating oils, lubricants, and incidental materials required for complete installation.
 10. Repairing or replacing items damaged after receipt until date of Substantial Completion of the Work by Owner.
- D. When Owner fails to deliver products in accordance with accepted Construction Schedule, adjustments will be made to Contract Times and Contract Price as stipulated in General Conditions.

1.05 ACTIVITIES BY OTHERS

- A. Activities by others which may affect performance of work include:
1. Stillwater Electric Utility:
 - a. Responsible for supplying overhead electrical power from Yost Road to the recovered water pump station site including:
 - 1) New utility poles.
 - 2) Overhead transformer.
 - 3) Primary conductors.
 - 4) Service drop.
 - 5) Utility metering.
 - b. Installing Fiber Optic cable on the new utility poles and within the plant as indicated on the Drawings and described in the specifications.
 - c. Refer to 26_05_03 for additional requirements.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01_11_02
CONTRACT DOCUMENT LANGUAGE

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Explanation of arrangement, language, reference standards, and format.

1.02 REFERENCES

- A. Construction Specifications Institute (CSI):
 - 1. MasterFormat™.
 - 2. SectionFormat™.
 - 3. PageFormat™.

1.03 PROJECT MANUAL ARRANGEMENT

- A. Document and Section numbers used in Project Manual, and Project Manual arrangement are in accordance with CSI MasterFormat™, except where departures have been deemed necessary.
- B. Sections are written in CSI SectionFormat™, Three-Part Section Format, except where departures have been deemed necessary.
- C. Page format for Sections in the Project Manual is in PageFormat™, except where departures have been deemed necessary.

1.04 CONTRACT DOCUMENT LANGUAGE

- A. Specification Section Paragraphs entitled "Section Includes" summarize briefly what is generally included in the section:
 - 1. Requirements of Contract Documents are not limited by "Section Includes" paragraphs.
- B. Specifications have been partially streamlined by intentionally omitting words and phrases, such as "the Contractor shall," "in conformity therewith," "shall be" following "as indicated," "a," "an," "the" and "all:"
 - 1. Assume missing portions by inference.
- C. Phrase "by Engineer" modifies words such as "accepted," "directed," "selected," "inspected," and "permitted," when they are unmodified.
- D. Phrase "to Engineer" modifies words such as "submit," "report," and "satisfactory," when they are unmodified.

- E. Colons (:) are used to introduce a list of particulars, an appositive, an amplification, or an illustrative quotation:
 - 1. When used as an appositive after designation of product, colons are used in place of words "shall be."
- F. Word "provide" means to manufacture, fabricate, deliver, furnish, install, complete, assemble, erect in place, test, or render ready for use or operation, including necessary related material, labor, appurtenances, services, and incidentals.
- G. Words "Contractor shall" are implied when direction is stated in imperative mood.
- H. Term "products" includes materials and equipment as specified in Section 01_60_00 - Product Requirements.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01_14_00
WORK RESTRICTIONS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Requirements for sequencing and scheduling the Work affected by existing site and facility, work restrictions, and coordination between construction operations and plant operations.

1.02 SUBMITTALS

- A. Baseline Schedule with MOP tasks.
- B. Method of Procedure (MOP) Form.
- C. Method of Procedure (MOP) Log.
- D. Progress Schedule with MOP tasks.

1.03 METHOD OF PROCEDURE (MOP)

- A. Comply with MOP Instructions as specified in Attachment A - Method of Procedure (MOP).
- B. Prepare MOP for the following conditions:
 - 1. Shutdowns, diversions, and tie-ins to the existing facility.
 - 2. Process start-up activities.
 - 3. Power interruption and tie-ins.
 - 4. Switch over between temporary and permanent facilities, equipment, piping, and electrical and instrumentation systems.
 - 5. Process constraints requiring interruption of operating processes or utilities.
- C. Other Work not specifically listed may require MOPs as determined necessary by the Contractor, Owner, or Engineer.
- D. Submit Baseline Schedule, as specified in Section 01_32_21 - Schedules and Reports with proposed MOPs.
- E. Submit MOP Log at construction progress meetings.
- F. No consideration will be given to claims of additional time and cost associated to preparing MOPs required by the Owner and Engineer to complete this work in a manner that facilitates proper operation of the facility and compliance with effluent discharge criteria.

- G. Where required to minimize treatment process interruptions while complying with specified constraints, provide temporary pumping, power, lighting, controls, instrumentation, and safety devices.

1.04 GENERAL CONSTRAINTS ON WORK AND SCHEDULING OF WORK

- A. Plant access for Contractor will be provided off Yost Road at the existing main entrance gate and the west entrance to the Recovered Water Pump Station that is to be constructed as part of this Work.
- B. Perform abandoned pipe Work as specified in Section 01_35_21 -Selective Alterations and Demolition.
- C. Water projects:
 - 1. The Stillwater Water Treatment Plant is the Owner's sole source of drinking water.
 - 2. Conduct Work such that the Owner's ability to meet its customer's demands for treated drinking water shall not be impaired or reduced in terms of the required quantity or quality of treated water. Do not impair the operational capabilities of essential elements of the treatment process or reduce treatment capacity below levels sufficient to meet demands for water throughout the contract time. The quantities of and quality of treated water required are described in this Section.
 - 3. Conduct commissioning activities as specified in Section 01_75_17 - Commissioning in a manner that will not impair capabilities of essential elements of the treatment process or reduce treatment capacity below levels sufficient to meet demands for water throughout the contract time. The quantities of and quality of treated water required are described in this Section.
 - 4. The status of the treatment plant shall be defined as "operational" when the plant is capable of meeting the Owner's customer's demands for treated drinking water in terms of the required quantity or quality of treated water as defined in this Section.

1.05 COMPLIANCE WITH DRINKING WATER PERMIT

- A. The existing facility is operating under the terms of a Drinking Water permit issued by the Oklahoma Department of Environmental Quality (ODEQ):
 - 1. This permit specifies the water quality limits that the plant must meet prior to discharge of finished water.
 - 2. A copy of the existing permit is on file for review at the Stillwater Water Treatment Plant.
- B. Perform work in a manner that will not prevent the existing facility from achieving the finished water quality requirements established by regulations.
- C. Bear the cost of penalties imposed on the Owner for water quality violations caused by actions of the Contractor.
- D. Conduct the Work and provide temporary facilities required to keep the existing plant continuously operational.

- E. Do not remove or demolish existing facilities required to keep the existing plant operational at the capacities specified until the existing facilities are replaced by temporary, new, or upgraded facilities or equipment:
 - 1. Test replacement facilities to demonstrate operational success prior to removing or demolishing existing facilities.
- F. Bear the costs for exceeding the drinking water standards of \$10,000 per day for each day of the occurrence and each subsequent day of a boil water notice.

1.06 UTILITIES

- A. Provide advance notice to and utilize services of Underground Services Alert (U.S.A.) or other for location and marking of underground utilities operated by utility agencies other than the Owner.
- B. Maintain electrical, telephone, water, gas, sanitary facilities, and other utilities within existing facilities in service. Provide temporary utilities when necessary.
- C. New yard utilities were designed using existing facility drawings:
 - 1. Field verification of utilities locations was not performed during design.
 - 2. Services crossed or located nearby by new yard utilities may require relocation and possible shutdowns.
 - 3. Pipe alignments as indicated on the Drawings.

1.07 WORK BY OTHERS

- A. Where proper execution of the Work depends upon work by others, inspect and promptly report discrepancies and defects.

1.08 SHUTDOWN CONSTRAINTS

- A. General shutdown constraints:
 - 1. Execute the Work while the existing facility is in operation.
 - 2. Some activities may be accomplished without a shutdown.
 - 3. Apply to activities of construction regardless of process or work area.
 - 4. Activities that disrupt plant or utilities operations must comply with these shutdown constraints.
 - 5. Organize work to be completed in a minimum number of shutdowns.
 - 6. Provide thorough advanced planning, including having required equipment, materials, and labor on hand at time of shutdown.
 - 7. Shutdown MOPs:
 - a. Advise the Engineer a minimum of 3 weeks prior to need for any complete or partial plant shutdown for tie-ins.
 - b. Prepare and submit MOP to Engineer for any complete or partial plant shutdown required a minimum of 2 weeks prior to the shutdown.
 - c. Owner's written approval of MOP is required prior to beginning Work.
 - 8. Where required to minimize treatment process interruptions while complying with specified constraints, provide temporary pumping, power, lighting, controls, instrumentation, and safety devices.
 - 9. Final determination of the permitting of shutdowns will be the sole judgment of the Owner.

10. Owner maintains the ability to abort on the day of the scheduled shutdown.
 11. Unplanned shutdowns due to emergencies are not specified in this Section.
- B. Unit process availability work limitations:
1. Shutdowns and tie-ins or other activities that disrupt plant operations are prohibited unless specified below or unless otherwise approved in writing by the Owner and Engineer.
- C. Clearwell.
1. Maximum shutdown: 48 hours.
 2. Shutdown must occur between November 1 and February 28.
- D. Northeast Zone discharge piping.
1. Maximum shutdown duration: 4 hours.
 2. Shutdown must occur between November 1 and February 28.
- E. Central Zone discharge piping.
1. Maximum shutdown duration: 24 hours.
 2. Shutdown must occur between November 1 and February 28.
- F. Plant water system.
1. No shutdown is allowed.
- G. Solids contact unit (SCU) sludge blowdown.
1. Maximum shutdown duration: 4 hours.
 2. Two of the three SCUs must remain in service at all times.
- H. Filter backwash system (including piping to lagoons).
1. Maximum shutdown duration: 24 hours.
 2. Shutdown must occur between November 1 and February 28.
- I. Filter surface wash system.
1. Maximum shutdown duration: 24 hours.
 2. Shutdown must occur between November 1 and February 28.
- J. Lagoons.
1. At least one filter backwash wastewater lagoon (L-1002, L-1001A) and one solids blowdown lagoon (L-1001B, L-1001C, L-1001D, L-1001E, L-1001F) must remain in service at all times.
- K. Recovered water pump station (including recycled water return piping between in-service lagoons and pump station).
1. Maximum shutdown duration: 48 hours.
- L. Yost Zone 6-inch suction line.
1. Maximum shutdown duration: 4 hours.
 2. Shutdown must occur between November 1 and February 28.
- M. Gas line.
1. Maximum shutdown duration: 24 hours.
 2. Shutdown must occur between June 1 and August 31.

- N. Plant electrical system:
 - 1. Maximum shutdown duration: 4 hours.
 - 2. Shutdown must occur between November 1 and February 28.
 - 3. Maximum number of shutdowns: 3.
- O. Process, electrical and instrumentation - tie-in shutdowns:
 - 1. Schedule no more than 1 tie-in shutdown per week.

1.09 WORK RESTRICTIONS

- A. New finished water pump station electrical:
 - 1. The following shutdowns of the Plant electrical system will be required to connect the new finished water pump station electrical system:
 - a. Pull in cables.
 - b. Conductor field verification.
 - c. Terminations and cable testing.
 - d. Breaker/relay testing.
 - 2. Shutdowns and tie-ins or other activities that disrupt plant operations are prohibited unless the following unit process availability conditions exist and unless otherwise approved in writing by the Owner and Engineer.
 - 3. Refer to table below for rental generator connection locations and general sizes of generators. Contractor shall submit calculations and field photos/notes (via power demand meters) that indicate the size of all generators is adequate to meet the operational limitations of the demand and loads for each unit process:

Facility	Estimated Generator size	Equipment Connection
Existing Finished Water Pump Station	1-1000kW	Existing transformer XFMR-4394 or XFMR-4395

- 4. Contractor shall perform power monitoring to substantiate generator sizes for each process.
- 5. Contractor shall identify/confirm each connection location based on field investigation and coordination with Stillwater staff. Contractor shall identify the following:
 - a. Location(s) where temporary cables can be routed to not interfere with plant operations.
 - b. Locations where rental generators may be parked to minimize interference with plant operations.
- 6. Remediation efforts contractor will take to minimize these impacts, including, but not limited to safety barriers, sealing around doors or openings to prevent heat loss to personnel spaces, efforts to maintain classified space restrictions, wildlife, etc.
- 7. All equipment located in structures listed in above table must be in service, either provided with power from a utility source or generator source, in order to proceed with a scheduled shutdown, except where noted for connecting/disconnecting rental generator sources.

- B. New finished water pump station:
1. Successful installation of the following yard piping and connections must be complete prior to functional testing:
 - a. Clearwell connection with valves and finished water pump station suction piping and valves.
 - b. Northeast Zone discharge main piping, valves, and connection.
 - c. Central Zone discharge main piping, valves, and connection.
 - d. Yost Zone discharge main piping, valve, and connection.
 - e. Plant water piping, valves, and connection.
 - f. Filter backwash discharge piping, valve, and connection.
 - g. Surface wash discharge piping, valve, and connection.
 2. Successful installation of the new finished water pump station electrical system must be complete prior to functional testing.
 3. Successful completion of functional testing of the new finished water pump station is required prior to startup.
 4. Following startup, complete the following:
 - a. Install restrained plug in tee on west outlet at new plant water discharge connection.
 - b. Install restrained plug in tee on west outlet at new Central Zone discharge connection.
 - c. Cut and cap existing Yost discharge piping east of new connection.
 - d. Install restrained plug in tee on west outlet at new filter backwash discharge connection.
 - e. Install restrained plug in tee on west outlet at new surface wash discharge connection.
- C. New recovered water pump station:
1. Successful installation of the following yard piping and connections must be complete prior to functional testing:
 - a. Lagoon piping improvements (including valves and manholes).
 - b. Recovered water pump station discharge piping and connection.
 - c. Recovered water return piping and new manholes.
 - d. Connection to the existing manhole west of Lagoon 1001C and installation of a temporary plug in the existing piping at the north manhole wall.
 2. Successful installation of the new overhead electrical power supply to the recovered water pump station by Stillwater Electric Utility must be complete prior to functional testing.
 3. Successful completion of functional testing of the new recovered water pump station is required prior to startup.
 4. Following startup, complete connection to the existing manhole west of Lagoon 1001D (including cutting and capping existing piping south of manhole) and remove temporary plug from existing manhole west of Lagoon 1001C (including cutting and capping existing piping north of manhole).
- D. Existing finished water pump station electrical demolition:
1. Successful completion of startup for the new finished water pump station.
- E. Existing recovered water pump station electrical demolition:
1. Successful completion of startup for the new recovered water pump station.

- F. Existing Yost meter vault demolition:
 - 1. Successful completion of startup for the new finished water pump station.
- G. Provide safe, continuous access to process control equipment for plant operations and maintenance personnel.
- H. Maintain truck access to the chemical feed building, lime silo, liquid oxygen storage tank, and carbon dioxide storage tank.
- I. Piping:
 - 1. Provide temporary piping during construction for existing and new equipment to maintain plant operation in service during construction.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

ATTACHMENT A - METHOD OF PROCEDURE (MOP)

“METHOD OF PROCEDURE” (MOP) Instructions and Forms

Definition and Purpose

“Method of Procedure” (MOP) is a detailed document submitted by the Contractor to request process shutdown(s), utility tie-in(s), work in areas that may risk unanticipated outages, or flow diversions to accommodate site construction activities during a project. Such activities may include (but are not limited to) new tie-ins to utilities or structures, mechanical modifications to process piping or equipment, demolition, bulkhead installation, and cleaning processes.

The MOP provides a detailed plan to the Owner and Engineer that describes specific aspects of the work including purpose, time of execution, and anticipated impacts on treatment processes. The MOP also includes contingency measures and provisions for rapid closure in the event that shutdown or work progress difficulties are encountered. Information from relevant trades associated with the requested shutdown, diversion, or tie-in is also included.

The Owner should use the information within the MOP to define operational procedures and methods to safely and successfully assist the Contractor.

MOP Process Summary

WHO	STEP	TIMING
Contractor	1. Identify MOPs needed on MOP Log and Baseline Schedule.	No later than 7 days prior to Preconstruction Scheduling Meeting
Contractor, Owner, Engineer	2. Pre-MOP Meeting.	More than 28 days prior to work
Contractor	3. Submits MOP.	No later than 28 days prior to work
Owner	4. Reviews MOP.	
Owner	5. MOP finalized.	No later than 7 days prior to work
Contractor	6. Complete Readiness Checklist.	No later than 5 days prior to work
Contractor	7. Complete Safety Checklist.	Immediately prior to commencing work
Contractor	8. Complete Work.	
Contractor	9. Update MOP Log and Progress Schedules.	Monthly

MOP Process Detail

STEP 1. Identifies MOPs needed on MOP Log and Baseline Schedule.

Contractor submits a preliminary list of anticipated project MOPs on MOP Log. MOPs identified but not limited to those shutdowns, diversions, or tie-ins described in the Contract Documents. Incorporate MOPs as tasks in Baseline Schedule. Date scheduled MOPs to coincide with the appropriate construction activities.

STEP 2. Pre-MOP Meeting.

Contractor requests a Pre-MOP Meeting with the Owner and Engineer to discuss the nature of the shutdown, diversion, or tie-in, and to gather the information necessary to complete the MOP Form. The pre-MOP meeting may be waived by the Owner or Engineer if the work is deemed to be minor.

STEP 3. Submits MOP.

Contractor completes the MOP Form and submit 3 copies for approval to the Owner's Project Manager (OPM).

STEP 4. Reviews MOP.

OPM distributes MOP Form for review by the Owner's Construction Coordinator, O&M Representative, and Engineer's Project Representative. Review MOP Form for completeness, accuracy, compliance with both the construction schedule, constraints defined in contract documents, and to ensure that the requested work does not negatively impact plant operations or other concurrent project activities. Additional information may be requested to better understand the nature of and method for completing the Work.

STEP 5. MOP finalized.

Once the MOP is agreed to by all parties, the MOP will be finalized by signature. Copies are distributed to the Owner, Engineer, and Contractor.

STEP 6. Complete Readiness Checklist.

Contractor verifies everything is ready for the work.

STEP 7. Complete Safety Checklist.

Contractor ensures safety.

STEP 8. Complete work.

Contractor complete work.

STEP 9. Update MOP Log and Progress Schedules.

Contractor updates MOP Log weekly and distributes at the regularly scheduled construction progress meetings.

ATTACHMENT B - METHOD OF PROCEDURE (MOP) FORM



METHOD OF PROCEDURE (MOP) FORM

Owner:	_____	Date:	_____
Contractor:	_____	Carollo Project No.:	_____
Project Name:	_____	Submittal No.:	_____
Submittal Title:	_____	Spec/Dwg. Reference:	_____

MOP #	Task Title (Provide <10 word title):	Submittal Date: (No later than 28 days prior to work)
-------	--------------------------------------	---

SCHEDULE OF WORK ACTIVITY START: (Date/Time) _____ END: (Date/Time) _____

REQUESTOR: _____

PRIMARY POINT OF CONTACT: _____

PHONE/PAGER: _____

SECONDARY POINT OF CONTACT: _____

PHONE/PAGER: _____

NOTIFY ☐ Control Room, Phone

☐ Security, Phone

BUILDING: _____

LOCATION OF WORK FLOOR/LEVEL: _____

DESCRIPTION OF WORK: (Provide sufficient details on process isolation, work sequencing, and safety (i.e., control of significant hazards unique to the work) to demonstrate an understanding of the work and how it will be completed within the constraints, and its impact on the processes and facility.)

Task Summary: _____

Processes

Affected: _____

Trades Affected: _____

WORK PLAN:

Work Sequencing: _____

Process Isolation: _____

Spill Prevention

Plan: _____

Contingency

Plans: _____

CRITICAL EQUIPMENT/TOOLS: (pumps and discharge hoses with correct fittings, blind flanges and pipe plugs, no-hub fittings, properly sized electrical service components, generators, portable lighting, chlorine for potable water pipe breaks, etc.)

☐	Acoustic Ceiling/or Walls Access	☐	Excavation Permit	☐	Lock Out/Tag Out
☐	Chemical Use Approval	☐	Fire Sprinkler Impairment	☐	Life Safety Systems
☐	Confined Space Permit	☐	Flammable Materials	☐	Roof Protocol
☐	Critical Lift Plan	☐	Flush / Discharge	☐	Work After Dark
☐	Energized Electrical Work	☐	High Pressure Test	☐	
☐	Elect. Panel Schedules	☐	Hot Work/Open Flame	☐	

EXISTING SERVICE(S) AT RISK:

☐	Breathing Air	☐	Elect Normal	☐	Process Access	☐	Telephones
☐	Chemical Distribution	☐	Fire Protection	☐	Safety Showers	☐	UPS
☐	City Water	☐	HVAC	☐	SCADA	☐	VAX/DATA
☐	Communication	☐	Inert Gas	☐	Security	☐	
☐	Domestic Drain	☐	Instrument - Air	☐	Solvent Drain	☐	

Work Restrictions

01_14_00-Attachment B-1

200281

August 2023

pw://Carollo/Documents/Carollo Internal Projects/_Non-Project Specific CAD Files/200281-000000/CAD with Phases/200281-000000_P2/Specifications/Carollo/A2 Specs/01_14_00 (FS100)

☐	Elect-Bus Duct	☐	Life Safety System	☐	Specialty Gases	☐	
☐	Elect Emergency	☐	Natural Gas	☐	Storm Drain	☐	
REVIEWER'S INSTRUCTIONS / COMMENTS:							
☐	PREJOB BRIEFING MUST BE COMPLETED PRIOR TO COMMENCING WORK:						
	Full Name (printed)	Signature	Phone	Date			
Submitted By							
System Owner							
Reviewer (if needed)							
Reviewer (if needed)							
Reviewer (if needed)							
Reviewer (if needed)							

ATTACHMENT C - READINESS CHECKLIST

READINESS CHECKLIST
(5 days prior to work)

Checklist provided as a guide but is not all inclusive.

1. Confirm all parts and materials are on site: _____

2. Review work plan: _____

3. Review contingency plan: _____

ATTACHMENT D - SAFETY CHECKLIST

SAFETY CHECKLIST
(Just prior to commencing work)

Checklist provided as a guide but is not all inclusive.

1. Location awareness:
 - a. Emergency exits: _____
 - b. Emergency shower and eyewash: _____
 - c. Telephones and phone numbers: _____
 - d. Shut-off valve: _____
 - e. Electrical disconnects: _____
2. Inspect work area:
 - a. Take time to survey the area you are working in. Ensure that what you want to do will work. Do you have enough clearance? Is your footing secure? Do you have adequate lighting and ventilation? Are surrounding utilities out of the way for you to perform your work?
3. SDS (Safety Data Sheets):
 - a. Understand the chemicals and substances in the area you are working in by reading the SDS.
4. Lockout/Tagout Procedure:
 - a. Lockout/tagout energy sources before beginning work.
 - b. Make sure all valves associated with the work are locked out and tagged out on each side of the penetration.
 - c. Make sure the lines are depressurized.
5. Overhead work:
 - a. Use appropriate personal protective equipment; i.e., safety harness, lifeline, etc.
 - b. Select appropriate tie-off points; i.e., structurally adequate, not a pipe or conduit, etc.
 - c. Spotter assigned and in position.
 - d. Pipe rack access; i.e., check design capacity, protective decking or scaffolding in place, exposed valves or electrical switches identified and protected.
6. Safety equipment:
 - a. Shepherd's hook.
 - b. ARC flash protection.
 - c. Fire extinguisher.
 - d. Other: _____
7. Accidents:
 - a. Should accidents occur, do not shut off and do not attempt to correct the situation, unless you are absolutely positive that your action will correct the problem and not adversely affect other people or equipment.
8. Review process start-up documents:
 - a. In the event the system is shutdown, the Control Center should have a working knowledge of the process start-up procedures in order to deal effectively with unforeseen events.
9. Evacuation procedures:
 - a. Do not obstruct evacuation routes.
 - b. Take time to survey the area for evacuation routes.

ATTACHMENT E - METHOD OF PROCEDURE (MOP) LOG

METHOD OF PROCEDURE (MOP) LOG
Sample

MOP Number	Task Title	Date Requested	Date Approved	Date Work Planned	Work Completed (yes/no)
001					
002					
003					

SECTION 01_20_20

MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Procedures for measurement and payment of Work under this Contract for lump sum items and unit prices.

1.02 REFERENCES

- A. Occupational Safety and Health Administration (OSHA).

1.03 LUMP SUM ITEMS

- A. Bid Item 1- Mobilization, Demobilization, General Conditions, Bonds, and Insurance:
 - 1. Measurement:
 - a. In the Application for Payments, separate out the following associated with the management and administration of the contract for the execution of Bid Items 2 through 7 as established by these contract documents. These are to specifically exclude any and all costs directly related those activities associated with the unit price:
 - 1) Mobilization and Demobilization from the site including all final punch list items as described in the general conditions. Contractor must submit with payment application a complete definition and line-item description of all items associated with mobilization and demobilization costs.
 - 2) Monthly management and administrative costs spread out through the duration of the project as defined by Bid Items 2 through 7. This shall include the following:
 - a) Monthly on-site administrative and management costs that are excluded from the Lump Sum Prices Established by Bid Items 2 through 7. These shall include the following:
 - (1) Monthly project meetings.
 - (2) Payment applications.
 - (3) Schedule preparation.
 - (4) Submittal preparations.
 - (5) Maintenance of Safety, traffic control, hauling route and QA/QC program throughout the performance of Bid Items 2 and 3.
 - (6) Other construction contract administration and management requirements not directly related to the unit price associated with Bid Items 2 and 3.
 - b) On-site temporary office facilities, utility connection fees, utility usage fees, and other monthly costs determined by Engineer to be a true monthly cost.

- c) All costs associated with the preparation and maintenance of on-site stormwater controls and associated SWPP BMP Plans.
 - d) All state, local, and federal taxes (if applicable).
 - e) Insurance and bonds in accordance with Section 006C - Standard General Conditions.
 - 3) Limit total administrative and operational costs over the duration of the project to less than 25 percent of the costs associated with Bid Items 2 through 7.
 - b. Limit amounts included under mobilization to the following items:
 - 1) Preparation of the site as necessary.
 - 2) Moving on the site any equipment required for the project.
 - 3) Preparing delegated designs as may be required for the preparation of the site as specified in Section 01_35_73 - Delegated Designs.
 - 4) Installing temporary construction power, wiring, and lighting facilities as required for the work as defined in the contract documents.
 - 5) Establish and submit fire protection plan and safety program.
 - 6) Provide temporary facilities as specified in Section 01_50_00 - Temporary Facilities and Controls:
 - a) Providing on-site sanitary facilities and potable water facilities as specified.
 - b) Providing field office trailers for the Contractor as specified.
 - c) Developing construction potable water supply as specified.
 - 7) Arranging for and erection of Contractor's work and storage yard, employee parking facilities, and entrance road.
 - 8) Submit required insurance certificates and bonds.
 - 9) Obtaining required permits, licenses, and fees.
 - 10) Submit preliminary schedule of values of the Work.
 - 11) Submit preliminary schedule and develop baseline schedule.
 - 12) Submit Schedule of Submittals.
 - 13) Submit standardized traffic maintenance and control plans.
 - 14) Post OSHA, Department of Labor, state, and other required notices.
 - 15) Location and flagging of construction and clearing.
 - 16) Submit Contractor's quality control plan.
 - 17) Submit pre-construction photographs and videos.
 - 18) Provide and erect the project sign.
 - 19) Limit total mobilization costs to less than 5 percent of the costs associated with Bid Items 2 through 7.
 - c. Limit amounts included under demobilization, to the following items:
 - 1) Demobilization of any equipment associated with the work required for the project.
 - 2) Removing all temporary facilities and controls.
 - 3) Closure of permits and SWPP.
 - 4) Final site cleaning and restoration.
 - 5) Limit demobilization costs to less than 1 percent of the costs associated with Bid Items 2 through 7.
2. Payment:
 - a. Furnish data and documentation to substantiate the amounts claimed under mobilization and demobilization costs.
 - b. Furnish breakdown of all monthly administrative and overhead costs as defined herein to a monthly rate breakdown based upon the anticipated contract duration for Bid Items 2 through 7.

- c. Payment for mobilization shall not be made until mobilization items listed above have been completed as specified.
 - d. Payment for demobilization shall not be made until demobilization items listed above have been completed as specified.
 - e. Lump sum – Mobilization.
 - f. Lump Sum – Demobilization.
 - g. Lump Sum Monthly Payment Applications – Operations and Administrative costs.
- B. Item 2: Lump sum Item: Recovered Water Pump Station
- 1. Measurement:
 - a. Includes all supervision, labor, materials, tools, equipment, incidentals, and related items required for the construction of the Recovered Water Pump Station, complete in place, in accordance with the Contract Documents, including:
 - 1) Two submersible pumps/motors with variable frequency drives and all associated piping, valves, and other appurtenances.
 - 2) Pre-engineered building, including building foundation and other required structural and architectural improvements.
 - 3) HVAC equipment and associated improvements and appurtenances.
 - 4) Electrical equipment, conduit, wiring, duct bank, electrical manholes and handholes, and associated improvements and appurtenances.
 - 5) Instrumentation and controls equipment, instruments, and associated improvements and appurtenances.
 - 6) Yard piping (designated RWR and D) including manholes, valves, connection to existing piping, and abandoning/removing existing piping as shown on Drawings 01D03, 01D06, 02C03, and 02C06.
 - 7) Sitework including grading, paving, drainage improvements and piping, fencing, and restoration at the pump station site and for the access road from Yost Road to the site as shown on Drawings 01D03, 01D06, 01D10, 01C03, 01C06, and 01C10.
 - 8) Sheet piling, shoring, and bracing for excavations as specified in Section 31_50_00 - Excavation Support and Protection.
 - 9) Storm water pollution prevention as specified in Section 008E - Special Provisions.
 - 10) SCADA integration including programming, testing, and commissioning as described in the Contract Documents.
 - 11) All required testing and commissioning as required in Section 01_75_17 - Commissioning.
 - 12) Any other materials, labor, equipment, or other incidentals not specifically included in another Bid Item required for a complete and functioning system.
 - b. Break down components into Schedule of Values as specified in the Special Provisions.
 - c. Include completeness of components in Application for Payment in accordance with the General Conditions and Special provisions.
 - 2. Payment:
 - a. Lump sum.

- C. Item 3: Lump sum Item: Finished Water Pump Station
1. Measurement:
 - a. Includes all supervision, labor, materials, tools, equipment, incidentals, and related items required for the construction of the Finished Water Pump Station, complete in place, in accordance with the Contract Documents, including:
 - 1) Vertical turbine pumps and motors with variable frequency drives and all associated piping, valves, and other appurtenances for the following systems:
 - a) Central Zone (four pumps)
 - b) Northeast Zone (three pumps)
 - c) Yost Zone (three pumps)
 - d) Filter Backwash (two pumps)
 - e) Filter Surface Wash (two pumps)
 - 2) New CMU pump station building, including building foundation, bridge crane, and other required structural and architectural improvements.
 - 3) HVAC equipment and associated improvements and appurtenances.
 - 4) Electrical equipment, conduit, wiring, duct bank, electrical manholes and handholes, and associated improvements and appurtenances.
 - 5) Instrumentation and controls equipment, instruments, and associated improvements and appurtenances.
 - 6) Yard piping (designated FW, UW, FBW, FSW, and D) including valves, connection to existing piping, and abandoning/removing existing piping as shown on Drawings 01D08, 01D12, 02C08, and 02C12.
 - 7) Sitework including grading, paving, drainage improvements and piping, fencing, and restoration as shown on Drawings 01D08, 01D12, 01C08, and 01C12.
 - 8) Sheet piling, shoring, and bracing for excavations as specified in Section 31_50_00 - Excavation Support and Protection.
 - 9) Storm water pollution prevention as specified in Section 008E - Special Provisions.
 - 10) SCADA integration including programming, testing, and commissioning as described in the Contract Documents.
 - 11) All required testing and commissioning as required in Section 01_75_17 - Commissioning.
 - 12) Any other materials, labor, equipment, or other incidentals not specifically included in another Bid Item required for a complete and functioning system.
 - b. Break down components into Schedule of Values as specified in the Special Provisions.
 - c. Include completeness of components in Application for Payment in accordance with the General Conditions and Special provisions.
 2. Payment:
 - a. Lump sum.

- D. Item 4: Lump sum Item: Piping Demolition/Relocation and Temporary Piping for Construction of Finished Water Pump Station:
- a. Includes all supervision, labor, materials, tools, equipment, incidentals, and related items required for the removal or relocation of existing piping in conflict with construction of the new finished water pump station and installation of temporary piping, complete in place, in accordance with the Contract Documents, including:
 - 1) Removal of the existing abandoned electrical conduit as shown on Drawing 01D12.
 - 2) Relocation of the existing 2-inch gas line as shown on Drawings 01D12 and 02C12.
 - 3) Removal of existing, installation of temporary piping including line stops and tapping saddles with valves, and removal of temporary piping as shown on Drawing 02C18.
 - 4) Sheeting, shoring, and bracing for excavations as specified in Section 31_50_00 - Excavation Support and Protection.
 - 5) Storm water pollution prevention as specified in Section 008E - Special Provisions.
 - 6) Any other materials, labor, equipment, or other incidentals not specifically included in another Bid Item required for a complete and functioning system.
 - b. Break down components into Schedule of Values as specified in the Special Provisions.
 - c. Include completeness of components in Application for Payment in accordance with the General Conditions and Special provisions.
2. Payment:
- a. Lump sum.
- E. Item 5: Lump sum Item: Lagoon Piping Improvements
1. Measurement:
- a. Includes all supervision, labor, materials, tools, equipment, incidentals, and related items required for the construction of the lagoon piping improvements, complete in place, in accordance with the Contract Documents, including:
 - 1) Yard piping (designated FWW) including valves, manholes, connection to existing piping and manholes, and abandoning/removing existing piping and manholes as shown on Drawings 01D07, 01D08, 02C07, and 02C08.
 - 2) Addition of plug valves to existing lagoon inlet piping for Lagoons L1001D, L1001E, and L1001F as shown on Drawings 01D02, 01D04, 02C02, and 02C04.
 - 3) Sitework including grading, paving, and restoration as shown on Drawings 01D07, 01D08, 01C07, and 01C08.
 - 4) Sheeting, shoring, and bracing for excavations as specified in Section 31_50_00 - Excavation Support and Protection.
 - 5) Storm water pollution prevention as specified in Section 008E - Special Provisions.
 - 6) Any other materials, labor, equipment, or other incidentals not specifically included in another Bid Item required for a complete and functioning system.

- b. Break down components into Schedule of Values as specified in the Special Provisions.
 - c. Include completeness of components in Application for Payment in accordance with the General Conditions and Special provisions.
 - 2. Payment:
 - a. Lump sum.
- F. Item 6: Lump sum Item: SCU Manhole and Piping Improvements
 - 1. Measurement:
 - a. Includes all supervision, labor, materials, tools, equipment, incidentals, and related items required for the construction of the SCU manhole and piping improvements, complete in place, in accordance with the Contract Documents, including:
 - 1) Yard piping (designated SL) including connection to existing manholes and removing existing piping as shown on Drawings 01D05, 01D08, 02C05, and 02C08.
 - 2) Modifications to two existing SCU solids blowdown manholes as described in the Contract Documents.
 - 3) Sitework including grading, sidewalk replacement, and restoration as shown on Drawings 01D05, 01D08, 01C05, and 01C08.
 - 4) Bypass pumping including associated piping and other appurtenances (if needed).
 - 5) Sitework including grading, paving, and restoration.
 - 6) Sheet piling, shoring, and bracing for excavations as specified in Section 31_50_00 - Excavation Support and Protection.
 - 7) Storm water pollution prevention as specified in Section 008E - Special Provisions.
 - 8) Any other materials, labor, equipment, or other incidentals not specifically included in another Bid Item required for a complete and functioning system.
 - b. Break down components into Schedule of Values as specified in the Special Provisions.
 - c. Include completeness of components in Application for Payment in accordance with the General Conditions and Special provisions.
 - 2. Payment:
 - a. Lump sum.
- G. Item 7: Lump sum Item: Existing Recovered Water Pump Station and Finished Water Pump Station Electrical Demolition:
 - 1. Measurement:
 - a. Includes all supervision, labor, materials, tools, equipment, incidentals, and related items required for the electrical demolition of the existing recovered water pump station and finished water pump station, in accordance with the Contract Documents, including:
 - 1) Demolition and disposal of the electrical equipment as shown on Drawings 03D01, 03D02, 04D01, 60D01 and 70D01.
 - 2) Any other materials, labor, equipment, or other incidentals not specifically included in another Bid Item required to complete the demolition of the existing recovered water pump station.
 - b. Break down components into Schedule of Values as specified in the Special Provisions.

- c. Include completeness of components in Application for Payment in accordance with the General Conditions and Special provisions.
- 2. Payment:
 - a. Lump sum.

1.04 UNIT PRICE ITEMS

- A. Measurement of quantities:
 - 1. Work paid at a unit price times number of units measured will be measured by Engineer in accordance with United States Standard Measures:
 - a. 1 ton shall consist of 2,000 pounds avoirdupois.
 - 2. Provide and pay for accurate scales:
 - a. Use platform scales of sufficient size and capacity to permit the entire vehicle or combination of vehicles to rest on the scale platform while being weighed.
 - b. Combination vehicles may be weighed as separate units provided they are disconnected while being weighed.
 - c. Have scales inspected and certified as often as necessary to ascertain accuracy.
 - d. Furnish weigh slips and daily summary weigh sheets to Engineer.
 - e. When material is shipped by rail, certified car weights will be acceptable, provided that not more than the actual weight of material will be paid, without consideration of minimum car weight used for assessing freight tariff:
 - f. Car weight will not be acceptable for materials passing through mixing plants.
 - g. Daily, or at shorter intervals when necessary to ensure accuracy, weigh empty trucks used to haul material paid by weight:
 - h. Provide such trucks with plain, unique, permanent, legible identification marks.
 - 3. Reinforcing steel, steel shapes, castings, and similar items paid by weight will be measured by handbook weights for the type and quantity indicated for the Work.
- B. Item 8: Additional Flowable Fill:
 - 1. Measurement:
 - a. Includes work for installation of flowable fill in addition to that defined in the Contract Documents.
 - b. Measurement for payment shall be based on the unit price per cubic yards.
 - c. Owner reserves the right to modify the actual quantity and/or delete this Bid Item from the project at their discretion.
 - d. If not used, a deductive change order will be issued to decrease the contract amount by the amount not used.
 - 2. Payment:
 - a. Unit Price.
- C. Item 9: Additional ODOT Type A Aggregate Base Course:
 - 1. Measurement:
 - a. Includes work for installation of ODOT Type A aggregate base course in addition to that defined in the Contract Documents.

- b. Measurement for payment shall be based on the unit price per cubic yards.
 - c. Owner reserves the right to modify the actual quantity and/or delete this Bid Item from the project at their discretion.
 - d. If not used, a deductive change order will be issued to decrease the contract amount by the amount not used.
 - 2. Payment:
 - a. Unit Price.
- D. Item 10: Additional Rock Excavation:
 - 1. Measurement:
 - a. Includes work for rock excavation in addition to that defined in the Contract Documents.
 - b. Measurement for payment shall be based on the unit price per cubic yards.
 - c. Owner reserves the right to modify the actual quantity and/or delete this Bid Item from the project at their discretion.
 - d. If not used, a deductive change order will be issued to decrease the contract amount by the amount not used.
 - 2. Payment:
 - a. Unit price.
- E. Item 11: Additional Structural Fill:
 - 1. Measurement:
 - a. Includes work for structural fill in addition to that defined in the Contract Documents.
 - b. Measurement for payment shall be based on the unit price per cubic yard.
 - c. Owner reserves the right to modify the actual quantity and/or delete this Bid Item from the project at their discretion.
 - d. If not used, a deductive change order will be issued to decrease the contract amount by the amount not used.
 - 2. Payment:
 - a. Unit price.
- F. Item 12: Temporary Generator Mobilization/Demobilization:
 - 1. Bid for unit price for 480V rental generator to supply power to XFMR-4394 or XFMR-4395 (Existing Finished Water Pump Station) for Generator Mobilization/Demobilization as defined in Paragraph 1.05 herein. Unit price (defined as each instance per generator rental) with characteristics as defined below shall include all taxes, bonds, insurance, fees, overhead, profit, permits, material, labor, equipment, and all other incidentals. This line item includes:
 - a. Contractor's cost to prepare crusher run foundation for generator, mobilize generators and to procure, install, test, and place into working operation temporary conduits and wires from the generator to equipment noted in Section 01_14_00 Work Restrictions.
 - b. Contractor's cost to demobilize generator and disconnect temporary conduits and wires from the generator to equipment noted in Section 01_14_00 - Work Restriction.
 - c. Includes coring into walls, and safety barriers for equipment and personnel as noted in Section 01_14_00 - Work Restrictions.

2. Measurement:
 - a. Measurement shall be based on the unit price bid per each.
 - b. Owner reserves the right to modify the actual quantity and/or delete this Bid Item from the project at their discretion.
 - c. If not used, a deductive change order will be issued to decrease the contract amount by the amount not used.
 3. Payment:
 - a. Unit price.
- G. Item 13: Temporary Generator Rental Cost:
1. Bid for unit price for 480V rental generator to supply power to XFMR-4394 or XFMR-4395 (Existing Finished Water Pump Station) for Rental Cost on a 7-day period as defined in Paragraph 1.05 herein.
 2. Unit price (defined as each instance per generator rental) with characteristics as defined below shall include all taxes, bonds, insurance, fees, overhead, profit, permits, material, labor, equipment, and all other incidentals.
 3. Measurement:
 - a. Measurement shall be based on the unit price bid per each.
 - b. Owner reserves the right to modify the actual quantity and/or delete this Bid Item from the project at their discretion.
 - c. If not used, a deductive change order will be issued to decrease the contract amount by the amount not used.
 4. Payment:
 - a. Unit price.
- H. Item 14: Temporary Generator to XFMR-4394 or XFMR-4395 Operating Cost:
1. Bid for unit price for 480V rental generator to supply power to XFMR-4394 or XFMR-4395 (Existing Finished Water Pump Station) for Generator Mobilization/Demobilization as defined in Paragraph 1.05 herein. Unit price (defined as each instance per generator rental) with characteristics as defined below shall include all taxes, bonds, insurance, fees, overhead, profit, permits, material, labor, equipment, and all other incidentals.
 2. This line item includes all labor, materials, consumables (diesel, filters, etc.) and equipment necessary to operate rental generator. Include supervision of equipment while operating to ensure that it will meet operational requirements, including, but not limited to:
 - a. Generator failure or requiring restart.
 - b. Generator fuel levels and scheduling refueling with plenty of advance time to ensure continuous operation.
 - c. Visual inspection (internal and external) of each generator as it is operating, etc. on a periodic basis to ensure each generator is operating as intended.
 3. Measurement:
 - a. Measurement shall be based on the unit price bid per hour of operation of generator.
 - b. Owner reserves the right to modify the actual quantity and/or delete this Bid Item from the project at their discretion.
 - c. If not used, a deductive change order will be issued to decrease the contract amount by the amount not used.
 4. Payment:
 - a. Unit price.

1.05 GENERATOR ITEM DESCRIPTIONS

- A. Included within individual generator pay items where noted:
 - 1. Unit price (defined as each instance per generator rental) with characteristics as defined below shall include all taxes, bonds, insurance, fees, overhead, profit, permits, material, labor, equipment, and all other incidentals.
 - 2. Generator Mobilization/Demobilization:
 - a. Contractor's cost to prepare crusher run foundation for generator, mobilize generators and to procure, install, test, and place into working operation temporary conduits and wires from the generator to equipment noted in Section 01_14_00 - Work Restrictions.
 - b. Contractor's cost to demobilize generator and disconnect temporary conduits and wires from the generator to equipment noted in Section 01_14_00 - Work Restrictions.
 - c. Includes coring into walls, and safety barriers for equipment and personnel as noted in Section 01_14_00 - Work Restrictions.
 - 3. Generator Rental Cost:
 - a. Contractor's cost to rent 480V generator (whether running or not) for a 7 calendar-day period.
 - 4. Generator Operating Cost:
 - a. Unit price shall include all labor, materials, consumables (diesel, filters, etc.) and equipment necessary to operate rental generator. Include supervision of equipment while operating to ensure that it will meet operational requirements, including, but not limited to:
 - 1) Generator failure or requiring restart.
 - 2) Generator fuel levels and scheduling refueling with plenty of advance time to ensure continuous operation.
 - 3) Visual inspection (internal and external) of each generator as it is operating, etc. on a periodic basis to ensure each generator is operating as intended.
 - b. Unit price shall be measured by hours of operation of generator.
 - c. When submitting pay application, provide record of hours operated.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01_26_00

CONTRACT MODIFICATION PROCEDURES

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Administrative and procedural requirements for executing a change in the Work.

1.02 PRELIMINARY REQUIREMENTS

- A. Change Order Cost Basis Summary Form:
 - 1. Submit a sample to Engineer for review within 15 calendar days following Notice to Proceed.
 - a. Items will be reviewed and their value, percentage, or calculation method mutually agreed to by the Contractor and Owner prior to executing a Change Order on the Project.
 - 2. Used by the Contractor for pricing each Change Order required for additions, deletions, or revisions in the Work.
 - 3. Include the following information:
 - a. Agreed upon markups, percentages, and procedures for calculating all surcharges, etc. associated with the Cost of the Change Order Work.
 - b. References for unit price information and special unit price information.
 - c. Attachments with the following information:
 - 1) Certified labor rates breakdown.
 - 2) Equipment rates.
 - 3) Bond and insurance rates (PI&I).

1.03 REQUEST FOR INFORMATION OR INTERPRETATION (RFI)

- A. Contractor may issue RFIs to request interpretation of the documents or to request for information that may be missing.
- B. General Instructions:
 - 1. Number RFIs consecutively.
 - a. Add a consecutive letter to the RFI number on modified submittals of the same RFI (i.e., RFI 4B).
 - 2. Provide RFI for 1 item.
 - a. There may be exceptions when multiple items are so functionally related that expediency indicates review of the group of items as a whole.
 - b. RFIs with multiple items will be rejected without review.
 - 3. Contractor sign and date RFIs indicating review and approval.
 - a. Contractor's signature indicates that they have satisfied RFI review responsibilities and constitutes Contractor's written approval of RFI.

- b. RFIs without Contractor's signature will be returned to the Contractor unreviewed. Subsequent submittal of this information will be counted as the first resubmittal.
- C. Engineer will render a written clarification, interpretation, or decision on the issue submitted or initiate an amendment or supplement to the Contract within 21 days:
 - 1. In the event the Contractor identifies an RFI as critical to the progress of the project, Engineer will make every effort to reduce the RFI response time.

1.04 PRELIMINARY PROCEDURES

- A. Owner or Engineer may initiate changes by submitting a Request for Proposal (RFP) to Contractor including the following information:
 - 1. Detailed description of the Change, Products, and location of the change in the Project.
 - 2. Supplementary or revised drawings or specifications.
 - 3. Projected time span for making the change, and a specific statement if overtime work is authorized.
 - 4. A specific period of time during which the requested price will be considered valid.
 - 5. Such request is for information only, and is not an instruction to execute the changes, or to stop work in progress.
- B. Contractor may initiate changes by submitting a Change Proposal to Engineer containing the following:
 - 1. Description of proposed changes.
 - 2. Reason for making changes.
 - 3. Specific period of time during which requested price will be considered valid.
 - 4. Effect on Total Contract Cost and/or Contract Time.
 - 5. Documentation supporting any change in Total Contract Cost and/or Contract Time, as appropriate.

1.05 WORK CHANGE DIRECTIVE AUTHORIZATION

- A. In lieu of a Request for Proposal (RFP), Engineer may issue a Work Change Directive Authorization for Contractor to proceed with a change for subsequent inclusion in a Change Order.
- B. Authorization will describe changes in the Work, both additions and deletions, with attachments of revised Contract Documents to define details of the change and will designate method of determining any change in the Contract Sum and/or the Contract Time, as appropriate.
- C. Owner and Engineer will sign and date the Work Change Directive Authorization as authorization for the Contractor to proceed with the changes.
- D. Contractor may sign and date the Work Change Directive Authorization to indicate agreement with the terms.

1.06 DOCUMENTATION OF CHANGE PROPOSALS

- A. Change proposal:
 - 1. Support with sufficient substantiating data to allow Engineer to evaluate the quotation.
 - a. Lump sum.
 - b. Unit prices: Use previously established unit prices.
 - c. Time-and-material/force account basis:
 - 1) Name of the Owner's authorized agent who ordered the work, and date of the order.
 - 2) Dates and times work was performed, and by whom.
 - 3) Time record, summary of hours worked, and hourly rates paid.
 - 4) Receipts and invoices for:
 - a) Equipment used, listing dates and times of use.
 - b) Products used, listing of quantities.
 - c) Subcontracts.
 - 2. Provide additional data to support time and cost computations:
 - a. Labor required.
 - b. Equipment required.
 - c. Products required:
 - 1) Recommended source of purchase and unit cost.
 - 2) Quantities required.
 - d. Taxes, insurance, and bonds.
 - e. Credit for work deleted from Contract, similarly documented.
 - f. Overhead and profit.
 - g. Justification for change to Contract Time.

1.07 PREPARATION OF CHANGE ORDERS AND FIELD ORDERS

- A. Engineer will prepare each Change Order and Field Order.
- B. Change Orders:
 - 1. Will describe changes in the Work, both additions and deletions, with attachments of revised Contract Documents to define details of the change.
 - 2. Will provide an accounting of the adjustment in the Contract Sum and in the Contract Time.
 - 3. Recommendation of Change Proposal is indicated by Engineer's signature.
 - 4. Upon signature and execution by Owner, the Change Proposal becomes a Change Order altering the Contract Time and Total Contract Cost, as indicated.
 - a. Owner's Representative will transmit one signed copy each to Contractor and Engineer.
 - 5. Contractor may only request payment for changes in the Work against an approved Change Order.
 - 6. If either Engineer or Owner's Representative disapproves the Change Proposal, the reason for disapproval will be stated.
 - a. A request for a revised proposal or cancellation of the proposal will be shown.

- C. Field Orders:
 - 1. Order minor changes in the Work without changes in Contract Price or Contract Times.

1.08 LUMP-SUM/FIXED PRICE CHANGE ORDER

- A. Content of Change Orders will be based on, either:
 - 1. Engineer's Proposal Request and Contractor's responsive Change Proposal as mutually agreed between Owner and Contractor.
 - 2. Contractor's Change Proposal for a change, as recommended by Engineer.
- B. Owner and Engineer will sign and date the Change Order to establish the change in Contract Sum and in Contract Time and serve as authorization for the Contractor to proceed with the changes.
- C. Contractor will sign and date the Change Order to indicate agreement with the terms.

1.09 UNIT PRICE CHANGE ORDER

- A. Content of Change Orders will be based on, either:
 - 1. Engineer's definition of the scope of the required changes.
 - 2. Contractor's Change Proposal for a change, recommended by Engineer.
 - 3. Survey of completed work.
- B. The amounts of the unit prices to be:
 - 1. Those stated in the Contract.
 - 2. Those mutually agreed upon between Owner and Contractor.
- C. When quantities of each of the items affected by the Change Order can be determined prior to start of the work:
 - 1. Owner and Engineer will sign and date the Change Order as authorization for Contractor to proceed with the changes.
 - 2. Contractor will sign and date the Change Order to indicate agreement with the terms.
- D. When quantities of the items cannot be determined prior to start of the work:
 - 1. Engineer or Owner will issue a Work Change Directive authorization directing Contractor to proceed with the change on the basis of unit prices, and will cite the applicable unit prices.
 - 2. At completion of the change, Engineer will determine the cost of such work based on the unit prices and quantities used.
 - 3. Contractor shall submit documentation to establish the number of units of each item and any claims for a change in Contract Time.
- E. Owner and Engineer will sign and date the Change Order to establish the change in Contract Sum and in Contract Time and serve as authorization for the Contractor to proceed with the changes.
- F. Contractor will sign and date the Change Order to indicate their agreement with the terms.

1.10 TIME AND MATERIAL/FORCE ACCOUNT CHANGE ORDER/WORK CHANGE DIRECTIVE AUTHORIZATION

- A. Engineer will issue a Work Change Directive for the Owner's signature authorizing Contractor to proceed with the changes.
- B. At completion of the change, Contractor shall submit itemized accounting and supporting data as specified in this Section.
- C. Engineer will determine the allowable cost of such work, as provided in the Contract Documents.
- D. Owner and Engineer will sign and date the Change Order to establish the change in Contract Sum and in Contract Time and serve as authorization for the Contractor to proceed with the changes.
- E. Contractor will sign and date the Change Order to indicate their agreement.

1.11 CORRELATION WITH CONTRACTOR'S SUBMITTALS

- A. Periodically revise Schedule of Values and Applications for Payment forms to record each Change Order as a separate item of Work, and to record the adjusted Contract Sum.
- B. Periodically revise the Construction Schedule to reflect each change in Contract Time. Revise subschedules to show changes for other items of work affected by the changes.
- C. Upon completion of work under a Change Order, enter pertinent changes in Record Documents.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01_29_73
SCHEDULE OF VALUES

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Requirements for preparation, format, and submittal of Schedule of Values.

1.02 PREPARATION

- A. Schedule of Values shall be a listing of all cost loaded, on-site construction activities from the progress schedule, listed in numerical order, showing that the sum total of all cost-loaded activities equal the Contract value.
- B. When the schedule is changed or revised to include added or deleted work, the Schedule of Values shall also be revised such that the sum total of all cost-loaded activities continuously equal the current Contract value:
 - 1. Equate the aggregate of these costs to the Lump Sum Contract Price.
- C. Prepare Schedule of Values identifying costs of Major Items of Work.

1.03 SUBMITTALS

- A. Submit Schedule of Values for the Preliminary Schedule as specified in, Section 01_32_21 - Schedules and Reports.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01_29_77
APPLICATIONS FOR PAYMENT

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Procedures for preparation and submittal of Applications for Payment.

1.02 FORMAT

- A. Develop satisfactory spreadsheet-type form generated by downloading cost data from the Progress Schedule:
 - 1. Submit payment requests and attach spreadsheet with cost data related to Progress Schedule.
- B. Fill in information required on form.
- C. When Change Orders are executed, add Change Orders at end of listing of scheduled activities:
 - 1. Identify change order by number and description.
 - 2. Provide cost of change order in appropriate column.
- D. After completing, submit Application for Payment.
- E. Engineer will review application for accuracy. When accurate, Engineer will transmit application to Owner for processing of payment.
- F. Execute application with signature of responsible officer of Contractor.

1.03 SUBSTANTIATING DATA

- A. Provide Substantiating Data identifying:
 - 1. Project.
 - 2. Application number and date.
 - 3. Cost flow summary.
 - 4. Updated schedule of values.
 - 5. Progress schedule.
 - 6. Detailed list of enclosures.
 - 7. Stored products log.
 - 8. Equipment log.
 - 9. Submit "certified" payroll, if applicable.
 - 10. Record (as-built) documents.
 - 11. Photos and videos from current pay period.
 - 12. Applicable unconditional waiver and release on progress payment for previous payment made by Owner.

1.04 SUBMITTALS

- A. Submit Application for Payment and Substantiating Data with cover letter to Owner via email. Hard copies are not required.

1.05 PAYMENT REQUESTS

- A. Prepare progress payment requests on a monthly basis. Base requests on the breakdowns of costs for each scheduled activity and the percentage of completion for each activity.
- B. Indicate total dollar amount of work planned for every month of the project. Equate sum of monthly amounts to Lump Sum Contract Price.
- C. Generate Progress Payment request forms by downloading cost data from the schedule information to a spreadsheet type format.
- D. Identify each activity on the Progress Schedule that has a cost associated with it, the cost for each activity, the estimated percent complete for each activity, and the value of work completed for both the payment period and job to date.
- E. Prepare summary of cost information for each Major Item of Work listed in the Schedule of Values. Identify the value of work completed for both the payment period and job to date.
- F. Payment period:
 - 1. Monthly Application for Payment period shall begin on the 1st day of each month, and end on the last day of each month.
 - 2. Submit Application for Payment to Engineer no later than the 5th day of each month for work completed the previous month.
 - 3. Engineer will finalize and submit recommendation for Application for Payment to Owner by the 15th day of each month to allow time for processing and approval.

1.06 COST SUMMARIES

- A. Prepare Summary of Cost Information for each Major Item of Work listed in the Schedule of Values. Identify the Value of Work Completed for both the payment period and job to date.
- B. Cash flow summary: Prepare cash flow summary, indicating total dollar amount of work planned for each month of the project. Equate sum of monthly amounts to Lump Sum contract price.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01_31_19

PROJECT MEETINGS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Requirements for conducting conferences and meetings for the purposes of addressing issues related to the Work, reviewing and coordinating progress of the Work and other matters of common interest, and includes the following:
1. Qualifications of Meeting Participants.
 2. Basic Meeting Requirements
 3. Pre-construction Conference.
 4. Pre-construction Safety Conference.
 5. Pre-submittal Conference.
 6. Web Based Construction Document Management Software Training.
 7. Progress Meetings.
 8. Schedule Update Meetings.
 9. Quality Control Meetings.
 10. Pre-Installation Meetings.
 11. Maintenance Of Plant Operations (MOPO) Meetings.
 12. Commissioning Coordination Meetings.
 13. Instrumentation and Control Coordination Meetings.
 14. Close-out Meeting.
 15. Post Construction Meeting.

1.02 QUALIFICATIONS OF MEETING PARTICIPANTS

- A. Representatives of entities participating in meetings shall be qualified and authorized to act on behalf of entity each represents.

1.03 BASIC MEETING REQUIREMENTS

- A. Attendees:
1. Meeting leader shall require attendance of parties directly affecting, or affected by, Work being discussed at the meeting.
- B. Location:
1. In location convenient for most invitees.
- C. Notification:
1. Meeting leader shall notify attendees of meeting, including an agenda, a minimum of 7 days prior to meeting.
- D. Agenda:
1. Meeting leader shall prepare copies of agenda for participants and distribute at the meeting.

2. Minimum requirements:
 - a. Meeting purpose.
 - b. Review minutes of previous meeting.
 - c. Safety and security.
 - d. Discuss issues.
 - e. Action items.
 - f. Next meeting.
- E. Meeting minutes:
 1. Meeting leader shall provide draft minutes within 7 days of meeting and send to all attendees for comment within 7 days.
 2. Meeting leader shall incorporate comments from attendees and submit final meeting minutes to attendees within 7 days of receipt of comments.

1.04 PRE-CONSTRUCTION CONFERENCE

- A. Engineer leads the meeting.
- B. Timing:
 1. Upon issuance of Notice to Proceed, or earlier when mutually agreeable.
- C. Attendees:
 1. Contractor's project manager and superintendent, Owner, Engineer, representatives of utilities, major subcontractors and others involved in performance of the Work, and others necessary to agenda.
- D. Agenda minimum requirements:
 1. Meeting purpose:
 - a. To establish working understanding between parties and to discuss Construction Schedule, shop drawing and other submittals, cost breakdown of major lump sum items, processing of submittals and applications for payment, and other subjects pertinent to execution of the Work.
 2. Review minutes of previous meeting.
 3. Adequacy of distribution of Contract Documents.
 4. Distribution and discussion of list of major subcontractors and suppliers.
 5. Proposed progress schedules and critical construction sequencing.
 6. Major equipment deliveries and priorities.
 7. Project coordination.
 8. Designation of responsible personnel.
 9. Procedures and processing of:
 - a. Field decisions.
 - b. Proposal requests.
 - c. Submittals - separate meeting.
 - d. Change Orders.
 - e. Request for Information/Interpretations.
 - f. Applications for Payment.
 - g. Record Documents.
 10. Use of premises:
 - a. Office, construction, and storage areas.
 - b. Owner's requirements.

11. Construction facilities, controls, and construction aids.
12. Temporary utilities.
13. Safety and first aid procedures.
14. Security procedures.
15. Housekeeping procedures.
16. Safety and security.
17. Review proposed photographer submittal.
18. Action items.
19. Next meeting.

1.05 PRECONSTRUCTION SCHEDULING MEETING

- A. Engineer will conduct Preconstruction Scheduling Meeting with Contractor's Project Manager, General Superintendent, and scheduler within 7 calendar days after Notice to Proceed:
 1. This meeting is separate from the Preconstruction Conference Meeting and is intended to exclusively cover schedule issues.
- B. At the meeting, review scheduling requirements:
 1. These include schedule preparation, reporting requirements, labor and equipment loading, updates, revisions, and schedule delay analysis.
 2. Present schedule methodology, planned sequence of operations, cost and resource loading methodology, and proposed activity coding structure.
 3. Naming convention: Name schedule files with the year, month and day of the data date, revision identifier, and a description of the schedule:
 - a. Example 1: 2014_07_30 rev 1 draft baseline schedule.xer.
 - b. Example 2: 2014_09_30 rev 2 sep final update.xer.
- C. Filing: Post submitted files to Owner's construction document control system.

1.06 PRE-CONSTRUCTION SAFETY CONFERENCE

- A. Engineer leads the meeting.
- B. Timing:
 1. Upon issuance of Notice to Proceed, or earlier when mutually agreeable.
- C. Attendees:
 1. Contractor's project manager, safety representative, and superintendent; Owner, Engineer, representatives of utilities, major subcontractors and others involved in performance of the Work, and others necessary to agenda.
- D. Agenda minimum requirements:
 1. Meeting purpose:
 - a. To establish safety procedures and identify lead participants.
 2. Review minutes of previous meeting.
 3. Safety and first aid procedures.
 4. Review of Experience Modification Rating for Contractor and each subcontractor.
 5. Security procedures.
 6. Housekeeping procedures.

7. Safety and security.
8. Action items.
9. Next meeting.

1.07 PRE-SUBMITTAL CONFERENCE

- A. Engineer leads the meeting.
- B. Timing:
 1. Prior to producing any submittals.
- C. Attendees:
 1. Contractor's project manager and superintendent, Owner, Engineer, representatives of utilities, major subcontractors, individual equipment manufacturers furnishing major pieces of equipment, and others involved in performance of the Work, and others necessary to agenda.
- D. Agenda minimum requirements:
 1. Meeting purpose:
 - a. Reviewing the entire Project, equipment, schedules, and submittal requirements.
 2. Review equipment list.
 3. Review submittal schedule.
 4. Format of submittals.
 5. Procedures and processing of submittals:
 - a. Review turn-around time.
 6. Discuss specific electrical and instrumentation and controls submittal requirements.
 7. Safety and security.
 8. Action items.
 9. Next meeting.

1.08 WEB BASED CONSTRUCTION DOCUMENT MANAGEMENT SOFTWARE TRAINING

- A. Contractor can submit a written request to the Engineer to waive the training based on staff having sufficient familiarity with the software and its complete usage. Engineer will lead the meeting.
- B. Timing:
 1. Upon issuance of Notice to Proceed, or earlier when mutually agreeable.
 2. Duration minimum: 2 hours.
- C. Attendees:
 1. Mandatory attendance:
 - a. Contractor's project manager.
 - b. Contractor's field superintendent.
 - c. Contractor's project engineer.
 2. Other attendees:
 - a. Owner, Engineer, Contractor's quality control manager, Contractor's project scheduler and any other persons involved with preparing and transmitting documents.

- D. Agenda minimum requirements:
 - 1. Meeting purpose:
 - a. Train construction team on the use of the web based document management system software.
 - 2. Safety.
 - 3. General Items.
 - 4. Contractor functions.
 - 5. Owner functions.
 - 6. Engineer functions.
 - 7. Action items.

1.09 PROGRESS MEETINGS

- A. Engineer will lead the meeting.
- B. Timing:
 - 1. Hold meetings throughout progress of the Work at maximum monthly intervals.
- C. Attendees:
 - 1. Owner, Engineer, Contractor, Contractor's Project Manager, superintendent, quality control manager, project scheduler, major subcontractors and suppliers as appropriate to agenda topics for each meeting.
 - 2. Additional invitees:
 - a. Owner utility companies when the Work affects their interests, and others necessary to agenda.
- D. Agenda minimum requirements:
 - 1. Meeting purpose:
 - a. To discuss project progress.
 - 2. Review minutes of previous meeting.
 - 3. Safety and security.
 - 4. Construction schedule summary.
 - 5. Review of 6 weeks schedule:
 - a. Contractor shall provide printed hard copies for each attendee.
 - 6. Review of off-site fabrication and delivery schedules.
 - 7. Review of submittals schedule and status of submittals.
 - 8. Request for information (RFI's) status.
 - 9. MOP's/shutdown coordination.
 - 10. Change order management status.
 - 11. Maintenance of quality standards (QA/QC).
 - 12. Field observations, problems, and conflicts.
 - 13. Commissioning.
 - 14. Partnering recognition status (optional).
 - 15. General Items.
 - 16. Action items.
 - 17. Next meeting.

1.10 SCHEDULE UPDATE MEETINGS

- A. Contractor leads the meeting.

- B. Timing:
 - 1. Hold meetings throughout progress of the Work at maximum monthly intervals.
- C. Attendees:
 - 1. Owner, Engineer, Contractor, Contractor's Project Manager, General Superintendent, project scheduler, major subcontractors and suppliers as appropriate to agenda topics for each meeting.
 - 2. Additional invitees:
 - a. Owner utility companies when the Work affects their interests and others necessary to the agenda.
- D. Agenda minimum requirements:
 - 1. Meeting purpose:
 - a. Discuss project schedule.
 - 2. Review minutes of previous meeting.
 - 3. Review Monthly Schedule, (Actual Progress and Variance):
 - a. "Activities Started/Completed" this period.
 - b. "Activities Started/Completed" "Variance" Baseline vs. current.
 - c. "Added/Deleted Activities".
 - d. "Revised Activity Descriptions".
 - e. Any significant Proposed Logic Changes.
 - 4. Review milestone "Substantial Completion" Schedule:
 - a. "Critical" Activities - "Critical Area, Float and Vital Statistics".
 - 5. Review "Cumulative and Monthly Costs" graph.
 - 6. Review "Budgeted Cost" indicating the Current Project Budgeted Cost.
 - 7. Safety and security.
 - 8. Action items.
 - 9. Next meeting.

1.11 QUALITY CONTROL MEETINGS

- A. Contractor leads the meeting.
- B. Timing:
 - 1. Hold meetings throughout progress of the Work at maximum monthly intervals.
- C. Attendees:
 - 1. Engineer, Construction Manager and staff, Contractor's Quality Control Manager, and staff.
- D. Agenda minimum requirements:
 - 1. Meeting purpose:
 - a. Discuss quality control activities.
 - 2. Review minutes of previous meeting.
 - 3. Review of Work progress and schedule.
 - 4. Review of out-of-compliance inspection or test results.
 - 5. Field observations, problems, and decisions.
 - 6. Review of offsite fabrication and delivery schedules.
 - 7. Planned progress during succeeding work period.
 - 8. Coordination of required inspections and tests.
 - 9. Review 6-week schedule report with upcoming inspections and special tests.

10. Maintenance of quality and work standards.
11. Other business relating to Work.
12. Safety and security.
13. Action items.
14. Next meeting.

1.12 PRE-INSTALLATION MEETINGS

- A. Contractor leads the meeting.
- B. Timing:
 1. When specified in Technical Sections or requested by Engineer, convene pre-installation meeting at Project site before commencing Work of specific section.
- C. Attendees:
 1. Require attendance of parties directly affecting, or affected by installation, including Engineer, specific work crews, Owner's construction, operations, and maintenance staff.
- D. Agenda minimum requirements:
 1. Meeting purpose:
 - a. Review conditions of installation, preparation and installation procedures.
 - b. Review coordination with related work.
 2. Review minutes of previous meeting.
 3. Safety and security.
 4. Action items.
 5. Next meeting.

1.13 PRE-SHUTDOWN MEETINGS

- A. Contractor leads the meeting.
- B. Timing:
 1. Short-term and longer-term shutdowns and other tie-ins that require an Owner approved MOP require a pre-shutdown meeting at Project site at least 5 working days prior to commencing shutdown for tie-in or modification of specific plant systems.
- C. Attendees:
 1. Require attendance of parties directly affecting, or affected by shutdown, including Engineer, specific work crews, Owner's construction, operations, and maintenance staff.
- D. Agenda minimum requirements:
 1. Meeting purpose:
 - a. Coordinate shutdown activities.
 2. Review minutes of previous meeting.
 3. Review accepted Construction Method of Procedure (MOP), as specified in Attachment A of Section 01_14_00 - Work Restrictions, including conditions of shutdown, preparation, and installation procedures.

4. Review timelines and sequences.
5. Review responsibilities.
6. Review dry run plan and schedule, as necessary.
7. Review coordination with related work.
8. Safety and security.
9. Action items.
10. Next meeting.

1.14 COMMISSIONING COORDINATION MEETINGS

- A. Contractor leads the meeting.
- B. Timing:
 1. Separate commissioning coordination meetings will be scheduled as required by Engineer.
- C. Attendees:
 1. Require attendance of parties directly affecting, or affected by process start-up and testing, including Engineer, Commissioning Coordinator, specific work crews, Owner's operations, and maintenance staff.
- D. Agenda minimum requirements:
 1. Meeting purpose:
 - a. Coordinate commissioning activities.
 2. Review minutes of previous meeting.
 3. Review Commissioning Schedule.
 4. Review Owner Training Schedule.
 5. Review test plans.
 6. Review accepted Construction Method of Procedure (MOP), as specified in Attachment A of Section 01_14_00 - Work Restrictions.
 7. Owner makes final decision for commissioning GO or NO GO.
 8. Safety and security.
 9. Action items.
 10. Next meeting.

1.15 INSTRUMENTATION AND CONTROL COORDINATION MEETINGS

- A. Meetings and conferences as specified in Section 40_61_00 - Common Work Results for Process Control and Instrumentation Systems.

1.16 CLOSE-OUT MEETING

- A. Engineer leads the meeting.
- B. Timing:
 1. After punch list items are completed.
- C. Attendees:
 1. Owner, Engineer, Contractor, Contractor's Project Manager, and Superintendent.

- D. Agenda minimum requirements:
 - 1. Meeting purpose:
 - a. Coordinate close-out activities.
 - 2. Review minutes of previous meeting.
 - 3. Review punch list completion.
 - 4. Transfer of record documents.
 - 5. Finalize payment.
 - 6. Safety and security.
 - 7. Action items.
 - 8. Next meeting.

1.17 POST CONSTRUCTION MEETING

- A. Engineer leads the meeting.
- B. Attendees:
 - 1. Engineer, Contractor, appropriate manufacturers, and installers of major units of constructions, affected subcontractors, and Owner's operations and maintenance staff.
- C. Timing:
 - 1. About 11 months after date of Substantial Completion.
- D. Location:
 - 1. Meet in Owner's office or other mutually agreed upon place.
- E. Agenda minimum requirements:
 - 1. Meeting purpose:
 - a. Review project for compliance with Contract Documents.
 - 2. Inspect the Work and draft list of items to be completed or corrected.
 - 3. Review service and maintenance contracts and take appropriate corrective action when necessary.
 - 4. Complete or correct defective work and may extend correction period .
 - 5. Safety and security.
 - 6. Action items.
 - 7. Next meeting.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01_31_24

WEB BASED CONSTRUCTION DOCUMENT MANAGEMENT

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Requirements for web-based construction document management.

1.02 REQUIREMENTS

- A. Owner, Engineer, and Contractor shall utilize the specified EADOC, web-based construction management software, for submission of data and documents:
 - 1. Web based construction management software is available to all Contractor's personnel, subcontractor personnel, suppliers, consultants, Owner, and Engineer at no cost.
 - 2. The joint use of this system is to facilitate electronic exchange of information, automation of key processes, and overall management of Contract Documentation.
 - 3. Web based construction management software shall be the primary means of project information submission and management.

1.03 USER ACCESS LIMITATIONS

- A. Provide a list of Contractor's key web based construction management software personnel for the Engineer's acceptance.
- B. The Engineer reserves the right to perform a security check on all potential users:
 - 1. The Contractor will be allowed to add additional personnel and subcontractors to the web-based construction management software.
 - 2. Subcontractors and suppliers will be given access to web-based construction management software by and through the Contractor.
 - 3. Contractor is responsible for adding and removing users from the system after the initial setup by the Engineer.
- C. The Engineer will grant initial access to the web-based construction management software by creating user profiles to accepted Contractor personnel:
 - 1. User profiles will define levels of access into the system; determine assigned function based authorizations and user privileges.

1.04 JOINT OWNERSHIP OF DATA

- A. Data entered in a collaborative mode (entered with the intent to share as determined by permissions and workflows within the web-based construction management software system) by Engineer and Contractor will be jointly owned.

1.05 AUTOMATED SYSTEM NOTIFICATION AND AUDIT LOG TRACKING

- A. Review comments made (or lack thereof) by Owner on Contractor submitted documentation shall not relieve Contractor from compliance with requirements of the Contract Documents.
- B. Contractor is responsible for managing, tracking, and documenting the Work to comply with the requirements of the Contract Documents.
- C. Owner's acceptance via automated system notifications or audit logs extends only to the face value of the submitted documentation and does not constitute validation of the Contractor's submitted information.

1.06 COMPUTER REQUIREMENTS

- A. Contractor shall use computer hardware and software that meets the requirements of the web-based construction management software system as recommended by the web-based construction management software to access and utilize the web-based construction management software.
- B. As recommendations are modified by the web-based construction management software, Contractor will upgrade their system(s) to meet or exceed the recommendations:
 - 1. Upgrading of Contractor's computer systems will not be justification for a cost or time modification to the Contract.
- C. Contractor shall ensure that connectivity to the web-based construction management software system is accomplished through DSL, cable, T-1 or wireless communications systems:
 - 1. The minimum bandwidth requirement for using the system is 128 kb/s. It is recommended a faster connection be used when uploading pictures and files into the system.
- D. Web-based construction management software supports the current and prior 2 major versions of Chrome, Mozilla's Firefox, Microsoft's Internet Explorer, and Apple's Safari on a rolling basis:
 - 1. Each time a new version of one of these browsers is released the web-based construction management software will begin supporting the update and stop supporting the fourth-oldest version.

1.07 CONTRACTOR RESPONSIBILITY

- A. Contractor shall be responsible for the validity of their information placed in the web-based construction management software and for the abilities of their personnel.
- B. Entry of information exchanged and transferred between the Contractor and its subcontractors and suppliers on the web-based construction management software shall be the responsibility of the Contractor.

- C. Accepted users shall be knowledgeable in the use of computers, including Internet Browsers, email programs, cad drawing applications, and Adobe Portable Document Format (PDF) document distribution program.
- D. Contractor shall utilize the existing forms in the web-based construction management software to the maximum extent possible. If a form does not exist in the web-based construction management software the Contractor must include a form of their own or provided by Engineer as an attachment to a submittal.
- E. Adobe PDF documents will be created through electronic conversion rather than optically scanned whenever possible. Contractor is responsible for the training of their personnel in the use of the web-based construction management software (outside what is provided by Owner) and the other programs indicated above as needed.

1.08 TRAINING

- A. The Contractor shall arrange and pay for web-based training on using web-based construction management software if needed.
- B. Contractor shall arrange and pay for the facilities and hardware/software required to facilitate Contractor's training.

PART 2 PRODUCTS

2.01 DESCRIPTION

- A. Web-based construction management software provided by EADOC.

PART 3 EXECUTION

3.01 WEB-BASED CONSTRUCTION MANAGEMENT SOFTWARE UTILIZATION

- A. Web-based construction management software shall be utilized in connection with all document and information management required by these Contract Documents.

3.02 SUBMITTALS

- A. Use the web-based construction management software feature for Master Submittals List:
 - 1. Contractor shall select from the predefined submittals list.
- B. Content: As specified in Section 01_33_00 - Submittal Procedures.
- C. Format: As specified in Section 01_33_00 - Submittal Procedures.
- D. Submit Portable Document Format (PDF) documents to the web-based construction management software submittal work flow process and forms:
 - 1. Consolidate electronic format submittals with multiples pages into a single file.

- E. Hardcopy submittals:
 - 1. Contractor shall provide 3 hard copies of submittals within 14 days of the Submittal being closed.
 - 2. Hardcopy requirements as specified in Section 01_33_00 - Submittal Procedures.
- F. Samples:
 - 1. Contractor shall enter submittal data information into the web-based construction management software.
 - 2. Attach a copy of the submittal form(s) to the sample.
- G. Record And Closeout Submittals:
 - 1. Operation and maintenance data as specified in Section 01_78_24 - Operation and Maintenance Manuals.
 - 2. Extra materials, spare parts, etc.

3.03 REQUESTS FOR INFORMATION/INTERPRETATION (RFI)

- A. Use web-based construction management software for RFIs as specified in Section 01_26_00 - Contract Modification Procedures.

3.04 OFFICIAL CORRESPONDENCE

- A. Use web-based construction management software for memos, notices, change proposals, or any official correspondence.

3.05 INSPECTION REQUESTS

- A. Use web-based construction management software to request inspection for a portion of Work that is ready for inspection and prior to covering up the Work.

3.06 FINANCIAL SUBMITTALS

- A. Use web-based construction management software for financial submittals as specified in Section 01_33_00 - Submittal Procedures.

3.07 OTHER

- A. Use web-based construction management software for daily reports, meeting agendas and minutes, and other construction documents.

END OF SECTION

SECTION 01_32_21
SCHEDULES AND REPORTS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Schedules and reports.

1.02 SUBMITTAL REQUIREMENTS

- A. Submit preliminary and baseline schedule.
- B. Submit preliminary and baseline schedule of values.
- C. Submit preliminary and baseline schedule of submittals.
- D. Submit, on a monthly basis, updated schedules as specified.
- E. Submit final schedule update as specified.
- F. Submit revised schedules and time impact analyses as specified.
- G. Submit schedules in the media and number of copies as follows:
1. Provide each submittal in PDF format and in other formats specified in this Section.
 2. CPM network and/or bar chart (as specified by the Owner) on D-size sheets:
 - a. Color-coding to be specified by the Owner.
 3. Tabular reports listing all activities sorted numerically identifying duration, early start, late start, early finish, late finish, total float, and all predecessor/successor information.
 4. CPM Schedule data electronic files in a native backed-up file (.xer).

1.03 SCHEDULER

- A. Designate, in writing and within 5 calendar days after Notice of Award, the person responsible for preparation, maintenance, updating, and revision of all schedules.
- B. Qualifications of scheduler:
1. Authority to act on behalf of Contractor.
 2. A minimum of 5 years verifiable experience in preparation of construction schedules for projects of similar value, size, and complexity.
 3. Knowledge of critical path method (CPM) scheduling utilizing Primavera P6 Professional or or Asta Powerproject software.

1.04 SCHEDULING FORMAT AND SOFTWARE

- A. Schedule format: Utilize CPM format.

- B. Provide a cost and labor loaded schedule.
- C. Contractor and Engineer must agree on the format.

1.05 SCHEDULING HARDWARE AND SOFTWARE

- A. All scheduling software and hardware located on-site.
- B. Prepare computerized schedule utilizing the most current version of Oracle Primavera P6 or Asta Powerproject.
 - 1. Provide 1 licensed copy of the scheduling software to the Engineer, registered in the Engineer's name, for the duration of the Project.
 - 2. The provided copy of the software shall be a standalone version for installation on a standalone computer.
- C. Contractor and Engineer must agree on the format.

1.06 PRE-CONSTRUCTION SCHEDULING MEETING

- A. As specified in Section 01_31_19 - Project Meetings.

1.07 REVIEW AND ACCEPTANCE OF SCHEDULES

- A. Engineer will review Baseline Schedule, Schedule Updates, Schedule Revisions and Time Impact Analyses to ascertain compliance with specified project constraints, compliance with milestone dates, reasonableness of durations and sequence, accurate inter-relationships, and completeness.
- B. Engineer and Owner will issue written comments following completion of review of Baseline Schedule within 21 calendar days after receipt.
- C. Written comments on review of Schedule Updates and Schedule Revisions and Time Impact Analyses will be returned to Contractor within 14 calendar days after receipt by Engineer.
- D. Revise and resubmit schedule in accordance with Engineer's comments within 7 calendar days after receipt of such comments or request joint meeting to resolve objections.
- E. If Engineer requests a meeting, the Contractor and all major subcontractors must participate in the meeting with Engineer:
 - 1. Revise and resubmit schedule within 7 calendar days after meeting.
- F. Use accepted schedule for planning, organizing, and directing the work and for reporting progress.
- G. Engineer's submittal review response:
 - 1. When schedule reflects Owner's and Contractor's agreement of project approach and sequence, schedule will be accepted by Owner.
 - 2. Engineer's submittal review response for schedule submittal will be "Receipt Acknowledged - Filed for Record" including applicable comments.

3. Acceptance of the schedules by the Owner is for general conformance with the Contract Documents and for Owner's planning information and does not relieve the Contractor of sole responsibility for planning, coordinating, and executing the Work within the contract completion dates:
 - a. Omissions and errors in the accepted schedules shall not excuse performance less than that required by the Contract Documents.
 - b. Acceptance by the Owner in no way constitutes an evaluation or validation of the Contractor's plan, sequence or means, methods, and techniques of construction.

1.08 SCHEDULE UPDATES

- A. Any update:
 1. Prepare update using most recent accepted version of schedule including:
 - a. Actual start dates of activities that have been started.
 - b. Actual finish dates of activities that have been completed.
 - c. Percentage of completion of activities that have been started but not finished.
 - d. Actual dates on which milestones were achieved.
 - e. Update activities by inputting percent complete figures with actual dates.
 - f. Use retained logic in preparing Schedule Updates.
 - g. When necessary, input remaining durations for activities whose finish dates cannot be calculated accurately with a percent complete figure only.
 - h. Revisions to the schedule may be included that have been previously approved as specified in this Section under Revisions to Schedule.
- B. Monthly progress meeting schedule updates:
 1. Update the schedule prior to monthly progress meeting:
 - a. Identify overall progress of each Major Item of Work in the Summary Schedule.
 - b. If there are significant changes to the schedule, submit a written report at the monthly progress meeting including the descriptions of the following:
 - 1) Activities added to or deleted from the schedule are to adhere to cost and other resource loading requirements:
 - a) Identify added activities in manner distinctly different from original activity designations.
 - 2) Changes in sequence or estimated duration of activities.
 - 3) Current or anticipated problems and delays affecting progress, impact of these problems and delays and measures taken to mitigate impact.
 - 4) Assumptions made and activities affected by incorporating change order work into the schedule.
 2. Should Monthly Schedule Update show project completion earlier than current Contract completion date, show early completion time as schedule activity, identified as "Project Float".
 3. Should Monthly Schedule Update show project completion later than current Contract completion date, prepare and submit a Schedule Revision in accordance with the Revisions to Schedule.
 4. Submit schedule and materials specified under Submittal of Progress Schedules, 5 calendar days before the monthly progress meeting.

5. Since Monthly Schedule Update is the application for progress payment required as specified in Section 01_29_77 – Applications for Payment, submittal and acceptance of the Monthly Schedule Update is a condition precedent to the making of any progress payments.

1.09 REVISIONS TO SCHEDULE

- A. Submit Revised Schedule within 5 days:
 1. When delay in completion of any activity or group of activities indicates an overrun of the Contract Time or milestone dates by 20 working days or 5 percent of the remaining duration, whichever is less.
 2. When delays in submittals, deliveries, or work stoppages are encountered making necessary the replanning or rescheduling of activities.
 3. When the schedule does not represent the actual progress of activities.
 4. When any change to the sequence of activities, the completion date for major portions of the work, or when changes occur which affect the critical path.
 5. When Contract modification necessitates schedule revision, submit schedule analysis of change order work with cost proposal.
- B. Create a separate submittal for Schedule Revisions:
 1. Comply with schedule updates as specified in this Section.
 2. Do not submit with Schedule Updates.
- C. Schedule Revisions will not be reflected in the schedule until after the revision is accepted by the Owner:
 1. This includes Schedule Revisions submitted for the purpose of mitigating a Contractor-caused project delay (Recovery Schedule).

1.10 ADJUSTMENT OF CONTRACT TIME OR PRICE

- A. Contract Time will be adjusted only for causes specified in Contract Documents:
 1. Non-excusable delay:
 - a. Non-excusable delays include actions or inactions of the Contractor, or events for which the Contractor has assumed contractual responsibility (including actions or inactions of subcontractors, suppliers, or material manufacturers at any tier) that would independently delay the completion of the Work beyond the current Contract completion date).
 - b. No time extensions will be granted for non-excusable delays.
 2. Excusable delay:
 - a. Events which are unforeseeable, outside the control of, and without the fault or negligence of either the Owner or the Contractor (or any party for whom either is responsible), which would independently delay the completion of the Work beyond the current Contract completion date.
 - b. The Contractor is entitled to a time extension only.
 - c. No other damages will be approved.
 3. Compensable delay:
 - a. Actions or inactions of the Owner, or events for which the Owner has assumed contractual responsibility, which would independently delay the completion of the Work beyond the current Contract completion date.
 - b. The Contractor is entitled to a time extension and delay damages.

4. Concurrent delay:
 - a. Concurrent delay is any combination of the above 3 types of delay occurring on the same calendar date.
 - b. Exception to concurrent delay:
 - 1) Cases where the combination consists of 2 or more instances of the same type of delay occurring on the same calendar date.
 - 2) When one cause of delay is Owner-caused or caused by an event which is beyond the control and without the fault or negligence of either the Owner or the Contractor and the other Contractor-caused, the Contractor is entitled only to a time extension and no delay damages.

CONTRACTOR'S ELIGIBILITY FOR TIME AND/OR EXTENDED OVERHEAD				
DELAY TYPE	NONCONCURRENT DELAY	DELAY CONCURRENT WITH		
Nonexcusable	X	X	T	T
Compensable	TEO	T	TEO	T
Noncompensable	T	T	T	T
ELIGIBILITY				
X: No Time and No Extended Overhead T: Time EO: Extended Overhead				

- B. If the Contractor believes that the Owner has impacted its work, such that the project completion date will be delayed, the Contractor must submit proof demonstrating the delay to the critical path:
 1. This proof, in the form of a Time Impact Analysis, may entitle the Contractor to an adjustment of Contract Time.
- C. Time Impact Analysis:
 1. Use the accepted schedule update that is current relative to the time frame of the delay event (change order, third party delay, or other Owner-caused delay). Represent the delay event in the schedule by:
 - a. Inserting new activities associated with the delay event into the schedule.
 - b. Revising activity logic.
 - c. Revising activity durations.
 2. If the project schedule's critical path and completion date are impacted as a result of adding this delay event to the schedule, a time extension equal to the magnitude of the impact may be warranted.
 3. The Time Impact Analysis submittal must include the following information:
 - a. A fragment of the portion of the schedule affected by the delay event.
 - b. A narrative explanation of the delay issue and how it impacted the schedule.
 - c. A schedule file used to perform the Time Impact Analysis.
- D. When a delay to the project as a whole can be avoided by revising preferential sequencing or logic, and the Contractor chooses not to implement the revisions, the

Contractor will be entitled to a time extension and no compensation for extended overhead.

- E. Indicate clearly that the Contractor has used, in full, all project float available for the work involved in the request, including any float that may exist between the Contractor's planned completion date and the Contract completion date:
 - 1. Utilize the latest version of the Schedule Update accepted at the time of the alleged delay, and all other relevant information, to determine the adjustment of the Contract Time.
- F. Adjustment of the Contract Times will be granted only when the Contract Float has been fully utilized and only when the revised date of completion of the Work has been pushed beyond the Contract completion date:
 - 1. Adjustment of the Contract Times will be made only for the number of days that the planned completion of the work has been extended.
- G. Actual delays in activities which do not affect the critical path work or which do not move the Contractor's planned completion date beyond the Contract completion date will not be the basis for an adjustment to the Contract Time.
- H. If completion of the project occurs within the specified Contract Time, the Contractor is not entitled to job-site or home office overhead beyond the Contractor's originally planned occupancy of the site.
- I. Notify Engineer of a request for Contract Time adjustment:
 - 1. Submit request as specified in the Contract Documents.
 - 2. In cases where the Contractor does not submit a request for Contract Time adjustment for a specific change order, delay, or Contractor request within the specified period of time, then it is mutually agreed that the particular change order, delay, or Contractor request has no time impact on the Contract completion date and no time extension is required.
- J. The Engineer will, within 30 calendar days after receipt of a Contract Time adjustment, request any supporting evidence, review the facts, and advise the Contractor in writing:
 - 1. Include the new Progress Schedule data, if accepted by the Owner, in the next monthly Schedule Update.
 - 2. When the Owner has not yet made a final determination as to the adjustment of the Contract Time, and the parties are unable to agree as to the amount of the adjustment to be reflected in the Progress Schedule, reflect that amount of time adjustment in the Progress Schedule as the Engineer may accept as appropriate for such interim purpose.
 - 3. It is understood and agreed that any such interim acceptance by the Engineer shall not be binding and shall be made only for the purpose of continuing to schedule the Work, until such time as a final determination as to any adjustment of the Contract Time acceptable to the Engineer has been made.
 - 4. Revise the Progress Schedule prepared thereafter in accordance with the final decision.

1.11 SCHEDULE PREPARATION

- A. Preparation and submittal of Progress Schedule represents Contractor's intention to execute the Work within specified time and constraints:
 - 1. Failure to conform to requirement may result in termination for cause.
- B. Contractor's bid covers all costs associated with the execution of the Work in accordance with the Progress Schedule.
- C. During preparation of the preliminary Progress Schedule, Engineer will facilitate Contractor's efforts by being available to answer questions regarding sequencing issues, scheduling constraints, interface points, and dependency relationships.
- D. Prepare schedule utilizing Precedence Diagramming Method (PDM).
- E. Prepare schedule utilizing activity durations in terms of working days:
 - 1. Do not exceed 15 working day duration on activities except concrete curing, submittal review, and equipment fabrication and deliveries.
 - 2. Where duration of continuous work exceeds 15 working days, subdivide activities by location, stationing, or other sub-element of the Work.
 - 3. Coordinate holidays to be observed with the Owner and incorporate them into the schedule as non-working days.
- F. Failure to include an activity required for execution of the Work does not excuse Contractor from completing the Work and portions thereof within specified times and at price specified in Contract:
 - 1. Contract requirements are not waived by failure of Contractor to include required schedule constraints, sequences, or milestones in schedule.
 - 2. Contract requirements are not waived by Owner's acceptance of the schedule. In event of conflict between accepted schedule and Contract requirements, terms of Contract govern at all times, unless requirements are waived in writing by the Owner.
- G. Reference schedule to working days with beginning of Contract Time as Day "1".
- H. Baseline Schedule and Project Completion:
 - 1. Should Contractor submit a Baseline Schedule showing project completion more than 20 working days prior to Contract completion date, Owner may issue Change Order, at no cost to Owner, revising time of performance of Work and Contract completion date to match Contractor's schedule completion date.
 - 2. Adjust accordingly any Contract milestone dates.
- I. Imposed dates, hidden logic prohibited: Do not use imposed dates or hidden logic in preparation of schedule.
- J. Interim milestone dates, operational constraints:
 - 1. In event there are interim milestone dates and/or operational constraints set forth in Contract, show them on schedule.
 - 2. Do not use Zero Total Float constraint or Mandatory Finish Date on such Contract requirements.

- K. Contract float is for the mutual benefit of both Owner and Contractor.
1. Changes to the project that can be accomplished within this available period of float may be made by Owner without extending the Contract Time, by utilizing float.
 2. Time extensions will not be granted nor delay damages owed until Work extends beyond currently accepted Contract completion date.
 3. Likewise, Contractor may utilize float to offset delays other than delays caused by Owner.
 4. Mutual use of float can continue until all available float shown by schedule has been utilized by either Owner or Contractor, or both. At that time, extensions of the Contract Time will be granted by Owner for valid Owner-caused or third party-caused delays which affect the planned completion date and which have been properly documented and demonstrated by Contractor.
 5. Non-sequestering of float: Pursuant to float sharing requirements of Contract, schedule submittals can be rejected for, use of float suppression techniques such as preferential sequencing or logic, special lead or lag logic restraints, extended activity durations or imposed dates.
- L. Resource loading and leveling:
1. Input labor and equipment data on each schedule activity:
 2. Manpower data consist of the man-hours estimated to perform each task, categorized by trade.
 3. Provide leveled manpower requirements.
 - a. Availability of the resources drive activity duration.
- M. Cost loading: All schedules:
1. Only on-site construction activities.
 2. The sum total of all cost loaded activities equal to the current value of the Contract, including change orders, at all times.
 3. Payment for mobilization or payment for materials or equipment delivered to the site, not yet incorporated into the Work.
 4. Owner acceptance of the Baseline Schedule creates the Schedule of Values required as specified in Section 01_29_73 - Schedule of Values.
 5. Provide updated Schedule of Values as the monthly Payment Application as specified in Section 01_29_77 - Applications for Payment.
 6. Payments will not be made until updated Schedule of Values is accepted.
- N. Schedule logic:
1. Assembled to show order in which Contractor proposes to carry out Work, indicate restrictions of access, availability of Work areas, and availability and use of manpower, materials, and equipment.
 2. Form basis for assembly of schedule logic on the following criteria:
 - a. Which activities must be completed before subsequent activities can be started?
 - b. Which activities can be performed concurrently?
 - c. Which activities must be started immediately following completed activities?
 - d. What major facility, equipment, or manpower restrictions are required for sequencing these activities?

- O. Major subcontractor, parallel prime contractor sign off:
 - 1. Provide written confirmation of concurrence from all major subcontractors and independent prime contractors on site with all schedule submittals.
 - 2. Term "major subcontractor" as used in this Section means any subcontractor, at any tier, with a subcontract worth 5 percent or more of the total cost of the Work.
- P. Schedule windows for Owner-furnished, Contractor-installed equipment or materials:
 - 1. Immediately after Award of Contract, obtain from Engineer anticipated delivery dates of Owner furnished equipment or materials.
 - 2. Show these dates in the schedule in same manner indicated by Engineer.
- Q. Commissioning schedule:
 - 1. Commissioning activities and milestones shall be an integral part of the overall project schedule.
 - 2. Commissioning activities and milestones shall be extracted from the main project schedule to provide a separate commissioning schedule that is submitted each time the project schedule is submitted.

1.12 NETWORK DETAILS AND GRAPHICAL OUTPUT

- A. Produce a clear, legible, and accurate calendar based, time scaled, and graphical network diagram:
 - 1. Group activities related to the same physical areas of the Work. Produce the network diagram based upon the early start of all activities.
- B. Include for each activity, the description, activity number, estimated duration in working days, total float, and all activity relationship lines.
- C. Illustrate order and interdependence of activities and sequence in which Work is planned to be accomplished:
 - 1. Incorporate the basic concept of the precedence diagram network method to show how the start of 1 activity is dependent upon the start or completion of preceding activities and its completion restricts the start of following activities.
- D. Provide schedule showing the critical path for the project.
 - 1. Critical Path is defined as a sequence of activities that has zero total float.
- E. Provide report of Near Critical Path activities for the project, when required by Engineer.
 - 1. Near Critical Path activities are those with 15 working days or less of float.
- F. Identify system shutdown dates, system tie-in dates, specified interim completion or milestone dates and contract completion date as milestones.
- G. Include, in addition to construction activities:
 - 1. Submission dates and review periods for major equipment submittals, shoring submittals, and indicator pile program:
 - a. Shoring reviews: Allow 4-week review period for each shoring submittal.

- b. Pile indicator program: Allow 3-week review period for analysis of program.
 - 2. Any activity by the Owner or the Engineer that may affect progress or required completion dates.
 - 3. Equipment and long-lead material deliveries over 8 weeks.
 - 4. Approvals required by regulatory agencies or other third parties.
- H. Produce network diagram on 22-inch by 34-inch sheets with grid coordinate system on the border of all sheets utilizing alpha and numeric designations.
- I. Identify the execution of the following:
- 1. Mobilization.
 - 2. All required submittals and submittal review times showing 30 calendar day duration for such activities and equal amount of time for re-submittal reviews.
 - 3. Equipment and materials procurement/fabrication/delivery.
 - 4. Excavation.
 - 5. Shoring design and submission of detailed shoring submittals. Identify submission as a milestone.
 - 6. Shoring review, shoring materials procurement, shoring installation, and shoring removal.
 - 7. Piles.
 - 8. Backfill and compaction.
 - 9. Dewatering.
 - 10. Grading, subbase, base, paving, and curb and gutters.
 - 11. Fencing and landscaping.
 - 12. Concrete, including installation of forms and reinforcement, placement of concrete, curing, stripping, finishing, and patching.
 - 13. Tests for leakage of concrete structures intended to hold water.
 - 14. Masonry.
 - 15. Metal fastenings, framing, structures, and fabrications.
 - 16. Waterproofing and dampproofing, insulation, roofing and flashing, and sealants.
 - 17. Doors and windows, including hardware and glazing.
 - 18. Finishes including coating and painting, flooring, ceiling, and wall covering.
 - 19. Pumps and drives, including identification of ordering lead time, factory testing, and installation.
 - 20. Conveying equipment including hoists and cranes, conveyor systems, and materials handling equipment, including identification of ordering lead-time and installation.
 - 21. Other mechanical equipment including fans and heating, ventilating, and air conditioning equipment.
 - 22. Trenching, pipe laying, and trench backfill and compaction.
 - 23. Piping, fittings, and appurtenances, including identification of ordering and fabrication lead time, layout, installation and testing.
 - 24. Valves, gates, and operators, including identification of order lead-time, installation, and testing.
 - 25. Plumbing specialties.
 - 26. Electric transmission, service, and distribution equipment, including identification of ordering lead-time, and factory testing.
 - 27. Other electrical work including lighting, heating and cooling, and special systems, including identification of ordering lead-time.

28. Instrumentation and controls, including identification of ordering lead-time.
29. Preliminary testing of equipment, instrumentation, and controls.
30. Commissioning Phase:
 - a. Source Testing.
 - b. Owner Training.
 - c. Installation Testing.
 - d. Functional Testing.
 - e. Clean Water Facility Testing.
31. Process Start-up Phase:
 - a. Process Start-up.
 - b. Process Operational Period.
 - c. Instrumentation and Controls Performance Testing.
32. Substantial completion.
33. Punch list work.
34. Demobilization.

1.13 WEATHER DAY ALLOWANCE

- A. Definition:
 1. Weather conditions that prevent or inhibit the Contractor's performance of the Work and affect the Critical Path indicated on the Schedule shall be referred to as a Weather Day.
 2. A Weather Day is defined as the Contractor being unable to perform at least 4 hours of work on the Critical Path due to weather conditions and any reasonable duration for recovery work necessary for the Contractor to recover operations from the weather event.
- B. Allowance:
 1. Include as a separate identifiable activity on the critical path, an activity labeled "Weather Days Allowance".
 2. Allowance for weather days shall be as established by the project contract schedule and the allowable weather days established in Article 12 of the Standard General Conditions of the Construction Contract.
- C. Actual weather day:
 1. Insert a weather delay activity in critical path to reflect actual weather day occurrences when weather days are experienced and accepted by Engineer.
 2. Reduce duration of Weather Days Allowance activity as weather delays are experienced and inserted into the Schedule. Remaining weather days in Weather Day Allowance at completion of project is considered float.
 3. The Contractor shall provide a written notice to the Engineer of the occurrence of a weather day within 2 days after the onset of such weather and shall describe in reasonable detail the type of weather encountered and the Work interfered with or interrupted:
 - a. A schedule update will not suffice as a written notice.
 - b. The Engineer will determine if the weather day constitutes a use of a portion of the Weather Day Allowance.
 - c. After use of all the Weather Day Allowance, the Engineer will determine if the Contractor is entitled to an extension of the Contract Time due to weather conditions.
 - d. Weather days are considered excusable delay as defined in this Section.

1.14 PRELIMINARY SCHEDULE

- A. Procedure:
 - 1. Submit proposed Preliminary Schedule within 14 calendar days after Notice to Proceed.
 - 2. Meet with Engineer within 7 calendar days after receipt of Preliminary Schedule to review and make necessary adjustments.
 - 3. Submit revised Preliminary Schedule within 5 calendar days after meeting.
 - 4. Update Preliminary Schedule monthly until the Baseline Schedule is accepted.
- B. Format:
 - 1. Simplified Gantt chart.
- C. Activities:
 - 1. Define activities to be completed in the first 90 calendar days of Work.
 - 2. Actualize activities performed during the first 90 days into the first monthly schedule update.

1.15 PRELIMINARY SCHEDULE OF VALUES

- A. Preliminary Schedule of Values as specified in in Section 01_29_73 - Schedule of Values.
- B. Procedure:
 - 1. Submit proposed Preliminary Schedule of Values within 14 calendar days after Notice to Proceed.
 - 2. Meet with Engineer within 7 calendar days after receipt of Preliminary Schedule of Values to review and make necessary adjustments.
 - 3. Submit revised Preliminary Schedule of Values within 5 calendar days after meeting.

1.16 WORK WITHIN THE FIRST 90 DAYS

- A. Proceed with Work after Preliminary Schedule and Preliminary Schedule of Values have been accepted by Owner.
- B. Submittal and acceptance of Preliminary Schedule and Preliminary Schedule of Values is condition precedent to making of progress payments as specified in Section 0129401_29_77 - Applications for Payment and payments for mobilization costs otherwise provided for in the Contract.

1.17 SCHEDULE OF SUBMITTALS

- A. Schedule of Submittals shall include submittals required in the Contract Documents but not limited to test plans, training plans, test procedures, operation and maintenance manuals, shop drawings, samples, record documents, and specifically required certificates, warranties, and service agreements:
 - 1. Data for "Or Equals" or substitutions shall be submitted with the Schedule of Submittals.

- B. Preliminary Schedule of Submittals:
1. Due date: After Preliminary Schedule has been submitted and accepted by Owner.
 2. Format:
 - a. Include submittals anticipated in the first 90 calendar days after award of contract using early start dates.
 - b. Indicate week and month anticipated for submittal to Engineer.
 - c. Indicate "Priority" submittals where review time can impact Contractor's schedule:
 - 1) "Priority" indication will not alter review times specified in Section 01_33_00 - Submittal Procedures.
 - 2) Engineer will endeavor to provide early review of "Priority" submittals where possible.
 - d. List of "Or Equals" or substitutions.
 3. Submittal of Preliminary Schedule of Submittals shall be a condition precedent to Owner making progress payments during the first 90 calendar days after award of contract.
- C. Final Schedule of Submittals:
1. Due date: 30 days after Baseline Schedule has been submitted and accepted by Owner.
 2. Format:
 - a. Include submittals using early start dates.
 - b. Include all submittals, including those required in the Preliminary Schedule of Submittals.
 - c. Indicate week and month anticipated for submittal to Engineer.
 - d. Indicate "Priority" submittals where review time can impact Contractor's schedule:
 - 1) "Priority" indication will not alter review times specified in Section 01_33_00 - Submittal Procedures.
 - 2) Engineer will endeavor to provide early review of "Priority" submittals where possible.
 - e. Data for "Or Equals" or substitutions.
 3. Submittal of Final Schedule of Submittals shall be a condition precedent to Owner making progress payments after the first 90 calendar days after Notice to Proceed.
- D. Provide updated Schedule of Submittals with updated schedules if schedule revisions change listing and timing of submittals.

1.18 BASELINE SCHEDULE AND BASELINE SCHEDULE OF VALUES

- A. Due date: No more than 45 calendar days after Notice to Proceed.
- B. Format:
1. Schedule: Show sequence and interdependence of all activities required for complete performance of all Work, beginning with date of Notice to Proceed and concluding with date of final completion of Contract.
 2. Schedule of Values: As specified in Section 01_29_73 - Schedule of Values.

- C. Acceptance of the Baseline Schedule and Baseline Schedule of Values by the Owner is a condition precedent to making payments as specified in Section 01_29_77 - Applications for Payment after the first 90 calendar days after Notice to Proceed.

1.19 SUMMARY SCHEDULE

- A. Due date: At monthly progress meetings and after each Schedule Update or Schedule Revision.
- B. Format:
 - 1. Consolidate groups of activities associated with Major Items of Work shown on Baseline Schedule.
 - 2. intended to give an overall indication of the project schedule without a large amount of detail.

1.20 COST FLOW SUMMARY

- A. Due date: After Baseline Schedule has been submitted and accepted by the Owner, submit on a monthly basis as specified in Section 01_29_77 - Applications for Payment.
- B. Format:
 - 1. Tabular and graphic report showing anticipated earnings each month of the Contract period.
 - 2. Base tabulation on the summation of the cost-loaded activities each month.
 - 3. Show planned amounts.
 - 4. Show actual earned amounts and anticipated remaining earnings.
 - 5. Spreadsheet format of all schedule activities showing cost and percentage completion during the current month for which payment is sought.

1.21 UPDATED SCHEDULE OF VALUES

- A. Due date: Submit on a monthly basis as specified in Section 01_29_77 - Applications for Payment.
- B. Format: Schedule of Values: As specified in Section 01_29_73 - Schedule of Values.

1.22 MONTHLY SCHEDULE UPDATE

- A. Due date: At every monthly progress meeting.
- B. Format:
 - 1. Contractor and Engineer must agree on the format.
 - 2. Schedule showing the activities completed during the previous month and the Contractor's schedule of activities for following month.

3. Use the logic and conform to the status of the current progress schedule when producing a Weekly Schedule in CPM schedule or a bar chart format:
 - a. In the event that the Weekly Schedule no longer conforms to the current schedule, Contractor may be required to revise the schedule as specified in this Section.
4. The activity designations used in the Monthly Schedule must be consistent with those used in the Baseline Schedule and the monthly Schedule Updates.

1.23 LABOR HISTOGRAM

- A. Due date:
 1. With progress payments after Baseline Schedule has been submitted and accepted by Owner.
- B. Format:
 1. Labor histogram depicting total craft manpower and craft manpower for Contractor's own labor forces and those of each subcontractor.
 2. Submit in electronic format.

1.24 EQUIPMENT SCHEDULE

- A. Due date: With any progress payment after Baseline Schedule has been submitted and accepted by Owner if it includes payment for equipment.
- B. Format:
 1. Tabular report listing each major piece of construction equipment to be used in performing the Work.
 2. Include major equipment for Contractor and each subcontractor.
 3. Submit electronically in Excel format with 1 paper copy.
- C. Progress payments after the first 90 calendar days after Notice to Proceed will not be made until equipment schedule is provided.

1.25 COMMISSIONING SCHEDULE

- A. Proposed Commissioning Schedule:
 1. Schedule requirements: As specified in Section 01_75_17 - Commissioning.
 2. Submittal due date: Within 120 days after Notice to Proceed.
 3. Engineer response due within 20 calendar days of receipt.
 4. Contractor responsible for updating schedule and resubmitting within 10 calendar days of receipt of Engineer and Owner comments.
- B. Construction Schedule can include the Commissioning Schedule after Engineer acceptance of the Proposed Commissioning Schedule:
 1. Capable of extracting a stand-alone Commissioning Schedule.
 2. Capable of extracting a stand-alone Owner Training Schedule.
- C. Monthly update requirements:
 1. Highlight percentages of completion, actual start and finish dates, and remaining durations, as applicable.

2. Include activities not previously included in the previously accepted detail work plan Commissioning Schedule.
3. Change Order required for any change to contractual dates.
4. Reviews of these submittals by Engineer will not be construed to constitute acceptance within the time frames, durations, or sequence of work for each added activity.

1.26 FINAL SCHEDULE

- A. The final Schedule Update becomes the As-Built Schedule:
 1. The As-Built Schedule reflects the exact manner in which the project was constructed by reflecting actual start and completion dates for all activities accomplished on the project.
 2. Contractor's Project Manager and scheduler sign and certify the As-Built Schedule as being an accurate record of the way the project was actually constructed.
- B. Retainage will not be released until final Schedule Update is provided.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01_32_34

PHOTOGRAPHIC AND VIDEOGRAPHIC DOCUMENTATION

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes requirements for photographs and videos.
- B. The purpose of the photographs and videos is to document the condition of the facilities prior to the Contractor beginning work at the Project site, the progress of the Work, and the Project site after Substantial Completion of the Work.
- C. The scope of the photographic and videographic documentation shall be the sole responsibility of the Contractor but shall be acceptable to the Engineer.

1.02 SUBMITTALS

- A. Photographer qualifications.
- B. Pre-construction photographs and videos: Submit prior to beginning work at the Project site or prior to the Preconstruction Conference specified in Section 01_31_19 - Project Meetings, whichever occurs earlier.
- C. Construction photographs and videos: Submit with each application for payment.
- D. Post-construction photographs and videos: Submit with project closeout documents as specified in Section 01_77_00 - Closeout Procedures.

1.03 PHOTOGRAPHER

- A. Photographer qualified and equipped to photograph either interior or exterior exposures, with lenses ranging from wide angle to telephoto.
- B. Submit example work of previous photographs and video recording meeting the requirements of this Section:
 - 1. Provide to Engineer no later than the pre-construction conference.
 - 2. Provide photographs used for site examination.
 - 3. Provide video of site examination.
 - 4. Provide samples that used same camera and lighting equipment proposed for the Work.
 - 5. Engineer will review work examples to determine if the quality of the images is acceptable.
 - 6. Contractor is responsible for modifications to equipment and/or inspection procedures to achieve report material of acceptable quality.
 - 7. Do not commence Work prior to approval of the material by the Engineer.
 - 8. Once accepted, the standard report material shall serve as a standard for the remaining work.

1.04 KEY PLAN

- A. Submit key plan of Project site with notation of vantage points marked for location and direction of each photograph.
- B. Include the same label information as the corresponding set of photographs.

1.05 PHOTOGRAPHS

- A. Provide prints of each photograph for each area of Work.
- B. Provide a digital copy of each photograph for each area of Work:
 - 1. Monthly: Indexed digital flash drive.
 - 2. Project record documents:
 - a. Catalog and index prints in chronological sequence.
 - b. Include typed table of contents.

1.06 PRE-CONSTRUCTION PHOTOGRAPHS AND VIDEOS

- A. Provide photographs and video of the condition entire site including each area of Work prior to the start of Work:
 - 1. Areas to be photographed and videoed shall include the site of the Work and all existing facilities, either on or adjoining the Project site, including the interior of existing structures, that could be damaged as a result of the Contractor's Work.
 - 2. Include general condition, structures, vegetation, staging, storing, working, parking areas and excavation areas.

1.07 CONSTRUCTION PHOTOGRAPHS AND VIDEOS

- A. Provide photographs and videos of construction in each area of Work throughout progress of Work including a key plan designating where each photograph was taken.
- B. Take site and interior photographs and videos from differing directions of building demolition, pre-excavation, footing excavation, soil testing, utility crossings, installation of bypass piping, excavation of access pits, installation of lining system in pipes, rehabilitation of manholes, building modifications, utilities, electrical and instrumentation modifications, and other applicable activities indicating relative progress of the work.
- C. Take photos a maximum of 7 calendar days prior to submittal.

1.08 POST-CONSTRUCTION PHOTOGRAPHS AND VIDEOS

- A. Provide photographs of the entire site including each area of Work at the completion of Work:
 - 1. Include general condition, structures, vegetation, staging, storing, working, parking areas and excavation areas.
 - 2. Take photos and video from same points in same direction as pre-construction examination.

- B. Submittal of photos and videos is a condition of final payment.

PART 2 PRODUCTS

2.01 MEDIA

- A. Digital media:
 - 1. Flash drive compatible with current Microsoft Windows.
 - 2. Provide photos as individual, indexed JPG files with the following characteristics:
 - a. Compression shall be set to preserve quality over file size.
 - b. Highest resolution JPG images shall be submitted. Resizing to a smaller size when high resolution JPGs are available shall not be permitted.
 - c. JPG image resolution shall be 5 megapixels at 2,400 by 1,800 or higher.
 - d. Images shall have rectangular clean images. Artistic borders, beveling, drop shadows, etc., are not permitted.
 - 3. Identification: On photograph, provide the following information:
 - a. Name of project.
 - b. Date stamp: Unless otherwise indicated, date and time stamp each photograph as it is being taken so stamp is integral to photograph.
 - c. Description of vantage point, indicating location and direction by compass point.
- B. Videos:
 - 1. Video quality shall be 720p HD or greater in MPG, AVCHD, AVI, or MP4 format.
 - 2. Digital color video format.
 - 3. Provide audio portion of the composite video sufficiently free from electrical interference and background noise to provide complete intelligibility of oral report.
 - 4. Identification: On each copy provide a label with the following information:
 - a. Name of project.
 - b. Date video was recorded.
 - 5. Submit 1 copy of each video within 7 days of recording.
 - 6. Display continuous running time.
 - 7. At start of each video recording, record weather conditions from local newspaper or television and the actual temperature reading at Project site.

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01_33_00
SUBMITTAL PROCEDURES

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Requirements and procedures for submittals to confirm compliance with Contract Documents.

1.02 GENERAL INSTRUCTIONS

- A. Contractor is responsible to determine and verify field measurements, field construction criteria, materials, dimensions, catalog numbers and similar data, and check and coordinate each item with other applicable approved shop drawings and Contract Document requirements.
- B. Provide submittals:
 - 1. That are specified or reasonably required for construction, operation, and maintenance of the Work.
 - 2. That demonstrate compliance with the Contract Documents.
- C. Where multiple submittals are required, provide a separate submittal for each specification section:
 - 1. In order to expedite construction, the Contractor may make more than 1 submittal per specification section, but a single submittal may not cover more than 1 specification section:
 - a. The only exception to this requirement is when 1 specification section covers the requirements for a component of equipment specified in another section.
 - b. For example, circuit breakers are a component of switchgear. The switchgear submittal must also contain data for the associated circuit breakers, even though they are covered in a different specification section.
- D. Prepare submittals in the English language. Do not include information in other languages.
- E. Present measurements in customary American units (feet, inches, pounds, etc.).
- F. Must be clear and legible, and of sufficient size for presentation of information.
- G. Page size other than drawings:
 - 1. Minimum page size will be 8 1/2 inches by 11 inches:
 - 2. Maximum page size will be 11 inches by 17 inches.

- H. Drawing sheet size:
 - 1. Maximum sheets size: 22-inch by 34-inch.
 - a. Minimum plan scale: 1/8-inch equals 1 foot-0 inches.
 - b. Minimum font size: 1/8 inch minimum.
 - 2. 11-inch by 17-inch sheet:
 - a. Minimum plan scale: 1/8-inch equals 1 foot-0 inches.
 - b. Minimum font size: 1/8 inch minimum.
- I. Show dimensions, construction details, wiring diagrams, controls, manufacturers, catalog numbers, and all other pertinent details.
- J. Provide submittal information from only 1 manufacturer for a specified product. Submittals with multiple manufacturers for 1 product will be rejected without review.

1.03 SUBMITTAL ORGANIZATION

- A. Organize submittals in exactly the same order as the items are referenced, listed, and/or organized in the specification section.
- B. For submittals that cover multiple devices used in different areas under the same specification section, the submittal for the individual devices must list the area where the device is used.
- C. Bookmarks:
 - 1. Bookmarks shall match the table of contents.
 - 2. Bookmark each section (tab) and heading.
 - 3. Drawings: Bookmark at a minimum, each discipline, area designation, or appropriate division.
 - 4. At file opening, display all levels of bookmarks as expanded.
- D. Where applicable (i.e., except for drawings, figures, etc.) submittal content shall be electronically searchable utilizing the PDF file as submitted.
- E. Thumbnails optimized for fast web viewing.
- F. Sequentially number pages within the tabbed sections:
 - 1. Submittals that are not fully indexed and tabbed with sequentially numbered pages, or are otherwise unacceptable, will be returned without review.
- G. Attachments:
 - 1. Specification section: Include with each submittal a copy of the relevant specification section:
 - a. Indicate in the left margin, next to each pertinent paragraph, either compliance with a check (✓) or deviation with a consecutive number (1, 2, 3).
 - b. Provide a list of all numbered deviations with a clear explanation and reason for the deviation.
 - 2. Drawings: Include with each submittal a copy of the relevant Drawing, including relevant addendum updates:
 - a. Indicate either compliance with a check (✓) or deviation with a consecutive number (1, 2, 3).

- b. Provide a list of all numbered deviations with a clear explanation and reason for the deviation.
 - c. Provide field dimensions and relationship to adjacent or critical features of the Work or materials.
- H. Contractor: Prepare submittal information in sufficient detail to show compliance with specified requirements:
 - 1. Determine and verify quantities, field dimensions, product dimensions, specified design and performance criteria, materials, catalog numbers, and similar data.
 - 2. Coordinate submittal with other submittals and with the requirements of the Contract Documents.
 - 3. Check, verify, and revise submittals as necessary to bring them into conformance with Contract Documents and actual field conditions.
- I. Contractor: Prepare "Or Equal" submittal information:
 - 1. Provide standard submittal requirements:
 - a. In addition, provide in sufficient detail to show reason for variance from specified product and impacts.
 - 2. Provide reason the specified product is not being provided.
 - 3. Explain the benefits to the Owner for accepting the "Or Equal".
 - 4. Itemized comparison of the proposed "Or Equal" with product specified including a list of significant variations:
 - a. Design features.
 - b. Design dimensions.
 - c. Installation requirements.
 - d. Operations and maintenance requirements.
 - e. Availability of maintenance services and sources of replacement materials.
 - 5. Reference projects where the product has been successfully used:
 - a. Name and address of project.
 - b. Year of installation.
 - c. Year placed in operation.
 - d. Name of product installed.
 - e. Point of contact: Name and phone number.
 - 6. Define impacts:
 - a. Impacts to other contracts.
 - b. Impacts to other work or products.
 - 7. Contractor represents the following:
 - a. Contractor bears the burden of proof of the equivalency of the proposed "Or Equal".
 - b. Proposed "Or Equal" is equal or superior to the specified product.
 - c. Contractor will provide the warranties or bonds that would be provided on the specified product on the proposed "Or Equal", unless Owner requires a Special Warranty.
 - d. Contractor will coordinate installation of accepted "Or Equal" into the Work and will be responsible for the costs to make changes as required to the Work.
 - e. Contractor waives rights to claim additional costs caused by proposed "Or Equal" which may subsequently become apparent.

- J. Contractor: Prepare substitution submittal information:
1. Provide standard submittal requirements:
 - a. In addition, provide in sufficient detail to show reason for variance from specified product and impacts.
 2. Provide reason the specified product is not being provided.
 3. Explain the benefits to the Owner for accepting the substitution.
 4. Itemized comparison of the proposed substitution with product specified including a list of significant variations:
 - a. Design features.
 - b. Design dimensions.
 - c. Installation requirements.
 - d. Operations and maintenance requirements.
 - e. Availability of maintenance services and sources of replacement materials.
 5. Reference projects where the product has been successfully used:
 - a. Name and address of project.
 - b. Year of installation.
 - c. Year placed in operation.
 - d. Name of product installed.
 - e. Point of contact: Name and phone number.
 6. Define impacts:
 - a. Impacts to Contract Price:
 - 1) Required license fees or royalties.
 - 2) Do not include costs under separate contracts.
 - 3) Do not include Engineer's costs for redesign or revision of Contract Documents.
 - b. Impacts to Contract Time.
 - c. Impacts to Contract Scope.
 - d. Impacts to other contracts.
 - e. Impacts to other work or products.
 7. Contractor represents the following:
 - a. Contractor shall pay associated costs for Engineer to evaluate the substitution.
 - b. Contractor bears the burden of proof of the equivalency of the proposed substitution.
 - c. Proposed substitution does not change the design intent and will have equal performance to the specified product.
 - d. Proposed substitution is equal or superior to the specified product.
 - e. Contractor will provide the warranties or bonds that would be provided on the specified product on the proposed substitution, unless Owner requires a Special Warranty.
 - f. Contractor will coordinate installation of accepted substitution into the Work and will be responsible for the costs to make changes as required to the Work.
 - g. Contractor waives rights to claim additional costs caused by proposed substitution which may subsequently become apparent.

1.04 SUBMITTAL IDENTIFICATION NUMBERING

A. Number each submittal using the format defined below:

	Spec Section Number	Dash	Initial Submittal - Sequential Number	Decimal Point	Subsequent Submittal Revisions Sequential Number
<i>Example 1 Description</i>	<i>Cast-In-Place Concrete</i>		<i>8th initial submittal</i>		
	03_30_00	-	0008		
<i>Example 2 Description</i>	<i>Cast-In-Place Concrete</i>		<i>8th initial submittal</i>		<i>First revision to the 8th initial submittal</i>
	03_30_00	-	0008	.	1

1.05 SUBMITTALS IN ELECTRONIC MEDIA FORMAT

- A. General: Provide all information in PC-compatible format using Windows® operating system as utilized by the Owner and Engineer.
- B. Text: Provide text documents and manufacturer's literature in Portable Document Format (PDF).
- C. Graphics: Provide graphic submittals (drawings, diagrams, figures, etc.) utilizing Portable Document Format (PDF).

1.06 SUBMITTAL PROCEDURE

- A. Engineer: Review submittal and provide response:
 - 1. Review description:
 - a. Engineer will be entitled to rely upon the accuracy or completeness of designs, calculations, or certifications made by licensed professionals accompanying a particular submittal whether or not a stamp or seal is required by Contract Documents or Laws and Regulations.
 - b. Engineer's review of submittals shall not release Contractor from Contractor's responsibility for performance of requirements of Contract Documents. Neither shall Engineer's review release Contractor from fulfilling purpose of installation nor from Contractor's liability to replace defective work.
 - c. Engineer's review of shop drawings, samples, or test procedures will be only for conformance with design concepts and for compliance with information given in Contract Documents.
 - d. Engineer's review does not extend to:
 - 1) Accuracy of dimensions, quantities, or performance of equipment and systems designed by Contractor.

- 2) Contractor's means, methods, techniques, sequences, or procedures except when specified, indicated on the Drawings, or required by Contract Documents.
 - 3) Safety precautions or programs related to safety which shall remain the sole responsibility of the Contractor.
- e. Engineer can Approve or Not Approve any exception at their sole discretion.
- 2. Review timeframe:
 - a. Except as may be provided in technical specifications, a submittal will be returned within 30 days.
 - b. When a submittal cannot be returned within the specified period, Engineer will, within a reasonable time after receipt of the submittal, give notice of the date by which that submittal will be returned.
 - c. Engineer's acceptance of progress schedule containing submittal review times less than those specified or agreed to in writing by Engineer will not constitute Engineer's acceptance of review times.
 - d. Critical submittals:
 - 1) Contractor will notify Engineer in writing that timely review of a submittal is critical to the progress of Work.
- 3. Schedule delays:
 - a. No adjustment of Contract Times or Contract Price will be allowed due to Engineer's review of submittals, unless all of the following criteria are met:
 - 1) Engineer has failed to review and return first submission within the agreed upon time frame.
 - 2) Contractor demonstrates that delay in progress of Work is directly attributable to Engineer's failure to return submittal within time indicated and accepted by Engineer.
- 4. Review response will be returned to Contractor with one of the following dispositions:
 - a. Approved:
 - 1) No Exceptions:
 - a) There are no notations or comments on the submittal and the Contractor may release the equipment for production.
 - 2) Make Corrections Noted - See Comments:
 - a) The Contractor may proceed with the Work, however, all notations and comments must be incorporated into the final product.
 - b) Resubmittal not required.
 - 3) Make Corrections Noted - Confirm:
 - a) The Contractor may proceed with the Work, however, all notations and comments must be incorporated into the final product.
 - b) Submit confirmation specifically addressing each notation or comment to the Engineer within 15 calendar days of the date of the Engineer's transmittal requiring the confirmation.
 - b. Not approved:
 - 1) Correct and resubmit:
 - a) Contractor may not proceed with the Work described in the submittal.
 - b) Contractor assumes responsibility for proceeding without approval.

- c) Resubmittal of complete submittal package is required within 30 calendar days of the date of the Engineer's submittal review response.
 - 2) Rejected - See Remarks:
 - a) Contractor may not proceed with the Work described in the submittal.
 - b) The submittal does not meet the intent of the Contract Documents. Resubmittal of complete submittal package is required with materials, equipment, methods, etc. that meet the requirements of the Contract Documents.
 - c. Receipt acknowledged - Filed for record:
 - 1) This is used in acknowledging receipt of informational submittals that address means and methods of construction such as schedules and work plans, conformance test reports, health and safety plans, etc.
 - d. Receipt acknowledged with comments - Resubmit:
 - 1) This is used in acknowledging receipt of informational submittals that address means and methods of construction such as schedules and work plans, conformance test reports, health and safety plans, etc. Feedback regarding missing information, conflicting information, or other information that makes it incomplete can be made with comments.
- B. Contractor: Prepare resubmittal, if applicable:
 - 1. Clearly identify each correction or change made.
 - 2. Include a response in writing to each of the Engineer's comments or questions for submittal packages that are resubmitted in the order that the comments or questions were presented from the 1st and subsequent submittals and numbered consistent with the Engineer's numbering.
 - a. Acceptable responses to Engineer's comments are listed below:
 - 1) "Incorporated" Engineer's comment or change is accepted and appropriate changes are made.
 - 2) "Response" Engineer's comment not incorporated. Explain why comment is not accepted or requested change is not made. Explain how requirement will be satisfied in lieu of comment or change requested by Engineer.
 - b. Reviews and resubmittals:
 - 1) Contractor shall provide resubmittals which include responses to all submittal review comments separately and at a level of detail commensurate with each comment.
 - 2) Contractor responses shall indicate how the Contractor resolved the issue pertaining to each review comment
 - a) Responses such as "acknowledged" or "noted" are not acceptable.
 - 3) Resubmittals which do not comply with this requirement may be rejected and returned without review.
 - 4) Contractor shall be allowed no extensions of any kind to any part of their contract due to the rejection of non-compliant submittals.
 - 5) Submittal review comments not addressed by the Contractor in resubmittals shall continue to apply whether restated or not in subsequent reviews until adequately addressed by the Contractor to the satisfaction of the reviewing and approving authority.

- c. Any resubmittal that does not contain responses to the Engineer's previous comments shall be returned for Revision and Resubmittal. No further review by the Engineer will be performed until a response for previous comments has been received.
- 3. Resubmittal timeframe:
 - a. Contractor shall provide resubmittal within 15 days.
 - b. When a resubmittal cannot be returned within the specified period, Contractor shall notify Engineer in writing.
- 4. Review costs:
 - a. Costs incurred by Owner as a result of additional reviews of a particular submittal after the second time it has been reviewed shall be borne by Contractor.
 - b. Reimbursement to Owner will be made by deducting such costs from Contractor's subsequent progress payments.

1.07 PRODUCT DATA

- A. Edit submittals so that the submittal specifically applies to only the product furnished.
- B. Neatly cross out all extraneous text, options, models, etc. that do not apply to the product being furnished, so that the information remaining is only applicable to the product being furnished.

1.08 SHOP DRAWINGS

- A. Contractor to field verify elevation, coordinates, and pipe material for pipe tie-in to pipeline or structure prior to the preparation of shop drawings.
- B. Indicate project designated equipment tag numbers for submittal of devices, equipment, and assemblies.

1.09 SAMPLES

- A. Details:
 - 1. Submit labeled samples.
 - 2. Samples will not be returned.
 - 3. Provide number of sample submittals as below:
 - a. Total: 3 minimum.
 - 1) Owner: 1.
 - 2) Engineer: 2.
 - 3) Contractor: None.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

ATTACHMENT A - CONTRACTOR SUBMITTAL TRANSMITTAL FORM

CONTRACTOR SUBMITTAL TRANSMITTAL FORM

Owner:	Click here to enter text.	Date:	MM/DD/YYYY
Contractor:	Click here to enter text.	Project No.:	XXXXX.XX
Project Name:	Click here to enter text.	Submittal Number:	000
Submittal Title:	Click here to enter text.		
To:	Click here to enter text.		
From:	Click here to enter text.	Click here to enter text.	
	Click here to enter text.	Click here to enter text.	

Specification No. and Subject of Submittal / Equipment Supplier			
Spec ##:	Spec ##.	Subject:	Click here to enter text.
Authored By:	Click here to enter text.		Date Submitted: XX/XX/XXXX

Submittal Certification	
Check Either (A) or (B):	
☐	(A) We have verified that the equipment or material contained in this submittal meets all the requirements specified in the project manual or shown on the contract drawings with no exceptions.
☐	(B) We have verified that the equipment or material contained in this submittal meets all the requirements specified in the project manual or shown on the contract drawings except for the deviations listed.
Certification Statement: By this submittal, I hereby represent that I have determined and verified all field measurements, field construction criteria, materials, dimensions, catalog numbers and similar data, and I have checked and coordinated each item with other applicable approved shop drawings and all Contract requirements.	
General Contractor's Reviewer's Signature:	
Printed Name:	
In the event, Contractor believes the Submittal response does or will cause a change to the requirements of the Contract, Contractor shall immediately give written notice stating that Contractor considers the response to be a Change Order.	
Firm: Click here to enter text.	Signature: Click here to enter text.
Date Returned: XX/XX/XXXX	

PM/CM Office Use	
Date Received GC to PM/CM:	Click here to enter text.
Date Received PM/CM to Reviewer:	Click here to enter text.
Date Received Reviewer to PM/CM:	Click here to enter text.
Date Sent PM/CM to GC:	Click here to enter text.

SECTION 01_35_21

SELECTIVE ALTERATIONS AND DEMOLITION

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Cutting or modifying of existing and new work.
 - 2. Partial demolition of structures.
 - 3. In-place abandonment of pipe.

1.02 REFERENCES

- A. American National Standards Institute (ANSI):
 - 1. A10.6 - Safety and Health Program Requirements for Demolition Operations.
- B. International Concrete Repair Institute (ICRI):
 - 1. Guideline No. 310.2R - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair.
 - 2. Guideline No. 310.3R - Guide for the Preparation of Concrete Surfaces for Repair Using Hydrodemolition Methods.

1.03 DEFINITIONS

- A. Chipping hammer: A hand-operated electrical or pneumatic demolition device for removal of hardened concrete or masonry materials having a weight of less than 15 pounds and an impact frequency of greater than 2,000 blows/minute.
- B. Concrete breaker: A hand-operated electrical or pneumatic demolition device for removal of hardened concrete or masonry materials having a weight greater or impact frequency less than the limits defined for a chipping hammer.
- C. Coring equipment: Non-impact rotary drill with diamond cutting edges.
- D. Heavy abrasive blast: Cleaning procedure by which various abrasives materials, or steel shot, are forcibly propelled by high pressure against a surface to remove loose material and produce a concrete surface roughened to ICRI Surface Profile CSP-7, or higher, as specified in ICRI 301.3R.
- E. Salvage material: Materials removed from existing facilities and stored for Owner's future reuse.

1.04 DESCRIPTION OF WORK

- A. The work includes partial demolition, cutting, and modifying of existing facilities, utilities, and/or structures.

- B. These facilities may be occupied and/or operational. Satisfactory completion of the work will require that the Contractor plan activities carefully to work around unavoidable obstacles and to maintain overall stability of structures and structural elements. It will further require restoration of existing facilities, utilities, and structures that are to remain in place and that are damaged by demolition or removal operations.

1.05 SUBMITTALS

- A. General:
 - 1. Submit specified in Section 01_33_00 - Submittal Procedures.
- B. Shop drawings: Include:
 - 1. The location of all embedded items shall be documented using diagrams and/or other media that clearly show dimensions and locations of existing structural elements, existing embedded items and any new embedded items and their relationship to each other.
- C. Submittals for information only:
 - 1. Permits and notices authorizing demolition.
 - 2. Certificates of severance of utility services.
 - 3. Permit for transport and disposal of debris.
 - 4. Selective Demolition Plan.
 - 5. Pipe Abandonment Plan.
- D. Quality assurance submittals:
 - 1. Qualifications of non-destructive testing agency/agencies.
- E. Project record documents.
- F. Drawings and/or other media documenting locations of service lines and capped utilities.

1.06 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Assign relocation, removal, cutting, coring and patching to trades and workers qualified to perform the Work in manner that causes the least damage and that provides means of returning surfaces to an appearance at least equal to that of the surrounding areas unaffected by the Work.
 - 2. Non-destructive testing agencies: Minimum of 5 years' experience performing non-destructive testing for location of steel reinforcement in existing concrete under conditions similar to that required for this Work.

1.07 SEQUENCING

- A. Perform Work in sequences and within times specified in Section 01_14_00 - Work Restrictions.

- B. If the facility or utility to be modified cannot be removed from service, perform the Work while the facility is in operation using procedures and equipment that do not jeopardize operation or materially reduce the efficiency of that facility.
- C. Coordinate the Work with operation of the facility:
 - 1. Do not begin alterations of designated portions of the Work until specific permission for activities in each area has been granted by Owner in writing.
 - 2. Engineer will coordinate the planned procedure with facility manager.
 - 3. Complete Work as quickly and with as little delay as possible.
- D. Operational functions of the facility that are required to be performed to facilitate the Work will be performed by facility personnel only.
- E. Owner will cooperate to assist in expediting the Work.
- F. When necessary for the proper operation or maintenance of portions of the facility, reschedule operations so the Work will not conflict with required operations or maintenance.

1.08 REGULATORY REQUIREMENTS

- A. Dispose of debris in accordance with governing regulatory agencies.
- B. Comply with applicable air pollution control regulations.
- C. Obtain permits for building demolition, transportation of debris to disposal site and dust control.

1.09 PREPARATION

- A. Non-destructive evaluation of existing concrete and masonry:
 - 1. Prior to cutting, drilling, coring, and/or any other procedure that penetrates existing concrete or masonry, retain and pay for the services of a qualified non-destructive testing agency to perform investigations to determine the location of existing steel reinforcement, plumbing, conduit, and/or other embedments in the concrete.
 - 2. Submit documentation of the investigations to the Engineer for review and approval as specified in Section 01_33_00 - Submittal Procedures, before any work involving penetration of existing concrete is initiated.

1.10 PROJECT CONDITIONS

- A. Do not interfere with use of adjacent structures and elements of the facility not subject to the Work described in this Section. Maintain free and safe passage to and from such facilities.
- B. Provide, erect, and maintain barricades, lighting, guardrails, and protective devices as required to protect building occupants, general public, workers, and adjoining property:
 - 1. Do not close or obstruct roadways without permits.
 - 2. Conduct operations with minimum interference to public or private roadways.

- C. Prevent movement, settlement, or collapse of structures adjacent services, sidewalks, driveways and trees:
 - 1. Provide and place bracing or shoring.
 - 2. Cease operations and notify Engineer immediately when safety of structures appears to be endangered. Take precautions to properly support structure. Do not resume operations until safety is restored.
 - 3. Assume liability for movement, settlement, or collapse. Promptly repair damage.
- D. Arrange and pay for capping and plugging utility services. Disconnect and stub off.
 - 1. Notify affected utility company in advance and obtain approval before starting demolition.
 - 2. Place markers to indicate location of disconnected services.
- E. Unknown conditions:
 - 1. The drawings may not represent all conditions at the site and adjoining areas. Compare actual conditions with drawings before commencement of Work.
 - 2. Existing utilities and drainage systems below grade are located from existing documents and from surface facilities such as manholes, valve boxes, area drains, and other surface fixtures.
 - 3. If existing active services encountered are not indicated or otherwise made known to the Contractor and interfere with the permanent facilities under construction, notify the Engineer in writing, requesting instructions on their disposition. Take immediate steps to ensure that the service provided is not interrupted, and do not proceed with the Work until written instructions are received from the Engineer.

PART 2 PRODUCTS

2.01 SALVAGE MATERIALS

- A. Materials designated for salvage:
 - 1. Yost Zone flow meters, valves, and double check detector assembly.
- B. Handling and storage:
 - 1. Prevent damage to salvaged materials during removal, handling, and transportation.
 - 2. Remove Yost Zone flow meters, valves, and double check detector assembly from vault and provide to Owner immediately following removal.
- C. Pay costs associated with salvaging materials, including handling, transporting, and storage.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Prior to beginning selective demolition operations, perform a thorough inspection of the facility and site.
 - 1. Report to the Engineer defects, structural damage, and deterioration of existing construction to remain in place.
- B. Examine areas affected by the Work and verify the following conditions prior to commencing demolition:
 - 1. Disconnection of utilities as required.
 - 2. Verify that utilities serving occupied or active portions of surrounding facilities will not be disturbed, except as otherwise indicated.
- C. If unsatisfactory conditions exist, notify the Engineer, and do not begin demolition operations until such conditions have been corrected.

3.02 PREPARATION

- A. Plan and organize Work to minimize inconvenience to adjacent buildings and to plant operations.
- B. Selective Demolition Plan:
 - 1. Prepare and submit a comprehensive selective demolition plan for the Work including the following elements, at a minimum:
 - a. Proposed sequence, methods, temporary support, and equipment for demolition, removal, and disposal of portions of structure(s).
 - b. Provisions and procedures for salvage and delivery to Owner of salvaged items, if required.
 - c. Detailed drawings showing proposed weatherproof closures and dustproof partitions.
 - 2. Plan shall be signed and sealed by a Professional Structural Engineer registered in the state where Project is located.
 - 3. Submit plan a minimum 4 weeks before demolition is scheduled to begin.
- C. Pipe Abandonment Plan:
 - 1. Prepare and submit a comprehensive Pipe Abandonment Plan for the Work.
 - 2. At a minimum, define the following elements:
 - a. Proposed sequence, methods, cleaning procedures, or demolition, removal, and disposal of contents of the piping.
 - b. Method of verification of final pipe condition.
 - c. Detailed drawings showing treatment of pipe ends.
 - 3. Submit plan a minimum 4 weeks before abandonment is scheduled to begin.
- D. Protection:
 - 1. Erect weatherproof closures to protect the interior of facilities and elements or equipment that are not designed for exposure to the weather.
 - 2. Provide temporary heat, cooling, and humidity control as necessary to prevent damage to existing and new equipment and construction.

3. Maintain existing exiting paths and/or provide new paths in compliance with Building Code requirements.
4. Erect and maintain dustproof partitions as required to prevent spread of dust, to other parts of building. Maintain negative pressure in the area where the Work is being performed to prevent the accidental spread of dust and to minimize the spread of fumes related to the Work.
5. Upon completion of Work, remove weatherproof closures and dustproof partitions.
6. Repair damaged surfaces to match adjacent surfaces.
7. Provide and maintain protective devices to prevent injury from falling objects.
8. Locate guardrails in stairwells and around open shafts to protect workers. Post clearly visible warning signs.
9. Protect the following from damage or displacement during Work.
 - a. Benchmarks and survey points.
 - b. Existing construction that will remain in place.
 - c. Trees and landscaping designated to remain in place.
10. Carefully remove designated materials and equipment to be salvaged by Owner or reinstalled.
11. Store and protect materials and equipment to be reinstalled.

E. Layout:

1. The limits of selective demolition are indicated on the Drawings. Confine demolition operations within the limits indicated on the Drawings.
2. Lay out demolition and removal work at the site and coordinate with related Work for which demolition and removal is required.
3. Clearly mark the extent of structural elements to be removed on the actual surfaces that will be removed.
4. Arrange for Engineer's inspection of the lay out extents.
5. Do not begin demolition/removal operations until the lay out markings have been reviewed by the Engineer.

3.03 DEMOLITION

A. General:

1. Perform demolition work in accordance with ANSI A10.6.
2. Demolish designated portions of structures and appurtenances in orderly and careful manner in accordance with the Selective Demolition Plan.
3. Conduct demolition and removal work in a manner that will minimize dust and flying particles.
 - a. Use water or dust palliative when necessary to prevent airborne dust.
 - b. Provide and maintain hoses and connections to water main or hydrant.
4. Remove materials carefully, to the extent indicated and as required.
 - a. Provide neat and orderly junctions between existing and new materials.
 - b. Use methods that terminate surfaces in straight lines at natural points of division.
5. Do not remove anything beyond the limits of Work indicated without prior written authorization from the Engineer.
 - a. If in doubt about whether to remove an item, obtain written authorization from the Engineer prior to proceeding.
6. Perform work so as to provide the least interference and most protection to existing facilities to remain.

7. Demolished materials:
 - a. Assume possession of materials unless otherwise indicated on the Drawings or specified.
 - b. Remove demolished materials from site at least weekly and dispose of them in accordance with Laws and Regulations.
 - c. Do not burn or bury materials on site.
- B. Demolition of concrete and masonry:
 1. Demolish concrete and masonry in small sections.
 - a. Perform demolition with small tools as much as possible.
 - b. Blasting with explosive charges is not permitted.
 2. Sawcut concrete to establish the edges of demolition, wherever possible.
 - a. Do not use a concrete breaker within 6 inches of reinforcing or structural metals that are designated to remain in place.
 - b. At edges that are not sawcut, remove the final 6 inches of material with a chipping hammer as defined herein. At surfaces where material is removed with a chipping hammer, follow with a heavy abrasive blast to remove all loose material and microcracking.
 - c. Alternate techniques to remove concrete may be used if acceptable to the Engineer; however, techniques other than those deemed by ICRI Guideline No. 310.2R to provide a low risk of introducing microcracking will require a subsequent procedure to remove loose material and microcracked.
 - d. Provide final surface preparation for repairs as specified in Div 03 Sections.
 3. At locations indicated on the Drawings where the existing reinforcing is to be preserved, remove concrete using methods that do not damage the reinforcing. Use one of the following techniques:
 - a. Hydrodemolition techniques as outlined in ICRI Guideline No. 310.3R.
 - b. Chipping hammer, as defined herein, followed by heavy abrasive blast to remove all loose material and microcracking at remaining surfaces impacted by the chipping hammer.
 - c. Alternate methods may be used, only when accepted in advance by the Engineer.
 - d. For all methods, provide a small completed area for Engineer's review and acceptance. If the proposed method, in the opinion of the Engineer, damages the reinforcing, revise the removal method to remove the concrete with a less aggressive technique to protect the reinforcing.
- C. Sizing of openings in existing concrete or masonry:
 1. Make openings large enough to permit final alignment of pipe and fittings without deflections, but without oversizing.
 2. Allow adequate space for packing around pipes and conduit to ensure watertightness.
 3. If the Engineer deems the opening to be insufficient in size to accomplish this criteria, remove additional material using the procedures outlined in this Section.
- D. Cutting openings in existing concrete or masonry:
 1. Do not allow saw cuts to extend beyond limits of openings.

2. Create openings by the following method or other means acceptable to the Engineer that prevents over-cutting of member at corners:
 - a. Core-drill through slab or wall at corners, being careful not to damage materials beyond the area to be removed.
 - b. Saw cut completely through the member, between the core holes at the corners.
 - c. As an alternate to sawcutting through the member, score the edges of the opening with a saw to a 1-inch depth.
 - 1) Provide score on both surfaces (when accessible).
 - 2) Remove concrete or masonry to within 6 inches of material to remain with a concrete breaker.
 - 3) Remove the remaining material with a chipping hammer.
 - d. Remove the remaining material at the corners left by the core-drilling with a chipping hammer.
 2. Prevent debris from falling into adjacent tanks or channels in service or from damaging existing equipment and other facilities.
- E. In-place Abandonment of Pipe:
1. Abandoned pipe in-place as indicated on the Drawings.
 2. Clean buried or exposed solids contact unit blowdown sludge (SL) piping to a condition free of residual.
 3. Provide closure of abandoned pipe cut ends as indicated on the Drawings using one of the following methods:
 - a. Leave one end open.
 - b. Install cap.
 - c. Install plug.
 - d. Install drain valves, pressure relief valves, vents, etc.
 - e. Fill abandoned pipe as specified in Section 31_23_24 - Controlled Low Strength Material (CLSM).
- F. Buried structures:
- a. Pump out buried tanks.
 - b. Remove tanks and service piping from site.
 - c. Demolish tanks and foundations to below-grade elevation indicated on the Drawings. Fill tanks with sand or fine gravel and cover with fill.
- G. Immediately upon discovery, remove and dispose of contaminated, vermin-infested, or dangerous materials using safe means that will not endanger health of workers and public.
- H. Remove trees and shrubs within marked areas, and clear undergrowth and dead plant material as specified in Section 31_00_00 - Earthwork.
- I. Backfill open pits and holes caused by demolition as specified in Section 31_00_00 - Earthwork.
- J. Remove demolished materials, tools, and equipment upon completion of demolition.

3.04 RESTORATION

A. General:

1. Repair damage caused by demolition to conditions equal to those that existed prior to beginning of demolition.
 - a. Patch and replace portions of existing finished surfaces that are damaged, lifted, and discolored. Refinish patched portion surfaces in a manner which produces uniform color and texture to entire surface, and that matches color and texture of adjacent surfaces.
 - b. When existing finish cannot be matched, refinish entire surface to nearest change of plane where angle of change exceeds 45 degrees.
2. The cost of repairs shall be at the Contractor's expense at no increase in the Contract Price.
3. When new construction abuts or finishes flush with existing construction, make smooth transitions. Match finish of existing construction.
4. Where partitions are removed, patch floors, walls, and ceilings with finish materials that match existing materials.
5. Where removal of partitions results in adjacent spaces becoming one, rework floors, walls, and ceilings to provide smooth planes without breaks, steps, or bulkheads.
 - a. Where change of plane between adjacent surfaces exceeds 2 inches, request and obtain instructions for making transition from Engineer.
 - 1) Refinish door surfaces and edges as necessary.
6. Trim existing doors as necessary to clear new floors.
7. Match patched construction with adjacent construction in texture and appearance so that patch or transition is invisible at 5-foot distance.
8. When finished surfaces are cut so that smooth transition is impossible, terminate existing surface in neat manner along straight line at natural line of division and provide appropriate trim.

B. Restore existing concrete reinforcement as follows:

1. Where existing reinforcement is to be incorporated into the new Work, protect, clean, and extend into new concrete.
2. Where existing reinforcement is not to be retained, cut off as follows:
 - a. Where new concrete joins existing concrete at the removal line, cut reinforcement flush with concrete surface at the removal line.
 - b. Where concrete surface at the removal line will become the finished surface, cut reinforcement 2 inches below the surface, paint ends with epoxy, and patch holes with dry pack mortar.

C. Restore areas affected by removal of existing equipment, equipment pads and bases, piping, supports, electrical panels, electric devices, conduits, and fasteners so little or no evidence of the previous installation remains:

1. After removal of piping, conduit, fasteners, and other construction, fill areas in existing concrete and masonry floors, walls, and ceilings with non-shrink grout and finish smooth.
2. Remove concrete bases for equipment and supports by:
 - a. Saw cutting clean, straight lines with a depth equal to the concrete cover over reinforcement minus 1/2 inch below finished surface:
 - 1) Do not cut existing reinforcement in slab.
 - b. Chip concrete within scored lines.

- c. Cut exposed reinforcing steel and anchor bolts that will project above the repaired surface.
 - d. Patch with non-shrink grout to match adjacent grade and finish.
- 3. Terminate abandoned piping and conduits with blind flanges, caps, or plugs.
- 4. Where existing fasteners are not to be retained, cut off as follows:
 - a. Where new concrete joins existing concrete at the removal line, cut fasteners flush with concrete surface at the removal line.
 - b. Where concrete surface at the removal line will become the finished surface, cut fasteners 1 inch below the surface, paint ends with epoxy, and patch holes with epoxy grout.

3.05 FIELD QUALITY CONTROL

- A. Do not proceed with demolition without Engineer's inspection of lay out.
- B. Do not deviate from the submitted demolition plan without notifying the Engineer prior to Work.

END OF SECTION

SECTION 01_35_73

DELEGATED DESIGN PROCEDURES

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Delegated Design Procedures.

1.02 GENERAL

- A. Delegated Design - Professional design services assigned to the Contractor by express delegation in the Contract Documents. Work is "Delegated Design" where the Technical Sections require the Contractor to provide professional design services and to submit signed and sealed documents from a registered Professional Engineer.
- B. Contractor's Professional Engineer – The design professional retained by the Contractor to perform Delegated Design.
- C. Owner may require Contractor to provide professional design services for a portion of the Work by express delegation in the Contract Documents.
 - 1. Requirements of Delegated Design component as specified in the technical section and as indicated on the Drawings.
 - 2. Such delegation will specify the performance and design criteria that such services must satisfy, and the Submittals that Contractor must furnish to Engineer with respect to the Delegated Design.
- D. Contractor shall cause such Delegated Design services to be provided pursuant to the professional standard of care by a properly licensed design professional, whose signature and seal shall appear on drawings, calculations, specifications, certifications, and submittals prepared by such design professional.
 - 1. Contractor shall not be responsible for the adequacy of performance or design criteria specified by Owner or Engineer.
 - 2. Contractor is not required to provide professional services in violation of applicable Laws and Regulations.
 - 3. Such design professional shall issue certifications of design required by Laws and Regulations.
 - 4. If a Shop Drawing or other Submittal related to the Owner-delegated design is prepared by Contractor, a Subcontractor, or others for submittal to Engineer, then such Shop Drawing or other Submittal shall bear the written approval of Contractor's design professional when submitted by Contractor to Engineer.
- E. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, and approvals performed or provided by the design professionals retained or employed by Contractor under Delegated Design, subject to the professional standard of care and the performance and design criteria stated in the Contract Documents.

- F. Engineer's review, approval, and other determinations regarding design drawings, calculations, specifications, certifications, and other Submittals furnished by Contractor pursuant to a Delegated Design will be only for the following limited purposes:
 - 1. Confirming that submittal is in conformance with the performance and design criteria specified in the Contract Documents.

1.03 CONTRACTOR'S PROFESSIONAL ENGINEER

- A. Contractor or Subcontractor shall retain a licensed professional engineer to perform Delegated Design.
- B. Qualifications:
 - 1. Holding a current license to perform the specified design in the same jurisdiction as the Project site.
 - 2. Experienced in designing similar systems of similar complexity.
- C. Insurance:
 - 1. Provide Contractor's Professional Engineer's Professional Liability Insurance as specified in the Standard General Conditions of the Construction Contract.
- D. Responsibilities:
 - 1. Review and design in accordance with system performance and design criteria stated in the Contract Documents:
 - a. Prepare written requests for clarifications or interpretations of performance or design criteria for submittal to Engineer by Contractor.
 - 2. Sign and seal design reports, calculations, design drawings and specifications, and other design Submittals for the Delegated Design Work.
 - 3. Review and submit written approval of submittals related to the Delegated Design Work.
 - 4. Design modifications to the Delegated Design Work as required.
 - 5. Visit the Site, as required, to verify that installation of the Delegated Design Work is in conformance with the Delegated Design drawings and specifications.
 - 6. Submit through Contractor to Engineer written, signed, and sealed certification that the installed Delegated Design Work complies with Contractor's professional engineer's design.

1.04 SUBMITTALS

- A. Prior to the start of Delegated Design:
 - 1. Contractor's Professional Engineer's qualifications:
 - a. Experience for the Delegated Design.
 - b. Evidence of professional engineering license.
 - 2. Contractor's Professional Engineer Professional Liability Insurance certificate.
- B. Delegated Design:
 - 1. Product data:
 - a. Details related to the Delegated Design as specified in technical sections to completely describe the system.

2. Design documents with signature and seal from the Contractor's Professional Engineer.
 - a. Design documents include but are not limited to drawings, calculations, specifications, inspection reports, and certifications.
 3. Lists and schedules:
 - a. Prepare and submit lists or schedules of items where delegated design is required by the Contract Documents.
 - b. Group items by location in the Work.
 - 1) When "Area Numbers" are indicated on the Contract Drawings, group lists in accordance with those "areas."
 - 2) For work without area numbers, group using logical divisions acceptable to Engineer.
 - 3) Group items within each "area" as follows:
 - a) Systems.
 - b) Components.
 - c) Supports.
 - d) Anchorage.
 - e) Bracing.
- C. Construction services:
1. Contractor's Professional Engineer's comments on submittals.
 2. Other construction documents, as required.

1.05 ENGINEER RESPONSE TO DELEGATED DESIGN SUBMITTALS

- A. The Engineer response will be either of the following:
1. Approved. Make Corrections Noted - See Comments:
 - a. The Contractor may proceed with the Work, however, all notations and comments must be incorporated into the final product.
 - b. The review was for the limited purpose of determining that the document was stamped by a Professional Engineer and that such design is generally consistent with and will not negatively affect the design concept presented in the Contract Documents.
 2. Rejected - See Remarks:
 - a. Contractor may not proceed with the Work described in the submittal.
 - b. The submittal does not meet the intent of the Contract Documents.
 - c. Resubmittal of complete submittal package is required with materials, equipment, methods, etc. that meet the requirements of the Contract Documents.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01_41_00
REGULATORY REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Regulatory authorities and codes.

1.02 AUTHORITIES HAVING JURISDICTION (AHJ)

- A. Also referred to as the permitting agency.
- B. Building Department: City of Stillwater.
- C. Fire Department: City of Stillwater.

1.03 APPLICABLE CODES

- A. International Code Council (ICC).
1. Building code:
 - a. International Building Code (IBC), 2015.
 2. Electrical code:
 - a. National Fire Protection Association (NFPA), NFPA 70: National Electrical Code (NEC), 2014.
 3. Energy code:
 - a. International Energy Conservation Code (IECC), 2009.
 4. Fire code:
 - a. International Fire Code (IFC), 2015.
 5. Fuel gas code:
 - a. International Fuel Gas Code (IFGC), 2015.
 6. Mechanical code:
 - a. International Mechanical Code (IMC), 2015.
 7. Plumbing code:
 - a. International Plumbing Code (IPC), 2015.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01_45_00

QUALITY CONTROL

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Quality control and control of installation.
 - 2. Tolerances.
 - 3. References.
 - 4. Mock-up requirements.
 - 5. Authority and duties of Owner's representative or inspector.
 - 6. Sampling and testing.
 - 7. Testing and inspection services.
 - 8. Contractor's responsibilities.

1.02 QUALITY CONTROL AND CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.
- C. When manufacturers' instructions conflict with Contract Documents, request clarification from Engineer before proceeding.
- D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Perform Work by persons qualified to produce required and specified quality.
- F. Verify field measurements are as indicated on Shop Drawings or as instructed by manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.
- H. When specified, products will be tested and inspected either at point of origin or at Work site:
 - 1. Notify Engineer in writing well in advance of when products will be ready for testing and inspection at point of origin.
 - 2. Do not construe that satisfactory tests and inspections at point of origin is final acceptance of products. Satisfactory tests or inspections at point of origin do not preclude retesting or re-inspection at Work site.
- I. Do not ship products which require testing and inspection at point of origin prior to testing and inspection.

1.03 TOLERANCES

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. When Manufacturers' tolerances conflict with Contract Documents, request clarification from Engineer before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

1.04 REFERENCES

- A. ASTM International (ASTM):
 - 1. E329 - Standard for Agencies Engaged in Construction Inspection, Testing or Special Inspection.
- B. National Institute of Standards and Technology (NIST).

1.05 PRODUCT REQUIREMENTS

- A. For products or workmanship specified by association, trade, or other consensus standards, comply with requirements of standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to reference standard by date of issue current on date of Contract Documents, except where specific date is established by code.
- C. Obtain copies of standards where required by product specification sections.
- D. When specified reference standards conflict with Contract Documents, request clarification from Engineer before proceeding.

1.06 MOCK-UP REQUIREMENTS

- A. Tests will be performed under provisions identified in this Section and identified in respective product specification sections.
- B. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.
- C. Accepted mock-ups shall be comparison standard for remaining Work.
- D. Where mock-up has been accepted by Engineer and is specified in product specification sections to be removed; remove mock-up and clear area when directed to do so by Engineer.

1.07 AUTHORITY AND DUTIES OF OWNER'S REPRESENTATIVE OR INSPECTOR

- A. Owner's Project Representative employed or retained by Owner is authorized to inspect the Work.

- B. Inspections may extend to entire or part of the Work and to preparation, fabrication, and manufacture of products for the Work.
- C. Deficiencies or defects in the Work which have been observed will be called to Contractor's attention.
- D. Inspector will not:
 - 1. Alter or waive provisions of Contract Documents.
 - 2. Inspect Contractor's means, methods, techniques, sequences, or procedures for construction.
 - 3. Accept portions of the Work, issue instructions contrary to intent of Contract Documents, or act as foreman for Contractor. Supervise, control, or direct Contractor's safety precautions or programs; or inspect for safety conditions on Work site, or of persons thereon, whether Contractor's employees or others.
- E. Inspector will:
 - 1. Conduct on-site observations of the Work in progress to assist Engineer in determining when the Work is, in general, proceeding in accordance with Contract Documents.
 - 2. Report to Engineer whenever Inspector believes that Work is faulty, defective, does not conform to Contract Documents, or has been damaged; or whenever there is defective material or equipment; or whenever Inspector believes the Work should be uncovered for observation or requires special procedures.

1.08 SAMPLING AND TESTING

- A. General:
 - 1. Prior to delivery and incorporation in the Work, submit listing of sources of materials, when specified in sections where materials are specified.
 - 2. When specified in sections where products are specified:
 - a. Submit sufficient quantities of representative samples of character and quality required of materials to be used in the Work for testing or examination.
 - b. Test materials in accordance with standards of national technical organizations.
- B. Sampling:
 - 1. Furnish specimens of materials when requested.
 - 2. Do not use materials which are required to be tested until testing indicates satisfactory compliance with specified requirements.
 - 3. Specimens of materials will be taken for testing whenever necessary to determine quality of material.
 - 4. Assist Engineer in preparation of test specimens at site of work, such as soil samples and concrete test cylinders.

1.09 TESTING AND INSPECTION SERVICES

- A. Contractor will employ and pay for specified services of an independent firm to perform Contractor quality control testing as required in the technical specifications for various work and materials.

- B. Owner will employ and pay for specified services of an “Owner’s independent testing firm” certified to perform testing and inspection as required in the technical specifications for various work and materials or stipulated in Section 01_45_24 - Regulatory Quality Assurance to confirm Contractor’s compliance with Contract Documents.
- C. The Owner’s independent testing firm will perform tests, inspections and other services specified in individual specification sections and as required by Owner and requested by the Engineer.
- D. The qualifications of laboratory that will perform the testing, contracted by the Owner or by the Contractor, shall be as follows:
 - 1. Has authorization to operate in the state where the project is located.
 - 2. Meets “Recommended Requirements for Independent Laboratory Qualification,” published by American Council of Independent Laboratories.
 - 3. Meets requirements of ASTM E329.
 - 4. Laboratory Staff: Maintain full time specialist on staff to review services.
 - 5. Testing Equipment: Calibrated at reasonable intervals with devices of accuracy traceable to NIST or accepted values of natural physical constants.
 - 6. Will submit copy of report of inspection of facilities made by Materials Reference Laboratory of NIST during most recent tour of inspection, with memorandum of remedies of deficiencies reported by inspection.
- E. Testing, inspections, and source quality control may occur on or off project site. Perform off-site testing inspections and source quality control as required by Engineer or Owner.
- F. Contractor shall cooperate with Owner’s independent testing firm, furnish samples of materials, design mix, equipment, tools, storage, safe access, and assistance by incidental labor as requested.
 - 1. Notify Engineer and Owner’s independent testing firm 48 hours prior to expected time for operations requiring testing.
 - 2. Make arrangements with Owner’s independent testing firm and pay for additional samples and tests required for Contractor’s use.
- G. Limitations of authority of testing Laboratory: Owner’s independent testing firm or Laboratory is not authorized to:
 - 1. Agency or laboratory may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 - 2. Agency or laboratory may not approve or accept any portion of the Work.
 - 3. Agency or laboratory may not assume duties of Contractor.
 - 4. Agency or laboratory has no authority to stop the Work.
- H. Testing and employment of an Owner’s independent testing firm or laboratory shall not relieve Contractor of obligation to perform Work in accordance with requirements of Contract Documents.
- I. Re-testing or re-inspection required because of non-conformance to specified requirements shall be performed by same Owner’s independent testing firm on instructions by Engineer. Payment for re-testing or re-inspection will be charged to Contractor by deducting testing charges from Contract Sum/Price.

- J. The Owner's independent testing firm responsibilities will include:
 - 1. Test samples of mixes submitted by Contractor.
 - 2. Provide qualified personnel at site. Cooperate with Engineer and Contractor in performance of services.
 - 3. Perform specified sampling and testing of products in accordance with specified standards.
 - 4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
 - 5. Promptly notify Engineer and Contractor of observed irregularities or non-conformance of Work or products.
 - 6. Perform additional tests required by Engineer.
 - 7. Attend preconstruction meetings and progress meetings when requested.
- K. Owner's independent testing firm individual test reports:
 - 1. After each test, Owner's independent testing firm will promptly submit electronically report to Engineer and to Contractor.
 - 2. Test reports shall include at least the following information:
 - a. Date issued.
 - b. Project title and number.
 - c. Name of inspector.
 - d. Date and time of sampling or inspection.
 - e. Identification of product and specifications section.
 - f. Location in Project.
 - g. Type of inspection or test.
 - h. Date of test.
 - i. Certified test results stamped and signed by a registered Engineer in the state where the project is located.
 - j. Summary of conformance with Contract Documents.
 - k. When requested by Engineer, the Owner's independent testing firm will provide interpretation of test results.

1.10 CONTRACTOR'S RESPONSIBILITIES

- A. Cooperate with Owner's independent testing firm or laboratory personnel and provide access to construction and manufacturing operations.
- B. Secure and deliver to Owner's independent testing firm or laboratory adequate quantities of representative samples of materials proposed to be used and which require testing.
- C. Provide to Owner's independent testing firm or laboratory and Engineer preliminary mix design proposed to be used for concrete, and other materials mixes which require control by testing laboratory.
- D. Submit product test reports electronically.
- E. Furnish incidental labor and facilities:
 - 1. To provide access to construction to be tested.
 - 2. To obtain and handle samples at Work site or at source of product to be tested.

3. To facilitate inspections and tests.
 4. For storage and curing of test samples.
- F. Notify Owner's independent testing firm or laboratory 48 hours in advance of when observations, inspections and testing is needed for laboratory to schedule and perform in accordance with their notice of response time.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01_45_17

CONTRACTOR QUALITY CONTROL PLAN

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Contractor Quality Control Plan.

1.02 SUBMITTALS

- A. Qualifications of the Contractor's Quality Control (CQC) Plan Manager.
- B. Contractor's Daily Quality Control Report:
 - 1. Submit to Engineer within 1 day of completion of each inspection using the approved form.
- C. Daily Inspection Report:
 - 1. Submit to Engineer at the end of each working day or no later than prior to the beginning of the next working day using the approved form.

1.03 CONTRACTOR'S INSPECTION OF THE WORK

- A. Work performed by Contractor shall be inspected by the Contractor's CQC Plan Manager. Non-conforming Work and any safety hazards in the Work area shall be noted and promptly corrected.
- B. No materials or equipment shall be used in Work without inspection and acceptance by Contractor's CQC Plan Manager.

1.04 QUALIFICATIONS

- A. Contractor's CQC Plan Manager: Demonstrate having performed similar CQC functions on similar type projects. Submit records of personnel experience, training, and qualifying registrations.
- B. Minimum qualifications: Candidate must have a minimum of 10 years of experience on projects of similar type and size.

1.05 COVERING WORK

- A. Whenever Contractor intends to backfill, bury, cast in concrete, or otherwise cover any Work, notify Engineer not less than 24 hours in advance to request inspection before beginning any such Work of covering. Failure of Contractor to notify Engineer in accordance with this requirement shall be resolved according to Article 14 of the General Conditions.

1.06 CONTRACTOR'S QUALITY CONTROL PROGRAM

- A. General: Establish and execute a Quality Control (CQC) Plan for Work. The plan shall establish adequate measures for verification and conformance to defined requirements by Contractor personnel and lower-tier Subcontractors (including Fabricators, Suppliers, and Subcontractors). This program shall be described in a Plan responsive to this Section.
- B. CQC personnel:
 - 1. Contractor's CQC Plan Manager shall report to a Senior Project Manager of the Contractor and shall have no supervisory or managerial responsibility over the workforce.
 - 2. The Contractor CQC Plan Manager shall be on-site as often as necessary, but not less than the daily working hours specified in the Contract Documents to remedy and demonstrate that Work is being performed properly and to make multiple observations of Work in progress.
 - 3. The Contractor is to furnish personnel with assigned CQC functions reporting to the CQC Manager. Persons performing CQC functions shall have sufficient qualifications, authority, and organizational freedom to identify quality problems and to initiate and recommend solutions.
- C. CQC Plan:
 - 1. Contractor's CQC Plan shall include a statement by the Senior Project Manager designating the CQC Plan Manager and specifying the authority delegated to the CQC Plan Manager to direct cessation or removal and replacement of defective Work.
 - 2. Describe the CQC program and include procedures, work instructions, and records. Describe methods relating to areas that require special testing and procedures as required by the specifications.
 - 3. Include specific instructions defining procedures for observing Work in process and comparing this Work with the Contract requirements (organized by specifications section).
 - 4. Describe procedures to ensure that equipment or materials that have been accepted at the Site are properly stored, identified, installed and tested.
 - 5. Include procedures to verify that procured products and services conform to the requirements of the Specifications. Requirements of these procedures shall be applied, as appropriate, to lower-tier Suppliers and/or Subcontractors.
 - 6. Commissioning quality control: Include procedures to verify that the commissioning requirements of the Contract Documents are integrated into the Contractor's CQC Plan and conform to the requirements of the Specifications. Requirements of these procedures shall be applied, as appropriate, to the Contractor and the lower-tier Suppliers and/or Subcontractors.
 - 7. Include instructions for recording inspections and requirements for demonstrating through the Daily Inspection Reports that Work inspected was in compliance or a deficiency was noted and action to be taken.
 - 8. Procedures to preclude the covering of deficient or rejected Work.
 - 9. Procedures for halting or rejecting Work.
 - 10. Procedures for resolution of differences between the CQC Plan Manager and the production personnel.

11. Identify contractual hold/inspection points as well as any Contractor-imposed hold/inspection points.
- D. Daily Inspection Report: Include, at a minimum:
1. Inspection of specific work.
 2. Quality characteristics in compliance.
 3. Quality characteristics not in compliance.
 4. Corrective/remedial actions taken.
 5. Statement of certification.
 6. CQC Manager's signature, electronic signature is acceptable.
 7. Information provided on the daily report shall not constitute notice of delay or any other notice required by the Contract Documents.
- E. Deficient and Non-conforming Work and Corrective Action: Include procedures for handling deficiencies and non-conforming Work. Deficiencies and non-conforming Work are defined as documentation, drawings, material, equipment, or Work not conforming to the indicated requirements or procedures. The procedure shall prevent non-conformances by identification, documentation, evaluation, separation, disposition, and corrective action to prevent reoccurrence. Conditions having adverse effects on quality shall be promptly identified and reported to the senior level management. The cause of conditions adverse to quality shall be determined and documents and measures implemented to prevent recurrence. In addition, at a minimum, this procedure shall address:
1. Personnel responsible for identifying deficient and non-complying items within Work.
 2. How and by whom deficient and non-compliant items are documented "in the field."
 3. The personnel and process utilized for logging deficient and non-compliant Work at the end of each day onto a deficiency log.
 4. Tracking processes and tracking documentation for deficient and non-conforming Work.
 5. Personnel responsible for achieving resolution of outstanding deficiencies.
 6. Include detailed procedures for the performance and control of special process (e.g., welding, soldering, heat treating, cleaning, plating, nondestructive examination, etc.).
- F. Audits: The CQC program shall provide for regularly scheduled documented audits to verify that CQC procedures are being fully implemented by Contractor and its Subcontractors. Audit records shall be made available to Engineer upon request.
- G. Documented control/quality records:
1. Establish methods for control of Contract Documents that describe how Drawings and Specifications are received and distributed to ensure the correct issue of the document being used. Describe how record document/drawing data are documented and furnished to Engineer.
 2. Maintain evidence of activities affecting quality. Including operating logs, records of inspection, audit reports, personnel qualification and certification records, procedures, and document review records.
 3. Maintain quality records in a manner that provides for timely retrieval and traceability. Protect quality records from deterioration, damage and destruction.

4. Develop a list of specific records as required by the Contract Documents that will be furnished to Engineer at the completion of activities.
- H. Acceptance of CQC Plan: Engineer's acceptance of the CQC Plan shall not relieve Contractor from any of its obligations for performance of Work. Contractor's CQC staffing is subject to Engineer's review and continued acceptance. Owner, at its sole discretion, and without cause, may direct Contractor to remove and replace the CQC Plan Manager:
1. Acceptance of the CQC Plan by the Engineer is required prior to the start of construction. Acceptance is conditional and will be predicated on satisfactory performance during the construction.
 2. After acceptance of the CQC Plan, notify the Engineer in writing of any proposed change. Proposed changes are subject to acceptance by the Engineer.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01_45_24

REGULATORY QUALITY ASSURANCE

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: This Section describes project regulatory requirements for quality assurance that includes special inspections, special certification, and structural observation.

1.02 REFERENCES

- A. American Concrete Institute (ACI):
 - 1. 318 - Building Code Requirements for Structural Concrete.
 - 2. 530 - Building Code Requirements for Masonry Structures.
 - 3. 530.1 - Specification for Masonry Structures.
- B. American Institute of Steel Construction (AISC):
 - 1. 360 - Specification for Structural Steel Buildings.
- C. American Society of Civil Engineers (ASCE):
 - 1. 7 - Minimum Design Loads for Buildings and Other Structures.
- D. American Welding Society (AWS):
 - 1. D1.3 - Structural Welding Code - Sheet Steel.
 - 2. D1.4 - Structural Welding Code - Reinforcing Steel.
- E. ASTM International (ASTM):
 - 1. A706 - Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement.
 - 2. C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
 - 3. C172 - Standard Practice for Sampling Freshly Mixed Concrete.
 - 4. C1611 - Standard Test Method for Slump Flow of Self-Consolidating Concrete.
- F. International Building Code (IBC) 2015.
- G. The Masonry Society (TMS):
 - 1. 402 - Building Code for Masonry Structures.
 - 2. 602 - Specifications for Masonry Structures.

1.03 DEFINITIONS

- A. Special Certification: Certification for designated seismic systems that demonstrates compliance with performance requirements.

- B. Special Inspection: Inspection of the materials, installation, fabrication, erection, or placement of components and connections requiring special expertise to ensure compliance with approved construction documents and referenced standards.
- C. Special Inspection, Continuous: The full-time observation of work requiring special inspection by an approved special inspector who is present in the area where the work is being performed.
- D. Special Inspection, Periodic: The part-time, or intermittent observation of work requiring special inspection by an approved special inspector who is present in the area where the work is being performed and at the completion of the work.
- E. Structural Observation: The visual observation of the structural system by a registered design professional for general conformance to the approved construction documents at significant construction stages and at completion of the structural system.

1.04 DESCRIPTION

- A. This Section describes special inspections, special certification and structural observation of structural assemblies and components to be performed in compliance with the building code specified in Section 01_41_00 - Regulatory Requirements.
- B. The special certification and special inspections specified in this Section are in addition to the requirements specified in Section 01_45_00 - Quality Control, and by the individual Sections.

1.05 SUBMITTALS

- A. Contractor shall submit special certifications for designated seismic systems.
- B. Contractor shall schedule and coordinate the submittal of Special Inspection reports and test results prepared by others.

1.06 SPECIAL INSPECTION

- A. Owner will employ 1 or more special inspectors who will provide special inspections during construction.
- B. Special inspector(s) shall be qualified for inspection of the particular type of materials or operations requiring special inspection.
- C. Testing laboratory: Testing that is required to satisfy the requirements of special inspection will be performed by the Owner's testing laboratory as specified in Section 01_45_00 - Quality Control.
- D. Duties of Special Inspector:
 - 1. General: Required duties of the special inspector(s) shall be as described in Chapter 17 of the building code specified in Section 01_41_00 - Regulatory Requirements.

2. Reporting: Special inspector(s) shall provide reports of each inspection to the Owner and shall distribute copies of inspection reports to the Engineer and Contractor as required:
 - a. Reports shall, at a minimum, include the following items:
 - 1) Date and time of inspection, and name(s) of individual(s) performing the inspection.
 - 2) Structures and areas of the structure where work or testing was observed.
 - 3) Discrepancies between the requirements of the Contract Documents and the work or testing observed.
 - 4) Other areas of deficiency in the Work.
- E. Special inspections shall not be construed as fulfilling the requirements for structural observation.
- F. Owner or special inspector are responsible to select materials for special inspection:
 1. It is not acceptable for Contractor to select materials for special inspection.

1.07 SPECIAL CERTIFICATION

- A. Contractor shall be responsible for providing equipment that meets the special certification requirements of the building code specified in Section 01_41_00 - Regulatory Requirements.
- B. The following designated seismic systems shall be subject to the testing and qualification requirements of the regulatory building code, Section 1705.12.4 as specified in Section 01_41_00 - Regulatory Requirements and shall require special certification as set forth in ASCE 7, Section 13.2:
 1. Mechanical equipment that is assigned an importance factor of 1.50 as specified in Section 01_81_50 - Design Criteria.
 2. All electrical equipment.
- C. Special certification requirements for designated seismic systems:
 1. Submittals for mechanical and electrical equipment identified in this Section as designated seismic systems shall include certification that the equipment is seismically qualified. Certifications shall be subject to review and acceptance by Owner.
 2. Certifications may be at least 1 of the following in accordance with ASCE 7, Section 13.2:
 - a. Analysis.
 - b. Testing.
 - c. Experience data.

1.08 STRUCTURAL OBSERVATION

- A. Owner will employ 1 or more registered design professionals who will provide structural observation(s) during construction:
 1. Registered design professional shall be a civil or structural engineer currently licensed as such in the state where the project is located and regularly engaged in structural design equivalent to or similar to those indicated on the Drawings.

- B. Structural observations shall not be construed as fulfilling the requirements for special inspections.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 SPECIAL INSPECTIONS

- A. The Owner will provide special inspection of following types of work as described in Section 1705 of the building code as specified in Section 01_41_00 - Regulatory Requirements wherever such work occurs unless otherwise specified:
 - 1. Attachment A - Concrete Special Inspection Schedule.
 - 2. Attachment B - Architectural, Mechanical, and Electrical Components - Special Inspection Schedule.
 - 3. Attachment C1 - Masonry Special Inspection Schedule – "Level B".
 - 4. Attachment C2 - Masonry Special Inspection Schedule – "Level C".
 - 5. Attachment D - Soils Verification and Inspection Schedule.
 - 6. Attachment E - Structural Steel Special Inspection Schedule.
 - 7. Attachment F - Structural Steel Bolting Special Inspection Schedule.
 - 8. Attachment G - Steel Construction - Steel Deck, Open Web Steel Joists and Joist Girders, and Cold Formed Steel Trusses - Special Inspection Schedule.
 - 9. Attachment H - Deep Foundations, Cast-in-Place - Special Inspection Schedule.
 - 10. Attachment I - Deep Foundations, Driven - Special Inspection Schedule.

3.02 SPECIAL CERTIFICATION

- A. Special inspector shall examine the designated seismic system(s) specified and determine whether the designated system components, including anchorage, are consistent with the evidence of compliance submitted for special certification.

3.03 STRUCTURAL OBSERVATION

- A. The following work requires structural observation in accordance with Section 1704.5 of the building code specified in Section 01_41_00 - Regulatory Requirements:
 - 1. All structures in all areas:
 - a. Foundations.
 - b. Elevated slabs.

3.04 SCHEDULE

- A. Contractor shall allow time necessary for special inspections and structural observation specified herein.
- B. Sufficient notice shall be given so that the special inspections and structural observations can be performed. Contractor shall allow time for individuals performing special inspection and structural observation to travel to the site.

3.05 PROCEDURE

- A. The special inspector will immediately notify the Engineer of any corrections required and follow notification with appropriate documentation.
- B. Contractor shall not proceed until the work is satisfactory to the Engineer.

END OF SECTION

ATTACHMENT A - CONCRETE SPECIAL INSPECTION SCHEDULE

CONCRETE SPECIAL INSPECTION SCHEDULE
(Includes: cast-in-place, precast, prestressed, precast-prestressed, and shotcrete.)

Verification and Inspection	Reference Standard ACI 318-14 AWS D1.4-18 IBC 2015	Frequency of Inspection ⁽¹⁾ (During Task Listed)	
		Continuous	Periodic
1. Inspect reinforcement, including prestressing tendons, and verify placement.	ACI 318: 20, 25.2, 25.3, 26.6.1-26.6.3 IBC: 1908.4		●
2. Reinforcing bar welding:			
a. Verify weldability of reinforcing bars other than ASTM A706;	AWS D1.4 ACI 318: 26.6.4		●
b. Inspect single-pass fillet welds, maximum 5/16"; and	AWS D1.4 ACI 318: 26.6.4		●
c. Inspect all other welds.	AWS D1.4 ACI 318: 26.6.4	●	
3. Inspect anchors cast in concrete.	ACI 318: 17.8.2		●
4. Inspect anchors post-installed in hardened concrete members.			
a. Adhesive anchors installed in horizontally or upwardly inclined orientations to resist sustained tension loads.	ACI 318: 17.8.2.4	●	
b. Mechanical anchors and adhesive anchors not defined in 4.a.	ACI 318: 17.8.2		●
5. Verify use of required design mix.	ACI 318: 19, 26.4.3, 26.4.4 IBC: 1904.1, 1904.2, 1908.2, 1908.3		●
6. Prior to concrete placement, fabricate specimens for strength tests, perform slump and air content tests, and determine the temperature of the concrete.	ASTM C172 ASTM C31 ACI 318: 26.5, 26.12 IBC: 1908.10	●	
7. Inspect concrete and shotcrete placement for proper application techniques.	ACI 318: 26.5 IBC: 1908.6, 1908.7, 1908.8	●	

Verification and Inspection	Reference Standard ACI 318-14 AWS D1.4-18 IBC 2015	Frequency of Inspection ⁽¹⁾ (During Task Listed)	
		Continuous	Periodic
8. Verify maintenance of specified curing temperature and techniques.	ACI 318: 26.5.3-26.5.5 IBC: 1908.9		●
9. Inspect prestressed concrete for:			
a. Application of prestressing forces; and	ACI 318: 26.10	●	
b. Grouting of bonded prestressing tendons.	ACI 318: 26.10	●	
10. Inspect erection of precast concrete members.	ACI 318: 26.9		●
11. Verify in-situ concrete strength, prior to stressing of tendons in post-tensioned concrete and prior to removal of shores and forms from beams and structural slabs.	ACI 318: 26.11.2		●
12. Inspect formwork for shape, location and dimensions of the concrete member being formed.	ACI 318: 26.11.1.2.(b)		●
Notes:			
(1) The "●" represents a required inspection activity for the project where it occurs.			

**ATTACHMENT B - ARCHITECTURAL, MECHANICAL AND ELECTRICAL COMPONENTS
SPECIAL INSPECTION SCHEDULE**

**ARCHITECTURAL, MECHANICAL AND ELECTRICAL COMPONENTS
SPECIAL INSPECTION SCHEDULE**

Verification and Inspection	Reference Standard IBC 2015	Frequency of Inspection ⁽¹⁾ (During Task Listed)	
		Continuous	Periodic
1. Architectural components:			
a. Cladding - exterior, weighing more than 5 psf: erection and fastening.	IBC: 1705.12.5		●
b. Exterior insulation and finish system (EIFS):	IBC: 1705.16		
c. Non-bearing walls – exterior: erection and fastening.	IBC: 1705.12.5		●
d. Non-bearing walls – interior, weighing more than 15 psf.	IBC: 1705.12.5		●
e. Veneer, exterior and interior, weighing more than 5 psf: erection and fastening.	IBC: 1705.12.5		●
f. Access floors: erection and anchorage.	IBC: 1705.12.5.1		●
g. Suspended ceiling system: bracing.			●
h. Storage racks – 8 feet or greater in height: anchorage.	IBC: 1705.12.7		●
i. Skylight: verification of safety compliance and labeling and installation.	IBC: 1709.6		●
2. Plumbing, mechanical, and electrical components:			
a. Anchorage of electrical equipment for emergency and standby power systems.	IBC: 1705.12.6.1		●
b. Anchorage of other electrical and mechanical equipment over 400 lb. on floors or roofs.	IBC: 1705.12.6.2		●
c. Installation and anchorage of pipelines carrying hazardous chemicals and their associated mechanical units.	IBC: 1705.12.6.3		●
d. Installation and anchorage of pipelines greater than 8 inches in diameter.			●
e. Installation and anchorage of ductwork designed to carry hazardous materials.	IBC: 1705.12.6.4		●

f. Installation and anchorage of ductwork greater than 6 sf in cross section.			●
g. Installation and anchorage of vibration isolation systems where contract documents require nominal clearance of 1/4 inch or less between the equipment support frame and its support/restraint.	IBC: 1705.12.6.5		●
h. Installation of mechanical and electrical equipment, including duct work, piping systems and their structural supports, where automatic fire sprinkler systems are installed.	IBC: 1705.12.6.6		●
3. Fire-resistance elements:			
a. Sprayed fire-resistant coatings:	IBC: 1705.14		
b. Mastic and intumescent coatings:	IBC: 1705.15		
c. Fire-resistant penetrations and joint systems:	IBC: 1705.17,		
4. Smoke control systems;	IBC: 1705.18		
Notes: (1) The "●" represents a required inspection activity for the project where it occurs.			

ATTACHMENT C1 - MASONRY SPECIAL INSPECTION SCHEDULE - "LEVEL B"

MASONRY SPECIAL INSPECTION SCHEDULE - "LEVEL B"

MINIMUM TESTS

Verification of Slump flow and Visual Stability Index (VSI) as delivered to the project site as determined by ASTM C1611 for self-consolidating grout

Verification of f_m in accordance with Specification Section 04_22_00 - Concrete Unit Masonry prior to construction.

MINIMUM SPECIAL INSPECTION – LEVEL B			
Verification and Inspection	Reference Standard TMS 402/ACI 530-13 TMS 602/ACI 530.1-13	Frequency of Inspection ⁽¹⁾ (During Task Listed)	
		Continuous	Periodic
1. Verify compliance with the approved submittals.	TMS 602/ACI 530.1: Art. 1.5		●
2. As masonry construction begins, verify that the following are in compliance:			
a. Proportions of site-prepared mortar.	TMS 602/ACI 530.1: Art. 2.1, 2.6A		●
b. Placement of masonry units and construction of mortar joints.	TMS 602/ACI 530.1: Art. 3.3B		●
c. Placement of reinforcement, connectors, and anchors.	TMS 602/ACI 530.1: Art. 3.4, 6.1, 6.2.6, 6.2.7		●
d. Reinforcing bar couplers and terminators.	ICC-ES Evaluation Report	●	
3. Prior to grouting, verify that the following are in compliance:			
a. Placement of masonry units and construction of mortar joints	TMS 602/ACI 530.1: Art.3.3B		●
b. Grout space.	TMS 602/ACI 530.1: Art. 3.2D, 3.2F		●
c. Grade, type, and size of reinforcement and anchor bolts.	TMS 602/ACI 530.1: Art. 2.4, 3.4 TMS 402/ACI 530: Sec. 6.1		●

MINIMUM SPECIAL INSPECTION – LEVEL B			
Verification and Inspection	Reference Standard TMS 402/ACI 530-13 TMS 602/ACI 530.1-13	Frequency of Inspection ⁽¹⁾ (During Task Listed)	
		Continuous	Periodic
d. Placement of reinforcement, connectors, and anchors.	TMS 602/ACI 530.1: Art. 3.2E, 3.4 TMS 402/ACI 530: Sec. 6.1		●
e. Proportions of site-prepared grout.	TMS 602/ACI 530.1: Art. 2.6B		●
4. Verify during construction:			
a. Size and location of structural elements:	TMS 602/ACI 530.1: Art. 3.3F		●
b. Type, size, and location of anchors, including details of anchorage of masonry to structural members, frames, or other construction.	TMS 402/ACI 530: Sec. 1.2.1(e), 6.1.4.3, 6.2.1		●
c. Welding of reinforcement.	TMS 402/ACI 530: Sec. 8.1.6.7.2, 9.3.3.4(c), 11.3.3.4(b)	●	
d. Preparation, construction, and protection of masonry during cold weather (temperature below 40 degrees F) or hot weather (temperature above 90 degrees F).	TMS 602/ACI 530.1: Art. 1.8C, 1.8D		●
5. Observe preparation of grout specimens, mortar specimens, and/or prisms.	TMS 602/ACI 530.1: Art. 1.4 B.2.a.3, 1.4 B.2.b.3, 1.4 B.2.c.3, 1.4 B.3, 1.4 B.4		●
Notes:			
(1) The "●" represents a required inspection activity for the project where it occurs.			

ATTACHMENT C2 - MASONRY SPECIAL INSPECTION SCHEDULE - “LEVEL C”

MASONRY SPECIAL INSPECTION SCHEDULE - “LEVEL C”

MINIMUM TESTS

Verification of Slump flow and Visual Stability Index (VSI) as delivered to the project site as determined by ASTM C1611 for self-consolidating grout.

Verification of proportions of materials in premixed or pre-blended mortar and grout as delivered to the project site.

Verification of f_m in accordance with Specification Section 04_22_00 - Concrete Unit Masonry prior to construction.

MINIMUM SPECIAL INSPECTION – LEVEL C			
Verification and Inspection	Reference Standard TMS 402/ACI 530-13 TMS 602/ACI 530.1-13	Frequency of Inspection ⁽¹⁾ (During Task Listed)	
		Continuous	Periodic
1. Verify compliance with the approved submittals.	TMS 602/ACI 530.1: Art. 1.5		●
2. As masonry construction begins, verify that the following are in compliance:			
a. Proportions of site-prepared mortar.	TMS 602/ACI 530.1: Art. 2.1, 2.6A		●
b. Placement of masonry units and construction of mortar joints.	TMS 602/ACI 530.1: Art. 3.3B		●
c. Placement of reinforcement, connectors, and anchors.	TMS 602/ACI 530.1: Art 3.4 TMS 402/ACI 530: Sec 6.1, 6.2.6, 6.2.7	●	
d. Reinforcing bar couplers and terminators.	ICC-ES Evaluation Report	●	
3. Prior to grouting, verify that the following are in compliance:			
a. Placement of masonry units and construction of mortar joints.	TMS 602/ACI 530.1: Art. 3.3B		●
b. Grout space.	TMS 602/ACI 530.1: Art. 3.2D, 3.2F	●	
c. Grade, type, and size of reinforcement and anchor bolts.	TMS 602/ACI 530.1: Art. 2.4, 3.4 TMS 402/ACI 530: Sec. 6.1		●

MINIMUM SPECIAL INSPECTION – LEVEL C			
Verification and Inspection	Reference Standard TMS 402/ACI 530-13 TMS 602/ACI 530.1-13	Frequency of Inspection ⁽¹⁾ (During Task Listed)	
		Continuous	Periodic
d. Placement of reinforcement, connectors, and anchors.	TMS 602/ACI 530.1: Art. 3.2E, 3.4 TMS 402/ACI 530: Sec. 6.1, 6.2.6, 6.2.7	●	
4. Verify during construction:			
a. Size and location of structural elements:	TMS 602/ACI 530.1: Art. 3.3F		●
b. Type, size, and location of anchors, including details of anchorage of masonry to structural members, frames, or other construction.	TMS 402/ACI 530: Sec. 1.2.1(e), 6.1.4.3, 6.2.1	●	
c. Welding of reinforcement.	TMS 402/ACI 530: Sec 8.1.6.7.2, 9.3.3.4(c), 11.3.3.4(b)	●	
d. Preparation, construction, and protection of masonry during cold weather (temperature below 40 degrees F) or hot weather (temperature above 90 degrees F).	TMS 602/ACI 530.1: Art. 1.8C, 1.8D		●
5. Observe preparation of grout specimens, mortar specimens, and/or prisms.	TMS 602/ACI 530.1: Art. 1.4 B.2.a.3, 1.4 B.2.b.3, 1.4 B.2.c.3, 1.4 B.3, 1.4 B.4	●	
Notes:			
(1) The "●" represents a required inspection activity for the project where it occurs.			

ATTACHMENT D - SOILS VERIFICATION AND INSPECTION SCHEDULE

SOILS VERIFICATION AND INSPECTION SCHEDULE

Verification and Inspection	Reference Standard IBC 2015	Frequency of Inspection ⁽¹⁾ (During Task Listed)	
		Continuous	Periodic
1. Verify materials below shallow foundations are adequate to achieve the design bearing capacity.	IBC: T-1705.6		●
2. Verify excavations are extended to proper depth and have reached proper material.	IBC: T-1705.6		●
3. Perform classification and testing of fill and backfill materials.	IBC: T-1705.6		●
4. Verify use of proper materials, densities, and lift thicknesses during placement and compaction of fill and backfill.	IBC: T-1705.6	●	
5. Prior to placement of fill, observe subgrade and verify that site has been prepared properly.	IBC: T-1705.6		●
Notes: (1) The "●" represents a required inspection activity for the project where it occurs.			

ATTACHMENT E - STRUCTURAL STEEL SPECIAL INSPECTION SCHEDULE

STRUCTURAL STEEL SPECIAL INSPECTION SCHEDULE

Verification and Inspection	Referenced Standard	Frequency of Inspection ⁽¹⁾ (During Task Listed)	
		Continuous	Periodic
Inspection Tasks Prior to Welding	AISC 360, Table N5.4-1		
1. Welding procedure specifications (WPSs) available.		●	
2. Manufacturer certifications for welding consumables available.		●	
3. Material identification (type/grade).			●
4. Welder identification system.			●
5. Fit-up groove welds (including joint geometry): - Joint preparation. - Dimensions (alignment, root opening, root face, bevel). - Cleanliness (condition of steel surfaces). - Tacking (tack weld quality and location). - Backing type and fit (if applicable).			●
5. Configuration and finish of access holes.			●
6. Fit-up of fillet welds: - Dimensions (alignment, gaps at root). - Cleanliness (condition of steel surfaces). - Tacking (tack weld quality and location).			●
7. Check welding equipment.			●
Inspection Tasks During Welding	AISC 360, Table N5.4-2		
8. Use of qualified welders.			●
9. Control and handling of welding consumables: - Packaging. - Exposure control.			●
10. No welding over cracked tack welds.			●
11. Environmental conditions: - Wind speed within limits. - Precipitation and temperature.			●

Verification and Inspection	Referenced Standard AISC 360-10	Frequency of Inspection ⁽¹⁾ (During Task Listed)	
		Continuous	Periodic
12. WPS followed: - Settings on welding equipment. - Travel speed. - Selected welding materials. - Shielding gas type/flow rate. - Preheat applied. - Interpass temperature maintained (min/max). - Proper position (F, V, H, OH).			●
13. Welding techniques: - Interpass and final cleaning. - Each pass within profile limitations. - Each pass meets quality requirements.			●
Inspection Tasks After Welding	AISC 360, Table N5.4-3		
14. Welds cleaned.			●
15. Size, length, and location of welds.		●	
16. Welds meet visual acceptance criteria: - Crack prohibition. - Weld/base-metal fusion. - Crater cross section. - Weld profiles. - Weld size. - Undercut. - Porosity.		●	
17. Arc strikes.		●	
18. k-area.		●	
19. Backing removed and weld tabs removed (if required).		●	
20. Repair activities.		●	
21. Document acceptance or rejection of welded joint or member.		●	
Notes: (1) The "●" represents a required inspection activity for the project where it occurs.			

ATTACHMENT F - STRUCTURAL STEEL BOLTING SPECIAL INSPECTION SCHEDULE

STRUCTURAL STEEL BOLTING SPECIAL INSPECTION SCHEDULE

Verification and Inspection	Referenced Standard	Frequency of Inspection ⁽¹⁾ (During Task Listed)	
		Continuous	Periodic
Inspection Tasks Prior to Bolting	AISC 360, Table N5.6-1		
1. Manufacturer's certifications available for fastener materials.		●	
2. Fasteners marked in accordance with ASTM requirements.			●
3. Proper fasteners selected for the joint detail (grade, type, bolt length if threads are to be excluded from shear plane).			●
4. Proper bolting procedure selected for joint detail.			●
5. Connecting elements, including the appropriate faying surface condition and hole preparation, if specified, meet applicable requirements.			●
6. Pre-installation verification testing by installation personnel observed and documented for fastener assemblies and methods used.			●
7. Proper storage provided for bolts, nuts, washers and other fastener components.			●
Inspection Tasks During Bolting	AISC 360, Table N5.6-2		
8. Fastener assemblies, of suitable condition, placed in all holes and washers (if required) are positioned as required.			●
9. Joint brought to the snug-tight condition prior to the pretensioning operation.			●
10. Fastener component not turned by the wrench prevented from rotating.			●
11. Fasteners are pretensioned in accordance with the RCSC Specification, progressing systematically from the most rigid point toward the free edges.			●
Inspection Tasks After Bolting	AISC 360, Table N5.6-3		
12. Document acceptance or rejection of bolted connections.		●	
Notes: (1) The "●" represents a required inspection activity for the project where it occurs.			

**ATTACHMENT G - STEEL CONSTRUCTION – STEEL DECK; OPEN WEB STEEL JOISTS
GIRDERS; AND COLD-FORMED STEEL TRUSSES AND JOIST SPECIAL INSPECTION
SCHEDULE**

**STEEL CONSTRUCTION – STEEL DECK; OPEN WEB STEEL JOISTS AND JOIST
GIRDERS; AND COLD-FORMED STEEL TRUSSES
SPECIAL INSPECTION SCHEDULE**

Verification and Inspection	Referenced Standard IBC 2015	Frequency of Inspection ⁽¹⁾ (During Task Listed)	
		Continuous	Periodic
1. Cold-formed steel deck:			
a. Materials: Identification markings conform to ASTM standards specified in the approved construction documents.	Applicable ASTM material standards		●
b. Materials: Manufacturer's certified test reports.			●
c. Welding: Floor and roof deck welds.	AWS D1.3		●
2. Open web steel joints and joist girders:			
a. End connections – welded or bolted	SJI specs		●
b. Bridging – horizontal or diagonal	SJI specs		●
3. Cold-formed steel:			
a. Trusses: Inspect temporary and permanent installation restraints/bracing conform to approved truss submittal.	IBC 1705.2.4		●
Notes:			
(1) The "●" represents a required inspection activity for the project where it occurs.			

ATTACHMENT H - DEEP FOUNDATIONS, CAST-IN-PLACE – SPECIAL INSPECTION SCHEDULE

DEEP FOUNDATIONS, CAST-IN-PLACE – SPECIAL INSPECTION SCHEDULE

Verification and Inspection	Reference Standard IBC 2015	Frequency of Inspection ⁽¹⁾ (During task listed)	
		Continuous	Periodic
1. Observe drilling operations and maintain complete and accurate records for each element.	IBC 1705.8	●	
2. Verify placement locations and plumbness, confirm element diameters, bell diameters (if applicable), lengths, embedment into bedrock or specified stratum (if applicable), and adequate end-bearing strata capacity. Record concrete or grout volumes.	IBC 1705.8	●	
3. For concrete or grout installations, perform additional special inspection in accordance with Attachment A – Concrete Special Inspection.	IBC 1705.8	-	-
Notes: (1) The "●" represents a required inspection activity for the project where it occurs.			

ATTACHMENT I - DEEP FOUNDATIONS, DRIVEN – SPECIAL INSPECTION SCHEDULE

DEEP FOUNDATIONS, DRIVEN – SPECIAL INSPECTION SCHEDULE

Verification and Inspection	Reference Standard IBC 2015	Frequency of Inspection ⁽¹⁾ (During task listed)	
		Continuous	Periodic
1. Verify that element materials, sizes, and lengths comply with approved contract documents and approved shop drawings.	IBC 1705.7	●	
2. Determine capacities of test elements and conduct additional load tests, as required	IBC 1705.7		
3. Inspect driving operations and maintain complete and accurate records for each element.	IBC 1705.7	●	
4. Verify placement location and plumbness, confirm type and size of hammer, record number of blows per foot of penetration, determine required penetrations to achieve required/design capacity, record tip and butt elevations, and document any damage to foundation element.	IBC 1705.7	●	
5. Steel elements: perform additional special inspection as specified for structural steel.	IBC 1705.7	-	-
6. Concrete and concrete-filled elements: perform tests and additional special inspections as specified for concrete.	IBC 1705.7	-	-
7. Specialty elements: perform additional inspections as indicated on the approved shop drawings.	IBC 1705.7	-	-
Notes: (1) The "●" represents a required inspection activity for the project where it occurs.			

SECTION 01_50_00

TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Furnishing, maintaining, and removing construction facilities and temporary controls, including temporary utilities, construction aids, barriers and enclosures, security, access roads, temporary controls, project sign, field offices and sheds, and removal after construction.

1.02 REFERENCE

- A. American National Standards Institute (ANSI).
- B. Occupational Safety and Health Administration (OSHA).

1.03 SUBMITTALS

- A. Submit as specified in Section 01_33_00 - Submittal Procedures.

1.04 TEMPORARY UTILITIES

- A. Temporary electrical power:
 - 1. Arrange with local utility to provide adequate temporary electrical service.
 - 2. Provide and maintain adequate jobsite power distribution facilities conforming to applicable Laws and Regulations.
 - 3. Provide, maintain, and pay for electric power for performance of the Work except for power required for the final 7-day operational test.
- B. Temporary electrical lighting:
 - 1. In work areas, provide temporary lighting sufficient to maintain lighting levels during working hours not less than lighting levels required by OSHA and state agency which administers OSHA regulations where Project is located.
 - 2. When available, permanent lighting facilities may be used in lieu of temporary facilities:
 - a. Prior to Substantial Completion of the Work, replace bulbs, lamps, or tubes used by Contractor for lighting.
- C. Temporary heating, cooling, and ventilating:
 - 1. Heat and ventilate work areas to protect the Work from damage by freezing, high temperatures, weather, and to provide safe environment for workers.
 - 2. Permanent heating system may be utilized when sufficiently completed to allow safe operation.

- D. Temporary water:
1. Pay for and construct facilities necessary to furnish potable water for human consumption and non-potable water for use during construction.
 2. Remove temporary piping and connections and restore affected portions of the facility to original condition before Substantial Completion.
 3. Development of potable water supply:
 - a. Potable water is not available at construction site.
 - b. Provide potable water for human consumption during construction period.
 - c. Furnish potable water that meets requirements of Laws and Regulations.
 4. Development of non-potable water supply:
 - a. Post ample signs throughout the work area warning that plant water is not potable.
 - b. Non-potable water is available from hydrants or hose valves within plant without cost. When combined demand of the Work and plant exceeds plant supply capacity, provide additional temporary supply capacity.
- E. Temporary sanitary facilities:
1. Provide suitable and adequate sanitary facilities that are in compliance with applicable Laws and Regulations.
 2. Existing facility use is not allowed.
 3. At completion of the Work, remove sanitary facilities and leave site in neat and sanitary condition.
- F. Temporary fire protection:
1. Provide fire protection required to protect the Work and ancillary facilities.
- G. First aid: Post first aid facilities and information posters conforming to requirements of OSHA and other applicable Laws and Regulations in readily accessible locations.
- H. Utilities in existing facilities: As specified in Section 01_14_00 - Work Restrictions.
- I. Temporary piping systems:
1. Submit layout drawings showing proposed routing of piping, including proposed pipe support and pipe restraint locations.
 2. Submit product data for piping, fittings, appurtenances, restraints, supports, and other components of the temporary piping system.
 3. Submit information at least 28 days prior to when each temporary piping system is scheduled to be installed and allow 14 days for review and comment.
- J. Temporary pumping systems:
1. Submit pump data, performance curves, and other operating information as specified in Section 46_05_10 - Common Work Results for Mechanical Equipment.
 2. Submit sketches showing layout of temporary pumping system, including pump quantity, configuration in wet well, and proposed piping layout specified in this Section.
 3. Submit piping headloss calculations based on proposed temporary piping system layout.

4. Submit information at least 28 days prior to when the temporary pumping system is scheduled to be installed and allow 14 days for review and comment.

1.05 CONSTRUCTION AIDS

- A. Provide railings, kick plates, enclosures, safety devices, and controls required by Laws and Regulations and as required for adequate protection of life and property.
- B. Use construction hoists, elevators, scaffolds, stages, shoring, and similar temporary facilities of ample size and capacity to adequately support and move loads.
- C. Design temporary supports with adequate safety factor to ensure adequate load bearing capability:
 1. When requested, submit design calculations by professional registered engineer prior to application of loads.
 2. Submitted design calculations are for information and record purposes only.
- D. Accident prevention:
 1. Exercise precautions throughout construction for protection of persons and property.
 2. Observe safety provisions of applicable Laws and Regulations.
 3. Guard machinery and equipment and eliminate other hazards.
 4. Make reports required by authorities having jurisdiction, and permit safety inspections of the Work.
 5. Before commencing construction work, take necessary action to comply with provisions for safety and accident prevention.
- E. Barricades:
 1. Place barriers at ends of excavations and along excavations to warn pedestrian and vehicular traffic of excavations.
 2. Provide barriers with flashing lights after dark.
 3. Keep barriers in place until excavations are entirely backfilled and compacted.
 4. Barricade excavations to prevent persons from entering excavated areas in streets, roadways, parking lots, treatment plants, or other public or private areas.
- F. Warning devices and barricades: Adequately identify and guard hazardous areas and conditions by visual warning devices and, where necessary, physical barriers:
 1. Provide devices in accordance with minimum requirements of OSHA and State agency which administers OSHA regulations where Project is located.
- G. Hazards in public right-of-way:
 1. Comply with local jurisdiction standards and requirements for right-of-way barricades and other safety devices.
 2. Mark at reasonable intervals, trenches, and other continuous excavations in public right-of-way, running parallel to general flow of traffic, with traffic cones, barricades, or other suitable visual markers during daylight hours:
 - a. During hours of darkness, provide markers with torches, flashers, or other adequate lights.

3. At intersections or for pits and similar excavations, where traffic may reasonably be expected to approach head on, protect excavations by continuous barricades:
 - a. During hours of darkness provide warning lights at close intervals.
- H. Hazards in protected areas: Mark or guard excavations in areas from which public is excluded, in manner appropriate for hazard.
- I. Above grade protection: On multi-level structures, provide safety protection that meets requirements of OSHA and State agency which administers OSHA regulations where Project is located.
- J. Protect existing structures, trees, shrubs, and other items to be preserved on Project site from injury, damage, or destruction by vehicles, equipment, worker or other agents with substantial barricades or other devices commensurate with hazards.
- K. Fences:
 1. When working outside the existing Plant site, enclose site of the Work with fence adequate to protect the Work against acts of theft, violence, and vandalism.
 2. When working inside the existing Plant site, enclose temporary offices and storage areas with fence adequate to protect temporary facilities against acts of theft, violence, and vandalism as needed.
 3. When entire or part of site is to be permanently fenced, permanent fence may be built to serve for both permanent and temporary protection of the work site, provided that damaged or defaced fencing is replaced prior to Substantial Completion.
 4. Protect temporary and permanent openings and close openings in existing fences to prevent intrusion by unauthorized persons:
 - a. Bear responsibility for protection of plant and material on site of the Work when openings in existing fences are not closed.
 5. During night hours, weekends, holidays, and other times when no work is performed at site, provide temporary closures or enlist services of security guards to protect temporary openings.
 6. Fence temporary openings when openings are no longer necessary.

1.06 SECURITY

- A. Make adequate provision for protection of the work area against fire, theft, and vandalism, and for protection of public against exposure to injury.
- B. Security at the Stillwater WTP is only provided on-site, within the existing fenced areas indicated on the Drawings. The Owner shall take no responsible for fire, theft, vandalism off-site, outside the existing fenced areas. It is the Contractor's decision and responsibility to enclose the site of any Work on-site and off-site with fencing adequate to protect the Work against acts of theft, violence, and vandalism.

1.07 ACCESS ROADS

- A. General:
 - 1. Existing WTP roads will be used for delivery of material and for access to existing and operating plant facilities onsite.
 - 2. Build and maintain access roads to and on site of the Work for the Recovered Water Pump Station to provide for delivery of material and for access to the site.
 - 3. Build and maintain dust free roads which are suitable for travel at 20 miles per hour.
- B. Off-site access roads:
 - 1. Build and maintain graded earth roads.
 - 2. Build roads only in public right-of-way or easements obtained by Owner.
 - 3. Obtain rights-of-way or easements when electing to build along other alignment.
- C. On-site access roads:
 - 1. Maintain access roads to storage areas and other areas to which frequent access is required.
 - 2. Maintain similar roads to existing facilities on site of the Work to provide access for maintenance and operation.
 - 3. Protect buried vulnerable utilities under temporary roads with steel plates, wood planking, or bridges.
 - 4. Maintain on-site access roads free of mud.
 - 5. Provide controls to prevent vehicles leaving the site from tracking mud off the site onto the public right-of-way.

1.08 TEMPORARY CONTROLS

- A. Dust control:
 - 1. Prevent dust nuisance caused by operations, unpaved roads, excavation, backfilling, demolition, or other activities.
 - 2. Control dust by sprinkling with water, use of dust palliatives, modification of operations, or other means acceptable to agencies having jurisdiction.
- B. Noise control:
 - 1. Comply with noise and work hours regulations by local jurisdiction.
 - 2. In or near inhabited areas, particularly residential, perform operations in manner to minimize noise.
 - 3. In residential areas, take special measures to suppress noise during night hours.
- C. Mud control:
 - 1. Prevent mud nuisance caused by construction operations, unpaved roads, excavation, backfilling, demolition, or other activities.

1.09 PROJECT SIGN

- A. Provide and maintain Project identification sign meeting the requirements outlined in the Supplemental Conditions for DWSRF Projects (DW-185).

- B. Erect Project identification sign where directed by Engineer within 14 days after the issuance of the Notice to Proceed.
- C. Replace or repair the project sign if it is damaged or covered with graffiti within 2 working days of observation or notification of damage or graffiti.

1.10 CONTRACTOR FIELD OFFICES AND SHEDS

- A. Maintain on Project Site weather tight space in which to keep copies of Contract Documents, progress schedule, shop drawings, and other relevant documents.
- B. Provide field office with adequate space to examine documents and provide lighting and telephone service in that space.

1.11 REMOVAL

- A. Remove temporary facilities and controls before inspection for Substantial Completion or when directed.
- B. Clean and repair damage caused by installation or use of temporary facilities.
- C. Remove underground installations to minimum depth of 24 inches and grade to match surrounding conditions.
- D. Restore existing facilities used during construction to specified or original condition.

1.12 TEMPORARY PROCESS PIPING SYSTEMS

- A. Provide piping, appurtenances, and other materials as required to provide temporary piping systems as specified in this Section, as indicated on the Drawings, and as needed to perform the Work.
- B. Provide field route piping as needed and as field conditions dictate, unless otherwise indicated on the Drawings, and determine appropriate lengths of piping and quantity/type of pipe fittings needed to construct temporary piping system. Do not block access points such as stairs, doors, and walkways to existing facilities unless approved in writing by the Owner.
- C. Restrain piping at valves and at fittings where piping changes direction, changes sizes, and at ends:
 - 1. When piping is buried, use concrete thrust block or mechanical restraints.
 - 2. When piping is exposed or under water, use mechanical or structural restraints.
 - 3. Determine thrust forces by multiplying the nominal cross sectional area of the piping by the operating pressure of the piping.
- D. Install temporary piping systems in a manner that will not damage existing or new facilities.
- E. Piping material, including gaskets: Suitable for the process fluid requiring temporary piping, unless indicated otherwise.

- F. Temporary piping includes, but is not limited to, the following piping services:
 - 1. Northeast Zone 18-inch temporary transmission main, as indicated on the Drawings.
- G. After temporary piping system is no longer required:
 - 1. Remove temporary piping system.
 - 2. Clean and repair damage caused by installation or use of temporary piping system.
 - 3. Restore existing facilities to original condition.

1.13 TEMPORARY PROCESS PUMPING SYSTEMS

- A. Provide temporary pumping system to pump flow from the Solids Contact Unit blowdown manholes to the north plant drain manhole as indicated on the Drawings:
 - 1. Required solids blowdown flow rate: 300 gallons per minute.
 - 2. Anticipated pressure will vary based on headlosses developed and the final length of installed temporary piping:
 - a. Calculate headlosses and provide pump with sufficient pressure to meet flow requirements.
 - b. Submit calculations sealed and signed by a professional engineer registered in the state in which the Project is located.
 - 3. Provide pump capable of passing a solid with a sphere size of 3 inches.
 - 4. Provide and pay for power required to operate temporary pumps.
 - 5. Provide electrical and instrumentation components with applicable code requirements for the area where the temporary pump is located.
 - 6. Temporary pumping will be required for 1 hour per day during the time period when pumping is required and is critical to the proper operation of the Owner's treatment facility.
 - 7. Provide on-site supervision of pumps during operation to ensure that pumps are always operational and performing as required:
 - a. Notify the Owner immediately if temporary pumping cannot be provided.
 - 8. Contractor shall be responsible for repairing any damage or reimbursing the Owner for any regulatory fines or additional plant staff time resulting from the Contractor's failure to maintain temporary pumping.
 - 9. Provide 100 percent backup (a.k.a., standby, redundant, etc.) pumping capacity equal to the required process flow rate:
 - a. Provide backup system capable of providing required pumping capacity immediately upon failure of primary pumping system.
 - 10. Provide necessary spare equipment and appurtenances on-site to allow immediate repair and/or replacement of any pumping system component that is not functioning properly.
- B. Providing temporary piping systems as specified in this Section.
- C. Temporary pumping of other process flows is not allowed unless approved in writing by the Owner.
- D. After temporary process pumping system is no longer required:
 - 1. Remove temporary process pumping system.
 - 2. Clean and repair damage caused by installation or use of temporary process pumping system.

3. Restore existing facilities to original condition.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01_60_00
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Requirements for tangible materials, raw or manufactured, that become part of the project.

1.02 REFERENCES

- A. NSF International (NSF):
 - 1. 60 - Technical Requirements.
 - 2. 61 - Drinking Water System Components - Health Effects.

1.03 DEFINITIONS

- A. Certificates: Documents that the work is in accordance with the Contract Documents.
- B. Extra stock materials: Extra stock materials provided for the Owner's use in facility operation and maintenance.
- C. Manufacturer's instructions:
 - 1. Stipulations, directions, and/or recommendations issued form by the manufacturer of the product addressing handling, installation, erection, and/or application of the product.
- D. Products:
 - 1. Raw materials, finished goods, equipment, systems, and shop fabrications.
- E. Product data:
 - 1. Public information about the product which is found in the manufacturer's catalogs or on their web site including catalog pages, data sheets, bulletins, layout drawings, exploded views, and brochures.
- F. Samples:
 - 1. As defined in the General Conditions and Supplementary Conditions.
 - 2. Full-size actual products or pieces of products intended to illustrate the products to be incorporated into the project. Sample submittals are often necessary for such characteristics as colors, textures, and other appearance issues.
- G. Schedules:
 - 1. Product parts and materials lists.
- H. Shop drawings:
 - 1. As defined in the General Conditions and Supplementary Conditions.

2. Shop drawings are prepared specifically for the project to illustrate details, dimensions, and other data necessary for satisfactory fabrication or construction that are not shown in the contract documents. Shop drawings could include graphic line-type drawings and single-line diagrams.
- I. Spare parts:
 1. Duplicate parts necessary to replace a damaged or worn part of the product.
 2. Consumables such as operating fluids.
- J. Special tools:
 1. Special wrenches, gauges, circuit setters, and other similar devices required for the proper operation or maintenance of a system that would not normally be in the Owner's tool kit and that have been specifically made for use on a product for assembly, disassembly, repair, or maintenance.
- K. Submittals:
 1. As defined in the General Conditions and Supplementary Conditions.
 2. Samples, product data, shop drawings, and others that demonstrate how Contractor intends to conform to the Contract Documents.

1.04 SUBMITTALS

- A. Products in contact with drinking water:
 1. Provide certification for by an independent ANSI accredited third party:
 - a. In accordance with NSF 61.
 - b. Weighted average lead content of less than 0.25 percent in accordance with NSF 372.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Provide products by same manufacturer when products are of similar nature, unless otherwise specified.
- B. Provide like parts of duplicate units that are interchangeable.
- C. Provide equipment or product that has not been in service prior to delivery, except as required by tests.
- D. Provide products produced by manufacturers regularly engaged in the production of these products.
- E. Provide products that bear approvals and labels as specified.

2.02 MATERIAL

- A. Dissimilar metals:
 1. Separate contacting surfaces with dielectric material.

2. Neoprene, bituminous impregnated felt, heavy bituminous coatings, nonmetallic separators or washers, or other materials as specified.
- B. Products in contact with drinking water or water in the process of becoming drinking water in accordance with NSF 60 or NSF 61 by an independent ANSI accredited third party.
- C. Edge grinding:
 1. Sharp projections of cut or sheared edges of ferrous metals which are not to be welded shall be ground to a radius required to ensure satisfactory paint adherence.
- D. Use anti-galling compound on threads of stainless steel fasteners during factory assembly.
- E. Provide anti-galling compound with stainless steel fasteners shipped for field assembly.
- F. Aluminum in contact with concrete or masonry: Apply epoxy mastic as specified in Section 09_96_01 - High-Performance Coatings, coating system EPX-M-5.
- G. Provide new pipe manufactured for the project, not from manufacturer's inventory, under the following conditions:
 1. Pipes 24-inch diameter and larger.
 2. Pipe manufactured more than 6 months prior to delivery if the pipe material or its coating is subject to UV degradation.
 3. Ductile iron pipe with cement-mortar lining manufactured more than 6 months prior to delivery to the project.
 4. Steel pipe 6-inch diameter and larger.
- H. Mark each length of pipe in accordance with applicable standards.

2.03 PRODUCT SELECTION

- A. Provide products with Engineer approved submittals.
- B. When products are specified by standard or specification designations of technical societies, organizations, or associations only, provide products that meet or exceed reference standard and Specifications.
- C. When products are specified with names of manufacturers but no model numbers or catalog designations, provide Products by one of named manufacturers that meet or exceed Specifications.
- D. When products are specified with names of manufacturers and model numbers or catalog designations, provide Products with model numbers or catalog designations by one of named manufacturers.

- E. When products are specified with names of manufacturers, but with brand or trade names, model numbers, or catalog designations by one manufacturer only, provide:
 - 1. Products specified by brand or trade name, model number, or catalog designation.
 - 2. Products by one of named manufacturers proven, in accordance with requirements for an "or equal", including Engineer's approval, to meet or exceed quality, appearance and performance of specified brand or trade name, model number, or catalog designation.
- F. When Products are specified with only one manufacturer followed by "or Equal," provide:
 - 1. Products meeting or exceeding Specifications by specified manufacturer.
 - 2. Engineer deemed "or equal" evidenced by an approved shop drawing or other written communication.
- G. When Products are specified by naming 2 or more manufacturers with 1 manufacturer as a "Basis of Design":
 - 1. Any of the named manufacturers can be submitted.
 - 2. If the product submitted requires a change in the scope (dimensions, configuration, physical properties, etc.), schedule (longer lead time), or budget, the Contractor must submit a substitution request.

2.04 SHIPMENT

- A. Requirements prior to shipment of equipment:
 - 1. Engineer approved shop drawings.
 - 2. Engineer approved Manufacturer's Certificate of Source Testing as specified in the Technical Sections .
 - 3. Draft operations and maintenance manuals, as specified in Section 01_78_24 - Operation and Maintenance Manuals, when required by specifications.
- B. Prepare products for shipment by:
 - 1. Tagging or marking to agree with delivery schedule or shop drawings.
 - 2. Including complete packing lists and bills of material with each shipment.
 - 3. Packaging products to facilitate handling and protection against damage during transit, handling, and storage.
 - 4. Securely attach special instructions for proper field handling, storage, and installation to each piece of equipment before packaging and shipment.
- C. Transport products by methods that avoid product damage.
- D. Deliver products in undamaged condition in manufacturer's unopened containers or packaging.

2.05 SPARE PARTS, MAINTENANCE PRODUCTS, AND SPECIAL TOOLS

- A. Provide spare parts and maintenance products as required by Technical Sections:
 - 1. Submit completed Attachment A - Spare Parts, Maintenance Products, and Special Tools Inventory List.

- B. Provide one set of special tools required to install or service the equipment.
- C. Box, tag, and clearly mark items.
- D. Contractor is responsible for spare parts, maintenance products, and special tools until acceptance by Owner.

PART 3 EXECUTION

3.01 DELIVERY AND HANDLING

- A. Handle equipment in accordance with manufacturer's instructions.
- B. Provide construction equipment and personnel to handle products by methods to prevent soiling or damage.
- C. Upon delivery, promptly inspect shipments:
 - 1. Verify compliance with Contract Documents, correct quantities, and undamaged condition of products.
 - 2. Acceptance of shipment does not constitute final acceptance of equipment.
- D. Spare parts, maintenance products, special tools:
 - 1. Immediately store in accordance with the manufacturer's instructions.
 - 2. Store spare parts, maintenance products, and special tools in enclosed, weather-proof, and lighted facility during the construction period:
 - a. Protect parts subject to deterioration, such as ferrous metal items and electrical components with appropriate lubricants, desiccants, or hermetic sealing.
 - 3. With Owner's written request for advanced delivery of spare parts, maintenance products, and special tools:
 - a. Deliver requested items and deduct them from the inventory list.
 - b. Provide transmittal documentation.
 - 4. Store large items individually:
 - a. Weight: Greater than 50 pounds.
 - b. Size: Greater than 24 inches wide by 18 inches high by 36 inches long.
 - c. Clearly labeled:
 - 1) Equipment tag number.
 - 2) Equipment manufacturer.
 - 3) Subassembly component, if appropriate.
 - 4) Store smaller items in spare parts box.
 - d. Weight: Less than 50 pounds.
 - e. Size: Less than 24 inches wide by 18 inches high by 36 inches long.
 - f. Clearly labeled:
 - 1) Equipment tag number.
 - 2) Equipment manufacturer.
 - 3) Subassembly component, if appropriate.
 - 4) Spare parts and special tools box.
 - g. Box material: Waterproof, corrosion resistant.

- h. Hinged cover:
 - 1) Locking hasp.
- i. Spare parts inventory list taped to underside of cover.
- j. Clearly labeled:
 - 1) The words "Spare Parts and/or Special Tools".
 - 2) Equipment tag number.
 - 3) Equipment manufacturer.
 - 4) Subassembly component, if appropriate.

3.02 STORAGE AND PROTECTION

- A. Immediately store and protect products until installed in Work.
- B. Furnish covered, weather-protected storage structures providing a clean, dry, noncorrosive environment for mechanical equipment, valves, architectural items, electrical and instrumentation equipment and special equipment to be incorporated into this project:
 - 1. Storage of equipment shall be in strict accordance with the "instructions for storage" provided by the manufacturer:
 - a. Including connection of heaters, lubrication, rotating shafts, etc.
 - 2. The Contractor shall furnish a copy of the manufacturer's instructions for storage to the Engineer prior to storage of equipment and materials.
- C. Store products with seals and legible labels intact.
- D. Protect painted or coated surfaces against impact, abrasion, discoloration, and damage:
 - 1. Repaint or recoat damaged painted or coated surfaces.
- E. Exterior storage of fabricated products:
 - 1. Place on aboveground supports that allow for drainage.
 - 2. Cover products subject to deterioration with impervious sheet covering.
 - 3. Provide ventilation to prevent condensation under covering.
- F. Store moisture sensitive products in watertight enclosures.
- G. Store loose granular materials on solid surfaces in well-drained area:
 - 1. Prevent materials mixing with foreign matter.
 - 2. Provide access for inspection.
- H. When needed and approved by the Engineer, offsite storage location shall be within 20 miles of the project site:
 - 1. Provide proof of insurance coverage for products stored offsite.
- I. Payment will not be made for equipment and materials improperly stored or stored without providing Engineer with the manufacturer's instructions for storage.
- J. Provide an equipment log and stored products log with monthly pay applications:
 - 1. Data includes as a minimum: The storage location, equipment or product identification, date stored, date of inspection/maintenance, date removed from storage, copy of manufacturer's recommended storage guidelines, description

of inspection/maintenance activities performed, and signature of party performing inspection/maintenance.

3.03 INSTALLATION

- A. Inspect hardware or fittings prior to product installation.
- B. Use anti-galling compound on stainless steel threads used for field assembly.

3.04 PROTECTION AFTER INSTALLATION

- A. Provide substantial coverings as necessary to protect installed products from damage from traffic and subsequent construction operations:
 - 1. Remove covering when no longer needed.
 - 2. Replace corroded, damaged, or deteriorated equipment, product, or parts before acceptance of the project.
- B. Update equipment log with monthly pay applications:
 - 1. Data includes as a minimum: Description of maintenance activities performed in accordance with the manufacturer's recommendation and industry standards and signature of party performing maintenance.

END OF SECTION

**ATTACHMENT A - SPARE PARTS, MAINTENANCE PRODUCTS,
AND SPECIAL TOOLS INVENTORY LIST**

SPARE PARTS, MAINTENANCE PRODUCTS, AND SPECIAL TOOLS INVENTORY LIST

Owner: _____ Date: _____
Contractor: _____ Project No.: _____
Project Name: _____

Inventory List				
Spec Number: _____		Spec Title _____		
Equipment Tag No.: _____		Equipment Manufacturer: _____		
Quantity	Subassembly Component	Description	Manufacturer's Part Number	Storage Location

SECTION 01_71_23
FIELD ENGINEERING

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Field engineering to establish lines and grades for the Work.

1.02 SUBMITTALS

- A. Submit as specified in Section 01_33_00 - Submittal Procedures.
- B. Qualifications of the professional land surveyor or licensed civil engineer with the authority to provide land surveying in Oklahoma that will be performing the field engineering.
- C. Pre-Excavation Report.

1.03 PRE-EXCAVATION REPORT

- A. Prior to the start of the Work, create a report confirming the verification of the following data:
1. Site elevation.
 2. Existing structures including but not limited to buildings, manholes (sanitary, storm, electrical, and other), drainage inlets:
 - a. Location coordinates.
 - b. Top of wall elevation and coordinates.
 - c. Floor elevations.
 - d. Invert elevations.
 3. Existing utilities as specified in Section 33_05_01 - Subsurface Utility Engineering.
 4. Proposed building corners, tank, and equipment locations.
 5. Verify existing electrical, instrumentation, and phone utilities.
- B. Incorporate information from Pre-Excavation Report into the record drawings.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 SURVEY REFERENCE POINTS

- A. Basic reference line, a beginning point on basic reference line, points with referenced coordinates, and a benchmark will be provided by Owner.

- B. From these reference points, establish other control and reference points as required to properly lay out the Work.
- C. Locate and protect control points prior to starting site work, and preserve permanent reference points during construction:
 - 1. Make no changes or relocations without prior written notice.
 - 2. Replace Project control point, when lost or destroyed, in accordance with original survey control.
- D. Set monuments for principal control points and protect them from being disturbed and displaced:
 - 1. Re-establish disturbed monuments.
 - 2. When disturbed, postpone parts of the Work that are governed by disturbed monuments until such monuments are re-established.

3.02 PROJECT SITE SURVEY REQUIREMENTS

- A. Perform verifications and checking in accordance with industry standard surveying practice.
- B. Maintain complete, accurate log of control points and survey.
- C. Affix civil engineer's or professional land surveyor's signature and license number to Record Drawings to certify accuracy of information shown.

3.03 CONSTRUCTION STAKES, LINES, AND GRADES

- A. Execute the Work in accordance with the lines and grades indicated.
- B. Make distances and measurements on horizontal planes, except elevations and structural dimensions.

3.04 QUALITY CONTROL

- A. Accuracy of stakes, alignments, and grades may be checked randomly by Engineer:
 - 1. Notice of when checking will be conducted will be given.
 - 2. When notice of checking is given, postpone parts of the Work affected by stakes, alignments, or grades to be checked until checked.
 - 3. Engineer's check does not substitute or complement required field quality control procedures.

3.05 RECORD DOCUMENTS

- A. Prepare and submit Record Documents as specified in Section 01_77_00 - Closeout Procedures.

END OF SECTION

SECTION 01_75_17

COMMISSIONING

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PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Commissioning.

1.02 DEFINITIONS

- A. Commissioning: The process of planning for, testing of, and start-up of systems, subsystems, equipment, components, and devices of the Work to demonstrate, through documented verification, that the Work has successfully met the Contract Documents. It includes training the Owner's staff on operation and maintenance of the installed Work.
- B. Commissioning Phases: The activities of commissioning are grouped into the phases defined in the following table:
1. Table 1 - Commissioning Phases.

TABLE 1 - COMMISSIONING PHASES		
Planning Phase	Testing and Training Phase	Start-Up Phase
Draft Test Plans	Source Testing • Documentation	Start-Up • Documentation • Owner Training
	Installation Verification • Documentation • Owner Training	
	Functional Testing • Documentation • Owner Training	

2. Attachment A provides Commissioning Flowcharts.
- C. Component: A part of a system that does not have an electrical connection or internal electronics. Examples: Piping and pressure gauges.
- D. Device: A part of a system that has electrical connections or internal electronics. Examples: level transmitter or pressure transmitter.
- E. Electrical Energization Plan: A plan to manage how and when power is applied to electrical equipment.
- F. Equipment: A factory or field assembled apparatus that performs an identifiable function. Examples: pumps, motors, VFDs, MCCs.
- G. Functional Testing: Testing performed on a completed subsystem or system to demonstrate that the system meets the specified requirements. Example systems: backwash system, dewatering system.

- H. Installation Verification: Testing to demonstrate that equipment or system and associated components or devices have been properly installed. Example equipment: pumps, meters, and blowers with associated piping.
- I. Manufacturer's Certificate of Functional Compliance: The form completed by the manufacturer to confirm that testing of the installed equipment or system has been performed and the results conform to the specified performance. The form is provided in Attachment D provided at the end of this Section.
- J. Manufacturer's Certificate of Installation Verification: The form completed by the manufacturer to confirm that the equipment or system is installed in conformance with the Contract. The form is provided in Attachment C at the end of this Section.
- K. Manufacturer's Certificate of Source Testing: The form completed by the manufacturer to confirm that the specified source tests have been performed and the results conform to the specified requirements. The form is provided in Attachment B at the end of this Section.
- L. Owner Training: The Owner's staff is trained by the Contractor, with assistance from manufacturer, to operate and maintain the completed Work. This is sometimes referred to as Vendor Specific Training.
- M. Process Stream: A series of liquid or solids flow processes that are designed to improve the water quality to meet regulatory permit requirements.
- N. Source Testing: Test equipment or products for performance at point of manufacture or assembly for the requirements specified in the Contract Documents. Also referred to as factory testing and factory acceptance testing (FAT).
- O. Start-Up Phase: The phase when Start-Up occurs.
- P. Start-Up: Operating the Work with process water to verify the Work meets the Contract Documents.
- Q. Subsystem: A grouping of equipment, components, and devices that is a part of a larger system and that perform a single definable function. Examples: sand filters, filter backwash.
- R. System: A grouping of equipment, components, and devices that perform a single definable function. If a system is a part of a larger system, it is referred to as a subsystem Examples: Flocculation and sedimentation, filtration.
- S. System Testing: Testing of a completed system for an extended time period. Examples: Headworks, filtration.
- T. Water Management Plan: A plan to manage the test water used for commissioning from source to disposal. The test water may be clean water, potable water, non-potable water, or process water (e.g., raw water, plant water, sludge). The plan demonstrates how water will be produced, conveyed, treated, disposed of as directed by the plant manager, and/or recycled.

1.03 SUBMITTALS

- A. Qualifications:
 - 1. Commissioning Coordinator's qualifications.
 - a. Submit to Engineer no later than 30 days after Notice to Proceed.
 - b. Describe previous similar experience on similar projects with a list of references including phone numbers.
 - c. Provide names and qualifications of commissioning assistants, if applicable.
 - 2. Manufacturer's representative's qualifications.
 - a. Submit to Engineer no later than 30 days in advance of required services.
 - b. Representative's name, phone, and e-mail address:
 - 1) May use 2 representatives: 1 for field testing and 1 for Owner Training.
 - 2) Provide resume stating instructor's technical expertise and instructional technology skills and experience.
- B. Schedules:
 - 1. Commissioning Schedule containing all commissioning activities.
 - 2. Owner Training Schedule.
- C. Certificates:
 - 1. Manufacturer's Certificate of Source Testing.
 - 2. Manufacturer's Certificate of Installation Verification.
 - 3. Manufacturer's Certificate of Functional Compliance.
- D. Test Plans:
 - 1. Submit draft Test Plan outlined in the Planning Phase, unless specified otherwise.
 - a. Engineer approval of draft Test Plans required for successful completion of Planning Phase.
 - 2. Submit final Test Plan a minimum of 60 calendar days prior to testing.
 - a. Engineer approval of final Test Plan required prior to start of testing.
- E. Test Reports:
 - 1. Submit draft Test Reports outline in the Planning Phase, unless specified otherwise.
 - a. Engineer approval of draft Test Reports outline required for successful completion of Planning Phase.
 - 2. Submit final Test Report a maximum of 30 calendar days after testing.
- F. Manufacturer's representatives field notes and data.
- G. Owner Training:
 - 1. Prior to the training session:
 - a. Training instructor qualifications.
 - b. Training course materials: Due 30 calendar days prior to initial training session.
 - 1) If Owner requires, Continuing Education Units (CEUs), submit training materials to state regulatory agency in sufficient time to obtain approval for training prior to the training.

- 2) Drafts of training agenda, lesson plan, presentation, handouts, and list of audio-visual aids.
- 3) Format: 1 electronic copy in format specified by Owner.
2. Post training session:
 - a. Training course materials: Due 14 calendar days after class completion.
 - 1) Recordings.
 - 2) Class attendance sheet.
 - 3) Final version of training agenda, final lesson plan, presentation, handouts, and audio-visual aids.
 - 4) Format: 1 electronic copy in format specified by Owner.
 - b. Provide materials for all sessions of the class in a single transmittal.
 - c. If the Owner requires training CEUs, issue training CEU certificates approved by the state regulatory agency to Owner's staff who successfully completed the training.

1.04 COMMISSIONING COORDINATOR (CC)

- A. Responsibilities include the following:
 1. Part-time person.
 2. Become thoroughly familiar with Contract commissioning requirements.
 3. Provide the primary interface with Engineer and Owner for Commissioning efforts.
 4. Lead Commissioning efforts - all phases and tasks.
 5. Coordinate training efforts.
 6. Meetings:
 - a. CC is responsible for setting commissioning coordination meeting dates and times, as well as preparing the agendas and meeting minutes.
 - b. CC shall conduct commissioning progress meetings throughout construction, to plan, scope, coordinate, and schedule future activities, resolve problems, etc.
 - c. Frequency: Monthly minimum. Increase frequency as needed based on complexity and quantity of commissioning activities.

1.05 MANUFACTURER'S REPRESENTATIVES

- A. Qualifications: as specified below and in the Technical Sections:
 1. For Installation and Functional Testing:
 - a. Factory trained and experienced in the technical applications, installation, operation, and maintenance of respective equipment/system with full authority by the equipment/system manufacturer to issue the certifications required of the manufacturer.
 2. Training instructor qualifications:
 - a. Provide resume stating instructor's technical preparation and instructional technology skills and experience.
 - b. If CEUs are required, the operator training instructors must comply with state regulatory.
 - c. Knowledgeable in the equipment/system for which they are training.
 - d. Experienced in conducting classes.
 - e. Sales representatives are not qualified instructors unless they possess the detailed operating and maintenance knowledge required for proper class instruction.

3. Representatives to be approved by Owner and Engineer.
 4. No substitute representatives without written approval by Owner and Engineer.
- B. Duties:
1. Determine if additional time and/or trips (beyond those specified in the Technical Sections) is required to perform the specified services.
 2. Coordinate services in accordance with the Contractor's project schedule up to and including making multiple trips to project site when there are separate milestones associated with installation of each occurrence of manufacturer's equipment.
 3. Perform on-site services as specified in the Technical Sections:
 4. Provide weekly copies of manufacturer's representatives field notes and data to Contractor.

1.06 PLANNING PHASE

- A. Overview of Planning Phase:
1. Define approach and timing for commissioning.
 2. Obtain Engineer approval of draft Test Plans.
- B. Test Plans.
1. Define approach and timing for:
 - a. Testing and Training Phases.
 - 1) Major systems, with separate plans for each system.
 - b. Start-Up Phase.
 2. Source Test (Factory Acceptance Test) and Functional Test Plans:
 - a. As specified in this Section and other Technical Sections.
 - b. Based on approved shop drawings.
 - c. Prepared by Contractor.
 - d. Include the following items for each test:
 - 1) Purpose of the test.
 - 2) Identification of each item of equipment/system to be tested, including system designation, location, tag number, control loop identifier, etc.
 - 3) Description of the pass/fail criteria that will be used.
 - 4) Listing of pertinent reference documents (Contract and industry standards or sections applicable to the testing).
 - a) Credentials of test personnel.
 - 5) Test equipment:
 - a) Include Product Data for the test equipment.
 - b) Appropriate calibration records.
 - (1) Drawings or photographs of test stands and/or test apparatus.
 - 6) Duration: Determine test durations with Owner's input.
 - 7) Detailed step-by-step test procedures.
 - a) The level of detail shall be sufficient for the witness to follow the steps.
 - e. Define for Functional Testing:
 - 1) Required temporary systems (pumps, piping, etc.).
 - 2) Shutdown requirements for existing systems.

- f. Furnish labor, power, tools, equipment, instruments, and services required for and incidental to testing activities.
 - 3. Test forms minimum requirements:
 - a. Name of product to be tested.
 - b. Test date.
 - c. Names of persons conducting the test.
 - d. Names of persons witnessing the test, where applicable.
 - e. Test data.
 - f. Applicable project requirements as specified in the Technical Sections.
 - g. Check offs for each completed test or test step.
 - h. Place for signature of person conducting tests and for the witnessing person, as applicable.
 - 4. Owner responsibilities:
 - a. Schedule Owner's staff within the constraints of their workloads.
 - 1) Those who will participate in this test have existing full-time work assignments, and testing is an additional assigned work task, therefore, scheduling is imperative.
 - 2) Owner staff work schedules regularly shift, as treatment facilities are typically operated on an around-the-clock basis.
 - 3) Maximum hours per week: 4.
 - 4) Days available: Monday to Thursday.
 - 5) CC is responsible for the following:
 - a) Coordinate schedule with the Owner's personnel and manufacturer's representatives (instructors).
- C. Test Reports:
 - 1. Minimum requirements:
 - a. Title.
 - b. Abstract.
 - c. Equipment.
 - d. Procedures.
 - e. Results.
 - 1) Complete disclosure of the calculation methodologies.
 - f. Conclusions.
 - g. Signature by an authorized party.
 - h. Appendices.
 - 1) Completed test forms signed by witnesses.
 - 2. Water Management Plan:
 - a. Requirements:
 - 1) Demonstrate how water will be produced, conveyed, treated, recycled, and or disposed until testing verifies specified requirements.
 - 3. Commissioning Schedule:
 - a. Content:
 - 1) Comply with Attachment G - Functional Testing Requirements and provide activities organized by system and subsystem.
 - 2) Include:
 - a) Source testing when required.
 - b) Functional testing.
 - c) Owner Training.

- 3) Comply with Attachment F - Commissioning Roles and Responsibilities Matrix.
- b. Procedures:
 - 1) Submit commissioning schedule as specified in Section 01_32_21 - Schedules and Reports.

1.07 TESTING AND TRAINING PHASE

A. Overview of Testing and Training Phase:

1. General:
 - a. Contractor tests the Work to verify it meets the Contract requirements.
 - b. Contractor trains the Owner to operate and maintain the Work.
2. Contractor responsibilities:
 - a. Furnish labor, power, tools, equipment, instruments, and services required for and incidental to completing commissioning activities in accordance with the approved Commissioning Plans.
3. Owner responsibilities:
 - a. Furnish chemicals required for and incidental to completing commissioning activities in accordance with the approved Commissioning Plans.
 - b. Owner provided services, equipment, and/or materials to be as specified in Section 01_11_00 - Summary of Work.

B. Source Testing:

1. As specified in the Technical Section.
2. Source Test Plan:
 - a. Engineer approval of Source Test Plan required prior to testing.
3. Witnessed in person:
 - a. As specified in the Technical Section.
 - b. Contractor is responsible for trip costs associated with Owner's and Engineer's representatives.
 - 1) Transportation:
 - a) Commercial airline costs to and from Stillwater Regional Airport including related fees.
 - b) Rental car to and from arrival airport, hotel, and test site including related fees.
 - 2) Hotel/Meals:
 - a) Hotel with an American Automobile Association 3 Diamond rating or higher equivalent for single occupancy room per person per day.
 - b) Meal allowance based on state government per diem guidelines per test site location.
4. Virtual witness testing:
 - a. As specified in the Technical Sections.
 - b. Contractor is responsible for costs associated with virtual witness.
 - c. Provide the following:
 - 1) An agenda detailing start time of each major phase in the procedure defined in the approved Test Plan.
 - 2) A dedicated operator (separate from the test technician) to operate the camera, provide commentary throughout test, and inspect devices at the request of the attendees.

- d. Online meeting platform: ZOOM or Microsoft Teams.
 - e. Share video through a high-definition camera.
 - f. Establish methods to communicate, convey, and record information clearly even in environments with loud background noise.
 - 1) Electronic feed for screen sharing of the control panel, HMI, or other screens used throughout testing.
 - 2) Provide recording of virtual sharing within 1 day after each meeting.
 - g. Test run of virtual sharing a minimum of 1 week prior to the test:
 - 1) Use current record documents in PDF format.
 - 2) Provide recording of virtual sharing within 1 day after the test run.
 - 3) Engineer approval of test run virtual sharing is required before source testing.
 - 5. If the Source Test is not ready on the scheduled date or if the Source Test fails:
 - a. Contractor is responsible for associated costs:
 - 1) First test costs that are non-refundable, if applicable.
 - 2) Repeat test costs:
 - a) Trip costs, if applicable.
 - 3) Virtual witness costs, if applicable.
 - 6. Source testing is complete after successful testing, submittal of test report, and Manufacturer's Certificate of Source Testing.
 - 7. Engineer approval of Source Testing Report is required.
- C. Installation Verification:
- 1. Overview:
 - a. Verifying the installation of equipment to be in accordance with Manufacturer's Instructions.
 - 2. Prerequisite:
 - a. Engineer approval of Source Testing Report.
 - 3. Perform checks:
 - a. Structural anchorage check.
 - b. Electrical energization check.
 - 1) As specified in the flowchart shown in Attachment A.
 - c. Health and safety check.
 - 4. Submit Manufacturer's Certificate of Installation Verification.
 - 5. Engineer approval of Manufacturer's Certificate of Installation Verification is required.
- D. Functional Testing:
- 1. Overview:
 - a. Testing the function of a system or subsystem.
 - 2. Prerequisites:
 - a. Engineer approval of Manufacturer's Certificate of Installation Verification .
 - b. Engineer approval of Functional Test Plan required prior to testing.
 - c. Draft Operations and Maintenance Manual as specified in Section 01_78_24 - Operations and Maintenance Manual.
 - d. Completed pipe, valve, and gate labeling of system or subsystem.
 - 1) As specified in Section 40_05_00.03 - Pipe Identification prior to the start of Functional Testing.
 - 3. Witnessed.

4. Discipline checks:
 - a. Verify support systems function properly, such as seal water, pipes, valves, etc.
 - b. As specified in the individual Technical Sections.
5. Consecutive Day Test:
 - a. Operate the Work as specified in Attachment G - Functional Testing Requirements and as specified in the individual Technical Sections.
 - 1) Successful completion of subsystem testing required prior to system testing.
 - b. Failure response time:
 - 1) Be equipped and ready to provide emergency repairs, adjustments, and corrections to comply with the "Significant Interruption Duration" requirements as specified in Attachment G - Functional Testing Requirements.
 - c. Duration:
 - 1) As specified in Attachment G - Functional Testing Requirements.
 - 2) Restart the consecutive day test when the system performance failures exceed the "Significant Interruption Duration" time period specified in Attachment G - Functional Testing Requirements.
 - a) Individual equipment/system failures that are corrected within the "Significant Interruption Duration" time specified in Attachment G - Functional Testing Requirements shall not require the consecutive day test to be restarted unless the failure recurs.
 - b) Engineer has the authority to reject the consecutive day test if individual equipment/system failures are repetitive.
6. Instrumentation and controls tests.
 - a. Loop Validation Tests.
 - b. Complete End-to-End Testing (CEET):
 - 1) Signal are tested from the field device through the PLC program, the network, and all the way to the operator's HMI graphic screens.
7. Restore to condition prior to testing:
 - a. Dewater and clean sumps.
 - b. Dewater process units, where required by test plan.
8. Submit Manufacturer's Certificate of Functional Compliance.
9. Engineer approval of Manufacturer's Certificate of Functional Compliance is required.

E. Documentation:

1. Provide records generated during Commissioning Phase of Project including but not limited to:
 - a. Training documentation.
 - b. Manufacturer's Certificate of Source Testing.
 - c. Manufacturer's Certificate of Installation Verification.
 - d. Manufacturer's Certificate of Functionality Compliance.
 - e. Daily logs of equipment/system testing identifying tests conducted and outcome.
 - f. Test forms and documentation.
 - g. Functional Testing results.
 - h. Logs of time spent by manufacturer's representatives performing services on the job site.

- i. Equipment lubrication records.
 - j. Electrical phase, voltage, and amperage measurements.
 - k. Insulation resistance measurements.
 - l. Bearing temperature measurements.
 - m. Data sheets of control loop testing including testing and calibration of instrumentation devices and setpoints.
 - n. Provide: 1 electronic copy in format specified by Owner.
 - o. Store the data within 24 hours of the test or document creation in the project web-based document management system.
 - p. Due date: Within 14 calendar days of Substantial Completion.
2. Engineer approval of documentation is required.

F. Owner Training:

- 1. Train Owner's staff on the operation and maintenance of the equipment/system:
 - a. Provide Owner staff with state regulatory agency approved training CEUs.
- 2. Train on each topic of the approved Operation and Maintenance Manual:
 - a. Include classroom instruction and field demonstration with all necessary tools and test equipment.
- 3. Training tailored to the skills and job classifications of the staff attending the classes (e.g., plant superintendent, treatment plant operator, maintenance technician, electrician, etc.).
- 4. Training outcomes:
 - a. Owner's staff can safely operate, maintain, and repair the equipment/systems provided as recommended by the manufacturer.
- 5. Training plan:
 - a. CC shall meet with Engineer and Owner's designated training coordinator to develop list of personnel to be trained and to establish expected training outcomes and objectives at least 90 calendar days prior to commissioning of equipment/system.
 - b. Coordinate and arrange for manufacturer's representatives to provide both classroom-based learning and field (hands-on) training, based on training module content and stated learning objectives.
 - c. Conduct classroom training at location designated by Owner.
 - d. Scope and sequence:
 - 1) Plan and schedule training in the correct sequence to provide prerequisite knowledge and skills to trainees:
 - a) Describe recommended procedures to check/test equipment/system following a corrective maintenance repair.
 - 2) If multiple classes are needed to meet the training objectives, they shall be included in the training plan.
- 6. Owner Training Schedule:
 - a. Schedule Owner's staff training within the constraints of their workloads:
 - 1) Those who will participate in this training have existing full-time work assignments, and training is an additional assigned work task, therefore, scheduling is imperative.
 - 2) Owner staff work schedules regularly shift, as treatment facilities are typically operated on an around-the-clock basis.
 - 3) Maximum training hours per week: 16.
 - 4) Days available for training:
 - a) Monday to Thursday.

- b. Training scheduling coordination:
 - 1) CC is responsible for the following:
 - a) Coordinate schedule for training periods with the Owner's personnel and manufacturer's representatives (instructors).
 - 2) Complete Owner Training no sooner than 15 calendar days prior to Functional Testing of each system.
 - c. Class logistics:
 - 1) Delivery time minimum: 2 hours.
 - 2) Delivery time maximum: 4 hours.
 - 3) Class agenda:
 - a) Refreshment break: One 10-minute break.
 - b) Meal break: One 45-minute break, unless otherwise specified.
 - c) Schedule refreshment breaks and meal breaks to meet the class needs and Owner work rules.
 - 4) Schedule specific sessions:
 - a) Minimum of 30 days in advance to allow Owner staffing arrangements to take place.
 - b) At the times requested by the Owner, within the period 7 a.m. to 3 p.m. Monday through Thursday.
 - (1) Times scheduled will be at Owner's discretion.
 - c) Owner approval and confirmation required for session schedules.
 - d) Provide minimum of 2 sessions for each class unless otherwise noted:
 - (1) The purpose of having multiple sessions on each class is to accommodate the attendance of as many Owner personnel working different shifts as possible.
 - e) A maximum of 1 session per day for each class.
 - d. Number of students:
 - 1) Estimated class size maximum: 5 staff.
 - 2) Engineer will confirm the headcount 1 week prior to the class, so that the instructor can provide the correct number of training aids for students.
7. Submittals:
- a. Submit Training Plan Schedule 60 calendar days before the first scheduled training session, including but not limited to lesson plans, participant materials, instructor's resumes, and training delivery schedules.
 - b. Submit training documentation including the following:
 - 1) Training plan:
 - a) Training modules.
 - b) Scope and sequence statement.
 - c) Contact information for manufacturer's instructors including name, phone, and e-mail address.
 - d) Instructor qualifications.
 - 2) Training program schedule:
 - a) Format: Bar chart:
 - (1) Include in the Project Progress Schedule.
 - b) Contents:
 - (1) Training modules and classes.

8. Lesson plans:
 - a. Divide training into discrete modules appropriate for the equipment and trades.
 - b. State performance-based learning objectives in terms of what the trainees will be able to do at the end of the lesson.
 - c. Define student conditions of performance and criteria for evaluating instructional success.
 - d. Minimum requirements:
 - 1) Hands-on demonstrations planned for the instructions.
 - 2) Cross-reference training aids.
 - 3) Planned training strategies such as whiteboard work, instructor questions, and discussion points or other planned classroom or field strategies.
 - 4) Attach handouts cross-referenced by section or topic in the lesson plan.
 - 5) Indicate duration of outlined training segments.
 - e. Provide instruction lesson plans for each trade:
 - 1) Detailed component description:
 - a) Identify each component function and describe in detail.
 - b) Identify equipment's mechanical, electrical, and electronic components and features.
 - c) Where applicable, group relative components into subsystems.
 - d) Identify and describe in detail equipment safety features, permissive and controls interlocks.
 - 2) Equipment operation:
 - a) Describe equipment's operating (process) function and system theory.
 - b) Describe equipment's fundamental operating principles and dynamics.
 - c) Identify support equipment associated with the operation of subject equipment.
 - d) Detail the relationship of each piece of equipment or component to the subsystems, systems, and process.
 - e) Cite hazards associated with the operations, exposure to chemicals associated with the component, or the waste stream handled by the component.
 - f) Specify appropriate safety precautions, equipment, and procedures to eliminate, reduce, or overcome hazards.
 - 3) Define Preventative Maintenance (PM) inspection procedures required on equipment in operation, spot potential trouble symptoms (anticipate breakdowns), and forecast maintenance requirements (predictive maintenance).
 - a) Review preventive maintenance frequency and task analysis table.
 - 4) Define equipment Corrective Maintenance (CM) troubleshooting:
 - a) Describe recommended equipment preparation requirements as they relate to specific craft problems.
 - b) Identify and describe the use of any special tools required for maintenance of the equipment as they relate to specific craft problems.

- c) Provide component specific troubleshooting checklists as they relate to specific craft problems.
 - d) Describe component removal/installation and disassembly/assembly procedures for specific craft repairs.
 - e) Perform at least 2 hands-on demonstrations of common corrective maintenance repairs.
- 5) Describe recommended measuring instruments and procedures, and provide instruction on interpreting alignment measurements, as appropriate.
- 9. Training instruction format:
 - a. The training for operations and maintenance personnel shall be provided as 1 entity.
 - b. Instructors shall apply adult education best practices, emphasizing learner participation and activity.
 - c. Lecturing should be less than 30 percent of class time.
 - d. Training delivery may include problem solving, question/answer, hands-on instruction, practice, evaluation/feedback tools, and lecture to support training objectives.
 - e. Conduct hands-on instruction according to the following descriptions:
 - 1) Present hands-on demonstrations of at least the following tasks:
 - a) Proper start-up, shutdown, and normal and alternative operating strategies.
 - b) Common corrective maintenance repairs for each group.
 - c) Recommended procedures to check/test equipment/system following a corrective maintenance repair.
 - d) Preventative maintenance points.
 - e) Calibration, if applicable.
 - 2) Use tools and equipment provided by manufacturer to conduct the demonstrations.
 - a) Submit requests for supplemental assistance and facilities with the Contractor's proposed lesson plans.
 - 3) Contractor remains responsible for equipment disassembly or assembly during hands-on training situations involving equipment disassembly or assembly by Owner's personnel.
 - f. Training aids:
 - 1) Instructors shall provide needed audio-visual devices such equipment (televisions, video recorder/player, computer, projectors, screens, easels, etc.), models, charts, etc. for each class.
 - 2) Instructor to confirm with Engineer in advance of each class that the classroom will be appropriate for the types of audiovisual equipment to be employed.
- 10. Training sessions:
 - a. Provide training sessions for equipment/system as specified in the individual equipment/system section.
 - b. Include the following information in the agenda:
 - 1) Instructor name.
 - 2) Listing of subjects to be discussed.
 - 3) Time estimated for each subject.
 - 4) Allocation of time for Owner staff to ask questions and discuss the subject matter.
 - 5) List of documentation to be used or provided to support training.

- c. Owner may request that particular subjects be emphasized, and the agenda be adjusted to accommodate these requests.
- d. Digitally record audio and video of each training session.
 - 1) Include classroom and field instruction with question and answering periods.
 - 2) Engineer approval required for producer of video materials from one of the following options:
 - a) Qualified, professional video production company or individual.
 - 3) Record in digital format and recording shall become property of the Owner with exclusive rights.
 - a) No video recording agreements will be entered into by the Owner.
 - 4) Media:
 - a) Video quality shall be 720p HD or greater in MPG, AVCHD, AVI, or MP4 format.
 - b) Digital color video format.
 - c) Provide audio portion of the composite CD sufficiently free from electrical interference and background noise to provide complete intelligibility of oral report.
 - d) Identification: On each copy provide a label with the following information:
 - (1) Name of training.
 - (2) Date video was recorded.
 - e) Display continuous running time.
 - f) At start of each video recording, record training class name, date, instructor's name.
 - g) Provide audio quality that is not degraded during the recording of the field sessions due to background noise, space, distance or other factors.
 - 5) The Contractor shall provide a written release from all claims to the recorded training material produced, if required.
- e. Distribute copies of the agenda to each student at the beginning of each training class.
- f. Trainees will keep training materials and documentation after the session.
- g. Distribute Training Evaluation Form following each training session.
 - 1) Training Evaluation Form is included in this Section.
 - 2) Return completed Training Evaluation Forms to Owner's designated training coordinator immediately after session is completed.
 - 3) Revise training sessions judged "Unsatisfactory" by a majority of attendees.
 - a) Conduct training sessions again until a satisfactory rating is achieved.

11. Engineer approval of Owner Training is required.

1.08 START-UP PHASE

- A. Overview of Start-Up Phase:
 - 1. General:
 - a. Confirm reliability requirements.

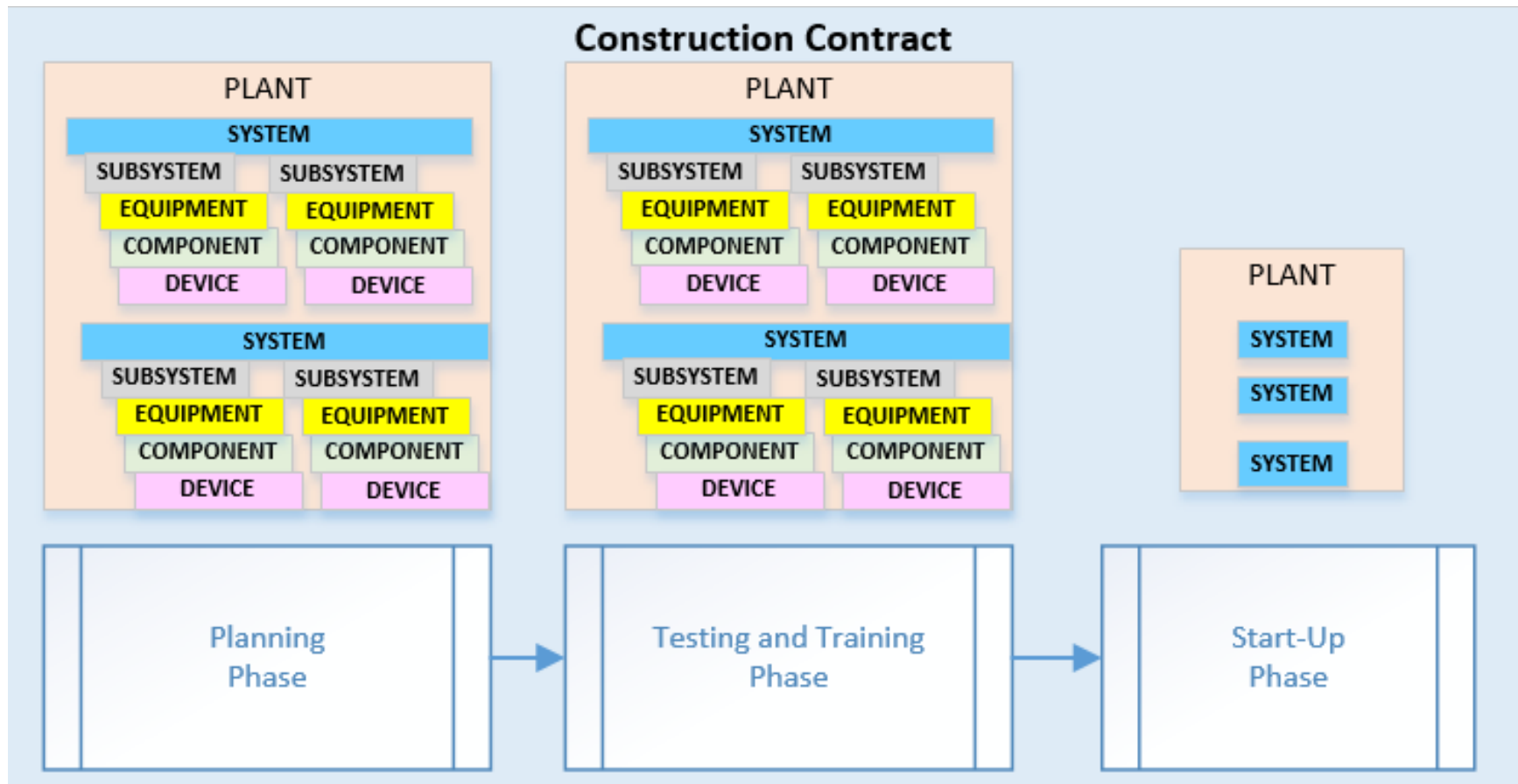
- B. Start-Up Period:
1. Contractor responsibilities:
 - a. Support Owner to operate the Work.
 2. Owner responsibilities:
 - a. Owner to operate the Work.
 - b. Owner-provided services, equipment, and/or materials to be as specified in Section 01_11_00 - Summary of Work.
 - c. Furnish labor, power, chemicals, tools, equipment, instruments, and services required for and incidental to completing commissioning activities in accordance with the approved Commissioning Plans.
 3. Prerequisites:
 - a. Engineer approval of Testing and Training Phase.
 4. Witnessed.
 5. Duration: 5 days.
 6. Engineer approval of Start-Up Period is required to achieve substantial completion.

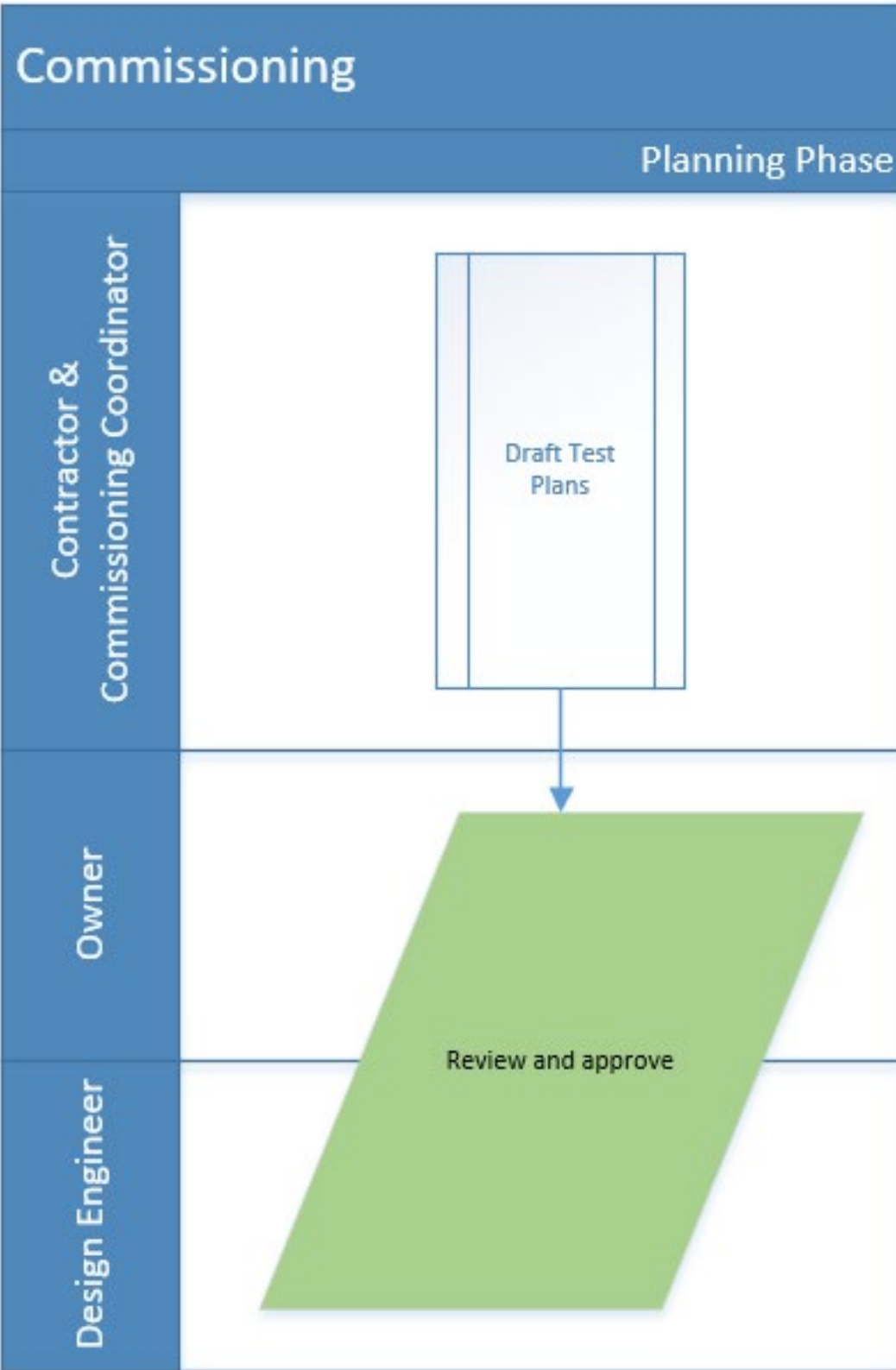
PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

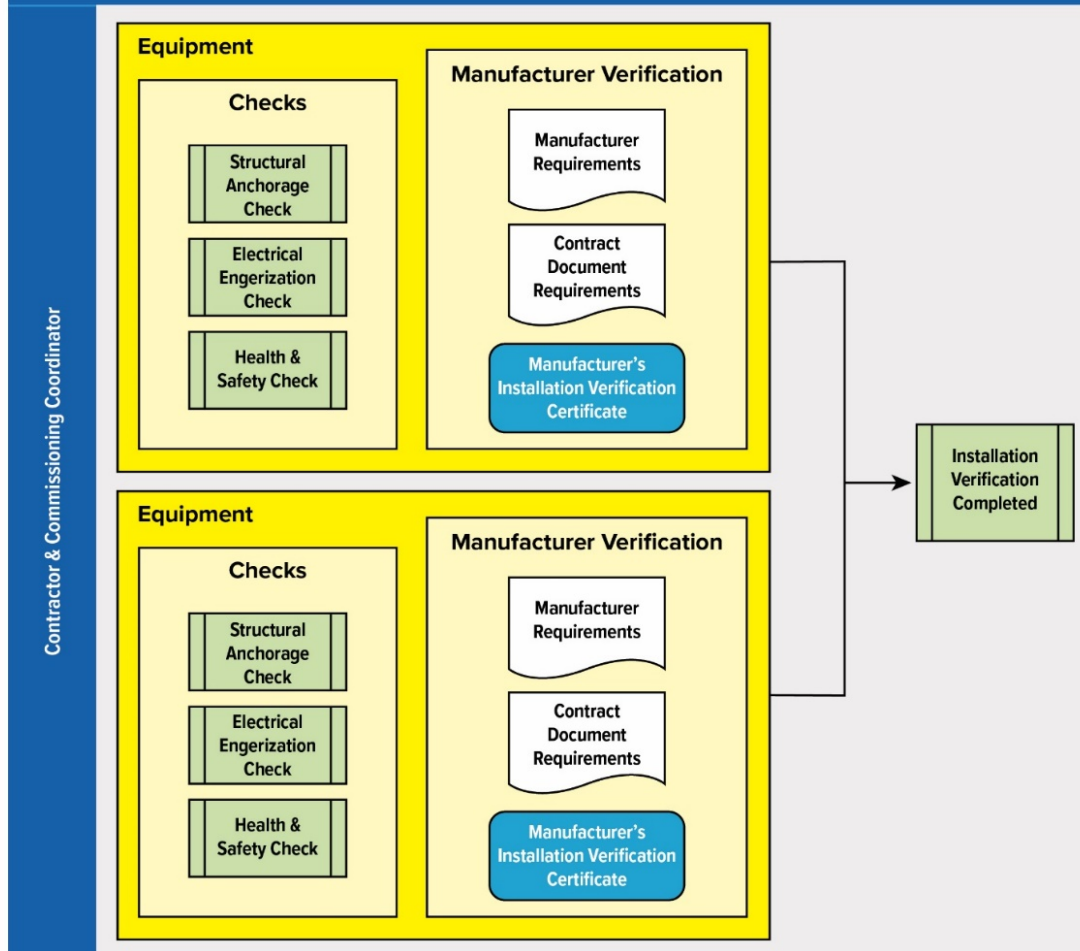
ATTACHMENT A - COMMISSIONING FLOWCHARTS





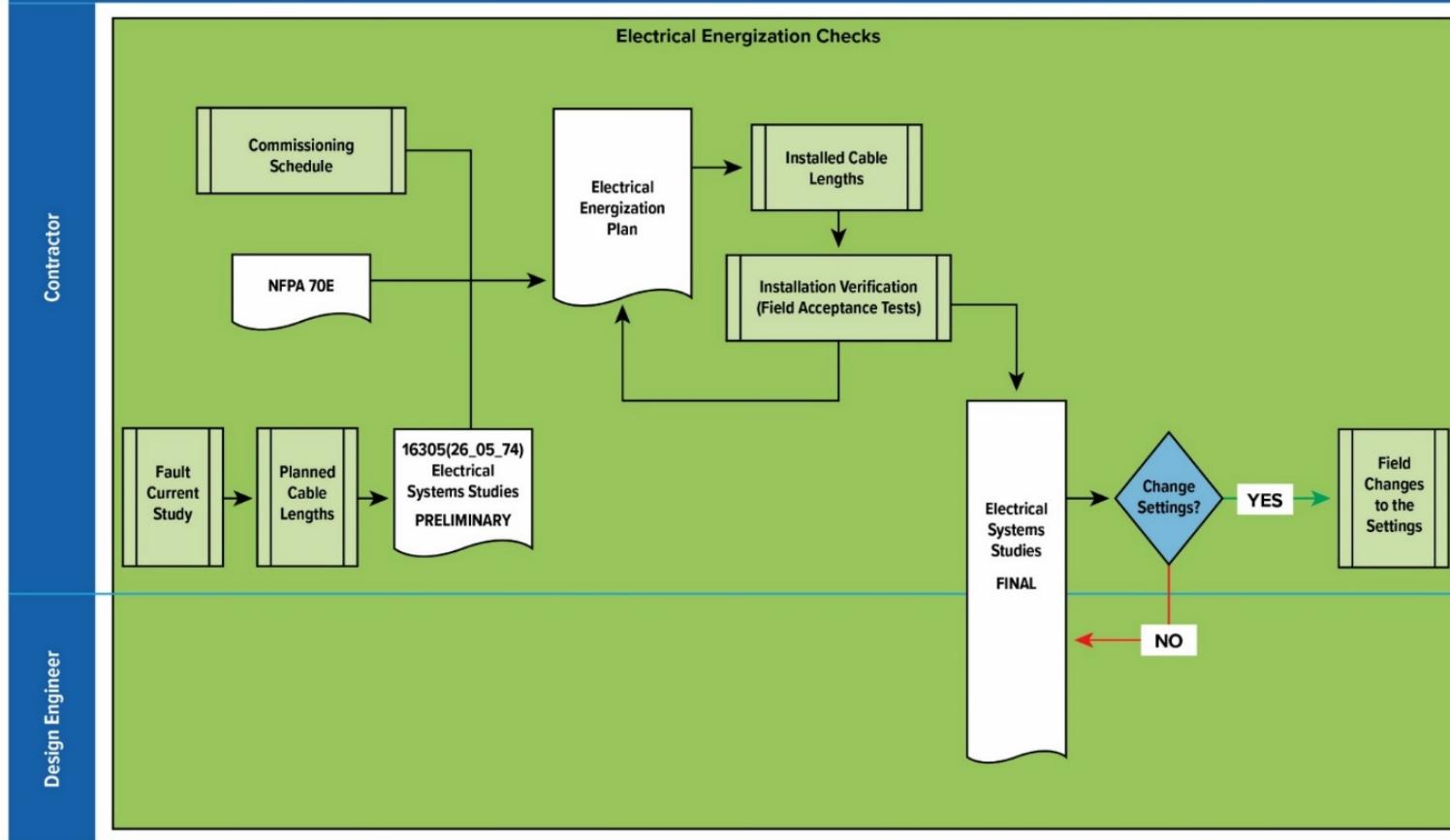
TESTING AND TRAINING PHASE

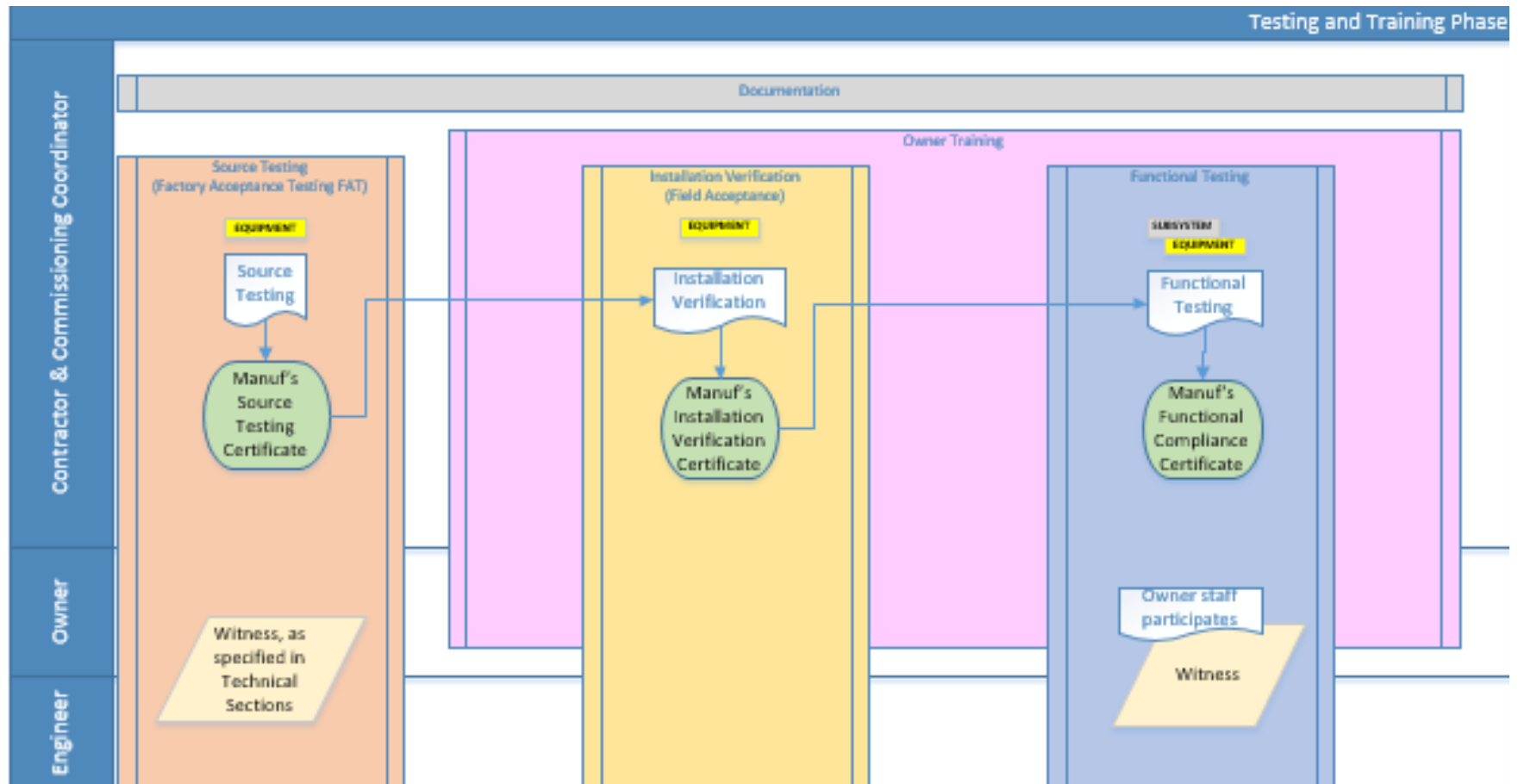
Installation Verification

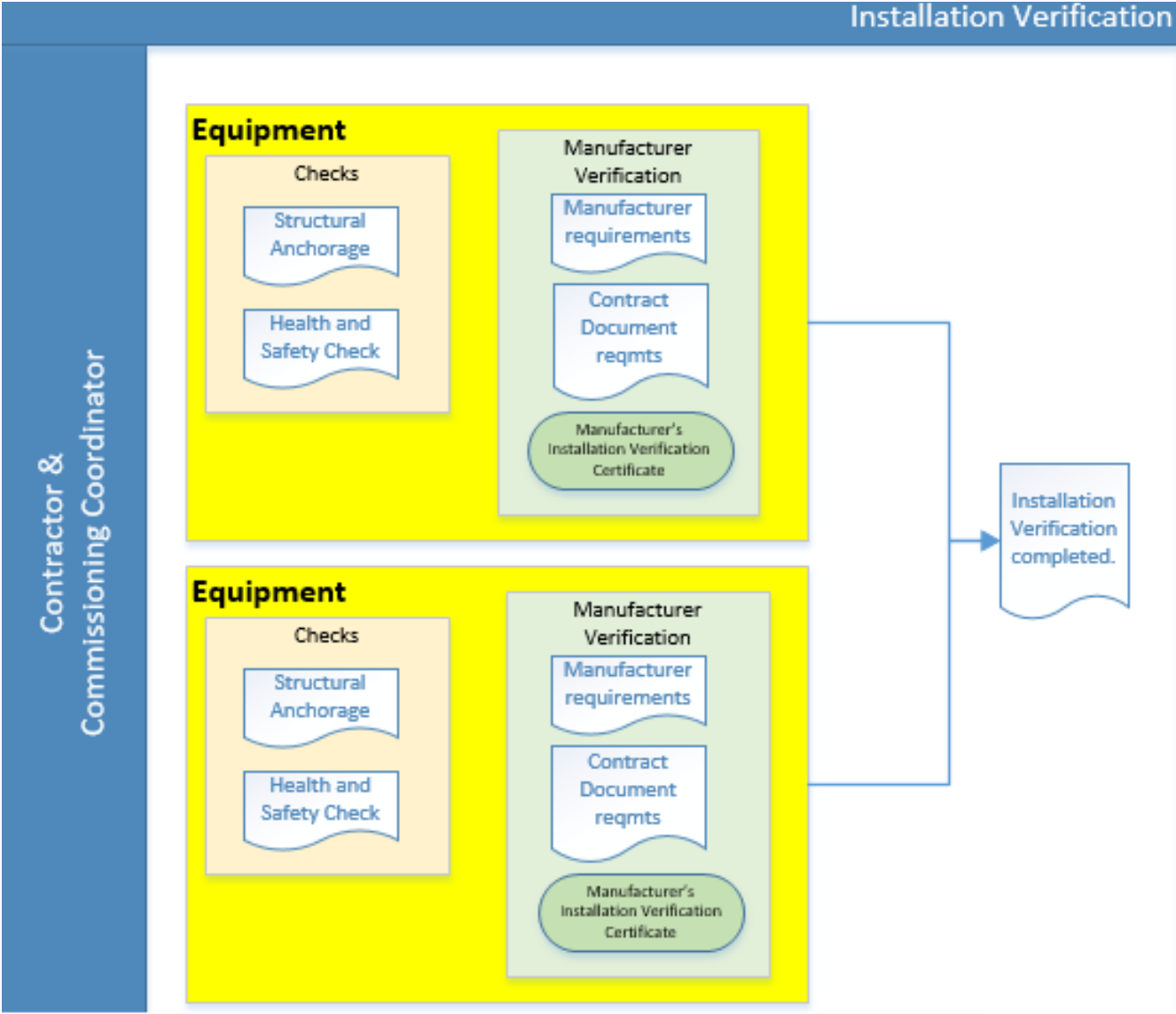


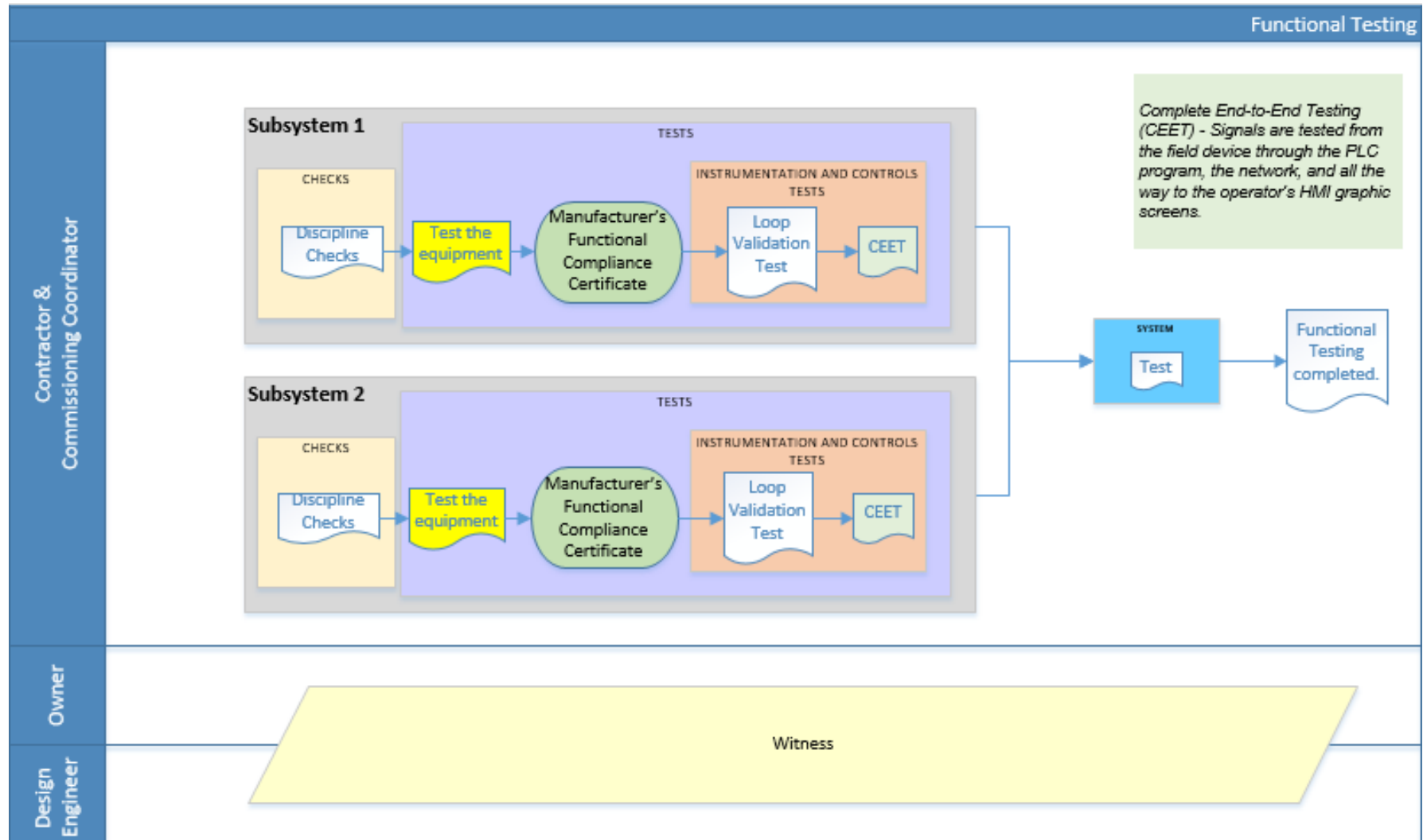
TESTING AND TRAINING PHASE - Installation Verification

Electrical Energization Checks



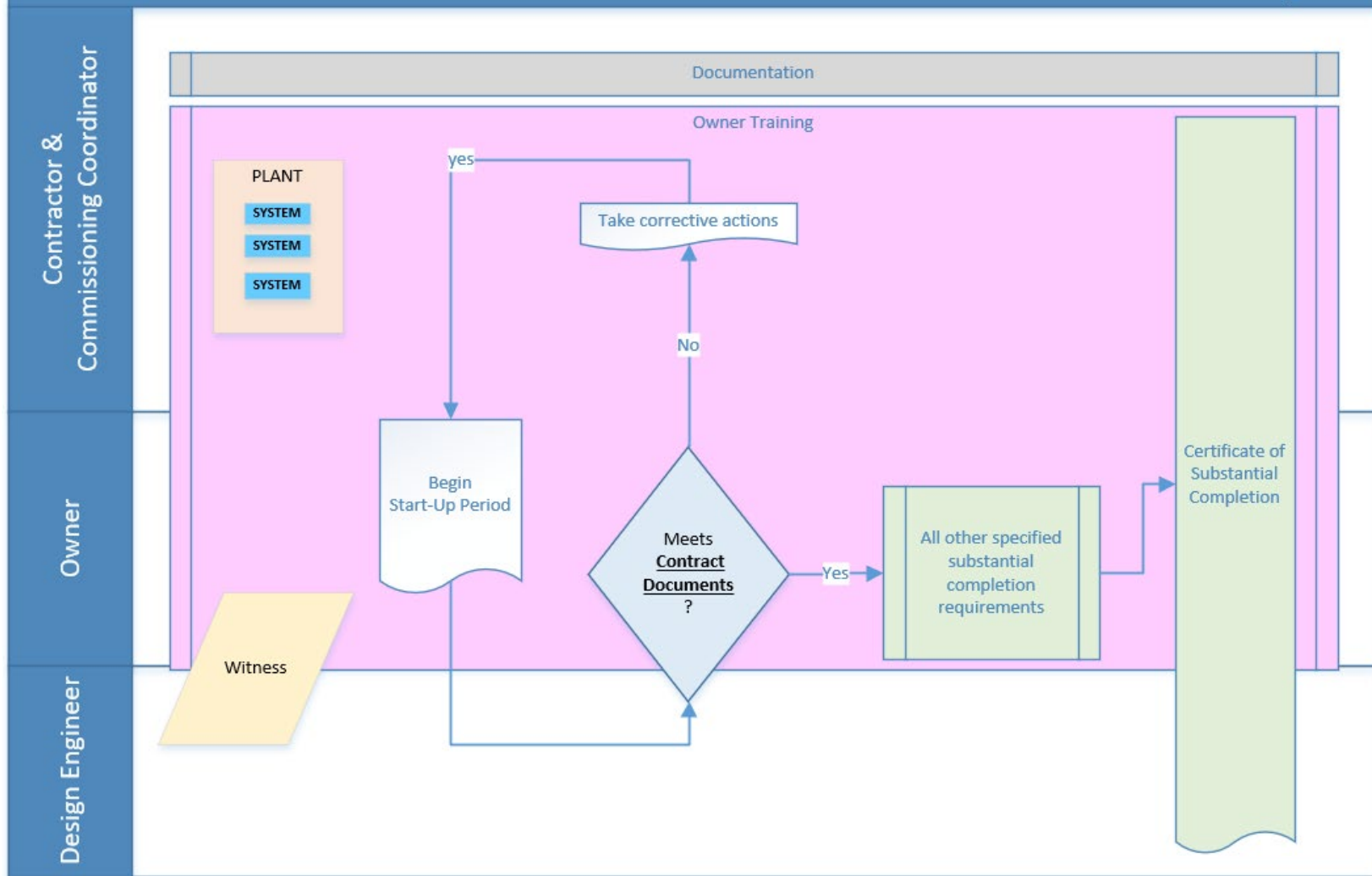






Commissioning

Start-Up Phase



ATTACHMENT B - MANUFACTURER'S CERTIFICATE OF SOURCE TESTING

MANUFACTURER'S CERTIFICATE OF SOURCE TESTING

OWNER _____ EQPT/SYSTEM _____
PROJECT NAME _____ EQPT TAG NO. _____
PROJECT NO. _____ EQPT SERIAL NO. _____
SPECIFICATION NO. _____
SPECIFICATION TITLE _____

Comments: _____

I hereby certify Source Testing has been performed on the above-referenced equipment/system as defined in the Contract, and results conform to the Contract Document requirements. Testing data is attached.

Date of Execution: _____, 20____

Manufacturer: _____

Manufacturer's Authorized Representative Name (*print*): _____

(Authorized Signature)

If applicable, Witness Name (*print*): _____

(Witness Signature)

ATTACHMENT C - MANUFACTURER’S CERTIFICATE OF INSTALLATION VERIFICATION

MANUFACTURER'S CERTIFICATE OF INSTALLATION VERIFICATION

OWNER _____ EQPT/SYSTEM _____
PROJECT NAME _____ EQPT TAG NO. _____
PROJECT NO. _____ EQPT SERIAL NO. _____
SPECIFICATION NO. _____
SPECIFICATION TITLE _____

I hereby certify the installation of the above-referenced equipment/system as defined in the Contract Documents.

NOTES:

Attach written certification report prepared by and signed by the electrical and/or instrumentation subcontractor.

Comments: _____

I, the undersigned manufacturer's representative, hereby certify that I am (i) a duly authorized representative of the manufacturer, (ii) empowered by the manufacturer to inspect, approve, and operate this equipment/system, and (iii) authorized to make recommendations required to ensure that the equipment/system furnished by the manufacturer is complete and operational, except as may be otherwise indicated herein. I further certify that all information contained herein is true and accurate.

Date: _____

Manufacturer: _____

Manufacturer's Authorized Representative Name (*print*): _____

By Manufacturer's Authorized Representative: _____
(Authorized Signature)

ATTACHMENT D - MANUFACTURER’S CERTIFICATE OF FUNCTIONAL COMPLIANCE

MANUFACTURER'S CERTIFICATE OF FUNCTIONAL COMPLIANCE

OWNER _____ EQPT/SYSTEM _____
PROJECT NAME _____ EQPT TAG NO. _____
PROJECT NO. _____ EQPT SERIAL NO. _____
SPECIFICATION NO. _____
SPECIFICATION TITLE _____

I hereby certify the Functional Testing of the above-referenced equipment/system as defined in the Contract Documents.

NOTES:

Attach test results with collected data and test report.

Attach written certification report prepared by and signed by the electrical and/or instrumentation subcontractor.

Comments: _____

I, the undersigned manufacturer's representative, hereby certify that I am (i) a duly authorized representative of the manufacturer, (ii) empowered by the manufacturer to inspect, approve, and operate this equipment/system, and (iii) authorized to make recommendations required to ensure that the equipment/system furnished by the manufacturer is complete and operational, except as may be otherwise indicated herein. I further certify that all information contained herein is true and accurate.

Date: _____

Manufacturer: _____

Manufacturer's Authorized Representative Name (*print*): _____

By Manufacturer's Authorized Representative: _____
(Authorized Signature)

WITNESSES

By Owner's Authorized Representative: _____
(Authorized Signature)

By Engineer's Authorized Representative: _____
(Authorized Signature)

ATTACHMENT E - TRAINING EVALUATION FORM

TRAINING EVALUATION FORM

EQUIPMENT/SYSTEM ITEM: _____

VENDOR/MANUFACTURER: _____

DATE: _____ NAME OF REPRESENTATIVE: _____

- | | | | | | |
|----|---|------------|--------------|----|-----|
| 1. | Was representative prepared? | Acceptable | Unacceptable | or | N/A |
| 2. | Was an overview description presented? | Acceptable | Unacceptable | or | N/A |
| 3. | Were specific details presented for system components? | Acceptable | Unacceptable | or | N/A |
| 4. | Were alarm and shutdown conditions clearly presented? | Acceptable | Unacceptable | or | N/A |
| 5. | Were step-by-step procedures for starting, stopping, and troubleshooting presented? | Acceptable | Unacceptable | or | N/A |
| 6. | Were routine/preventative maintenance items clearly identified? | Acceptable | Unacceptable | or | N/A |
| 7. | Was the lubrication schedule (if any) discussed? | Acceptable | Unacceptable | or | N/A |
| 8. | Was the representative able to answer all questions? | Acceptable | Unacceptable | or | N/A |
| 9. | Did the representative agree to research and answer unanswered questions? | Acceptable | Unacceptable | or | N/A |

10. Comments: _____

11. Overall Rating:	Satisfactory	Unsatisfactory
---------------------	--------------	----------------

Note:

Sessions judged "Unsatisfactory" by a majority of attendees shall be revised and conducted again until a satisfactory rating is achieved.

ATTACHMENT F - COMMISSIONING ROLES AND RESPONSIBILITIES MATRIX

COMMISSIONING ROLES AND RESPONSIBILITIES MATRIX

NO.	TASK	OWNER	CONTRACTOR	ENGINEER
Testing and Training Phase				
Source Testing				
	Source Testing	Non-Witnessed	Lead	Non-Witnessed Review
	Manufacturer's Certificate of Source Testing	No Action	Lead	Review
Installation Verification				
	Structural Anchorage Check	Witness	Lead	Review
	Health and Safety Check	Witness	Lead	Review
	Manufacturer Requirements Verification	No Action	Lead	Review
	Contract Documents Verification	No Action	Lead	Review
	Manufacturer's Certificate of Installation Verification	No Action	Lead	Review
Functional Testing				
	Checks	Witness	Lead	Witness, Review
	Tests	Witness	Lead	Witness, Review
	Manufacturer's Certificate of Functional Compliance	No Action	Lead	Witness, Review
System Testing				
	System Testing	Witness	Lead	Witness, Review
Start-Up Phase				
	Start-Up	Lead	Support	Witness, Review
Legend: Lead: Primarily responsible for organization, coordination, and execution of task work product or result. Support: Assist the lead with organization, coordination, and execution of task work product or result. Witness: Observe and document completion of task work product or result. No Action: Limited or no involvement. Review: Approve for compliance with Contract Documents or reject.				

ATTACHMENT G - FUNCTIONAL TESTING REQUIREMENTS

FUNCTIONAL TESTING REQUIREMENTS

System	Subsystem	Consecutive Day Test Duration (Days)	Significant Interruption Duration (Hours)	Test Liquid	System Operated By
Entire Finished Service Pump Station		4	2	Finished Water	Owner
	Pumps				
	Variable Frequency Drive(s)				
	Valves				
Entire Recovered Water Pump Station		2	2	Recovered Water	Owner
	Pumps				
	Variable Frequency Drive(s)				
	Valves				
Notes: 1. As specified in Section 01_11_00 - Summary of Work. 2. As specified in Section 40_61_16 - Specific Control Strategies. 3. As specified in this Section under Functional Testing. 4. As specified in this Section under Functional Testing.					

A. Schedule delays:

1. Changes in the dates for source testing less than 30 days of the date provided in the latest approved Commissioning Schedule are considered delays.
2. Contractor is responsible for associated costs resulting from delays:
 - a. In person and/or virtual witnessing.
 - b. Travel costs and witness labor costs.
 - 1) Witness labor costs at \$250 per hour.

- B. Repeat test costs:
 - 1. Contractor is responsible for associated costs for repeat testing:
 - a. In person and/or virtual witnessing.
 - b. Travel costs and witness labor costs.
 - 1) Witness labor costs at \$250 per hour.

SECTION 01_75_18

DISINFECTION

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Cleaning and disinfection requirements for new and existing facilities affected by the Work.

1.02 REFERENCES

- A. American Water Works Association (AWWA):
 - 1. C651 - Disinfecting Water Mains.
 - 2. C652 - Disinfection of Water Storage Facilities.
 - 3. C653 - Disinfection of Water Treatment Plants.
- B. U.S. Environmental Protection Agency (EPA):
 - 1. Safe Drinking Water Act (SDWA).

1.03 SUBMITTALS

- A. Submit disinfection test plan which details procedure to be utilized to disinfect the facilities including:
 - 1. Method and locations of disinfectant application.
 - 2. Locations of sampling points.
 - 3. Method of flushing and location of flushing ports (as appropriate for method of chlorination).
 - 4. Method of dechlorination (as appropriate for method of chlorination).
 - 5. Disposal location for chlorinated water (as appropriate for method of chlorination).
- B. Submit disinfection reports and include the following:
 - 1. Date issued.
 - 2. Project name and location.
 - 3. Treatment subcontractor's name, address, and phone number.
 - 4. Type and form of disinfectant used.
 - 5. Time and date of disinfectant injection start.
 - 6. Time and date of disinfectant injection completion.
 - 7. Test locations.
 - 8. Initial and 24-hour disinfectant residuals in milligrams per liter for each outlet tested.
 - 9. Time and date of flushing start.
 - 10. Time and date of flushing completion.
 - 11. Disinfectant residual after flushing in milligrams per liter for each outlet tested.
- C. Submit bacteriological reports and include the following:
 - 1. Date issued.

2. Project name and location.
 3. Laboratory's name, certification number, address, and phone number.
 4. Time and date of water sample collection.
 5. Name of person collecting samples.
 6. Test locations.
 7. Time and date of laboratory test start.
 8. Coliform bacteria test results for each outlet tested.
 9. Certification that water conforms or fails to conform to bacterial standards of SDWA.
 10. Bacteriologist's signature and bacteriological laboratory's evidence of certification.
- D. Submit required permits, including but not limited to permit clearance.
1. Coordinate with Owner and Engineer to obtain any necessary signatures.

1.04 QUALITY ASSURANCE

- A. Bacteriological and physical chemistry laboratory: Certified by state in which Project is located.

1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Protect chlorine and bacteriological samples against damage and contamination.
- B. Maintain caution labels on hazardous materials.
- C. Maintain storage room dry and with temperatures as uniform as possible between 60 degrees Fahrenheit and 80 degrees Fahrenheit.

1.06 PROTECTION

- A. Provide necessary signs, barricades, and notices to prevent persons from accidentally consuming water or disturbing system being treated.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Disinfectant: Free chlorine in liquid, powder, tablet, or gas form in accordance with AWWA C653.
- B. Dechlorination agent: Sulfur dioxide, sodium bisulfate, sodium sulfite, or sodium thiosulfate in accordance with AWWA C653.

PART 3 EXECUTION

3.01 PRELIMINARY CLEANING

- A. Complete hydrostatic/leakage tests prior to disinfection.

- B. Clean newly constructed and/or modified facilities, including filters and conveyance facilities, such as pipes and channels at the plant, in accordance with AWWA C653 and the following:
 - 1. Remove debris and material not associated with the structure or process prior to disinfection.
 - 2. Clean wall, floor, ceiling, and attached surfaces by use of high-pressure water jet, sweeping, scrubbing, or equally effective means.
 - 3. Remove water, paint flakes, sediment, dirt, and foreign material accumulated during cleaning.
 - 4. Remove by flushing or other means, soil and debris from water pipes and channels in accordance with AWWA C651.
 - 5. Protect surfaces from adverse environmental exposure between the preliminary cleaning and the disinfection stages.
- C. Prior to chlorination, clean newly constructed and/or modified facilities to be disinfected in accordance with AWWA C651, C652, or C653, as applicable.
- D. Contractor shall provide necessary blind flanges, hoses, sample taps, or any other appurtenances that may be required to clean and disinfect the piping and wetted surfaces.

3.02 SURFACES TO BE DISINFECTED

- A. Piping systems that are used to convey water, solutions, or chemicals to potable water facilities.

3.03 DISINFECTION OF WATER LINES

- A. Cleaning:
 - 1. Remove by flushing or other means, soil and debris from the water tanks in accordance with AWWA C652 prior to chlorination.
- B. Inspection:
 - 1. Verify that water system is completed and cleaned of soil and debris prior to chlorination.
 - 2. Start disinfection when conditions are satisfactory.
- C. System treatment:
 - 1. Perform disinfection of water lines and structures in accordance with AWWA C651, C652, and C653, and as specified in this Section.
 - 2. Starting at outlet closest to water source, bleed water from each outlet until water produces odor of disinfectant. Repeat process at each outlet throughout system.
 - 3. Test for disinfectant residual at each of following locations and other locations in accordance with submitted disinfection test plan:
 - a. Ends of piping runs.
 - b. Remote outlets.
 - c. Tanks.
 - d. At least 2 outlets on each building floor where directed.
 - e. Drain lines.
 - f. Filters and effluent channels and piping.

4. Maintain disinfectant in system for appropriate 6-hour or 24-hour interval in accordance with AWWA C652.
5. When disinfectant residual is less than 10 milligrams per liter after 24 hours, repeat system treatment.
6. Stainless steel piping:
 - a. Modify procedures for disinfection of stainless steel piping and appurtenances as necessary to avoid causing corrosion, pitting, or attack of stainless steel materials.
 - 1) Take steps to eliminate chlorinated water trapped in crevices and under gaskets through the following procedures:
 - a) Pressurize stainless steel piping systems so that gaskets and O-rings are seated before introducing chlorinated water into the system.
 - b) Flush to displace a minimum of 3 pipe volumes at the conclusion of the disinfection procedure.
 - c) Use the continuous-feed method to fill the stainless steel piping system with the minimum chlorine concentration required to provide a 10 milligrams per liter residual after 24 hours of contact time in accordance with AWWA C651.

3.04 REPAIRS OR CONNECTIONS TO EXISTING LINES

- A. Clean and sterilize the interior surfaces of new piping, fittings, equipment, and appurtenances to be installed in an existing potable water system or connected to an existing system.
- B. Clean and sterilize the existing pipe or facilities for a minimum distance of 3 pipe diameters back from the ends of the pipe. Plug the ends of the line when work is not being performed on the pipe.
- C. Perform sterilization by swabbing each item with a concentrated chlorine solution.
 1. Each piece is to be disinfected prior to being assembled for installation in the existing pipe.
 2. Disinfect each piece just prior to assembly to help prevent recontamination.
 3. Plug the ends of the assembly until a new item is to be added to the assembly.
 4. Store disinfected materials on blocks to prevent contact with the ground.

3.05 FLUSHING

- A. Remove disinfection water from the facilities as appropriate for the type of disinfectant and method used for disinfection.
- B. Flush facilities with potable water containing no more disinfectant residual than the active distribution system or 1.0 milligrams per liter, whichever is greater (as appropriate for method of chlorination).
- C. Continue flushing until water at designated flushing ports contains disinfectant residual equal to concentration specified above.

3.06 DISPOSAL OF CHLORINATED WATER

- A. Dispose of chlorinated water in accordance with the submitted disinfection test plan and applicable requirements of federal, state, county, and city having jurisdiction over disposal of hazardous wastes in location of the Project and disposal site.
- B. Chlorinated water may only be disposed of in a sanitary sewer system with the written permission of the Owner. If allowed, discharge the chlorinated water at a low rate so it does not surcharge the sewer line.

3.07 BACTERIOLOGICAL TEST

- A. Instruct bacteriological laboratory to collect water samples no sooner than 24 hours after start of disinfection of each facility.
- B. A minimum of 24 hours after flushing system and within 24 hours before the water main is placed in service, collect bacteriological quality samples at each of following locations and other locations in accordance with the submitted disinfection test plan and Standard Methods for the Examination of Water and Wastewater:
 - 1. Where water enters system.
 - 2. Inlet piping.
 - 3. Ends of piping runs.
 - 4. Drain lines.
 - 5. Remote outlets.
 - 6. Tanks.
 - 7. At least 2 outlets on each building floor.
- C. Analyze water samples in accordance with Standard Methods for Examination of Water and Wastewater.
- D. When bacteriological test proves water quality to be unacceptable, repeat disinfection treatment process until water meets quality standards for disinfection.

END OF SECTION

SECTION 01_75_19

WATER LEAKAGE TEST FOR CONCRETE STRUCTURES

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Hydrostatic leakage test for concrete water-holding structures.

1.02 REFERENCES

- A. Abbreviations and acronyms.
- B. Definitions.
 - 1. Damp spots: Surfaces where visible moisture can be picked up by a dry hand.
 - 2. Containment structure lined: Liquid-containing structure with barrier coating or membrane applied to the inside surfaces to prevent leaking of contents to the outside.
 - 3. Containment structure, unlined: Liquid containing structure where only the concrete structure itself is used to prevent leaking of contents to the outside.
- C. Reference standards.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination.
- B. Pre-installation meetings.
- C. Sequencing.
- D. Scheduling.

1.04 SUBMITTALS

- A. Product data.
- B. Shop drawings:
 - 1. Description and details of each evaporation/precipitation-measuring device anticipated for use during the test.
- C. Samples.
- D. Certificates.
- E. Delegated design submittals.

- F. Tests and evaluation reports:
 - 1. Results of water leakage test for each structure and for each portion of a structure designated for testing.
- G. Manufacturer instructions.
- H. Source quality control submittals.
- I. Field/site quality control submittals.
- J. Manufacturer reports.
- K. Sustainable design submittals.
- L. Special procedure submittals:
 - 1. Testing plan for each structure, or portion thereof, required to be tested.
 - a. Describe methods of obtaining water for testing and of releasing water for disposal, including provisions for dechlorination if required.
 - b. Contractor is responsible for providing hoses, pumps, and other equipment to convey, fill, or dewater.
 - c. Include plans showing locations where measurements will be made and locations of evaporation/precipitation-measuring device.
 - d. Indicate plans for filling and draining structure(s).
 - e. Include schedule showing duration of test for each structure or cell to be tested, date and time for start of each test, dates and times of observations and measurements during the test, dates and times for closeout of testing procedures, and date for submittal of final results.
 - 2. Proposed procedures and products for repair of leaks.
- M. Qualifications statements.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

- A. Test structures and portions of structures listed in the following paragraphs for water leakage.
 - 1. Unless otherwise specified, the Contractor shall:
 - a. Obtain all required permits for discharging testing water.
 - b. Provide dechlorination of such water if required by the permits.
 - c. Prepare and fill the structures.
 - d. Provide access and equipment required for testing and for recording test results.
 - e. Take measurements and make observations required for testing.
 - 2. At all times during testing, the Engineer shall have access to observe measurements by others or to make independent measurements.

- B. Test the following concrete structures for water leakage:
 - 1. Recovered Water Pump Station Wet Well.
- C. Required preparation for testing is designated in this Section. Waiver of, or failure to complete preparations shall not change the testing criteria or approval criteria for the areas tested.
- D. Retest structures and portions of structures until the evaluation criteria are satisfied.

3.02 TEST WATER SOURCE AND DISPOSAL

- A. Water used for the first filling of the structure will be furnished by Owner.
 - 1. Contractor shall obtain water for leakage testing from the Residuals Lagoons using the existing recovered water pump station and the recovered water piping system.
- B. In the event that retesting is required, Contractor shall bear the cost of refilling the structure for subsequent tests.
- C. After leakage testing is complete, Contractor shall dispose of water by in the Residuals Lagoons or in the existing recovered water piping system.

3.03 PREPARATION

- A. For each structure to be tested, prepare and submit a plan showing schedule and sequence of activities, method of filling, and methods of disposing of test water.
- B. Sequencing requirements:
 - 1. Complete construction of concrete structure and cure concrete to obtain minimum specified 28-day compressive strength as specified in Section 03_30_00 - Cast-in-Place Concrete.
 - a. Do not begin tests until all portions of structure are complete and have reached their minimum specified 28-day compressive strength.
 - b. Do not begin tests until at least 14 days have passed since completion of the last concrete placement.
 - 2. Complete tests before:
 - a. Covering any surface of the structure with materials that might mask the location of leaks or obscure damp concrete surfaces. Such coverings include, but are not limited to basin bottom grout, masonry veneer, stucco, plaster, and other coatings.
 - b. Installation of equipment, unless otherwise approved by the Engineer.
 - c. Backfilling structures to elevations above the limits indicated in the following paragraphs.
 - 3. Liners and coatings:
 - a. Install liners that are mechanically locked to the concrete surface during placement of plastic concrete and before leakage testing.
 - 1) Examine liners for pinholes, tears, and partially fused splices, complete all required liner integrity testing, and make required repairs before commencing leakage testing.
 - b. Unless otherwise specified, do not install surface-applied protective or decorative coatings and linings until leakage tests have been completed.

- C. Weather requirements:
 - 1. Tests on structures with tops open to the atmosphere shall not be scheduled for periods when the 10-day weather forecast indicates a substantial change in weather patterns.
 - 2. Measurements of water surface levels in the structure shall not be scheduled for periods when the weather forecast indicates a difference of more than 35 degrees Fahrenheit between the ambient temperature readings at the times of initial and final measurements.
 - 3. Tests shall not be scheduled for periods when the 10-day weather forecast indicates that the water surface may freeze before the test is complete.
- D. Groundwater requirements:
 - 1. Bring groundwater to a level below the top of the floor slab and maintain at that level for the duration of the test.
- E. Clean interior of structure:
 - 1. Remove dirt, contaminants, and construction debris.
 - 2. Flush floors and sumps to provide clean surfaces.
 - 3. Remove standing water that would interfere with examination of surfaces, cracks, or joints.
- F. Observe the structure, or portions of the structure being tested, for potential leak locations:
 - 1. Give particular attention to cracks, open joints, voids, and honeycombed and repaired surfaces.
 - 2. Visually observe openings, fitting, and pipe penetrations in the structure at both faces, if possible.
 - 3. Repair potential leak locations in accordance with these Specifications and as approved by the Engineer.
 - 4. Backfill excavations to the top of the structure foundation. Do not place backfill against water-bearing walls or over footings unless approved in advance by the Engineer.
 - a. If requesting backfilling of walls before testing, include a description of methods that will be used to detect leakage in the backfilled areas.
 - b. Engineer's approval of backfilling before testing shall not relieve Contractor of the responsibility to conduct leakage tests, to satisfy the leakage acceptance criteria for the structure, or to repair leaking portions of the structure, including those portions below or behind the backfill.
 - 5. See Drawings and Section 31_00_00 - Earthwork for requirements to provide wall stability before backfilling.
- G. Inlets to/outlets from the structure:
 - 1. Make inlets to and outlets from the structure watertight.
 - a. Include valves; stop, sluice, and slide gates; and temporary bulkheads as required.
 - b. Inlets and outlets not required to be operable may be temporarily sealed before testing of the compartments to which they open.
 - c. Secure inlets used to fill the structure for testing to ensure that no water is entering or leaving the structure once it has been filled to the test level.

2. Adjustments to measured leakage at inlets and outlets based on manufacturer's or Contractor's estimates will not be allowed.
 - a. Adjustments to measured leakage may be permitted by the Engineer, and, at his/her discretion, only when the Contractor makes specific measurements of leakage at each individual inlet and outlet using methods approved by the Engineer.

3.04 HYDROSTATIC LEAKAGE TEST FOR OPEN OR COVERED CONTAINMENT STRUCTURES ("HST-100")

- A. Isolate sections of water-holding structures that can be isolated in actual operation. Fill and test sections for leakage separately.
 1. Fill structures and sections of structures scheduled for testing to one foot below the top of the structure.
- B. Initial rate for filling of structures shall not exceed 4 feet per hour.
- C. HST-100 testing includes 2 parts, "Qualitative Testing," and "Quantitative Testing," as described in the following paragraphs:
 1. HST-100, Part 1 - Qualitative Testing:
 - a. During the first 24 hours after structures are filled, examine exposed concrete surfaces for damp spots or flowing water.
 - 1) Make observations in early morning, at midday, and in late afternoon.
 - 2) Continue observations through the duration of the Quantitative Testing period.
 - 3) Pay particular attention to conditions at joints, honeycombed areas, cracks, and repaired portions of the structure.
 - b. Evaluation criteria:
 - 1) The structure shall be considered to have failed these Qualitative Testing requirements if any of the following conditions are observed.
 - a) Water droplets or moist areas on an outside surface that could only have originated inside the structure.
 - b) Water is flowing or seeping from joints, cracks, or surfaces.
 - (1) Exception: Dampness or wetness on top of a footing, in the absence of flowing water, shall not be considered as failure to meet this criterion.
 - c) Moisture can be transferred to a dry hand from the outside surfaces of the filled area.
 - c. Repairs and retesting:
 - 1) Where damp spots or flowing water as described in the preceding paragraphs are observed, mark locations, provide repairs, and retest the structure as specified in subsequent paragraphs.
 2. HST-100 - Part 2: Quantitative Testing:
 - a. If approved by the Engineer, Quantitative Testing may begin before repairs are made to areas failing Part 1 of this test; however:
 - 1) Adjustments to volume loss calculations of Quantitative Testing based on observed leakage will not be permitted.
 - 2) All defects identified for repair during Qualitative Testing shall be repaired to the satisfaction of the Engineer before approval of the structure.

- b. Report the results of quantitative testing.
 - 1) Submit completed Attachment A - Leakage Test Report or at a minimum, include the information specified in Attachment A - Leakage Test Report.
- c. Unlined concrete structures:
 - 1) Fill to the designated water surface elevation. Maintain that level for at least 72 hours before recording initial water levels for leakage test.
 - 2) Duration of test:
 - a) Theoretical time required to lower the water surface in the structure by 3/8 inch when leakage is occurring at the maximum allowable rate specified in subsequent paragraphs of this Section.
 - b) The duration ("D") of the test in days is determined by the following equation:

$$D = \frac{0.375 \text{ inches}}{(0.0005 \text{ in/in/day} \times H \text{ ft} \times 12 \text{ in/ft})}$$

Where: H = maximum liquid depth

- (1) Round results upward to the next full 24-hour period (day).
 - (2) Minimum duration of test: 24 hours (1 day).
 - (3) Maximum duration of test: 120 hours (5 days).
- d. Measurements: Water level:
 - 1) Record water levels at 24-hour intervals for the full duration of the test period.
 - 2) Measure water levels at not less than 2 locations on opposite ends of the structure, and preferably at 4 locations spaced equally around the structure. Mark locations on the structure and take measurements at the same locations throughout the duration of the test.
 - 3) Measure, to an accuracy of 1/16 inch, the vertical distance to the water surface from a fixed point on the structure above.
- e. Measurements: Temperatures:
 - 1) As part of the first and last sets of level measurements, record water temperature at a depth of 18 inches below the water surface. Measure temperature at the same locations where level measurements are taken.
 - 2) Record ambient temperature at the time of each water level measurement.
- f. Measurements: Evaporation and precipitation:
 - 1) Measure evaporation and precipitation by floating pans inside the structures during testing.
 - a) For uncovered structures, measure both evaporation and precipitation.
 - b) For covered structures that are well ventilated, measure evaporation.
 - 2) Measure using specially constructed clear containers:
 - a) Provide clear plastic, calibrated, open-top containers not less than 18 inches in diameter and 18-inches deep.
 - b) Partially fill containers with water and float inside the structure. Make provisions to hold containers in place at each

- measurement location, but away from structure walls and items passing overhead, such as beams or pipes.
- c) Measure initial depth of water in each device. Measure changes in water level in each device at the same time measurements of the water level inside the structure are taken.
- g. Restart of test:
- 1) The Engineer may order a restart of the test when, in the Engineer's opinion, measurements have become unreliable due to unusual precipitation or other factors.
 - 2) If measurements or observed leakage during the testing period indicate that the allowable leakage requirements will be exceeded, the test may be terminated before completion of the full test period. Take appropriate actions to correct problems before restarting the test.
- h. Calculations of leakage test results:
- 1) For each section of the structure tested, use water surface level records to calculate average loss of volume per 24-hour interval.
 - a) For each 24-hour interval during the test, calculate the average of all measured drops in water level around the structure.
 - b) Use the average drop thus determined to calculate an average loss of volume for each 24-hour interval.
 - 2) Adjustments to leakage calculations:
 - a) For uncovered basins, calculations shall be corrected for precipitation added to the structure.
 - b) Calculations may be corrected for evaporation and water temperature.
- i. Evaluation criteria:
- 1) Unless otherwise specified, the average loss of volume during any 24-hour interval shall not exceed the limits shown in Table A.

Table A - Loss of Volume Criteria for Leakage Tests	
Structure Type	Maximum Loss of Water Volume
- Structure fully lined prior to leakage test. - Secondary containment areas.	No measurable loss over 72-hour test period.
Structure with monolithically placed membrane floor slab.	0.0125 percent of volume per 24-hour period.
Concrete paved canals, drying beds, lagoons, and similar structures.	0.100 percent of volume per 24-hour period.
Other containment structures.	0.050 percent of volume per 24-hour period.

- j. Repairs and retesting:
- 1) Structures and portions of structures that have satisfied the qualitative requirements of HST-100, but have failed to satisfy the quantitative requirements of HST-100 may be immediately retested for volume loss.
 - a) If the structure fails the second test for volume loss, the structure shall be drained, and the Contractor shall observe the interior for probable areas of leakage.

- b) The structure shall not be retested until repairs to the probable areas of leakage are complete.

3.05 REPAIRS FOR RETESTING

- A. Locations showing damp spots or flowing water:
 - 1. Mark locations of visible leaks and damp spots.
 - 2. Drain structures for repair.
 - 3. Repair defects causing damp spots and flowing water using methods specified in Section 03_30_00 - Cast-in-Place Concrete and approved by the Engineer:
 - a. Repair both interior and exterior surfaces and make structures watertight.
 - b. Submit proposed repair products and procedures for Engineer's review.
 - c. Refill structures for retesting.
 - 4. Repeat filling, observations, and repairs until no leaks or damp spots appear.
- B. Structures for which water volume loss exceeds the limits specified after adjustments for evaporation, and precipitation:
 - 1. Determine cause of volume loss.
 - 2. Drain structures of water.
 - 3. Repair defects causing loss of water volume using methods specified in Section 03_30_00 - Cast-in-Place Concrete and approved by the Engineer:
 - a. Submit proposed repair products and procedures for Engineer's review.
 - 4. Refill water-holding structures.
 - 5. Repeat testing and repairs until volume loss does not exceed specified limits.

END OF SECTION

ATTACHMENT A - LEAKAGE TEST REPORT

LEAKAGE TEST REPORT

PROJECT: _____			SUBMITTED BY: _____				
STRUCTURE: _____			WITNESSED BY: _____				
AREA: _____			TEST DATES: _____				
TEST DURATION: _____			TEST DURATION: _____				

Surface area of structure tested: _____	(square feet)
Volume of structure tested: _____	(cubic feet)
Volume of structure tested: _____	(gallons)
Measured loss through gates, etc.: _____	(gallons / day)
Allowable loss of water volume: _____	(per day)
Allowable loss of water volume: _____	(% in 24 hours)
Allowable measured loss over test duration (inches): _____	
Measured loss of water: _____	(gallons / day - From E below)
Measured loss of water volume (%): _____	(in 24 hours - From E below)

Water Temperature:			Start of test: _____ °F		End of test: _____ °F	
---------------------------	--	--	-------------------------	--	-----------------------	--

			Water Surface Elevation (top of structure to top of water)				
			Location #1	Location #2	Location #3	Location #4	Initials**
Day	Date	Time	(inches)	(inches)	(inches)	(inches)	
1							
2							
3							
4							
5							
Changes in Level:							

A. Average change in level (feet): _____	(Average of total charges for all locations)
B. Correction for precipitation: _____	(Measured from pan)
C. Correction for evaporation: _____	(Measured from pan)
D. Corrected change in level (CL): _____	
E. Total days tested: _____	
F. Average measured % water loss in 24 hours: _____	$= \frac{(\text{CL}) \times (\text{surface area}) \times 100}{(\text{initial water volume}) \times (\text{number of test days})}$

Notes and field observations**

** Place date and initials at the beginning of each entry

Water Leakage Test for Concrete Structures

01_75_19-Attachment A-1

200281

August 2023

pw://Carollo/Documents/Carollo Internal Projects/_Non-Project Specific CAD Files/200281-000000/CAD with Phases/200281-000000_P2/Specifications/Carollo/A2 Specs/01_75_19 (FS100)

SECTION 01_77_00
CLOSEOUT PROCEDURES

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Contract closeout requirements.

1.02 REFERENCES

- A. American Water Works Association (AWWA).

1.03 FINAL CLEANING

- A. Perform final cleaning prior to inspections for Final Completion.
- B. Employ skilled workers who are experienced in cleaning operations.
- C. Use cleaning materials which are recommended by manufacturers of surfaces to be cleaned.
- D. Prevent scratching, discoloring, and otherwise damaging surfaces being cleaned.
- E. Clean roofs, gutters, downspouts, and drainage systems.
- F. Broom clean exterior paved surfaces and rake clean other surfaces of site work:
 - 1. Police yards and grounds to keep clean.
- G. Remove dust, cobwebs, and traces of insects and dirt.
- H. Clean grease, mastic, adhesives, dust, dirt, stains, fingerprints, paint, blemishes, sealants, plaster, concrete, and other foreign materials from sight-exposed surfaces, and fixtures and equipment.
- I. Remove non-permanent protection and labels.
- J. Polish waxed woodwork and finish hardware.
- K. Wash tile.
- L. Wax and buff hard floors, as applicable.
- M. Wash and polish glass, inside and outside.
- N. Wash and shine mirrors.
- O. Polish glossy surfaces to clear shine.

- P. Vacuum carpeted and soft surfaces.
- Q. Clean permanent filters and replace disposable filters when heating, ventilation, and air conditioning units were operated during construction.
- R. Clean ducts, blowers, and coils when units were operated without filters during construction.
- S. Clean light fixtures and replace burned-out or dim lamps.
- T. Probes, elements, sample lines, transmitters, tubing, and enclosures have been cleaned and are in like-new condition.

1.04 WASTE DISPOSAL

- A. Arrange for and dispose of surplus materials, waste products, and debris off-site:
 - 1. Prior to making disposal on private property, obtain written permission from Owner of such property.
- B. Do not fill ditches, washes, or drainage ways which may create drainage problems.
- C. Do not create unsightly or unsanitary nuisances during disposal operations.
- D. Maintain disposal site in safe condition and good appearance.
- E. Complete leveling and cleanup prior to Final Completion of the Work.

1.05 TOUCH-UP AND REPAIR

- A. Touch-up or repair finished surfaces on structures, equipment, fixtures, and installations that have been damaged prior to inspection for Final Completion.
- B. Refinish or replace entire surfaces which cannot be touched-up or repaired satisfactorily.

1.06 FINAL CLEANING AND DISINFECTION OF SYSTEMS OF PLANT FACILITIES

- A. Clean channels, pipe, basins, reservoirs, and tanks before running of 7-day test, or before facility goes on stream when 7-day test is not required.
- B. Wash, wherever practicable, or broom sweep channels, pipe, basins, reservoirs, and tanks.
- C. Disinfect filter basins, reservoirs, clear wells, tanks, channels, and piping intended to carry potable water as follows or in accordance with AWWA Standards.
- D. Provide ample sampling outlets in pipe for testing.
- E. Fill pipe and other plant facilities with chlorine solution of sufficient strength to retain residual of not less than 10 parts per million at end of 24 hours.

- F. When reservoirs and basins are too large to be economically disinfected by filling with chlorine solution, spray reservoirs and basins with solution containing 100 parts per million of chlorine.
- G. After disinfection, rinse entire potable water system with potable water sufficient to reduce chlorine residual to not more than 0.6 parts per million throughout system before system is put into service.

1.07 FINAL CLEANING AND DISINFECTION OF SYSTEMS OF POTABLE WATER MAINS

- A. Clean interior of pipe and fittings.
- B. When pipe contains dirt that cannot be removed by flushing, swab pipe interiors with solution containing not less than 500 parts per million of chlorine until clean.
- C. Flush 12-inch in diameter and smaller pipe as thoroughly as available water sources will permit.
- D. Fill pipe with chlorine solution of sufficient strength to provide 10 parts per million chlorine residual at end of 24 hours.
- E. Flush pipes with potable water until chlorine residual is less than 0.6 parts per million before pipe are put into service.

1.08 CLOSEOUT DOCUMENTS

- A. Submit the following Closeout Submittals before Substantial Completion:
 - 1. Punch list of items to be completed or corrected with the request for issuance of Substantial Completion.
 - 2. Evidence of Compliance with Requirements of Governing Authorities.
 - 3. Project Record Documents.
 - 4. Approved Operation and Maintenance Manuals.
 - 5. Approved Warranties and Bonds.
 - 6. Keys and Keying Schedule.
 - 7. Completed contract requirements for commissioning and process start-up.
- B. Submit the following Closeout Submittals before final completion of the Work and at least 7 days prior to submitting Application for Final Payment:
 - 1. Punch list of items have been completed and Engineer and Owner are satisfied that all deficiencies are corrected.
 - 2. Evidence of Payment and Release of Liens or Stop Payment Notices as outlined in Conditions of the Contract.
 - 3. Release of claims as outlined in Conditions of the Contract.
 - 4. Submit certification of insurance for products and completed operations, as specified in the General Conditions.
 - 5. Final statement of accounting.
 - 6. Submit Final (As-Built) Schedule as specified in Section 01_32_21 - Schedules and Reports.

1.09 EVIDENCE OF COMPLIANCE WITH REQUIREMENTS OF GOVERNING AUTHORITIES

- A. Submit the following:
 - 1. Certificate of Occupancy.
 - 2. Certificates of Inspection.

1.10 PROJECT RECORD DOCUMENTS

- A. Maintain at Project site, available to Owner and Engineer, 1 copy of the Contract Documents, shop drawings, and other submittals in good order:
 - 1. Mark and record field changes and detailed information contained in submittals and change orders.
 - 2. Record actual depths, horizontal and vertical location of underground pipes, duct banks, and other buried utilities. Reference dimensions to permanent surface features.
 - 3. Identify specific details of pipe connections, location of existing buried features located during excavation, and the final locations of piping, equipment, electrical conduits, manholes, and pull boxes.
 - 4. Identify location of spare conduits including beginning, ending, and routing through pull boxes and manholes. Record spare conductors, including number and size, within spare conduits and filled conduits.
 - 5. Provide schedules, lists, layout drawings, and wiring diagrams.
 - 6. Make annotations in electronic format. conforming to the following color code:

Additions:	Red
Deletions:	Green
Comments	Blue
Dimensions:	Graphite

- B. Maintain documents separate from those used for construction:
 - 1. Label documents "RECORD DOCUMENTS."
- C. Keep documents current:
 - 1. Record required information at the time the material and equipment is installed and before permanently concealing.
 - 2. Engineer will review Record Documents weekly to ascertain that changes have been recorded.
- D. Affix civil engineer's or professional land surveyor's signature and registration number to Record Drawings to certify accuracy of information shown.
- E. Deliver Record Documents with transmittal letter containing date, Project title, Contractor's name and address, list of documents, and signature of Contractor.
- F. Record Documents will be reviewed monthly to determine the percent complete for the monthly pay application.
- G. Updated Record Documents are a condition for Engineer's recommendation for progress payment.

- H. Final Schedule Submittal as specified in Section 01_32_21 - Schedules and Reports.

1.11 MAINTENANCE SERVICE

- A. Maintenance service as specified in technical specifications.

1.12 SUBSTANTIAL COMPLETION

- A. Obtain Certificate of Substantial Completion.

1.13 FINAL COMPLETION

- A. When Contractor considers the Work is complete, submit written certification that:
 - 1. Work has been completed in accordance with the Contract Documents:
 - 2. Punch list items have been completed or corrected.
 - 3. Work is ready for final inspection.
- B. Engineer will make an inspection to verify the status of completion with reasonable promptness.
- C. Should the Engineer consider that the Work is incomplete or defective:
 - 1. Engineer will promptly notify the Contractor in writing, listing the incomplete or defective work.
 - 2. Contractor shall take immediate steps to remedy the stated deficiencies and send a second written certification to the Engineer that the Work is complete.
 - 3. Engineer shall re-inspect the Work.

1.14 FINAL ADJUSTMENT OF ACCOUNTS

- A. Submit a final statement of accounting to the Engineer at least 7 days prior to final Application for Payment.
- B. Statement shall reflect all adjustments to the Contract amount.
 - 1. The original Contract amount.
 - 2. Additions and deductions resulting from:
 - a. Change Orders.
 - b. Units installed and unit prices.
 - c. Set-offs for uncorrected or incomplete Work.
 - d. Set-offs for liquidated damages.
 - e. Set-offs for reinspection payments.
 - f. Extended engineering and/or inspection services and inspection overtime.
 - g. Excessive shop drawings review cost by the Engineer.
 - h. Other adjustments.
 - 3. Total Contract amount, as adjusted.
 - 4. Previous payments.
 - 5. Remaining payment due.
- C. Engineer will prepare a final Change Order reflecting approved adjustments to the Contract amount which were not previously made by Change Orders.

1.15 FINAL APPLICATION FOR PAYMENT

- A. Contractor shall submit the final Application for Payment reflecting the agreed upon information provided in the final statement of accounting.

PART 2 PRODUCTS

2.01 SPARE PARTS

- A. Owner may request advanced delivery of spare parts, maintenance products, and special tools.
 - 1. Deduct the delivered items from the inventory list and provide transmittal documentation.
- B. Prior to Substantial Completion, arrange to deliver spare parts, maintenance products, and special tools to Owner at a location on site chosen by the Owner.
 - 1. Provide itemized list of spare parts and special tools that matches the identification tag attached to each item.
 - 2. Owner and Engineer will review the inventory and the itemized list to confirm it is complete and in good condition prior to signing for acceptance.

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01_78_24

OPERATION AND MAINTENANCE MANUALS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Preparation and submittal of manual with requirements to operate and maintain the equipment.

1.02 PREPARATION

- A. General requirements:
 - 1. Provide dimensions in English units.
 - 2. Assemble material, where possible, in the same order within each volume.
 - 3. Reduce drawings and diagrams to 8 1/2 by 11-inch size, if possible unless otherwise specified.
 - 4. Complete forms on computer, handwriting not acceptable.
 - 5. Delete items or options not provided in the supplied equipment or system.
 - 6. Provide package control system annotated ladder logic for PLC, if applicable.
- B. Hard copy requirements:
 - 1. Binders: 3-ring with rigid covers.
 - a. Break into separate binders as needed to accommodate large size.
 - 2. Utilize numbered tab sheets to organize information.
 - 3. Provide original and clear text on reproducible non-colored paper, 8 1/2 by 11-inch size, 24 pound paper.
 - 4. Drawings larger than 8 1/2 by 11 inch:
 - a. Fold drawings separately and place in envelope bound into the manual.
 - b. Label each drawing envelope on the outside regarding contents.
- C. Electronic requirements:
 - 1. File format:
 - a. Entire manual in PDF format.
 - 1) Include text and drawing information.
 - 2) Provide a single PDF file even if the hard copy version is broken into separate binders due to being large.
 - 3) Create PDF from the native format of the document (Microsoft Word, graphics programs, drawing programs, etc.).
 - a) If material is not available in native format and only available in paper format, remove smudges, fingerprints, and other extraneous marks before scanning to PDF format.
 - b) Hard copy record drawing requirements:
 - (1) Provide a single multipage PDF file of each set of the scanned drawings.
 - (2) Page 1 shall be the cover of the drawing set.

- c) At file opening, display the entire cover.
 - (1) Scan drawings at 200 to 300 dots per inch (DPI), black and white, Group IV Compression, unless otherwise specified.
 - (2) Scan drawings with photos in the background at 400 dots per inch (DPI), black and white, Group IV Compression.
 - 4) Pagination and appearance to match hard copy.
 - 5) Searchable.
 - 6) Scanned images are not acceptable.
 - 7) Bookmarks:
 - a) Bookmarks shall match the table of contents.
 - b) Bookmark each section (tab) and heading.
 - c) Drawings: Bookmark at a minimum, each discipline, area designation, or appropriate division.
 - d) At file opening, display all levels of bookmarks as expanded.
 - 8) Thumbnails optimized for fast web viewing.
 - b. Drawing requirements:
 - 1) Provide additional copy of drawings in most current version of MicroStation format.
 - 2) Drawings shall have a white background.
 - 3) Drawing shapes shall not degrade when closely zoomed.
 - 4) Screening effects intended to de-emphasize detail in a drawing must be preserved.
 - 5) Delete items or options not provided in the supplied equipment or system.
- 2. Media:
 - a. USB flash drive.
 - b. Secure File Transfer Protocol (SFTP).
- 3. Label media with the following information:
 - a. Operation and Maintenance Manual.
 - b. Equipment name.
 - c. Specification Section Number
 - d. Equipment tag number.
 - e. Owner's name.
 - f. Project number and name.
 - g. Date.
- 4. If multiple submittals are made together, each submittal must have its own subdirectory that is named and numbered based on the submittal number.

1.03 MANUAL PACKAGING

- A. Label the spines:
 - 1. Equipment name.
 - 2. Tag number.
 - 3. Project name.
 - 4. Owner name.
- B. Cover page:
 - 1. Operation and Maintenance Manual.
 - 2. Equipment name.
 - 3. Specification Section Number

4. Equipment tag number.
5. Owner's name.
6. Project number and name.
7. Date.

1.04 CONTENTS

- A. Table of Contents: General description of information provided within each tab section.
- B. Complete Attachment A - Equipment Summary Form.
- C. Description of system and components.
- D. Description of equipment function, normal operating characteristics, and limiting conditions.
- E. On-line resources.
- F. Telephone resources.
- G. Approved submittals.
 1. Markup with any field changes.
 2. Final programming.
- H. Start-up procedures: Recommendations for installation, adjustment, calibration, and troubleshooting.
- I. Operating procedures:
 1. Step-by-step instructions including but not limited to the following:
 - a. Safety precautions and applicable Safety Data Sheets.
 - b. Guidelines.
 - c. Other information as needed for safe system operation and maintenance.
- J. Preventative maintenance procedures:
 1. Recommended steps and schedules for maintaining equipment.
 2. Troubleshooting.
- K. Lubrication information: Required lubricants and lubrication schedules.
- L. Overhaul instructions: Directions for disassembly, inspection, repair and reassembly of the equipment; safety precautions; and recommended tolerances, critical bolt torques, and special tools that are required.
- M. Manufacturer's technical reference manuals.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

ATTACHMENT A - EQUIPMENT SUMMARY FORM

EQUIPMENT SUMMARY FORM

1. EQUIPMENT ITEM _____
2. MANUFACTURER _____
3. EQUIPMENT TAG NUMBER(S) _____
4. LOCATION OF EQUIPMENT _____
5. WEIGHT OF INDIVIDUAL COMPONENTS (OVER 100 POUNDS) _____

6. NAMEPLATE DATA -
 - Horsepower _____
 - Amperage _____
 - Voltage _____
 - Service Factor (S.F.) _____
 - Speed _____
 - ENC Type _____
 - Capacity _____
 - Other _____

7. MANUFACTURER'S LOCAL REPRESENTATIVE
 - Name _____
 - Address _____
 - Telephone Number _____

8. MAINTENANCE REQUIREMENTS:

Maintenance Operation	Frequency	Lubricant (if applicable)	Comments
(List each operation required. Refer to specific information in Manufacturer's Manual, if applicable)	(List required frequency of each maintenance operation)	(Refer by symbol to lubricant list as required)	

9. LUBRICANT LIST:

Reference Symbol	Conoco Phillips	Exxon/Mobil	BP/Amoco	Other (List)
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(Symbols used in Item 7 above)	(List equivalent lubricants, as distributed by each manufacturer for the specific use recommended)			

10. SPARE PARTS (recommendations)_____

11. COMMENTS _____

12. GENERAL INFORMATION:

Date Accepted*: _____

Expected Life*: _____

Project Name & Number: _____

Design Engineer: _____

13. WARRANTY:

Start Date: _____

Expiration Date: _____

Prorated: _____

SECTION 01_78_36
WARRANTIES AND BONDS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Warranty and bonds requirements.

1.02 SUBMITTALS

- A. For each item of material or equipment furnished under the Contract:
1. Submit manufacturer's warranty prior to fabrication and shipment of the item from the manufacturer's facility.
 2. Submit manufacturer's special warranty when specified.
- B. Provide consolidated warranties and bonds within 15 calendar days of Substantial Completion:
1. Contents:
 - a. Organize warranty and bond documents:
 - 1) Include Table of Contents organized by specification section number and the name of the product or work item.
 - b. Include each required warranty and bond in proper form, with full information, certified by manufacturer as required, and properly executed by Contractor, or subcontractor, supplier, or manufacturer.
 - c. Provide name, address, phone number, and point of contact of manufacturer, supplier, and installer, as applicable.
 2. Hardcopy format:
 - a. Submit 2 copies.
 - b. Assemble in 3 D-side ring binders with durable cover.
 - c. Identify each binder on the front and spine with typed or printed title "Warranties and Bonds"; Project Name or Title, and the Name Address and Telephone Number of the Contractor.
 3. Electronic copy in PDF format:
 - a. Submit 1 copy.

1.03 OWNER'S RIGHTS

- A. Owner reserves the right to reject warranties.
- B. Owner reserves the right to refuse to accept Work for the project if the required warranties have not been provided.

1.04 RELATIONSHIP TO GENERAL WARRANTY AND CORRECTION PERIOD

- A. Warranties specified for materials and equipment shall be in addition to, and run concurrent with, both Contractor's general warranty and the correction period requirements.

- B. Disclaimers and limitations in specific materials and equipment warranties do not limit Contractor's general warranty, nor does such affect or limit Contractor's performance obligations under the correction period.

1.05 MANUFACTURER'S 1 YEAR WARRANTY MINIMUM REQUIREMENTS

- A. Written warranty issued by item's manufacturer.
- B. Project-specific information, properly executed by product manufacturer, and expressly states that its provisions are for the benefit of the Contractor.
- C. Covers all costs associated with the correction of the defect, including but not limited to removal of defective parts, new parts, labor, and shipping.
- D. Provides a timely response to correct the defect:
 - 1. Manufacturer shall provide, in a timely fashion, temporary equipment as necessary to replace warranted items requiring repair or replacement, when warranted items are in use and are critical to the treatment process, as defined by Owner.
- E. Warranty commences running on the date of substantial completion:
 - 1. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit warranty within 10 calendar days after acceptance, listing date of acceptance as beginning of warranty period.
- F. Duration of Warranty: 1 year.

1.06 MANUFACTURER'S SPECIAL WARRANTY

- A. Manufacturer's special warranty is a written warranty published by the manufacturer which includes the requirements as specified in the Technical Section:
 - 1. Project-specific information and requirements.
 - 2. Properly executed by product manufacturer.
 - 3. Expressly states that its provisions are for the benefit of the Contractor or Owner.
 - 4. Manufacturer's special warranties commence on the date that the associated item is certified by Engineer as substantially complete.

1.07 WARRANTY WORK

- A. Contractor's responsibilities:
 - 1. Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the work that incorporates the product, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with Contractor.

- B. Replacement cost:
 - 1. Upon determination that work covered by warranty has failed, replace or rebuild the work to an acceptable condition complying with requirement of the Contract Documents:
 - a. Contractor is responsible for the cost of replacing or rebuilding defective work regardless of whether Owner has benefited from the use of the work through a portion of its anticipated useful service life.
- C. Related damages and losses:
 - 1. When correcting warranted work that has failed, remove and replace other work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted work.
- D. Owner's recourse:
 - 1. Written warranties are in addition to implied warranties, and shall not limit the duties, obligations, rights, and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitation on time in which Owner can enforce such other duties, obligations, rights, or remedies.
- E. Reinstatement of warranty:
 - 1. When work covered by a warranty has failed and has been corrected by replacement or rebuilding, reinstate the warranty by written endorsement:
 - a. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

1.08 IMPLIED WARRANTIES

- A. Warranty of title and intellectual rights:
 - 1. Except as may be otherwise indicated in the Contract Documents, implied warranty of title required by Laws and Regulations is applicable to the Work and to materials and equipment incorporated therein.
 - 2. Provisions on intellectual rights, including patent fees and royalties, are in the General Conditions, as may be modified by the Supplementary Conditions.
- B. Implied warranties: Duration in accordance with Laws and Regulations.

1.09 BONDS

- A. Equipment bond and other bond requirements as specified in the Technical Sections.
- B. Bonds commence running on the date of substantial completion:
 - 1. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit warranty within 10 calendar days after acceptance, listing date of acceptance as beginning of bond period.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01_81_50

DESIGN CRITERIA

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Design criteria for use in the selection of equipment and appurtenances specified in Technical Sections of these Specifications and indicated on the Drawings.
 - 2. Criteria for design of systems, components and equipment fabricated off site and shipped to the Work for installation.
 - 3. Criteria for design of anchors to connect equipment and appurtenances to supports and structures.
- B. The criteria in this Section apply throughout the Work, unless additional criteria, or more restrictive criteria, are indicated.
 - 1. Additional criteria and requirements relevant to specific locations, specific materials, and specific equipment are indicated on the Drawings, and in the Technical Sections.

1.02 REFERENCES

- A. American Society of Civil Engineers (ASCE):
 - 1. 7-10 - Minimum Design Loads for Buildings and Other Structures (ASCE 7).
- B. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE):
 - 1. ASHRAE Fundamentals Handbook.
- C. International Code Council (ICC):
 - 1. International Energy Conservation Code (IECC).
 - 2. International Plumbing Code (IPC).
- D. Sheet Metal and Air Conditioning Contractor's National Association (SMACNA):
 - 1. Seismic Restraint Manual: Guidelines for Mechanical Systems, 3rd edition - 2008.

1.03 SUBMITTALS

- A. Submit documentation of Contractor-prepared designs as specified in Technical Sections of the Contract Documents.
 - 1. Calculations:
 - a. Where submittal of calculations is required:
 - 1) Provide complete calculations, including sketches to illustrate the design concepts being evaluated, and details to fully describe proposed construction.

- 2. Shop drawings:
 - a. Shop drawings describing components and manufacturer's requirements for connections.
 - 1) Include details for connections of components to structures and supports
 - 2) Include details for anchoring bracing to structures where required.
- B. Delegated Design Submittals:
 - 1. As specified in Section 01_35_73 - Delegated Design Procedures.

PART 2 PRODUCTS

2.01 DESIGN CRITERIA - SITE INFORMATION

- A. Site name: Stillwater Water Treatment Plant.
 - 1. Location:
 - a. Street Address: As specified in Section 01_11_00 - Summary of Work.
 - b. Elevation (approximate):
 - 1) 1015 feet above mean sea level.

2.02 DESIGN CRITERIA - REGULATORY REQUIREMENTS

- A. Requirements of authorities having jurisdiction over the project are included in Section 01_41_00 - Regulatory Requirements.

2.03 DESIGN CRITERIA - OPERATING ENVIRONMENT

- A. Project conditions:
 - 1. Equipment and materials for the Work shall be suitable for performance in a potable water treatment plant.
 - 2. The Drawings and Technical Sections include additional criteria and requirements relevant to specific locations, materials, and equipment.
- B. Outdoor conditions:
 - 1. International Energy Conservation Code (IECC): Climate Zone 3A.
 - 2. Site climatic data location: Stillwater, OK.
 - 3. Temperature criteria: As specified in the following Table: Design Temperatures - Outdoor Criteria in Accordance with ASHRAE Fundamentals Handbook.

Table: Design Temperatures - Outdoor Criteria in Accordance with ASHRAE Fundamentals Handbook	
Reference Location:	723545
Condition	Criteria
Summer Daily mean range:	22.1 degrees Fahrenheit.
Winter:	At or above this temperature 99.6 percent of the time: 12.3 degrees Fahrenheit dry-bulb.
Summer:	At or above this temperature 0.4 percent of the time: 102 degrees Fahrenheit dry-bulb.

4. Rainfall intensity:
 - a. Reference: International Plumbing Code (IPC):
 - 1) 3.75 inches per hour (100-year, 1-hour rainfall).
- C. Indoor Conditions:
 1. HVAC schedules as specified.
 2. Humidity:
 - a. Moisture/humidity conditions: As specified, and as defined in individual equipment sections.

2.04 DESIGN CRITERIA - STRUCTURAL

- A. General:
 1. Criteria for structural design of:
 - a. Equipment at locations subject to seismic events.
 - b. Equipment exposed to outdoor environments.
 - c. Equipment supports and bracing, and anchorage of such items to building and non-building structures.
 - d. Structures provided for the Work through delegated design.
 - e. Manufactured and prefabricated structures, and anchorage of such structures to foundations or other supporting elements.
 2. Structural design criteria used by the engineer of record and required by the building code to be indicated on the Drawings.
- B. Delegated Design:
 1. Structural engineering design shall be performed by a Structural Engineer licensed in the state of Oklahoma.
- C. Groundwater elevation:
 1. See project geotechnical reports, listed in Specification Section 008E - Supplementary Conditions, for information.
 2. For design of buried and partially buried construction:
 - a. Assume groundwater level at grade.
- D. Structure risk category:
 1. Determine importance factors, develop design loads, and provide detailing in accordance with the provisions of ASCE 7 and the building code specified in

Section 01_41_00 - Regulatory Requirements, based on the Structure Risk Category indicated in Table: Project Structures - Risk Category and Seismic Design Information.

E. Seismic loads:

1. Seismic design parameters: Basic parameters - ASCE 7:
 - a. Ground motion MCE_R , 5 percent damped:
 - 1) Short periods, $S_s = 0.149$ g.
 - 2) One second period, $S_1 = 0.064$ g.
 - b. Peak ground acceleration, MCE_G :
 - 1) Peak ground acceleration, $PGA = 0.118$ g.
 - c. Mapped long-period transition period:
 - 1) $TL = 12$ seconds.
2. Structures - General:
 - a. Seismic Design Category (SDC): As indicated in the following Table: Project Structures - Risk Category and Seismic Design Information.

Table: Project Structures - Risk Category and Seismic Design Information						
Description: Water Treatment Facility						
Area	Description	Risk Category	Site Class	S_Ds	S_{D1}	Seismic Design Category ⁽¹⁾
All	All Structures	III	D	0.159	0.102	B
Notes:						
(1) Seismic Design Category for delegated design, and for seismic certification of electrical and mechanical equipment as required by ASCE 7.						

- b. Structure response modification coefficient, R :
 - 1) In accordance with ASCE 7, and the requirements of the Technical Sections.
 3. Structures - Tanks and vessels.
 - a. Includes: Tank structures, tank supports, and anchorage to structures or foundations:
 - b. Liquid storage structures (e.g.: basins and tanks)
 - 1) Include impulsive and convective ("sloshing") effects.
 - 2) Component response modification factor - impulsive effects, R_i : In accordance with ASCE 7, Table 15.4-2.
 - 3) Component response modification factor - convective effects, $R_c = 1.0$.
 - c. Dry material storage structures (e.g.: silos, hoppers):
 - 1) Include effects of stored materials.
 - 2) Component response modification factor - impulsive effects, R_i : In accordance with ASCE 7, Table 15.4-2.
 4. Non-structural components - General:
 - a. Includes:
 - 1) Mechanical and electrical equipment; anchorage of equipment to structures or supports; design of equipment supports; and anchorage of supports to structures or foundations.

- 2) Distribution systems associated with mechanical and electrical equipment such as piping, ductwork, conduits, cable trays, raceways, bus ducts, and similar items; anchorage of such systems to supports and structures; and bracing or such systems.
- b. Seismic design requirements for non-structural components are based on the Seismic Design Category (SDC) of the structure or facility where the equipment is installed.
 - 1) See Table: Project Structures - Risk Category and Seismic Design Information for Seismic Design Categories of facilities or structures included in the Work.
- c. Design components, component anchorage, and component connections to piping and utilities in accordance with the requirements of ASCE 7, Table 13.2-1
- d. Component amplification factor (a_p), response factor (R_p), and overstrength factor for anchorage to concrete (Ω_o):
 - 1) Mechanical and electrical components and systems: In accordance with ASCE 7, Table 13.6-1, unless otherwise indicated in the Technical Sections for these items.
 - 2) Architectural components and systems: In accordance with ASCE 7, Table 13.6-1, unless otherwise indicated in the Technical Sections for these items.
- e. Component importance factor, I_p :
 - 1) In accordance with the following Table: Component Importance Factor for seismic design, I_p .
 - 2) For items not listed in Table: Component Importance Factor for seismic design, I_p , designate importance factor in accordance with the provisions of ASCE 7, Chapter 13 and submit to Engineer for review prior to developing calculations and details related to that component.

Table: Component Importance Factor for seismic design, I_p		
Structure Seismic Design Category	Components	I_p
All	Electrical: Items and distribution system components specified in Division 26 - Electrical.	1.5
All	Process Control and Instrumentation Systems: Components and distribution systems specified in Division 40 - Process Integration.	1.5
All	Fire protection: Components and distribution systems specified in Section 10_44_00 - Fire Protection Specialties.	1.5
All	Equipment and components specified in Divisions 11 through 49, <u>except</u> HVAC and plumbing components listed below.	1.5
All	Plumbing equipment specified in the following Sections: 22_42_01 - Plumbing Systems	1.0

Table: Component Importance Factor for seismic design, I_p		
Structure Seismic Design Category	Components	I_p
All	HVAC equipment specified in the following Sections: 23_81_14 - Air Conditioning Units 23_83_01 - Heating Units 23_34_01 - Fans	1.0
All	Other equipment not listed above.	1.0

5. Non-structural components: HVAC ductwork.
 - a. Component importance factor, I_p : Determine in accordance with ASCE 7, Section 15.4.1.1.
 - b. Seismic design category:
 - 1) See Table: Component Importance Factor for seismic design, I_p (preceding).
 - c. SMACNA seismic hazard level.
 - 1) Seismic hazard level for design of heating, ventilating, and air conditioning ductwork in accordance with SMACNA Seismic Restraint Manual:
 - a) SMACNA Seismic hazard level = C.
- F. Wind loads:
1. Design structures and non-structural components that are exposed to wind to withstand design wind loads.
 - a. Reduction of wind loads based on shielding effects of surrounding structures or components is not allowed.
 - b. Design for wind loading is not required for non-structural components and for non-building structures located inside enclosed buildings.
 2. Design parameters:
 - a. Basic wind speed:
 - 1) 120 miles per hour (33 feet, 3 second gust).
 - b. Exposure category: C.
 - c. Topographic factor, K_{zt} : 1.0.
 - d. Wind pressure for design of "components and cladding".
 - 1) "Components and cladding" includes doors, windows, siding panels, skylights, parapets and similar architectural elements.
 - 2) Minimum wind pressure for components and cladding, strength level:
 - a) Wall elements: Minimum 16 pounds per square foot, pressure or vacuum.
 - b) Roof elements: Minimum 16 pounds per square foot, pressure or vacuum.
 - c) For "allowable stress level" pressures, multiply strength level pressures by 0.625.
- G. Snow loads:
1. Design for snow loading is not required for non-structural components and for non-building structures located inside enclosed buildings.

2. Design parameters:
 - a. Ground snow load: $p_g = 10$ pounds per square foot.
 - b. Flat roof snow load: $p_f = 10$ pounds per square foot, minimum.
 - c. Exposure factor, minimum: $C_e = 1.1$.
 - d. Importance factor, minimum: $I_s = 1.2$.
 - e. Drifting:
 - 1) Consider effects of adjacent and nearby structures and equipment on drift loads.
- H. Atmospheric icing design criteria ASCE 7, Ch 10:
 1. Nominal ice thickness due to rain (33-foot height): 0.75 inches.
- I. Rainfall loads:
 1. Determine rainfall loads using rainfall intensity specified herein, and including effects of exposed surface slope, height above surface to discharge elevation, and deflection of ponded surfaces.
- J. Operational loads:
 1. Loads may include equipment vibration, torque, thermal effects, effects of internal contents (weight and sloshing), surge or "water hammer," and other load conditions.
 2. Design for loads indicated by equipment manufacturer.
 3. Design for loads indicated in the Technical Sections for equipment and appurtenances.
- K. Serviceability considerations: ASCE 7-16:
 1. Deflection, unless otherwise indicated on the Drawings, or specified:
 - a. Beam deflection as fraction of span:
 - 1) Walkways and platforms: total load = $L/240$; live load = $L/360$.
 - 2) Equipment supports: $L/450$.

PART 3 EXECUTION

3.01 GENERAL

- A. Design in accordance with the requirements of:
 1. Regulatory requirements, including but not limited to the building code specified in Section 01_41_00 - Regulatory Requirements; AND
 2. Reference standards and project-specific design criteria listed in this Section; AND
 3. Specific requirements for individual elements and components of the Work as specified in subsequent Technical Sections.
- B. Designs based on criteria in this Section shall not be less than what is required to comply with the codes and standards specified in Section 01_41_00 - Regulatory Requirements.
- C. In the event of conflicts between design criteria, contact Engineer for interpretation.

- D. Prepare and submit designs for the following, and where Owner-delegated design is required by the Specifications.
 - 1. Design, detailing, and anchoring of pre-engineered structures.
 - 2. Design, detailing, and anchoring of pre-engineered structural components.
 - 3. Anchoring of equipment and components to structures.
 - 4. Bracing of equipment and components from structures.
 - 5. Anchoring and bracing for distribution systems attached to or braced from structures.
- E. Requirements for seismic design calculations will be waived for the following:
 - 1. Furniture and storage racks 6 feet in height or less.
 - 2. Moveable equipment.
 - 3. Mechanical and electrical equipment and components located in structures designated as Seismic Design Category A or B.
 - 4. Mechanical and electrical equipment and components located in structures designated as Seismic Design Category C and where the component importance factor, I_p , is equal to 1.0.
- F. Requirements for wind design calculations will be waived for the following:
 - 1. Equipment and components located inside structures, and away from the effects of wind loads.

3.02 DESIGN - ANCHORS FOR EQUIPMENT, COMPONENTS, AND BRACING

- A. General:
 - 1. Complete, submit, and obtain Engineer's approval of anchor designs after approval of equipment and before placement of concrete or masonry that will support or provide bracing for the equipment.
 - 2. Adjust equipment pad sizes and add additional anchorage confinement reinforcing to provide required strength at anchorage points.
 - 3. Supports and bracing:
 - a. Design and install braces and anchors to transfer forces from equipment and components to the lateral force resisting system of the surrounding structure.
 - b. Anchor and brace piping, ductwork, and electrical distribution components so that lateral or vertical displacement does not result in damage to or failure of essential architectural, mechanical, or electrical equipment.
 - 1) Provide supplementary framing where required to transfer forces.
 - 2) Detail and locate braces and anchors to minimize differential movements between components and structure.
- B. Preparation:
 - 1. Obtain manufacturer's information:
 - a. Layout and location of anchors that connect to equipment base plates, sole plates, or skids.
 - b. Sizes of holes for anchors that will be provided in equipment bases or support frames.

- C. Analysis and design:
1. Perform and submit calculations to determine anchor designs at locations where equipment and equipment supports are connected to the supporting structure.
 - a. Indicate number, size, type, and material for anchors.
 2. In determining forces at locations where equipment is anchored to structures, include effects of:
 - a. Equipment self-weight and operating weight.
 - b. Location of equipment center of mass.
 - c. Forces from equipment operation including, but not limited to:
 - 1) Effects of internal contents including weight, sloshing, surge, and water hammer.
 - 2) Equipment reactions and operating torque.
 - 3) Equipment vibration.
 - 4) Thermal effects from equipment and from attached distribution systems.
 - 5) Other load or displacement inducing conditions.
 - d. Forces on equipment from piping and electrical connections.
 - e. Forces on equipment from loads specified in this Section.
 - 1) Include effects of wind, snow, and icing loads where applicable based on location of the equipment in the Work.
 - 2) Design for load combinations indicated in ASCE 7, unless otherwise specified or indicated on the Drawings.
 - 3) Seismic and wind loads: For equipment and tanks having varying weight based on the volume of contained material, determine anchor forces to accommodate the full range of filled, partially filled, and empty conditions.
 3. Determine forces and overturning moments at equipment supports and at locations where supports are anchored to structures.
 - a. Indicate shears and associated axial forces at each anchor.
 4. Do not use friction to resist sliding resulting from seismic or wind forces. Resist only by direct application of sliding loads to fasteners as bearing, shear, tension, or compression forces.
 5. Using combined shears and axial forces at each anchor, design anchors and anchor groups for ductile failure.
 - a. Ductile failure: Anchor yield before failure of base material, typically concrete or masonry, at the anchor.
 6. Anchor selection:
 - a. Provide anchors type indicated on the Drawings.
 - b. Where anchors are not specifically indicated on the Drawings, select in accordance with the following:
 - 1) Anchors that resist seismic and wind forces:
 - a) Cast-in-place forged hex-head anchor bolt.
 - 2) Anchors loaded in sustained tension:
 - a) Cast-in-place forged hex-head anchor bolt.
 - 3) Anchors for reciprocating, vibrating, and rotating equipment:
 - a) Cast-in-place forged hex-head anchor bolt.
 - c. Do not use post-installed anchors, mechanical or adhesive, unless:
 - 1) Post-installed anchors are indicated on the Drawings; or
 - 2) Post-installed are approved by Engineer prior to placement of the surrounding concrete or masonry.

- d. Anchor diameter:
 - 1) Select diameter so that hole in base plate is not greater than 125 percent of the nominal diameter of the anchor, nor greater than the diameter of the anchor plus 1/4 inch.
- 7. Determine number, size, layout, and minimum effective embedment for anchors.
 - a. Layout includes anchor spacing and required distance(s) from anchor to edge(s) of supporting concrete or masonry.
 - b. Anchors in concrete: Design based on minimum specified 28-day compressive strength, f'_c , as follows, unless otherwise indicated on the Drawings for the Work area:
 - 1) Concrete placed for this Work: $f'_c = 4,000$ pounds per square inch.
 - c. Anchors in masonry: Design based on minimum specified compressive strength, f'_m , as follows, unless otherwise indicated on the Drawings for the Work area:
 - 1) Concrete masonry placed for this Work: $f'_m = 2,000$ pounds per square inch.
- 8. Prepare drawings showing construction details of anchor designs.
- 9. Submit design calculations and drawings prior to placement of anchors, and of the structural elements to which they will connect.

END OF SECTION

SECTION 03_11_07
CONCRETE FORMWORK

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Concrete formwork.

1.02 REFERENCES

- A. American Concrete Institute (ACI):
1. 117 - Specifications for Tolerances for Concrete Construction and Materials and Commentary.
- B. NSF International (NSF):
1. 61 - Drinking Water System Components - Health Effects.
- C. Underwriters Laboratories (UL).

1.03 TERMINOLOGY

- A. The words and terms listed below are not defined terms that require initial capital letters, but, when used in this Section, have the indicated meaning.
1. Green Concrete: Concrete with less than 100 percent of the minimum specified compressive strength (f'_c).

1.04 SUBMITTALS

- A. Information on proposed forming system:
1. Submit in such detail as the Engineer may require to assure themselves that intent of the Specifications can be complied with by use of proposed system.
 2. Alternate combinations of plywood thickness and stud spacing may be submitted.
- B. Form release agent. NSF 61 certification prepared by NSF, Underwriters Laboratories (UL) or other, similar, nationally recognized testing laboratory acceptable to the Engineer.

1.05 QUALITY ASSURANCE

- A. Qualifications of formwork manufacturers: Use only forming systems by manufacturers having a minimum of 5 years of experience, except as otherwise specified, or accepted in writing by the Engineer.
- B. Regulatory requirements: Install work of this Section in accordance with local, state, and federal regulations.

PART 2 PRODUCTS

2.01 DESIGN AND PERFORMANCE CRITERIA

- A. Design requirements:
 - 1. Design of concrete forms, falsework, and shoring in accordance with local, state, and federal regulations.
 - 2. Design forms and ties to withstand concrete pressures without bulging, spreading, or lifting of forms.
- B. Performance requirements:
 - 1. Construct forms so that finished concrete conforms to shapes, lines, grades, and dimensions indicated on the Drawings.
 - 2. It is intended that surface of concrete after stripping presents smooth, hard, and dense finish that requires minimum amount of finishing.
 - 3. Provide sufficient number of forms so that the work may be performed rapidly and present uniform appearance in form patterns and finish.
 - 4. Use forms that are clean and free from dirt, concrete, and other debris.
 - a. Coat with form release agent if required, prior to use or reuse.

2.02 MANUFACTURED UNITS

- A. Forms: Built-up plywood:
 - 1. Built-up plywood forms may be substituted for prefabricated forming system subject to following minimum requirements:
 - a. Size and material:
 - 1) Use full size 4-foot by 8-foot plywood sheets, except where smaller pieces are able to cover entire area.
 - 2) Sheet construction: 5-ply plywood sheets, 3/4-inch nominal, made with 100 percent waterproof adhesive, and having finish surface that is coated or overlaid with surface which is impervious to water and alkaline calcium and sodium hydroxide of cement.
 - b. Wales: Minimum 2-inch by 4-inch lumber.
 - c. Studding and wales: Contain no loose knots and be free of warps, cups, and bows.
- B. Forms: Steel or steel framed:
 - 1. Steel forms:
 - a. Rigidly constructed and capable of being braced for minimum deflection of finish surface.
 - b. Capable of providing finish surfaces that are flat without bows, cups, or dents.
 - 2. Steel framed plywood forms:
 - a. Provide forms that are rigidly constructed and capable of being braced.
 - b. Plywood paneling: 5-ply, 5/8-inch nominal or 3/4-inch nominal, made with 100 percent waterproof adhesive, and having finish surface that is coated or overlaid with surface which is impervious to water and alkaline calcium and sodium hydroxide of cement.

- C. Form release agent.
 - 1. Effective, non-staining, bond-breaking coating compatible with form surfaces and concrete mixes used.
 - 2. Certified for conformance to NSF 61 and leaving no taste or odor on the concrete surface.
- D. Form ties:
 - 1. General:
 - a. Provide form ties for forming system selected that are manufactured by recognized manufacturer of concrete forming equipment.
 - b. Do not use wire ties or wood spreaders of any form.
 - c. Provide ties of type that accurately tie, lock, and spread forms.
 - d. Provide form ties of such design that when forms are removed, they locate no metal or other material within 1-1/2 inches of the surface of the concrete.
 - e. Do not allow holes in forms for ties to allow leakage during placement of concrete.
 - 2. Cone-snap ties:
 - a. Cone-snap ties shall form a cone shaped depression in the concrete with minimum diameter of 1 inch at the surface of the concrete and minimum depth of 1-1/2 inches.
 - b. Provide neoprene waterseal washer that is located near the center of the concrete.
 - 3. Taper ties:
 - a. Neoprene plugs for taper tie holes: Size so that after they are driven, plugs are located in center third of wall thickness.
- E. Incidentals:
 - 1. External angles:
 - a. Where not otherwise indicated on the Drawings, provide with 3/4-inch bevel, formed by utilizing true dimensioned wood or solid plastic chamfer strip on walkways, slabs, walls, beams, columns, and openings.
 - b. Provide 1/4-inch bevel formed by utilizing true dimensioned wood or solid plastic chamfer strip on walkways, walls, and slabs at expansion, and construction joints.
 - 2. Keyways: Steel, plastic, or lumber treated with form release agent.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Site verification of conditions:
 - 1. Do not place concrete until forms have been checked for alignment, level, and strength, and mechanical and electrical inserts or other embedded items for correct location.

3.02 INSTALLATION

- A. Forms: Built-up plywood:
 - 1. Studding:
 - a. Spaced at 16 inches or 24 inches on center.
 - b. Closer spacing may be required depending upon strength requirements of the forms, in order to prevent any bulging surfaces on faces of finished concrete work.
 - c. Install studs perpendicular to grain of exterior plys of plywood sheets.
 - 2. Wales: Form wales of double lumber material with minimum size as specified in this Section.
 - 3. Number of form reuses: Depends upon durability of surface coating or overlay used, and ability to maintain forms in condition such that they are capable of producing flat, smooth, hard, dense finish on concrete when stripped.
- B. Forms: Steel or steel framed:
 - 1. Steel forms:
 - a. Adequately brace forms for minimum deflection of finish surface.
 - 2. Steel framed plywood forms:
 - a. Rigidly construct and brace with joints fitting closely and smoothly.
 - b. Number of form reuses: Depends upon durability of surface coating or overlay used.
 - 3. Built-up plywood forms: As specified in this Section may be used in conjunction with steel forms or steel framed plywood forms for special forming conditions such as corbels and forming around items which will project through forms.
- C. Form bracing and alignment:
 - 1. Line and grade: Limit deviations to tolerances which will permit proper installation of structural embedded items or mechanical and electrical equipment and piping.
 - 2. Formwork:
 - a. Securely brace, support, tie down, or otherwise hold in place to prevent movement.
 - b. Make adequate provisions for uplift pressure, lateral pressure on forms, and deflection of forms.
 - 3. When second lift is placed on hardened concrete: Take special precautions in form work at top of old lift and bottom of new lift to prevent:
 - a. Spreading and vertical or horizontal displacement of forms.
 - b. Grout "bleeding" on finish concrete surfaces.
 - 4. Pipe stubs, anchor bolts, and other embedded items: Set in forms where required.
 - 5. Cracks, openings, or offsets at joints in formwork: Close those that are 1/16-inch or larger by tightening forms or by filling with acceptable crack filler.
- D. Forms: Incidentals:
 - 1. Keyways: Construct as indicated on the Drawings.
 - 2. Reentrant angles: May be left square.
 - 3. Level strips: Install at top of wall concrete placements to maintain true line at horizontal construction joints.

- 4. Inserts:
 - a. Encase pipes, anchor bolts, steps, reglets, castings, and other inserts, as indicated on the Drawings or as required, in concrete.
- 5. Pipe and conduit penetrations:
 - a. Install pipe and conduit in structures as indicated on the Drawings, and seal with materials as specified in Section 007_92_00 - Joint Sealants.
- E. Form release agent:
 - 1. Apply in accordance with manufacturer's instructions.
- F. Form ties:
 - 1. Cone-snap ties: Tie forms together at not more than 2-foot centers vertically and horizontally.

3.03 FORM REMOVAL

- A. General:
 - 1. Keep forms in place, as specified in the following paragraphs, to provide curing and to protect concrete surfaces and edges from damage.
 - 2. Immediately after forms are removed, carefully examine concrete surfaces, and repair any irregularities in surfaces and finishes as specified.
- B. Form removal:
 - 1. Do not remove forms from concrete which has been placed when outside ambient air temperature is below 50 degrees Fahrenheit until the following conditions are satisfied:
 - a. Concrete has sufficient strength to allow form removal without damage to surfaces.
 - b. At least 48 hours have elapsed since the end of concrete placement.
 - c. Provisions are in place to maintain moisture for curing concrete, and temperature at or above the required minimum curing temperature specified.
 - 2. Vertical forms:
 - a. Retain in place for a minimum of 24 hours after concrete is placed.
 - b. If concrete has sufficient strength and hardness to resist surface or other damage after 24 hours, forms may be removed.
 - 3. Other forms supporting concrete, and shoring: Retain in place as follows:
 - a. Formed sides of footings: 24 hours minimum.
 - b. Formed vertical sides of beams, girders, and similar members: 48 hours minimum.
 - c. Forms below slabs, beams, and girders: Until concrete strength reaches specified strength f'_c or until shoring is installed.
 - 1) Shoring for slabs, beams, and girders: Shore until concrete strength reaches minimum specified 28-day compressive strength.

3.04 SURFACE REPAIRS AND FINISHING

- A. Immediately after forms are removed, carefully examine concrete surfaces, and repair any irregularities in surfaces and finishes as specified in Section 03_30_00 - Cast-in-Place Concrete.

- B. Form ties: Remove form ties from surfaces. Fill tie holes as follows:
1. Remove form ties from surfaces.
 2. Roughen cone shaped tie holes by heavy sandblasting before repair.
 3. Dry pack cone shaped tie holes with dry-pack mortar as specified in Section 03_60_00 - Grouting.
 4. Taper ties:
 - a. After forms and taper ties are removed from wall, plug tie holes with neoprene plug as follows:
 - 1) Heavy sandblast and then clean tie holes.
 - 2) After cleaning, drive neoprene plug into each of taper tie holes with steel rod. Final location of neoprene plug shall be in center third of wall thickness. Bond neoprene plug to concrete with epoxy.
 - 3) Locate steel rod in cylindrical recess and against middle of plug during driving.
 - a) At no time are plugs to be driven on flat area outside cylindrical recess.
 - b. Dry-pack of taper tie holes:
 - 1) After installing plugs in tie holes, coat tie hole surface with epoxy bonding agent and fill with dry-pack mortar as specified in Section 03_60_00 – Grouting:
 - a) Place dry-pack mortar in holes in layers with thickness not exceeding tie hole diameter and heavily compact each layer.
 - b) Dry-pack the outside of the hole no sooner than 7 days after the inside of the hole has been dry packed.
 - c) Wall surfaces in area of dry-packed tie holes: On the water side of water containing structures and the outside of below grade walls:
 - (1) Cover with minimum of 10 mils of epoxy gel.
 - (2) Provide epoxy gel coating on wall surfaces that extend minimum of 2 inches past dry-pack mortar filled tie holes.
 - (3) Provide finish surfaces that are free from sand streaks or other voids.

3.05 TOLERANCES:

- A. Finished concrete shall conform to shapes, lines, grades, and dimensions indicated on the Drawings.
- B. Construct work within the tolerances in accordance with ACI 117, except as modified in the following paragraphs or as indicated on the Drawings:
1. General:
 - a. At certain locations in the Work, tolerances required for equipment placement and operation may be more restrictive than the general tolerance requirements of this Section.
 - b. Confirm equipment manufacturers' required tolerances for location and operation of equipment that will be installed, and construct concrete to satisfy those requirements.
 2. Slabs:
 - a. Slope: Uniformly sloped to drain when slope is indicated on the Drawings.
 - b. Slabs indicated to be level: Have maximum vertical deviation of 1/8-inch in 10-foot horizontal length without any apparent changes in grade.

3. Circular tank walls:
 - a. The Contractor may deviate from finish line indicated on the Drawings by use of forms with chord lengths not to exceed 2 feet.
4. Inserts and embedments:
 - a. Set inserts and embedments to tolerances required for proper installation and operation of equipment or systems to which insert pertains.
 - b. Maximum tolerances: As follows:

Item	Tolerance
Sleeves and inserts	Plus 1/8 Minus 1/8 inches.
Anchor bolts:	
Projected ends	Plus 1/4 Minus 0.0 inches.
Axial alignment	Not more than 2 degrees off the axis indicated on the Drawings.
Setting location	Plus 1/16 Minus 1/16 inches.
All embedments	Minimum 1 inch clearance from reinforcing steel.

- c. Securing embedded items in formwork by wiring or welding to reinforcement is not permitted.
- C. Remove and replace work that does not conform to required tolerances. Procedures and products employed in and resulting from such re-work shall be acceptable to the Engineer.

END OF SECTION

SECTION 03_15_00
CONCRETE ACCESSORIES

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Waterstops.
 - 2. Joint fillers.

1.02 REFERENCES

- A. ASTM International (ASTM):
 - 1. C203 - Standard Test Methods for Breaking Load and Flexural Properties of Block-Type Thermal Insulation.
 - 2. D570 - Standard Test Method for Water Absorption of Plastics.
 - 3. D624 - Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.
 - 4. D638 - Standard Test Method for Tensile Properties of Plastics.
 - 5. D746 - Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact.
 - 6. D747 - Standard Test Method for Apparent Bending Modulus of Plastics by Means of a Cantilever Beam.
 - 7. D792 - Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement.
 - 8. D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
 - 9. D1752 - Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
 - 10. D2240 - Standard Test Method for Rubber Property - Durometer Hardness.
- B. American National Standards Institute (ANSI):
 - 1. A135.4 - Basic Hardboard.
- C. U. S. Army Corps of Engineers (USACE):
 - 1. CRD-C-572, Specification for Polyvinyl Chloride Waterstop.

1.03 SUBMITTALS

- A. Product data:
 - 1. Polyvinyl chloride waterstops: Complete physical characteristics.
 - 2. Preformed expansion joint material: Sufficient information on each type of material for review to determine conformance of material to requirements specified.

- B. Samples:
 - 1. Polyvinyl chloride waterstop.
- C. Laboratory test reports: Indicating that average properties of polyvinyl chloride waterstops material and finish conform to requirements specified in this Section.
- D. Quality control submittals:
 - 1. Certificates of Compliance:
 - a. Written certificates that polyvinyl chloride waterstops supplied on this Project meet or exceed physical property in accordance with USACE CRD-C-572 and the requirements of this Section.
 - 2. Manufacturer's instructions: For materials specified in this Section that are specified to be installed with such instructions.

1.04 QUALITY ASSURANCE

- A. Mock-ups:
 - 1. Welding demonstration:
 - a. Demonstrate ability to weld acceptable joints in polyvinyl chloride waterstops before installing waterstop in forms.
- B. Field joints:
 - 1. Polyvinyl chloride waterstops field joints: Free of misalignment, bubbles, inadequate bond, porosity, cracks, offsets, and other defects which would reduce the potential resistance of material to water pressure at any point. Replace defective joints. Remove faulty material from site and disposed of by Contractor at its own expense.
- C. Inspections:
 - 1. Quality of welded joints will be subject to acceptance of Engineer.
 - 2. Polyvinyl chloride waterstop: Following defects represent partial list that will be grounds for rejection:
 - a. Offsets at joints greater than 1/16 inch or 15 percent of the material thickness, at any point, whichever is less.
 - b. Exterior crack at joint due to incomplete bond, which is deeper than 1/16 inch or 15 percent of material thickness, at any point, whichever is less.
 - c. Any combination of offset or crack that will result in net reduction in cross section of waterstop in excess of 1/16 inch or 15 percent of material thickness, at any point, whichever is less.
 - d. Misalignment of joint that will result in misalignment of waterstop in excess of 1/2 inch in 10 feet.
 - e. Porosity in welded joint as evidenced by visual inspection.
 - f. Bubbles or inadequate bonding.

PART 2 PRODUCTS

2.01 JOINT FILLERS

- A. General:
 - 1. Use specific type in applications as indicated on the Drawings.
 - 2. Do not use scrap or recycled materials to manufacture joint fillers.
- B. Preformed expansion joint materials:
 - 1. Bituminous fiber expansion joint material:
 - a. Properties:
 - 1) Thickness: To match joint width indicated on the Drawings.
 - 2) Asphalt-impregnated fiber in accordance with ASTM D1751.
 - b. Manufacturers: One of the following or equal:
 - 1) Durajoint.
 - 2) W.R. Meadows, SealTight Fibre Expansion Joint.
 - 2. Synthetic sponge rubber expansion joint material:
 - a. Properties:
 - 1) Thickness: As recommended for width indicated on the Drawings.
 - 2) Material in accordance with ASTM D1752, Type I.
 - b. Manufacturers: One of the following or equal:
 - 1) Williams Products Inc., Everlastic 1300.
 - 2) W.R. Meadows, SealTight Sponge Rubber.

2.02 WATERSTOPS

- A. Waterstops - polyvinyl chloride (PVC):
 - 1. Manufactured from prime virgin polyvinyl chloride plastic compound containing the plasticizers, resins, stabilizers, and other materials necessary to meet the requirements as specified in this Section.
 - 2. Manufacturers: One of the following or equal:
 - a. Vinylex Corp.
 - b. Sika Corp., Greenstreak PVC Waterstop.
 - 3. Type: Ribbed waterstop:
 - a. Construction joints: 6-inch wide ribbed type.
 - b. Expansion joint for wall penetrations for concrete encased electrical duct banks: 6-inch ribbed type with hollow center bulb.
 - c. Expansion joints: 9-inch wide ribbed type with hollow center bulb.
 - d. Dumbbell-type waterstop will not be allowed unless otherwise specified or indicated on the Drawings.
 - e. No scrap or reclaimed material shall be used.
 - 4. Properties as indicated in the following table:

Physical Characteristics	Test Method	Required Results
Specific Gravity	ASTM D792	Not less than 1.3.
Hardness	ASTM D2240	70 to 90 Type A15 Shore durometer.
Tensile Strength	ASTM D638	Not less than 2,000 pounds per square inch.
Ultimate Elongation	ASTM D638	Not less than 300 percent.

Physical Characteristics	Test Method	Required Results
Alkali Extraction	CRD-C-572	Change in weight after 7 days: Between minus 0.1 percent and plus 0.25 percent. Change in hardness after 7 days: Not more than plus 5 points.
Low Temperature Brittle Point	ASTM D746	No sign of cracking or chipping at -35 degrees Fahrenheit.
Water Absorption	ASTM D570	Not more than 0.15 percent after 24 hours.
Accelerated Extraction Test	CRD-C-572	Tensile strength: Not less than 1,600 pounds per square inch. Elongation: Not less than 280 percent.
Stiffness in Flexure	ASTM D747	Not less than 600 pounds per square inch.
Tear Resistance	ASTM D624	Not less than 225 pounds per inch.
Thickness	-	3/8 inch.
Center Bulb		
6-inch Waterstops	-	7/8 inch or 1-inch nominal outside diameter.
9-inch Waterstops	-	For expansion joints 1 inch and narrower: 1-inch nominal outside diameter. For expansion joints wider than 1 inch: 2-inch nominal outside diameter.
Allowable Tolerances		
Width	-	Plus or minus 3/16 inch.
Thickness	-	Plus or minus 1/32 inch.

B. Waterstops - hydrophilic rubber:

1. As specified in Section 03_15_14 - Hydrophilic Rubber Waterstop.

PART 3 EXECUTION

3.01 INSTALLATION

A. Waterstops:

1. General:
 - a. Store waterstops so as to permit free circulation of air around waterstop material and prevent direct exposure to sunlight.
 - b. Install waterstops in concrete joints where indicated on the Drawings.

- c. Carry waterstops in walls into lower slabs and join to waterstops in slabs with appropriate types of fittings.
 - d. In waterbearing structures: Provide all joints with waterstops, whether indicated on the Drawings or not.
 - e. Provide waterstops that are continuous.
 - f. Set waterstops accurately to position and line as indicated on the Drawings.
 - g. Hold and securely fix edges in position at intervals of not more than 24 inches so that they do not move during placing of concrete.
 - h. Position the waterstop so that symmetrical halves of waterstop are equally divided between concrete pours. Center axis of waterstop shall be coincident with centerline of the joint.
 - i. Do not drive nails, screws, or other fasteners through waterstops in vicinity of construction joints.
 - j. Use wires at not more than 24 inches on centers near outer edge of waterstop to tie waterstops into position.
 - k. Special clips may be used in lieu of wires, at Contractor's option.
 - l. Terminate waterstops 3 inches from top of finish surfaces of walls and slabs unless otherwise specified or indicated on the Drawings.
 - m. When any waterstop is installed in concrete on one side of joint, while the other half or portion of the waterstop remains exposed to the atmosphere for more than 2 days, take suitable precautions to shade and protect exposed waterstop from direct rays of sunlight during entire exposure and until exposed portion is embedded in concrete.
 - n. When placing concrete at waterstops in slabs, lift edge of waterstop while placing concrete below the waterstop. Manually force waterstop against and into concrete, and then cover waterstop with fresh concrete.
2. Polyvinyl chloride waterstop:
- a. Install waterstops so that joints are watertight.
 - b. Weld joints such as unions, crosses, ells, and tees, with thermostatically controlled equipment recommended by waterstop manufacturer:
 - 1) Do not damage material by heat sealing.
 - 2) Make joints by overlapping, then simultaneously cut ends of sections to be spliced so they will form smooth even joint. Heat cut ends with splicing tool until the plastic melts. Press 2 ends together until plastic cools.
 - 3) Maintain continuity of waterstop ribs and tubular center axis.
 - 4) The splices shall have tensile strength of not less than 60 percent of unspliced materials tensile strength.
 - c. Butt joints of ends of 2 identical waterstop sections may be made while material is in forms.
 - d. Manufacturer shall factory prefabricate joints for crosses and tees.
 - e. Split-type waterstops will not be permitted except where specifically indicated on the Drawings.

- B. Joints:
1. Construct construction and expansion joints as indicated on the Drawings.
 2. Preformed expansion joint material: Fasten expansion joint strips to concrete, masonry, or forms with adhesive. No nailing will be permitted, nor shall expansion joint strips be placed without fastening.

END OF SECTION

SECTION 03_15_14

HYDROPHILIC RUBBER WATERSTOP

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Hydrophilic rubber waterstop.

1.02 REFERENCES

- A. NSF International (NSF):
 - 1. 61 - Drinking Water System Components - Health Effects.

1.03 SUBMITTALS

- A. General:
 - 1. Submit the following items for each type, style and size of hydrophilic waterstop to be installed.
 - 2. Product data:
 - a. Manufacturer's product data sheets.
 - 1) Include complete physical dimensions, expansion characteristics, and laboratory test reports indicating that average material properties conform to the requirements specified.
 - 2) Provide data sheets for all materials to be included in the waterstop system.
 - 3. Samples:
 - a. Minimum 6-inch long samples of each type of waterstop to be used if requested by the Engineer.
 - 4. Manufacturer's installation instructions:
 - a. Installation instructions and recommended installation details for the complete waterstop system, and for each component used in that system.

PART 2 PRODUCTS

2.01 HYDROPHILIC RUBBER WATERSTOP

- A. General:
 - 1. System composed of flexible hydrophilic urethane polymer with preformed strips, adhesives, paste, fasteners, and other accessories required for a complete and watertight installation.
 - a. To ensure compatibility of materials, a single manufacturer shall provide all products and accessories for the hydrophilic waterstop system.
 - b. Products incorporating bentonite are not acceptable under this Section.
 - c. Provide waterstop and accessories resistant to degradation under cyclic wetting and drying and to chemicals typically found in water treatment structures.

- B. Hydrophilic strip waterstop:
 - 1. Pre-formed strips of flexible hydrophilic rubber designed to undergo controlled expansion when exposed to moisture:
 - a. Strips manufactured to limit expansion in directions parallel to the plane of the joint, and to direct expansion against confining material perpendicular to that plane.
 - 2. Provide normal or low-expansion pressure as scheduled and as indicated on the Drawings.
 - 3. Manufacturers: One of the following or equal:
 - a. Hydrophilic strip:
 - 1) Adeka Ultra Seal USA, MC-2010MN.
 - 2) Sika Corp., Hydrotite CJ1020-2K.
 - b. Low expansion hydrophilic strip:
 - 1) Adeka Ultra Seal USA, KBA-1510FP.
 - 2) Sika Corp., Hydrotite CJ0725-3K.
- C. Hydrophilic paste waterstop.
 - 1. Single-component gun grade paste of hydrophilic rubber designed to undergo controlled expansion when exposed to moisture after initial curing.
 - 2. Manufacturers: One of the following or equal:
 - a. Adeka Ultra Seal USA: P-201.
 - b. Sika Corp., Leakmaster LV-Z.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install products in accordance with manufacturer's instructions and recommended details.
- B. Prepare concrete joint surfaces:
 - 1. Use wire brushing or scraping to expose an uncontaminated, solid surface.
 - 2. Clean prepared surface with high-pressure air or water to remove residue and debris.
 - 3. Confirm that prepared surfaces conform to manufacturer's recommendations for surface profile and moisture conditions before installing materials.
- C. Provide manufacturer's recommended lap, splice, and corner details for hydrophilic waterstops.
 - 1. Use hydrophilic paste at all corner joints and overlap splices of hydrophilic strips.
- D. Hydrophilic strip waterstop:
 - 1. Install primers and adhesives when recommended by the manufacturer before setting hydrophilic strips.
 - 2. Keep hydrophilic strip taut during the fastening process.
 - 3. Secure hydrophilic strip in place with concrete nails, screws, or adhesive.

4. Provide installation with no gap between the hydrophilic strip and the concrete to which it is attached. At rough or irregular surfaces, set hydrophilic strip waterstop strip in a bead of hydrophilic paste:
 - a. Fill all voids and rough areas under the hydrophilic strip with hydrophilic paste.
 - b. Allow hydrophilic paste to cure in accordance with manufacturer's recommendations before encapsulating paste in fresh concrete.

3.02 SCHEDULE

- A. At the following joint locations/conditions, use the hydrophilic strip waterstop configuration noted unless otherwise indicated on the Drawings.
- B. Concrete construction joints:
 1. Under all of the following conditions, use hydrophilic strip waterstop set in a bed of hydrophilic paste waterstop, and screw strip waterstop to concrete surface:
 - a. Slab or wall thickness is greater than 10 inches.
 - b. Waterstop is placed between 2 rows of steel reinforcement.
 - c. Concrete cover from waterstop to nearest concrete face is at least 4 inches.
 2. Under any one of the following conditions, use low-expansion hydrophilic strip waterstop set in bed of hydrophilic paste waterstop and screw strip to concrete surface:
 - a. Waterstop is placed on 1 side of a single row of steel reinforcement.
 - b. Concrete cover from waterstop to nearest concrete face is less than 4 inches.
- C. Pipe penetrations through concrete:
 1. Pipe diameter less than 4 inches: Not allowed.
 2. Pipe diameter of 4 to 24 inches: Continuous bead of hydrophilic paste waterstop, minimum 1/4-inch high by 1/2-inch wide, encircling pipe.
 3. Pipe diameter greater than 24 inches: Continuous hydrophilic strip waterstop around perimeter of pipe, with hydrophilic paste seal at lapped ends of strip.

END OF SECTION

SECTION 03_20_00
CONCRETE REINFORCING

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Reinforcing bars:
 - a. Carbon steel.
 - 2. Thread bars.
 - 3. Bar supports.
 - 4. Tie wires.
 - 5. Welded wire fabric.
 - 6. Mechanical reinforcing bar couplers.
 - 7. Mechanical reinforcing bar end anchors (terminators).

1.02 REFERENCES

- A. American Concrete Institute (ACI):
 - 1. 318 - Building Code Requirements for Structural Concrete and Commentary.
 - 2. SP-66 - ACI Detailing Manual.
- B. American Iron and Steel Institute (AISI).
- C. American Welding Society (AWS):
 - 1. D1.4 - Structural Welding Code - Reinforcing Steel.
- D. ASTM International (ASTM):
 - 1. A493 - Standard Specification for Stainless Steel Wire and Wire Rods for Cold Heading and Cold Forging.
 - 2. A615 - Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement.
 - 3. A706 - Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
 - 4. A955 - Standard Specification for Deformed and Plain Stainless-Steel Bars for Concrete Reinforcement.
 - 5. A1064 - Standard Specification of Carbon-Steel wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
- E. Concrete Reinforcing Steel Institute (CRSI):
 - 1. Manual of Standard Practice.
- F. ICC Evaluation Service (ICC-ES):
 - 1. AC133 - Acceptance Criteria for Mechanical Connector Systems for Steel Reinforcing Bars.
 - 2. AC347 - Acceptance Criteria for Headed Deformed Bars.

1.03 DEFINITIONS

- A. Architectural Concrete: Concrete surfaces that will be exposed to view in the finished work.
 - 1. Additionally, for purposes of this Section, includes:
 - a. Concrete surfaces that are designated to receive paints or coatings.
 - b. Exposed concrete in open basins, channels, and similar liquid containing structures: Surfaces shall be considered exposed to view if located above a line 2 feet below the normal operating water surface elevation in that structure.
- B. Bars: Reinforcement or reinforcing bars as specified in this Section.
- C. Evaluation Report: Report prepared by ICC-ES, or by other testing agency acceptable to the Engineer and to the Building Official, that documents testing and review of a product to confirm that it complies with the requirements of designated ICC-ES Acceptance Criteria, and its acceptance for use under the Building Code specified in Section 01_41_00 - Regulatory Requirements.
- D. Give Away Bars: Reinforcing bars that are not required by the Contract Documents, but are installed by the Contractor to provide support for the required reinforcing bars.
- E. Wire Supports: Metal reinforcing supports constructed of steel wire as specified. Includes individual high chairs, continuous high chairs, bolsters and other similar configurations and shapes.

1.04 SUBMITTALS

- A. General:
 - 1. Submit in accordance with Section 01_33_00 - Submittal Procedures.
 - 2. Changes to reinforcement in Contract Documents:
 - a. Indicate in a separate letter submitted with shop drawings any changes to reinforcement indicated on the Drawings or specified.
 - b. Such changes will not be acceptable unless Engineer has accepted them in writing.
- B. Product data:
 - 1. Bar supports:
 - a. Wire bar supports:
 - 1) Schedule of support materials to be provided and locations of use.
 - b. Precast concrete bar supports ("dobies"):
 - 1) Manufacturer's data indicating compression strength of concrete and confirming dimensions and thickness(es). height(s) to be provided for each location where used.
 - 2. Mechanical reinforcing bar couplers. For each type and/or series to be provided:
 - a. Evaluation Report documenting compliance with the requirements of ICC-ES AC133.

- b. Details, properties, and dimensions of couplers. Include type or size identification, and bar size(s) and grade(s) for which the coupler is suitable.
 - c. Manufacturer's installation and testing instructions.
 - d. Manufacturer's statement that products installed in accordance with manufacturer's recommended procedures will develop strengths and limit slip as specified in this Section.
 - 3. Mechanical reinforcing bar end anchors (terminators).
 - a. Evaluation Report documenting compliance with the requirements of ICC-ES AC307.
 - b. Details, properties, and dimensions of end anchors. Include type or size identification, and bar size(s) and grade(s) for which the end anchor is suitable.
 - c. Manufacturer's installation and testing instructions.
 - d. Manufacturer's statement that products installed in accordance with manufacturer's recommended procedures will develop strengths and limit slip as specified in this Section.
- C. Shop drawings:
 - 1. Reinforcement shop drawings:
 - a. Submit drawings showing bending and placement of reinforcement required by the Contract Documents.
 - b. Clearly indicate structures or portions of structures covered by each submittal.
 - 1) Submit reinforcement shop drawings for each structure as a complete package. Submittals addressing only a portion of a structure will be rejected and returned without review, unless such presentation is accepted by Engineer in advance.
 - c. Shop drawings shall conform to the recommendations of the CRSI Manual of Standard Practice and ACI SP-66.
 - d. Use the same bar identification marks on bending detail drawings, placement drawings, and shipping tags.
 - e. Submittals consisting solely of reinforcing bar schedules, without accompanying placement drawings, will not be accepted unless accepted under prior written agreement with Engineer.
 - 2. Reinforcement placement drawings:
 - a. Clearly show placement of each bar listed in the bill of materials, including additional reinforcement at corners and openings, and other reinforcement required by details in the Contract Documents.
 - b. Clearly identify locations of reinforcement with coatings (e.g., galvanized or epoxy) and with yield strength other than ASTM A615, Grade 60.
 - c. Show anchor bolt locations based on anchor bolt templates for approved equipment.
 - d. Show splice locations.
 - e. Show locations of mechanical reinforcing couplers if used.
 - f. Show locations of reinforcing bar end anchors, if used.
 - 3. Reinforcement fabrication drawings:
 - a. If bend types or nomenclature differs from that recommended in the CRSI Manual of Standard Practice, provide details showing bend types and dimensional designations.

Clearly identify reinforcement with coatings and with yield strength other than ASTM A615, Grade 60.

- D. Samples (when requested by Engineer):
 - 1. Bar supports/wire reinforcement supports: Samples of each type of chair and bolster proposed for use. Submit with letter stating where each type will be used.
 - 2. Precast concrete bar supports: Samples of each type of precast support proposed for use. Submit with letter stating where each will be used.
- E. Test reports:
 - 1. Certified copy of mill test for each steel used. Show physical properties and chemical analysis.
 - a. Mill test reports may be submitted as record documents at the time the reinforcement from that heat of steel is shipped to the site.
 - b. In such cases, submit certificates under the shop drawing submittal number with the letter "R" (for record date) appended to the end (e.g., of the reinforcement was submitted as 03_20_00-002-1, deliver the associated mill certificate as submittal 03_20_00-002-1R).
 - 2. Mechanical reinforcing bar couplers:
 - a. Current Evaluation Report confirming that couplers provide specified tension and compression strength and conform to specified limits on total slip within the coupler.
 - b. Certified copy of mill tests for heat(s) of steel incorporated into the reinforcing bar couplers shipped.
 - c. For threaded sleeve type couplers, heat treatment lot numbers for each shipment.
 - 3. Reinforcing bar end anchors:
 - a. Current Evaluation Report confirming that end anchors provide specified tension strength.
 - b. Certified copy of mill tests for heat(s) of steel incorporated into the materials shipped.
- F. Manufacturer's instructions:
 - 1. Mechanical reinforcing bar couplers:
 - a. Manufacturer's installation instructions.
 - b. Manufacturer's instructions for confirmation testing of couplers after reinforcing bars have been inserted into the couplers.
 - 2. Mechanical reinforcing bar end anchors:
 - a. Manufacturer's installation instructions.
 - b. Manufacturer's instructions for confirmation testing of end anchors.
- G. Special procedures:
 - 1. Welding procedures conforming to AWS D1.4 for reinforcement to be field welded.
 - a. Procedures qualification record.
- H. Qualifications statements:
 - 1. Welder qualifications.

- I. Closeout documents:
 - 1. Field quality control and inspection reports.
 - 2. Field quality assurance special inspection and testing reports.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Packing and shipping:
 - 1. Deliver bars bundled and tagged with identifying tags.
- B. Acceptance at site:
 - 1. Reinforcing bars: Deliver reinforcing bars lacking grade identification marks with letter containing manufacturer's guarantee of grade.

1.06 SEQUENCING AND SCHEDULING

- A. Bar supports:
 - 1. Do not place concrete until samples and product data for bar supports have been accepted by Engineer.

PART 2 PRODUCTS

2.01 DESIGN AND PERFORMANCE CRITERIA

- A. The drawings contain notes describing the size and spacing of reinforcement and its placement, details of reinforcement at wall corners and intersections, and details of extra reinforcement around openings in concrete, and other related information.

2.02 MATERIALS

- A. Reinforcing bars:
 - 1. Provide reinforcement of the grades and quality specified, fabricated from new stock, free from excessive rust or scale, and free from unintended bends or other defects affecting its usefulness.
 - 2. Reinforcing bars:
 - a. ASTM A615 Grade 60 deformed bars, including the following requirements, or ASTM A706 Grade 60 deformed bars.
 - 1) Actual yield strength based on mil tests of reinforcement provided shall not exceed the minimum yield strength specified in this Section by more than 18,000 pounds per square inch.
 - 2) Ratio of actual ultimate tensile strength to actual tensile yield strength shall not be less than 1.25.
 - 3. Reinforcing bars designated or required to be welded:
 - a. Low-alloy, ASTM A706 Grade 60, deformed bars.
 - b. ASTM A615 Grade 60 deformed bars may be used in lieu of ASTM A706 Grade 60 if following requirements are satisfied.
 - 1) Welding procedures conforming to AWS D1.4 are submitted to Engineer.
 - 2) The specific location for proposed substitution is acceptable to Engineer.

- B. Bar supports:
1. Wire supports:
 - a. All stainless steel bar supports:
 - 1) Conforming to CRSI Manual of Standard Practice recommendations for types and details, but custom fabricated entirely from stainless steel wire conforming to ASTM A493, AISI Type 316.
 - b. Stainless steel protected bar supports:
 - 1) Conforming to CRSI Manual of Standard Practice Class 2, Type B, and consisting of bright basic wire support fabricated from cold--drawn carbon steel wire with stainless steel ends attached at the bottom of each leg.
 - 2) Stainless steel wire ends shall conform to ASTM A493, AISI Type 316 and shall extend at least 3/4 inch inward from the formed surface of the concrete.
 - c. Bright basic wire bar supports.
 - 1) Conforming to CRSI Manual if Standard Practice, Class 3.
 2. Plastic supports:
 - a. Manufacturers: The following or equal:
 - 1) Aztec Concrete Accessories.
 3. Deformed steel reinforcing bar supports:
 - a. Fabricated of materials and to CRSI details recommended for typical reinforcement embedded in concrete and bent to dimensions required to provide specified clearances and concrete cover.
 4. Precast concrete bar supports ("dobies"):
 - a. Pre-manufactured, precast concrete blocks with cast-in annealed steel wires, 16-gauge or heavier.
 - b. Compression strength of concrete: Equal to or exceeding the compression strength of the surrounding concrete.
 - c. Block dimensions:
 - 1) Height to provide specified concrete cover.
 - 2) Footprint not less than 3 inches by 3 inches, and adequate to support the weight of the reinforcement and maintain specified concrete cover without settling into the underlying surface.
 5. Stainless steel wire supports on stainless steel plates:
 - a. Type 304 stainless steel wire bar support chairs or bolsters supported on Type 304 stainless steel plates resting on the ground surface.
 - 1) Weld plates to at least 2 legs of wire support chairs.
- C. Tie wires:
1. General use: Black annealed steel wire, 16-gauge or heavier.
- D. Welded wire fabric reinforcement:
1. Material:
 - a. Carbon steel conforming to ASTM A1064.
 2. Provide welded wire reinforcement in flat sheet form. Rolled wire fabric is not permitted.
 3. Fabric may be used in place of reinforcing bars if accepted by Engineer:
 - a. Provide welded wire fabric having cross-sectional area per linear foot not less than the cross-sectional area per linear foot of reinforcing bars indicated on the Drawings.

- E. Mechanical reinforcing bar couplers and end anchors:
1. General:
 - a. Only products conforming to the requirements of ACI 318 for mechanical splices, and holding a current Evaluation Report that documents the following performance characteristics, will be considered for use.
 - b. Strength of coupler: Capable of developing tension and compression strength not lower than the lesser of the following:
 - 1) ACI 318 "Type 2" units: In static tension and compression:
 - a) Minimum 125 percent of the ASTM-specified minimum yield strength of the reinforcement being spliced or terminated.
 - b) Minimum 100 percent of the ASTM-specified minimum ultimate strength of the reinforcement being spliced or terminated.
 - c. Slip of reinforcing bars within coupler: Total slip of the reinforcing bars within the splice sleeve limited as follows:
 - 1) For bar sizes #14 and smaller, elongation between gauge points measured clear of the splice sleeve not exceeding 0.010 inches after coupler has been loaded to a tension of 30,000 pounds per square inch and load relaxed to a tension of 3,000 pounds per square inch.
 - d. Fabrication:
 - 1) Threaded joints:
 - a) Provide threaded ends designed so that cross-threading of bars will not occur during assembly.
 - b) Fabricate male ends for female couplers using coupler manufacturer's bar threading equipment to ensure proper taper and thread engagement.
 - 2) Mark each sleeve with heat treatment lot number.
 2. Couplers: Threaded - Reinforcing bar splice at construction joints.
 - a. Steel sleeve butt splice with tapered internal threads in forged or swaged head, and nailing flange for attaching to forms. Provide with matching, tapered male-threaded dowels for insertion and tightening into threaded sleeve after form removal.
 - 1) Provide sleeve with factory-installed plugs to prevent concrete mortar from entering internally threaded coupler.
 - 2) Provide optional clipped nailing flanges as required to maintain minimum specified concrete cover over surfaces of coupler.
 - b. Holding current Evaluation Report demonstrating acceptance under ICC-ES AC133.
 - c. Manufacturers: One of the following or equal:
 - 1) Dayton Superior, DBDI Splice System.
 - 2) ERICO-Pentair, Lenton Form Saver.
 3. Couplers: Threaded - reinforcing bar splice:
 - a. Steel sleeve butt splice with tapered internal threads at each end for joining to matching tapered male threads on reinforcing bars.
 - b. Holding current Evaluation Report demonstrating acceptance under ICC-ES AC133.
 - c. Manufacturers: One of the following, or equal:
 - 1) Dayton Superior: Taper-Lock System.
 - 2) ERICO-Pentair: Lenton Taper Threaded Splicing System.
 4. Couplers: Threaded - All thread rod to reinforcing bar:
 - a. Steel sleeve butt splice with tapered internal threads on one end for joining to matching tapered male threads on reinforcing bars, and straight

- internal threads at opposite end for joining to matching straight male threads on all-thread rods.
- b. Holding current Evaluation Report demonstrating acceptance under ICC-ES AC133.
- c. Manufacturers: The following or equal:
 - 1) ERICO-Pentair, Lenton Bolt Coupler - S4 or S5 Series.
- 5. End anchors:
 - a. Headed steel disc with tapered internal female threads for joining to matching tapered male threads on reinforcing bars.
 - b. Holding current Evaluation Report demonstrating acceptance under ICC-ES AC347.
 - c. Manufacturers: One of the following or equal:
 - 1) Dayton Superior, D350/351 Taper-Lock End Anchor Disc.
 - 2) ERICO-Pentair, Inc., Lenton Terminator.

2.03 FABRICATION

- A. Shop fabrication and assembly:
 - 1. Cut and bend bars in accordance with provisions of ACI 318 and the CRSI Manual of Standard Practice.
 - 2. Bend bars cold. Use bending collars to develop the recommended bend radius.
 - 3. Provide bars free from defects and kinks and from bends not indicated on the Drawings.
 - 4. Circumferential and radiused reinforcement: Roll to the radius required for its location in the structure before installation.
 - 5. Bars to be fitted with mechanical couplers or mechanical end anchors:
 - a. Fabricate threaded ends for connections in shop using manufacturer's recommended tools. Field fabrication is not allowed.
 - b. Cut ends square.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of conditions:
 - 1. Reinforcing bars and welded wire reinforcement:
 - a. Verify that reinforcement is new stock, free from rust scale, loose mill scale, excessive rust, dirt, oil, and other coatings that will adversely affect bonding capacity when placed in the Work.
 - 2. Welded wire fabric:
 - a. Verify that sheets are not curled or kinked before or after installation.

3.02 PREPARATION

- A. Surface preparation:
 - 1. Reinforcing bars - uncoated:
 - a. Clean reinforcement of concrete, dirt, oil and other coatings that will adversely affect bond before embedding bars in subsequent concrete placements.

- b. Thin coating of red rust resulting from short exposure will not be considered objectionable. Thoroughly clean bars having rust scale, loose mill scale, or thick rust coat.
- c. Partially embedded reinforcement: Remove concrete or other deleterious coatings from dowels and other projecting bars by wire brushing or sandblasting before bars are embedded in subsequent concrete placements.

3.03 INSTALLATION

- A. Reinforcing bars: General:
 - 1. Field-cutting of reinforcing bars is not permitted.
 - 2. Field-bending of reinforcing bars, including straightening and rebending, is not permitted.
- B. Placing reinforcing bars:
 - 1. Accurately place bars to meet position and cover requirements indicated on the Drawings and specified. Secure bars in position.
 - 2. Tolerances for placement and minimum concrete cover: As listed in Table 1.

Table 1 - Reinforcement Placing Tolerances		
Member	Tolerance on Reinforcement Location ⁽¹⁾	Tolerance on Minimum Concrete Cover ^(1,2)
Slabs, beams, walls and columns except as noted below:		
10 inches thick and less	$\pm 3/8$ inch	- 3/8 inch
More than 10 inches thick	$\pm 1/2$ inch	- 1/2 inch
Formed soffits:	As noted above	- 1/4 inch
Longitudinal location of bends and ends of reinforcement:		
Conditions not listed below:	± 2 inches	- 1/2 inch
At discontinuous ends of brackets and corbels	$\pm 1/2$ inch	- 1/4 inch
At discontinuous ends of other members:	± 1 inch	- 1/2 inch
Notes:		
(1) $\pm$ indicates "plus or minus;" - indicates "minus;" + indicates "plus."		
(2) Tolerance on cover is limited as noted, but decrease in cover shall not exceed one third of the minimum cover indicated on the Drawings.		

- 3. Spacing between bars:
 - a. Minimum clear spacing between bars in a layer:
 - 1) As indicated on the Drawings, but not less than the larger of 1.5 times the bar diameter or 1-1/2 inches.
 - b. Minimum clear spacing between bars in 2 or more parallel layers:
 - 1) Place bars in upper layers directly above bars in lower layers.

- 2) Minimum spacing between layers: As indicated on the Drawings, but not less than the larger of 1.5 times the bar diameter or 1-1/2 inches.
- c. Limits on minimum clear spacing between bars also applies to the clear spacing between a lap splice and the adjacent bars and/or lap splices.
4. Lap splices for bars:
 - a. Lap splice locations and lap splice lengths: as indicated on the Drawings. Where lap lengths are not indicated, provide in accordance with ACI 318.
 - b. Unless otherwise specifically indicated on the Drawings (and noted as "non-contact lap splice"), install bars at lap splices in contact with each other and fasten together with tie wire.
 - c. Where bars are to be lap spliced at concrete joints, ensure that bars project from the first concrete placement a length equal to or greater than minimum lap splice length indicated on the Drawings.
 - d. Stagger lap splices where indicated on the Drawings.
 - e. Where lap splice lengths are not indicated on the Drawings, provide lap splice lengths in accordance with ACI 318.
- C. Reinforcing supports:
 1. Provide supports of sufficient numbers, sizes, and locations to maintain concrete cover, to prevent sagging and shifting, and to support loads during construction without displacement and without gouging or indentation into forming surfaces.
 - a. Quantities and locations of supports shall not be less than those indicated in ACI SP-66 and the CRSI Manual of Standard Practice.
 2. Do not use brick, concrete masonry units, concrete spalls, rocks, wood, or similar materials for supporting reinforcement.
 3. Do not use "give away bars" that have less cover than that required by the Contract Documents. Do not adjust the location of reinforcement required by the Contract Documents to provide cover for give away bars.
 4. Provide bar supports of height required to maintain the clear concrete cover indicated on the Drawings.
 5. Provide bar supports at formed vertical faces to maintain the clear concrete cover indicated on the Drawings.
 6. Schedule of reinforcement support materials: Provide bar supports as indicated in Table 2.

Table 2 - Reinforcement Support Materials		
Case	Location	Material
a.	Concrete placed over earth and concrete seal slabs ("mud mats"):	Precast concrete bar supports or Stainless steel wire supports on stainless steel plates.
b.	Concrete placed against forms and exposed to water or wastewater process liquids (whether or not such concrete received additional linings or coatings):	All stainless steel bar supports.
c.	Concrete placed against forms and exposed to earth, weather, frequent washdown, or groundwater in the finished work	All stainless steel bar supports or Stainless steel protected bar supports.

Table 2 - Reinforcement Support Materials		
Case	Location	Material
d.	Concrete placed against forms and exposed to interior equipment/piping areas in the finished work	All stainless steel bar supports or Stainless steel protected bars supports.
e.	Between mats of reinforcement, and fully embedded within a concrete member	Bright basic wire bars supports, or deformed steel reinforcing bars.

D. Tying of reinforcing:

1. Fasten reinforcement securely in place with wire ties.
2. Tie reinforcement at spacings sufficient to prevent shifting.
 - a. Provide at least 3 ties in each bar length. (Does not apply to dowel lap splices or to bars shorter than 4 feet, unless necessary for rigidity).
3. Tie slab bars at every intersection around perimeter of slab.
4. Tie wall bars and slab bar intersections other than around perimeter at not less than every fourth intersection, but at not more than the spacing indicated in Table 3:

Table 3 - Maximum Spacing of Tie Wires for Reinforcement		
Bar Size	Slab Bar Spacing (inches)	Wall Bar Spacing (inches)
Bars Number 5 and Smaller	60	48
Bars Number 6 through Number 9	96	60
Bars Number 10 and Number 11	120	96

5. After tying:
 - a. Bend ends of wires inward towards the center of the concrete section. Minimum concrete cover for tie wires shall be the same as cover requirements for reinforcement.
 - b. Remove tie wire clippings from inside forms before placing concrete.

E. Welded wire fabric reinforcement:

1. Install only where indicated on the Drawings or accepted in advance by Engineer.
2. Install necessary tie wires, spacing chairs, and supports to keep welded wire fabric at its designated position in the concrete section while concrete is being placed.
3. Straighten welded wire fabric to make sheets flat in the Work.
4. Do not allow wire fabric to drape between supports unless such a configuration is specifically indicated on the Drawings.
 - a. If fabric is displaced during placement of concrete, make provisions to restore it to the designated location using methods acceptable to Engineer.
5. Bend welded wire fabric as indicated on the Drawings or required to fit Work.

6. Lap splice welded wire fabric as indicated on the Drawings:
 - a. If lap splice length is not indicated, splice in accordance with ACI 318, but not less than 1 1/2 courses of fabric or 8 inches minimum. Tie laps at ends and at not more than 12 inches on center.
- F. Welding reinforcing bars:
 1. Weld reinforcing bars only where indicated on the Drawings or where acceptance is received from Engineer prior to welding.
 2. Perform welding in accordance with AWS D1.4 and welding procedures accepted by Engineer:
 - a. Conform to requirements for minimum preheat and interpass temperatures.
 3. Submit:
 - a. Welding procedures specification.
 - b. Procedures qualification record.
 - c. Welder qualification test record.
 4. Do not tack weld reinforcing bars except where specifically indicated on the Drawings.
- G. Reinforcing bar mechanical couplers and end anchors:
 1. Install only at locations indicated on the Drawings or where prior approval has been obtained from Engineer.
 2. Install in accordance with manufacturer's instructions and requirements of Evaluation Report:
 - a. Make splices using manufacturer's standard equipment, jigs, clamps, and other required accessories.
 - b. After assembly of the splice, tighten using torque load not less than that recommended by the manufacturer.
 3. Unless greater cover is indicated on the Drawings, provide clear cover from surface of concrete to outside face of couplers that is not less than the minimum concrete cover specified for typical reinforcement:
 - a. If cover is less than required, contact Engineer for evaluation of conditions before modifying locations of bars or placing concrete.
 - b. Modifications to maintain or provide required concrete cover, such as addition of concrete ; re-positioning of stirrups, ties, etc., may be completed only after approval by Engineer.

3.04 FIELD QUALITY CONTROL

- A. Provide quality control for the Work of this Section as specified in Section 01_45_00 - Quality Control.
- B. Field inspections and testing:
 1. Submit records of inspections and testing to Engineer in electronic format within 24 hours after completion.

3.05 FIELD QUALITY ASSURANCE

- A. Provide quality assurance as specified in Section 01_45_00 - Quality Control.

- B. Special inspections and tests:
1. Provide as specified in Section 01_45_24 - Regulatory Quality Assurance.
 2. Frequency of inspections:
 - a. Unless otherwise indicated on the Drawings or in this Section, provide periodic special inspection as required by the Building Code specified in Section 01_41_00 - Regulatory Requirements.
 3. Preparation:
 - a. Review Drawings and Specification for the Work to be observed.
 - b. Review approved submittal and shop drawings.
 4. Inspections: Special inspection shall include, but is not limited to, the following items:
 - a. Reinforcement: General:
 - 1) Type (material) and location of reinforcement supports.
 - 2) Bar material/steel grade and bar size.
 - 3) Location, placement, and spacing of bars.
 - 4) Clear concrete cover over reinforcement.
 - 5) Lap splice: Location and lap length. Bars within tolerances for contact (unless non-contact splice is indicated on the Drawings.)
 - 6) Bar hooks and development lengths embedded within concrete sections as indicated on the Drawings.
 - 7) Reinforcement tied in position and tie wire legs turned inward toward the center of the concrete section.
 - b. Reinforcement: Welding:
 - 1) Inspector qualification and inspections shall be in accordance with the requirements of AWS D1.4.
 - 2) Provide periodic inspection for:
 - a) Weldability of reinforcement other than ASTM A706.
 - b) Single pass fillet welds with thickness less than or equal to 5/16 inch.
 - 3) Provide continuous inspection for:
 - a) Other welds.
 - b) Welds at mechanical reinforcing bar couplers and end anchors.
 - 4) In addition to visual inspection, Owner may inspect reinforcing bar welds by other methods, including radiographic inspection.
 5. Mechanical reinforcing bar couplers and end anchors:
 - a. Special inspection shall include, but is not limited to, the following items:
 - 1) Coupler and end anchor model and identification.
 - 2) Couplers and end anchors are installed in accordance with the requirements of the Engineering Report for each product.
 - 3) Confirmation of the following:
 - a) Grade and size of reinforcing bars.
 - b) Position of couplers and end anchors.
 - c) Insertion length of reinforcement.
 - d) Tightening of bars in the couplers and end anchors.
 6. Records of inspections:
 - a. Provide a written record of each inspection using forms acceptable to the Engineer and to the Building Official.
 - b. Submit electronic copies of inspection reports to Engineer within 24 hours after completion of inspections.

3.06 NON-CONFORMING WORK

- A. Before placing concrete, adjust or remove and re-install reinforcement to conform to the requirements of the Contract Documents.

END OF SECTION

SECTION 03_21_17

ADHESIVE-BONDED REINFORCING BARS AND ALL THREAD RODS IN CONCRETE

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Bonding reinforcing bars and all thread rods in concrete using adhesives.

1.02 REFERENCES

- A. American Concrete Institute (ACI).
 - 1. 355.4 - Qualification of Post-Installed Adhesive Anchors in Concrete and Commentary.
- B. American National Standards Institute (ANSI):
 - 1. Standard B212.15 - Carbide Tipped Masonry Drills and Blanks for Carbide Tipped Masonry Drills.
- C. ASTM international (ASTM):
 - 1. C881 - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.
- D. Concrete Reinforcing Steel Institute (CRSI).
- E. ICC Evaluation Service, Inc. (ICC-ES):
 - 1. AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements.
- F. NSF International (NSF):
 - 1. 61 - Drinking Water System Components - Health Effects.
- G. Society for Protective Coatings (SSPC):
 - 1. SP-1 - Solvent Cleaning.

1.03 DEFINITIONS

- A. Evaluation Service Report (ESR): Report prepared by ICC-ES, or other testing agency acceptable to Engineer and to the Building Official, that documents testing and review of a product to confirm that it complies with the requirements of designated ICC-ES Acceptance Criteria, and to document its acceptance for use under the Building Code specified in Section 01_41_00 - Regulatory Requirements.

1.04 SUBMITTALS

- A. Product data: Technical data for adhesives, including:
 - 1. Manufacturer's printed installation instructions (MPII).

2. Independent laboratory test results indicating allowable loads in tension and shear for concrete of the types included in this Work, with load modification factors for temperature, spacing, edge distance, and other installation variables.
 3. Handling and storage instructions.
 4. Evidence of current listing under NSF-61 for use in contact with potable water.
- B. Quality control submittals:
1. Special inspection: Detailed step-by-step instructions for the special inspection procedures required by the building code specified in Section 01_41_00 - Regulatory Requirements.
 2. For each adhesive to be used, Evaluation Report confirming that the product complies with the requirements of AC308 for both un-cracked and cracked concrete and for use in Seismic Design Categories A through F.
 3. Installer qualifications:
 - a. Submit evidence of successful completion of adhesive manufacturer's installation training program.
 - b. Submit evidence of current certification for installation of inclined and overhead anchors under sustained tension loading.
- C. Inspection and testing reports:
1. Inspections: Field quality control: Reports of inspections and tests:
 - a. Inspections: Field quality assurance: Reports of special inspections and tests.

1.05 QUALITY ASSURANCE

- A. Qualifications:
1. Installation requirements:
 - a. Have available at the site, and install anchors in accordance with, the adhesive manufacturer's printed installation instructions.
 2. Installer qualifications:
 - a. Demonstrating successful completion of adhesive manufacturer's on-site training program for installation of adhesive-bonded anchors.
 - b. Holding current certification for installation of adhesive-bonded anchors by a qualified organization acceptable to the Engineer and to the Building Official.
 - 1) Organizations/certification programs deemed to be qualified are:
 - a) ACI-CRSI Adhesive Anchor Installer Certification Program.
 - b) Adhesive anchor manufacturer's certification program, subject to acceptance by the Engineer and the Building Official.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store and protect products as follows, unless more restrictive requirements are recommended by the manufacturer:
1. Store adhesives and adhesive components on pallets or shelving in a covered-storage area protected from weather.

2. Control temperature to maintain storage within manufacturer's recommended temperature range:
 - a. If products have been stored at temperatures outside manufacturer's recommended range, test by methods acceptable to the Engineer to confirm acceptability before installing in the Work.
3. Dispose of products that have passed their expiration date.

1.07 PROJECT CONDITIONS

- A. As specified in Section 01_81_50 - Design Criteria.
- B. Seismic Design Category (SDC) for structures: As specified in Section 01_81_50 - Design Criteria.

PART 2 PRODUCTS

2.01 GENERAL

- A. Like items of materials: Use end products of one manufacturer in order to achieve structural compatibility and singular responsibility.
- B. Adhesives shall have a current Evaluation Report documenting testing and compliance with the requirements or ACI 355.4 and of ICC-ES AC308 for use with un-cracked concrete and with cracked concrete in the Seismic Design Category specified.
- C. Bond reinforcing bars and all thread rods in concrete using epoxy adhesive unless other adhesives specified are specifically indicated on the Drawings or approved in writing by the Engineer.
- D. For locations where adhesive will be in direct contact with potable water in the finished work, provide documentation of testing and listing under NSF-61. Testing shall be by a nationally recognized agency acceptable to the Engineer.

2.02 EPOXY ADHESIVE

- A. Materials:
 1. Meeting the physical requirements of ASTM C881, Type IV, Grade 3, Class B or C depending on site conditions.
 2. 2-component, 100 percent solids, insensitive to moisture.
 3. Cure temperature, pot life, and workability: Compatible with intended use and environmental conditions.
- B. Packaging:
 1. Disposable, self-contained cartridge system furnished in side-by-side cartridges designed to fit into a manually or pneumatically operated caulking

gun, and with resin and hardener components isolated until mixing through manufacturer's static mixing nozzle:

- a. Nozzle designed to dispense components in the proper ratio and to thoroughly blend the components for injection from the nozzle directly into prepared hole.
 - b. Provide nozzle extensions as required to allow full-depth insertion and filing from the bottom of the hole.
2. Container markings: Include manufacturer's name, product name, batch number, mix ratio by volume, product expiration date, ANSI hazard classification, and appropriate ANSI handling precautions.
- C. Manufacturers: One of the following or equal:
1. Hilti, Inc., HIT-RE 500-V3.
 2. Simpson Strong-Tie Co., Inc., SET-XP.

2.03 ACRYLIC AND HYBRID ADHESIVE

- A. Materials:
1. 2-component, high-solids, acrylic-based or hybrid acrylic and epoxy-based adhesive.
 2. Approved by the manufacturer for installation at substrate temperatures of 0 degrees Fahrenheit and above.
- B. Packaging:
1. Disposable, self-contained cartridge system furnished in side-by-side cartridges designed to fit into a manually or pneumatically operated caulking gun, and with resin and hardener components isolated until mixing through manufacturer's static mixing nozzle. Nozzle designed to dispense components in the proper ratio and to thoroughly blend the components for injection from the nozzle directly into prepared hole.
 2. Container markings: Include manufacturer's name, product name, batch number, mix ratio by volume, product expiration date, ANSI hazard classification, and appropriate ANSI handling precautions.
- C. Manufacturers: One of the following or equal:
1. Hilti, Inc., HIT-HY-200.
 2. Simpson Strong-Tie Co., Inc., AT-XP.

2.04 ALL THREAD RODS

- A. Materials: As specified in Section 05_12_00 - Structural Steel Framing for rods, nuts and washers.

2.05 REINFORCING BARS

- A. As specified in Section 03_20_00 - Concrete Reinforcing.

PART 3 EXECUTION

3.01 GENERAL

- A. Execution of this work is restricted to installers who have personally completed the adhesive manufacturer's on-site training for the products to be installed, and who are personally certified through a qualified certification program described under Quality Assurance and accepted by the Engineer and the Building Official:
 - 1. Do not install holes or adhesive until training is complete.
- B. Perform work in strict compliance with the accepted MP11 and the following instructions. Where the accepted MP11 and the instructions conflict, the MP11 shall prevail.
- C. Install reinforcing bars and all thread rods to embedment depth, and at spacing and locations indicated on the Drawings:
 - 1. If embedment depth is not indicated, contact Engineer for requirements.
 - 2. Do not install adhesive-bonded all thread rods or reinforcing bars in upwardly inclined or overhead applications unless accepted in advance by Engineer.

3.02 PREPARATION

- A. Do not begin installation of adhesive bonded anchors until:
 - 1. Concrete has achieved an age of at least 21 days after placement.
 - 2. On-site training in installation of adhesive bonded anchors by manufacturer's technical representative is complete. Do not drill holes in concrete or install adhesive and embeds in holes.
- B. Review manufacturer's printed installation instructions (MP11) and "conditions of use" stipulated in the Evaluation Report before beginning work:
 - 1. Bring to the attention of the adhesive manufacturer's technical representative any discrepancies between these documents and resolve before proceeding with installation.
- C. Install adhesive bonded anchors in full compliance with manufacturer's printed installation instructions using personnel who have successfully completed manufacturer's on-site training for products to be used and who hold certifications specified in this Section.
- D. Confirm that adhesive and substrate receiving adhesive are within manufacturer's recommended range for temperature and moisture conditions, and will remain so during the curing time for the product.

3.03 HOLE SIZING AND INSTALLATION

- A. Drilling holes:
 - 1. Determine location of reinforcing bars or other obstructions with a nondestructive indicator device, and mark locations with construction crayon on the surface of the concrete.

2. Do not damage or cut existing reinforcing bars, electrical conduits, or other items embedded in the existing concrete without prior acceptance by Engineer.
- B. Hole drilling equipment:
1. Electric or pneumatic rotary impact type with medium or light impact:
 - a. Installation of anchors in cored holes is not permitted.
 - b. Set drill to "rotation only" mode, or to "rotation plus hammer" mode in accordance with the manufacturer's installation instructions and the requirements of the Evaluation Report.
 - c. Where edge distances are less than 2 inches and "rotation plus hammer" mode is permitted, use lighter impact equipment to prevent micro-cracking and concrete spalling during the drilling process.
 2. Drill bits: Carbide-tipped in accordance with ANSI B212-15 unless otherwise recommended by the manufacturer or required as a "condition of use" in the Evaluation Report:
 - a. Hollow drill bits with flushing air systems are preferred. Air supplied to hollow drill bits shall be free of oil, water, or other contaminants that will reduce bond.
- C. Hole diameter: As recommended in the manufacturer's installation instructions and the Evaluation Report.
- D. Hole depth: As recommended in the manufacturer's installation instructions to provide minimum effective embedment indicated on the Drawings.
- E. Obstructions in drill path:
1. If an existing reinforcing bar or other obstruction is hit while drilling a hole, unless otherwise accepted by Engineer, stop drilling. Prepare and fill the hole with dry-pack mortar. Relocate the hole to miss the obstruction and drill another hole to the required depth:
 - a. Obtain Engineer's acceptance of distance between abandoned and relocated holes before proceeding with the relocation.
 - b. Allow dry-pack mortar to cure to a strength equal to that of the surrounding concrete before resuming drilling in the area.
 - c. Epoxy grout may be substituted for dry-pack mortar when accepted by Engineer.
 2. Avoid drilling an excessive number of holes in an area of a structural member, which would excessively weaken the member and endanger the stability of the structure.
 3. When existing reinforcing steel is encountered during drilling and when specifically accepted by Engineer, enlarge the hole by 1/8 inch, core through the existing reinforcing steel at the larger diameter, and resume drilling at original hole diameter using pneumatic rotary impact drill.
 4. Bent bar reinforcing bars: Where edge distances are critical, and interference with existing reinforcing steel is likely, if acceptable to Engineer, drill hole at 10 degree (or less) angle from axis of reinforcing bar or all thread rod being installed.

- F. Cleaning holes:
1. Insert air nozzle to bottom of hole and blow out loose dust:
 - a. Use compressed air that is free of oil, water, or other contaminants that will reduce bond.
 - b. Provide minimum air pressure of 90 pounds per square inch for not less than 4 seconds.
 2. Using a stiff bristle brush with diameter that provides contact around the full perimeter of the hole, vigorously brush hole to dislodge compacted drilling dust:
 - a. Insert brush to the bottom of the hole and withdraw using a simultaneous twisting motion.
 - b. Repeat at least 4 times.
 3. Repeat the preceding steps as required to remove drilling dust or other material that will reduce bond, and in the number of cycles required by the MPII and the Evaluation Report.
 4. Leave prepared holes clean and dry.
 5. Protect prepared and cleaned holes from contamination and moisture until adhesive is installed.
 6. Re-clean and dry previously prepared holes if, in the opinion of the Engineer, the hole has become contaminated after initial cleaning.

3.04 INSTALLATION OF ADHESIVE AND INSERTS

- A. Clean and prepare inserts reinforcing bars and all thread rods:
1. Prepare embedded length of reinforcing bars and all thread rods by cleaning to bare metal. Inserts shall be free of oil, grease, paint, dirt, mill scale, rust, or other coatings that will reduce bond.
 2. Solvent clean prepared reinforcing bars and all thread rods over the embedment length in accordance with SSPC SP-1. Provide an oil and grease free surface for bonding of adhesive to steel.
- B. Fill holes with adhesive:
1. Starting at the bottom of the hole, fill hole with adhesive inserting the reinforcing bar or all thread rod.
 2. Fill hole as nozzle is withdrawn without creating air voids.
 3. Unless otherwise indicated on the Drawings, fill hole with sufficient adhesive so that excess adhesive is extruded out of the hole when the reinforcing bar or all thread rod is inserted.
 4. Where necessary, seal hole at surface of concrete to prevent loss of adhesive during curing.
- C. Installing reinforcing bars and all thread rods:
1. Unless otherwise indicated on the Drawings, install bars and rods perpendicular to the concrete surface.
 2. Insert reinforcing bars and all thread rods into adhesive in accordance with manufacturer's recommended procedures.
 3. Confirm that insert has reached the designated embedment in the concrete, and that adhesive completely surrounds the embedded portion.
 4. Securely brace bars and all thread rods in place to prevent displacement while the adhesive cures. Bars and rods displaced during curing will be considered damaged and replacement will be required.

5. Clean excess adhesive from the mouth of the hole.
- D. Curing and loading:
1. Provide and maintain curing conditions recommended by the adhesive manufacturer for the period required to fully cure the adhesive at the temperature of the concrete.
 2. Do not disturb or load bonded embeds until manufacturer's recommended cure time, based on temperature of the concrete, has elapsed.

3.05 POST-INSTALLATION ACTIVITIES

- A. Do not bend bars or all-thread rods after bonding to the concrete, unless accepted in advance by the Engineer.
- B. Attachments to all thread rods:
1. After assemblies to be connected are placed, install nuts and washers for threaded rods as indicated on the Drawings.
 2. Draw nuts down tight, using practices specified for "snug tight" installation of bolts in steel to steel connections.

3.06 FIELD QUALITY CONTROL

- A. Provide field quality control over the Work of this Section as specified in Section 01_45_00 - Quality Control.
- B. Do not allow work described in this Section to be performed by individuals who do not hold the specified certifications and who have not completed the specified job site training.
- C. Manufacturer's services:
1. Before beginning installation, furnish adhesive manufacturer's technical representative to conduct on-site training in proper storage and handling of adhesive, drilling and cleaning of holes, and preparation and installation of reinforcing bars and all thread rods:
 - a. Provide notice of scheduled training to Engineer and to Special Inspector(s) not less than 10 working days before training occurs. Engineer and Special Inspector may attend training sessions.
 2. Submit record, signed by the manufacturer's technical representative, listing Contractor's personnel who completed the training. Only qualified personnel who have completed manufacturer's on-site training shall perform installations.
- D. Field inspections and testing:
1. Hole drilling and preparation.
 2. Results: Submit records of inspections and testing to Engineer by electronic copies within 24 hours after completion.

3.07 FIELD QUALITY ASSURANCE

- A. Provide field quality assurance over the Work of this Section as specified in Section 01_45_00 - Quality Control.

- B. Special inspections, special tests, and structural observation:
1. Provide as specified in Section 01_45_24 - Regulatory Quality Assurance.
 2. Frequency of inspections:
 - a. Unless otherwise indicated on the Drawings or in this Section, provide periodic special inspection as required by the Evaluation Report for the product installed.
 - b. Provide continuous inspection for the initial installation of each type and size of adhesive bonded reinforcing bar and all thread rod. Subsequent installations of the same anchor may be installed with periodic inspection as defined in subsequent paragraphs.
 - c. Provide continuous inspection of all drilling, cleaning and bonding activities for bars and rods installed in horizontal and upwardly inclined positions.
 3. Preparation:
 - a. Review Drawings and Specifications for the Work to be observed.
 - b. Review adhesive manufacturer's MPPI and recommended installation procedures.
 - c. Review Evaluation Report "Conditions of Use" and "Special Inspection" requirements.
 4. Inspection: Periodic:
 - a. Initial inspection. Provide an initial inspection for each combination of concrete and reinforcing bar strength or concrete strength and all thread rod material being installed. During initial inspection, observe the following for compliance with the installation requirements:
 - 1) Concrete: Class (minimum specified compressive strength) and thickness.
 - 2) Environment: Temperature conditions at work area, and moisture conditions of concrete and drilled hole.
 - 3) Holes: Locations, spacing, and edge distances; verification of drill bit compliance with requirements; cleaning equipment and procedures; cleanliness of hole. Before adhesive is placed, confirm that depth and preparation of holes conforms to the requirements of the Contract Documents, the MPPI, and the "conditions of use" listed in the Evaluation Report.
 - 4) Adhesive: Product manufacturer and name; lot number and expiration date; temperature of product at installation; installation procedure. Note initial set times observed during installation.
 - 5) Reinforcing bars and all thread rods: Material diameter and length; steel grade and/or strength; cleaning and preparation; cleanliness at insertion; minimum effective embedment provided.
 - b. Subsequent inspections: Subsequent installations of the same reinforcing bars or all thread rods may be performed without the presence of the special inspector, provided that:
 - 1) There is no change in personnel performing the installation, the general strength and characteristics of the concrete receiving the inserts, or the reinforcing bars and all thread rods being used.
 - 2) For ongoing installations, the special inspector visits the site at least once per day during each day of installation to observe the work for compliance with material requirements and installation procedures.

5. Inspection: Continuous:
 - a. Make observations as described under "Inspection - Periodic, Initial Inspection" during all drilling, cleaning, and bonding activities for all bars and rods installed.
6. Records of inspections:
 - a. Provide a written record of each inspection using forms acceptable to the Engineer and to the Building Official.
 - b. Submit electronic copies of inspection reports to Engineer within 24 hours after completion of inspection.

END OF SECTION

SECTION 03_30_00

CAST-IN-PLACE-CONCRETE

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ATTACHMENT A - MENZEL FORMULA AND NOMOGRAPH

ATTACHMENT B - COARSENESS FACTOR CHART

ATTACHMENT C - COMBINED AGGREGATE GRADATION CHART

ATTACHMENT D - CONCRETE PLACEMENT CHECKLIST

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Cast-in-place concrete:
- B. The requirements of this Section will require advance planning for preparation and testing of trial batches. Review the mix design and testing requirements carefully, and schedule preparations and testing with sufficient time to complete tests, to obtain Engineer's review of mixes and testing results, and to complete revisions and re-testing if required.

1.02 REFERENCES

- A. American Concrete Institute (ACI):
 - 1. 212.3R - Report on Chemical Admixtures for Concrete.
 - 2. 302.1R - Guide to Concrete Floor and Slab Construction.
 - 3. 305R - Guide to Hot Weather Concreting.
 - 4. 306R - Guide to Cold Weather Concreting.
 - 5. 318 - Building Code Requirements for Structural Concrete and Commentary.
 - 6. 350 - Code Requirements for Environmental Engineering Concrete Structures and Commentary.
 - 7. Manual of Concrete Practice.
- B. ASTM International (ASTM):
 - 1. C29 - Standard Test Method for Bulk Density ("Unit Weight") and Voids in Aggregate.
 - 2. C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
 - 3. C33 - Standard Specification for Concrete Aggregates.
 - 4. C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
 - 5. C40 - Standard Test Method for Organic Impurities in Fine Aggregates for Concrete.
 - 6. C42 - Standard Test Method of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
 - 7. C88 - Standard Test Method of Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate.
 - 8. C94 - Standard Specification for Ready-Mixed Concrete.
 - 9. C114 - Standard Test Methods for Chemical Analysis of Hydraulic Cement.
 - 10. C117 - Standard Test Method for Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing.
 - 11. C123 - Standard Test Method for Lightweight Particles in Aggregate.
 - 12. C131 - Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
 - 13. C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - 14. C138 - Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
 - 15. C142 - Standard Test Method for Clay Lumps and Friable Particles in Aggregate.

16. C143 - Standard Test Method for Slump of Hydraulic-Cement Concrete.
17. C150 - Standard Specification for Portland Cement.
18. C156 - Standard Test Method for Water Loss from a Mortar Specimen Through Liquid Membrane-Forming Curing Compounds for Concrete.
19. C157 - Standard Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete.
20. C171 - Standard Specifications for Sheet Materials for Curing Concrete.
21. C172 - Standard Practice for Sampling Freshly Mixed Concrete.
22. C173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
23. C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
24. C293 - Standard Test Method for Flexural Strength of Concrete (Using Simple Beam With Center-Point Loading).
25. C295 - Standard Guide to Petrographic Examination of Aggregates for Concrete.
26. C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
27. C311 - Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use in Portland-Cement Concrete.
28. C469 - Standard Test Method for Static Modulus of Elasticity and Poisson's Ratio of Concrete in Compression.
29. C494 - Standard Specification for Chemical Admixtures for Concrete.
30. C595 - Standard Specification for Blended Hydraulic Cements.
31. C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
32. C702 - Standard Practice for Reducing Samples of Aggregate to Testing Size.
33. C856 - Standard Practice for Petrographic Examination of Hardened Concrete.
34. C989 - Standard Specification for Slag Cement for Use in Concrete and Mortars.
35. C1017 - Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
36. C1064 - Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.
37. C1218 - Standard Test Method for Water-Soluble Chloride in Mortar and Concrete.
38. C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures.
39. C1260 - Standard Test Method of Potential Alkali Reactivity of Aggregates (Mortar Bar Method).
40. C1293 - Standard Test Method for Determination of Length Change of Concrete due to Alkali-Silica Reaction.
41. C1567 - Standard Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Method).
42. C1602 - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete.
43. C1778 - Standard Guide for Reducing the Risk of Deleterious Alkali-Aggregate Reaction in Concrete.
44. D29 - Standard Practice for Determining Volatile and Nonvolatile Content of Cellulosics, Emulsions, Resin Solutions, Shellac, and Varnishes.
45. D75 - Standard Practice for Sampling Aggregates.

46. D2103 - Standard Specification for Polyethylene Film and Sheeting.
 47. D3665 - Standard Practice for Random Sampling of Construction Materials.
 48. D4791 - Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.
- C. National Ready-Mixed Concrete Association (NRMCA).
- D. NSF International (NSF):
1. 61 - Drinking Water System Components - Health Effects.

1.03 DEFINITIONS

- A. Alkali: The sum of sodium oxide and potassium oxide calculated as sodium oxide.
- B. Alkali load: Amount of alkalies contributed by the Portland cement in a concrete mixture, expressed in pounds per cubic yard (lb/yd³) and calculated by multiplying the Portland cement content of the concrete in lb/yd³ by the alkali content of the Portland cement, or the Portland cement portion of a blended cement, divided by 100.
- C. Architectural concrete: Concrete surfaces that will be exposed to view in the finished work:
1. For purposes of this Section, includes only those surfaces that receive paint or coatings.
 2. Exposed concrete surfaces in open basins, channels, and similar liquid containing structures: Surfaces will be considered exposed to view if located above the water line as defined in Section 03_35_29 - Tool Concrete Finishing.
 3. Exterior concrete surfaces with portions above and below grade: Surface will be considered exposed to view if located above the grade line as defined in Section 03_35_29 - Tool Concrete Finishing.
- D. Average daily temperature: Calculated by summing hourly measurements of air temperature in the shade at the face of the concrete and dividing that sum by 24. In calculating the sum of the temperatures recorded, any measurement less than 50 degrees Fahrenheit shall be recorded as 0 degrees Fahrenheit and included in the sum.
- E. Cementitious materials: Portland cement and supplementary cementitious materials.
- F. Class of concrete: Refers to a mix with characteristics, proportions, and constituents (including a specific combination of admixtures) as specified in this Section:
1. Any change in the source or characteristics of constituent materials, in the proportions of materials, or in the admixtures included in a mix shall be considered as creating a new and separate class of concrete.
 2. Any mix to be placed by pumping shall be considered as creating a new and separate class of concrete.
- G. Cold weather: Includes one or more of the following conditions:
1. Current air temperature is 45 degrees Fahrenheit and falling.

2. Air temperature during the first 24 hours after placement is expected to fall into the range of 45 degrees Fahrenheit to 40 degrees Fahrenheit.
 3. A period when, for more than 3 consecutive days, the following conditions exist:
 - a. The average daily air temperature drops below 40 degrees Fahrenheit.
 - b. The air temperature is not greater than 50 degrees Fahrenheit for more than one-half of any consecutive 24-hour period.
- H. Cold weather concreting: Operations for placing, finishing, curing, and protecting concrete during cold weather.
- I. Green concrete: Concrete that has not yet achieved 100 percent of the minimum specified compressive strength, f'_c , for that mix.
- J. Hairline crack: Crack with a crack width of less than 4 thousandths of an inch (0.004 inches).
- K. Hot weather: Any combination of ambient temperature, concrete temperature, relative humidity, wind speed, and solar radiation intensity that creates conditions that will evaporate water from a free concrete surface at a rate equal to or greater than 0.2 pounds per square foot per hour as determined by the Menzel Formula and nomograph published in ACI 305R and in this Section, Attachment A - Menzel Formula and Nomograph.
- L. Hot weather concreting: Operations for placing, finishing, curing, and protecting concrete during hot weather.
- M. Paste content: The total concrete volume minus the volume of aggregate, expressed as a percentage of total volume. Paste volume includes volume of cementitious materials, water, air, admixtures materials, and any fibers.
- N. Supplemental cementitious material: inorganic material such as fly ash, natural pozzolans, silica fume, or slag cement that reacts pozzolanically or hydraulically.

1.04 DELEGATED DESIGN

- A. Provide Delegated Design for the following Work, based on the requirements of this Section:
1. Concrete mix designs.

1.05 SUBMITTALS

- A. General:
1. Data for concrete mixes and mix constituents supplied to the Work shall be coordinated through a single supplier.
 2. A maximum of 2 mix designs will be reviewed by the Engineer for each class of concrete required.
 - a. Review of additional mix designs shall be at the expense of the Contractor.

- B. Product data:
1. Submit data completely describing products and demonstrating compliance with the requirements of this Section.
 2. Data for all products in the mix for each class of concrete shall be submitted concurrently with that mix design.
 3. Where products conforming to NSF-61 are required, submit evidence of testing and listing under NSF-61 for use in direct contact with potable water. Testing and listing shall be by a nationally recognized agency acceptable to the Engineer.
 4. Admixtures:
 - a. For each admixture included in concrete mixes, submit manufacturer's product data demonstrating compliance with standards specified.
 - b. If air entraining admixture requires test method other than ASTM C173 to accurately determine air content, make special note of requirements in submittal.
 5. Curing compound: Submit complete data on proposed compound.
- C. Design data:
1. Concrete mix designs:
 - a. Submit full details, including mix design calculations and plots, for concrete mixes proposed for use for each class of concrete.
 - b. Include mix design calculations of proportions by both weight and volume.
 - c. Determine and include the alkali load of the proposed mix.
 - d. Include information on correction of batching for varying moisture contents of fine aggregate.
 - e. Submit source quality test records with mix design submittal.
 - f. Provide calculations demonstrating that the mixes proposed provide the required average compression strength of concrete (f_{cr}) based on source quality test records.
 - g. For each Class A mix design submitted, plot the mix design Attachment B - Coarseness Factor Chart and submit.
 - h. For each Class A mix design submitted, plot the combined aggregate gradation on the chart Attachment C - Combined Aggregate Gradation Chart and submit.
- D. Concrete mixes - Trial batches:
1. Drying shrinkage test results:
 - a. Submit results of testing.
 - b. Submit test specimens from drying shrinkage tests for trial batches:
 - 1) Submit all specimens from each mix accepted by Engineer.
 - 2) Using indelible marker, clearly label each specimen with concrete class, trial batch mix designator, and specimen number.
 2. Compression strength test results:
 - a. Submit results of testing. Provide data for each cylinder tested.
 - b. Submit data indicating trial batch mix designator, slump, and specimen number for each test cylinder.
 - c. Submit test specimens from compression strength tests for trial batches:
 - 1) Submit 2 cylinders from each mix accepted by Engineer.
 - 2) Using indelible marker, clearly label each cylinder with concrete class, trial batch number, and specimen number.

3. If there is any change in suppliers or in quality of concrete mix constituents, submit new test data.
- E. Test reports:
1. Dated not more than 24 months prior to the date of submittal.
 2. Aggregate:
 - a. Submit certified copies of commercial laboratory tests proposed for use in concrete.
 - b. Sieve analyses:
 - 1) During construction, submit sieve analyses of coarse, intermediate, fine, and combined aggregates used any time there is a change in supplier, or a significant change in the character and/or grading of materials, and when requested by the Engineer.
 - c. Aggregates - coarse:
 - 1) Physical properties:
 - a) Sieve analysis.
 - b) Percentage of particles having flat and/or elongated characteristics.
 - c) Abrasion loss.
 - d) Soundness.
 - 2) Deleterious substances:
 - a) Clay lumps and friable particles content.
 - b) Materials finer than 200 sieve (percentage).
 - c) Shale and chert content.
 - d) Coal and lignite content.
 - 3) Alkali reactivity.
 - 4) Petrographic analysis.
 - d. Aggregates - Intermediate:
 - 1) Physical properties:
 - a) Sieve analysis.
 - b) Percentage of particles having flat and/or elongated characteristics.
 - c) Abrasion loss.
 - d) Soundness.
 - 2) Deleterious substances:
 - a) Clay lumps and friable particles content.
 - b) Chert and shale content.
 - c) Coal and lignite content.
 - d) Materials finer than No. 200 sieve.
 - 3) Alkali reactivity.
 - 4) Petrographic analysis.
 - e. Aggregates - Fine:
 - 1) Physical properties:
 - a) Sieve analysis and fineness modulus.
 - b) Soundness.
 - 2) Deleterious substances:
 - a) Clay lumps and friable particles (percentage).
 - b) Materials finer than No. 200 sieve (percentage).
 - c) Coal and lignite (percentage).
 - d) Shale and chert.
 - e) Organic impurities ("Color" as determined by ASTM C40).

- 3) Alkali reactivity.
 - 4) Petrographic analysis.
- f. Aggregates - Combined:
 - 1) Test combined gradation for the following sieve sizes: 1.5 inches, 1 inch, 3/4 inch, 1/2 inch, 3/8 inch, Number 4, Number 8, Number 16, Number 30, Number 100, Number 200.
 - 2) Bulk density in accordance with ASTM C29.
 - 3) Void content in accordance with ASTM C29.
 - 4) Submit at:
 - a) Initial mixture design submittal,
 - b) Intervals of not more than 4 weeks,
 - c) Any time there is a change in character or grading of constituent materials,
 - d) When requested by the Engineer.
- 3. Cement:
 - a. Mill tests, including alkali content measured as equivalent alkalis, for each shipment of cement included in the Work.
 - 1) During construction, submit mill certificates for cement being used at intervals of not more than 90 days, any time there is a change in supplier or a significant change in the character of the materials, and when requested by the Engineer.
- 4. Supplemental cementitious material:
 - a. Fly ash: Identify source and provide testing results to demonstrate compliance with requirements of ASTM C618 and this Section.
 - 1) Include supplier's report certifying the total alkali content of the material, expressed as equivalent percentage of sodium oxide (Na_2Oe).
 - b. Slag cement: Identify source and provide testing results to demonstrate compliance with requirements of ASTM C989 and this Section.
 - c. Silica fume: Identify source and provide testing results to demonstrate compliance with requirements of ASTM C1240 and this Section.
- F. Certificates:
 - 1. Current NRMCA certification for all plants and trucks that will be used to supply concrete.
- G. Source quality control submittals:
 - 1. Truck batch tickets for each load of concrete delivered to the site, whether accepted or rejected.
 - 2. Concrete supplier's quality control plan. Include the following elements, at a minimum:
 - a. Names and qualifications of key quality control personnel:
 - 1) Quality control manager.
 - 2) Testing and inspection personnel.
 - b. Names and qualifications of testing laboratories:
 - 1) Each laboratory shall hold current accreditation from the AASHTO Accreditation Program, or other accreditation program acceptable to the Engineer, for each test performed.
 - c. Example forms for: inspection reports, certificates of compliance, and test results.

- d. Quality control procedures: Method and frequency of performing each procedure, including inspections and materials testing. At a minimum, the plan shall include:
 - 1) Daily testing of aggregate gradation.
 - 2) Monthly testing of cement quality.
 - 3) Monthly testing of fly ash quality.
 - e. Procedures to control quality characteristics, including standard procedures to address properties outside the specified operating limits, and example reports to document non-conformances and corrective actions taken. Include procedure for notifying Contractor and Engineer of non-conformances.
 - f. Procedures for verifying that:
 - 1) Materials are properly stored during concrete batching operations.
 - 2) Batch plants have the ability to maintain concrete consistency during periods of extreme heat and of low temperatures.
 - 3) Admixtures are dispensed in the correct dosages within the accuracy requirements specified.
 - 4) Delivery trucks have a valid NRMCA certification card.
 - g. Procedures for verifying that weighmaster certificate for each load of concrete shows:
 - 1) Cement and supplementary materials are from sources designated in the approved submittals.
 - 2) Concrete as-batched complies with the constituent weights designated in the approved submittals.
 - 3) Corrections for aggregate moisture are being correctly applied.
 - 4) Any mix water withheld from the batch.
 - h. Procedures for visually inspecting concrete during discharge.
- H. Field quality control submittals:
- 1. Contractor's notifications of readiness for concrete placement.
 - 2. Contractor's reports of field quality control testing.
 - a. Include with each report the concrete batch ticket number and identification numbers for associated cylinders used for compressive strength testing.
 - b. Testing results for slump, temperature, unit weight, and air entrainment.
 - c. Testing results for compressive strength at 7 and 28 days, and for any compressive strength tests after 28 days.
 - d. Note on batch ticket the amount of water that was withheld and the maximum amount that can be added on site as "Max add water." Record on the batch ticket the volume of water actually added at site.
 - e. Note on the batch ticket the concrete mix classification as defined in Table 3 of this Section.
- I. Special procedure submittals:
- 1. Sequence of concrete placing:
 - a. Submit proposed sequence of placing concrete showing proposed beginning and ending of individual placements. Submittal shall include plans sections and details to address all pours.
 - 2. Cold weather concreting plan.
 - 3. Hot weather concreting plan.

4. Repair of defective concrete: Submit mix design for repair materials to be used.

1.06 QUALITY ASSURANCE

- A. Pre-installation meetings:
 1. Schedule and conduct pre-installation meeting at least 10 days prior to batching and placing of concrete:
 - a. Provide additional meetings if necessary, to discuss specific concrete submittals, mixes, or placing and curing conditions.
 - b. Notify Engineer of location and time of each conference.
 2. Required attendees:
 - a. Contractor including Contractor's superintendent and key personnel.
 - b. Concrete supplier.
 - c. Technical representative(s) of supplier(s) of concrete admixtures.
 - d. Subcontractor(s) providing pumping, placing, finishing, and curing.
 - e. Subcontractor(s) providing embedded items (structural embedded plates, electrical conduit).
 - f. Sampling and testing personnel.
 - g. Engineer.
 - h. On-site inspectors representing Engineer.
 - i. Other persons deemed by the Engineer and the Contractor to be critical to the quality and efficiency of the Work.
 3. Agenda:
 - a. Review of requirements of Drawings and Specifications.
 - b. Project and product safety requirements.
 - c. Discussion of points of interface and coordination between various trades or products to be used in the Work.
 - d. Contractor's schedule for cast-in-place concrete work.
 - e. Mix designs, mix tests, and submittals.
 - f. Admixture types, dosing, performance, requirements for monitoring, and limits on dosing or re-dosing at the site.
 - g. Placement and consolidation methods, techniques, and equipment and the effects of those methods on form pressures.
 - h. Slump and limits on placing time or conditions to maintain placeability.
 - 1) Field adjustment of slump and air content.
 - i. Procedures for finishing, curing, and retention of moisture during these operations.
 - j. Procedures and protection for hot and cold weather conditions.
 - k. Requirements and coordination for inspections.
 - 1) Responsibility for test specimen curing and storage.
 - 2) Distribution of test reports.
 - l. Other Specification requirements requiring coordination between parties to the work.
 4. Prepare and submit minutes of the pre-installation meeting as specified in Section 01_31_19 - Project Meetings.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Packing and shipping:
 - 1. Deliver, store, and handle concrete materials in manner that prevents damage and inclusion of foreign substances.
 - 2. Deliver and store packaged materials in original containers until ready for use.
 - 3. Deliver aggregate to mixing site and handle in such manner that variations in moisture content will not interfere with steady production of concrete of specified degree of uniformity and slump.
 - 4. For Class M concrete:
 - a. Store coarse and fine aggregate in covered area. Shade aggregates to prevent heating by direct sunlight.
 - b. Store cementitious materials in covered, shaded silos to prevent heating by direct sunlight.
- B. Acceptance at site:
 - 1. Reject material containers or materials showing evidence of water or other damage.
 - 2. Concrete mixes: Do not accept or incorporate into the Work concrete mixes that do not comply with the specified requirements for water content, slump, temperature, and air content.

1.08 PROJECT CONDITIONS

- A. Cold weather concreting: During periods of cold weather as defined in this Section, implement cold weather concreting procedures in this Section.
- B. Hot weather concreting: During periods of hot weather as defined in this Section, implement hot weather concreting procedures in this Section.

1.09 SEQUENCING AND SCHEDULING

- A. Schedule placing of concrete in a manner that completes all placing operations from one construction, contraction, or expansion joint to another construction, contraction, or expansion joint.
- B. Joints at each end of the placement shall be as indicated on the Drawings, or as identified and accepted in advance by the Engineer.

PART 2 PRODUCTS

2.01 DESIGN AND PERFORMANCE CRITERIA

- A. It is the intent of this Section to secure, for every part of the Work, concrete with a homogeneous mixture, that, when hardened, will have required strength, watertightness, and durability.
- B. It is the intent of this Section to procure a workable, low-shrinkage concrete mix that maximizes aggregate content and minimizes paste content.

C. Performance requirements:

1. General:

- a. Except as otherwise specified, provide concrete composed of Portland cement, supplemental cementitious materials, aggregate, admixtures and water, proportioned and mixed to produce a plastic, workable mixture in accordance with requirements of this Section, and suitable to specific conditions of placement.
 - b. Proportion aggregates to produce an optimized gradation of aggregate that combines fine, intermediate, and coarse aggregate in well-graded proportions that maximizes the aggregate content and minimizes the paste content of the mix. The gradation should maximize long-term durability and strength of the concrete mixture.
 - c. Durability requirements will be deemed to be satisfied when:
 - 1) The mixture is proportioned with a well-graded combined aggregate.
 - 2) The specified water-cement ratio is satisfied.
 - 3) The concrete contains the specified range of air content.
 - 4) The maximum specified paste content is satisfied.
 - 5) The requirements of ASTM C1778 to reduce the risk of deleterious alkali-aggregate reactions are satisfied. Reduce alkali loading of concrete, provide minimum supplemental cementitious material content, or both as required:
 - a) Size and Exposure Conditions (ASTM C1778, Table 2):
Concrete exposed to humid air, buried or immersed .
 - b) Structure Class (ASTM C 1778, Table 3): Class SC 4.
 - d. Proportion materials in a manner that will secure the lowest cement content, water-cementitious materials ratio, and paste volume that is consistent with good workability, that provides a plastic and cohesive mixture, and that provides a slump that is within the specified range.
 - e. Construction and expansion joints have been positioned in structures as indicated on the Drawings, and curing methods have been specified, for purpose of to reduce the number and size of cracks, resulting from normal expansion and contraction expected from the concrete mixes specified.
 - f. Remove and replace, or repair as specified in this Section, non-conforming work and surfaces with cracks, voids and honeycombs, or surface wetness.
2. Workmanship and methods: Provide concrete work, including detailing of reinforcing, conforming with best standard practices and as set forth in ACI 318, ACI 350, and the ACI Manual of Concrete Practice.

2.02 MATERIALS - GENERAL

A. Water and ice:

1. Water for concrete mixes, for washing aggregate, and for curing concrete: Clean and free from oil and deleterious amounts of alkali, acid, organic matter, or other substances from a municipal potable water source.
2. Comply with the optional chemical limits of ASTM C1602.
3. Do not use water from concrete production operations, or combined water from concrete production operations as defined in ASTM C1602.

2.03 MATERIALS - CONCRETE MIX CONSTITUENTS

- A. Water and ice:
 - 1. As specified in the preceding paragraphs.
- B. Cementitious materials:
 - 1. Portland cement:
 - a. In accordance with ASTM C150.
 - 1) Type II
 - b. Single source: To provide uniformity of appearance, for each structure use only one source, type, and brand of Portland cement for walls and slabs that will be exposed in the finished work.
 - 1) Confirm adequate supply of cement over duration of project before making trial batches or beginning concrete placements.
 - c. Cement for finishing: Provide cement from same source and of same type as concrete to be finished or repaired.
 - d. In accordance with NSF 61.
- C. Supplementary cementitious materials:
 - 1. Fly ash:
 - a. Class C or Class F fly ash in accordance with the requirements of ASTM C618, except as modified in this Section.
 - 1) Class C, may be used in concrete made with Type II Portland cement.
 - 2) Class F required if used in concrete mixes containing aggregates classified as potentially reactive based on ASTM C1293 or ASTM C1260.
 - a) CaO content: Less than 18 percent.
 - b. Loss on ignition: Not exceeding 3 percent.
 - c. In accordance with NSF 61.
 - d. Replace Portland cement at ratio of 1.0 pound fly ash for each pound of cement, up to minimum and maximum replacement as specified in "Requirements for Mix Proportioning."
 - 2. Slag cement:
 - a. Grade 80, 100, or 120 in accordance with ASTM C989, except as modified below:
 - 1) Fineness: Amount retained on a No. 325 sieve: 20 percent maximum.
 - 2) Total alkalis $\text{Na}_2\text{O} + 0.658 \text{K}_2\text{O}$:
 - a) Minimum: 0.60 percent.
 - b) Maximum: 0.90 percent.
 - b. In accordance with NSF 61.
 - 3. Silica fume:
 - a. Provide silica fume in accordance with ASTM C1240, except as modified below:
 - 1) Moisture content: 3 percent maximum.
 - 2) Loss on ignition: 6 percent maximum.
 - 3) Reactivity with cement alkalis: 80 percent minimum.
 - 4) Sulfate resistance: maximum 0.10 percent expansion at 6 months.
 - b. In accordance with NSF 61.

D. Admixtures:

1. General:

- a. Do not include admixtures, other than those specified, unless written acceptance has been obtained from the Engineer during submittal of mix designs.
- b. Admixtures shall be compatible with concrete constituents and with other admixtures.
 - 1) All admixtures in a given mix shall be products of the same manufacturer to ensure compatibility.
 - 2) Admixture manufacturers: One of the following, or equal:
 - a) Master Builders Solutions.
 - b) Euclid Chemical.
 - c) GCP Applied Technologies (formerly W.R. Grace).
 - d) Sika Corp.
- c. Admixtures shall be tested and listed under NSF-61 for use in direct contact with potable water.
- d. Do not use admixtures containing chlorides, calculated as chloride ion, in excess of 0.5 percent by weight of cement.
- e. Use in accordance with manufacturer's recommendations. Add each admixture to concrete mix separately.
- f. Admixtures used shall be the same products used in concrete trial batches, or the same products used in concrete represented by submitted field test records.

2. Air entraining admixture (AEA):

- a. In accordance with ASTM C260, and dosed to provide entrained air percentages specified in this Section.
- b. Provides entrained air as bubbles, evenly dispersed at the time of placement and during curing.

3. Water reducing admixture(WRA):

- a. May be used at the Contractor's option.
- b. Conforming to ASTM C494, Type A (water-reducing).
 - 1) ASTM C494, Type D (water-reducing and retarding) may be used during periods of hot weather with prior acceptance by the Engineer.
- c. Not containing air-entraining agents.
- d. Liquid form before adding to the concrete mix.

4. High-range, water-reducing admixture ("superplasticizer") (HRWR):

- a. In accordance with ASTM C494, Type F (high-range, water-reducing) or ASTM C1017, Type I (plasticizing).
 - 1) ASTM C494, Type G (high-range, water-reducing and retarding) or ASTM C1017, Type 2 (plasticizing and retarding) may be used during periods of hot weather with prior acceptance by the Engineer.
- b. Producing non-segregating, plasticized concrete with little bleeding and the physical characteristics of low water/cement ratio concrete.
- c. Admixture shall maintain treated concrete in a plasticized state for not less than 1 hour.

5. Shrinkage reducing admixture (SRA):

- a. May be used at Contractor's option:
 - 1) Provide shrinkage reducing admixture in sufficient dosage so as to produce shrinkage within the limits specified.
- b. Not containing expansive agents.
- c. In accordance with ASTM C494, Type S (specific performance).

- d. One of the following, or equal:
 - 1) Master Builders Solutions: SRA Series.
 - 2) Euclid Chemical: Eucon SRA Series.
 - 3) GCP Applied Technologies: Eclipse Series.
 - 6. Set-controlling admixtures:
 - a. Shall not be used without prior acceptance from Engineer.
 - b. Retarders, when permitted:
 - 1) In accordance with ASTM C494, Type B, D or G.
 - c. Accelerating admixtures: not permitted.
- E. Coloring admixtures:
 - 1. Conduit encasement coloring agent:
 - a. Red color concrete used for encasement of electrical ducts, conduits, and similar type items.
 - b. Manufacturers: One of the following or equal:
 - 1) Davis Co., #100 Utility Red.
 - 2) I. Reiss Co., Inc., equivalent product.
 - 3) Euclid Chemical Co., Increte Division, "Colorcrete Brick Red."
 - c. Conduit encasement concrete: Mix into each cubic yard of concrete 10 pounds of coloring agent.
- F. Aggregate:
 - 1. General:
 - a. Provide concrete aggregates that are sound, graded as specified, and free of deleterious material in excess of allowable amounts specified.
 - b. Provide aggregates to produce in place concrete with unit weight as follows:
 - 1) Normal weight concrete: Not less than 140 pounds per cubic foot.
 - c. Do not use aggregate made from recycled materials such as crushed and screened hydraulic-cement concrete, brick, and other construction materials.
 - d. Do not use aggregate recycled from fresh concrete returned to the batching facility.
 - e. In accordance with NSF 61.
 - 2. Alkali-silica reactivity:
 - a. Provide aggregate classified as aggregate-reactivity class of R0 in accordance with ASTM C1778 with expansion not greater than 0.10 percent at 14 days when tested in accordance with ASTM C1260, and not greater than 0.04 percent at one year when tested in accordance with ASTM C1293.
 - 3. Fine aggregate:
 - a. Material graded such that 95 to 100 percent of material passes the No. 4 (4.75 mm) sieve, when sampled in accordance with ASTM D75 and D3665, and tested in accordance with ASTM C136.
 - b. Provide fine aggregate consisting of clean, natural sand, or sand prepared from crushed stone or crushed gravel.

- c. In accordance with ASTM C33 requirements for grading, deleterious substances, soundness, and alkali reactivity, except as modified in the following paragraphs:
 - 1) Grading: For sieve sizes listed in ASTM C33 for fine aggregate, not more than 45 percent passing any sieve and retained on the next consecutive sieve.
 - 2) Deleterious substances: not in excess of the percentages by weight specified in Table 1 of this Section.

Table 1: Fine Aggregate, Limits on Deleterious Substances

Item	Test Method	Percent (maximum)
Materials finer than No. 200 sieve(2)	ASTM C117	3.00 ⁽²⁾
Clay lumps and friable particles	ASTM C142	1.00
Lightweight particles (SG < 2.40) • Chert or shale(1)	ASTM C123	1.00
	ASTM C295	1.00 ⁽¹⁾
Coal and lignite	ASTM C123	0.50
Notes: (1) ASTM C123 tests for particles in the sample having a specific gravity less than 2.40. ASTM C295 is used to identify which of those lightweight particles are chert, shale, or coal and lignite. If testing under ASTM C123 indicates a combined percentage of lightweight particles (sum of shale, chert, coal and lignite) not greater than 1.00, testing under ASTM C295 will not be required. (2) For manufactured sand, if material finer than the No. 200 sieve consists of crusher dust and the aggregate is essentially free of clay or shale, maximum percentage may be increased to 5.0 percent.		

- 3) Organic impurities: Free of injurious amounts of organic matter and producing a supernatant liquid with color not darker than “standard color” when tested in accordance with ASTM C40.
- 4) Soundness: In accordance with requirements of ASTM C33 when tested in accordance with ASTM C88 using sodium sulfite solution.
4. Intermediate aggregate:
 - a. Material graded such that 90 to 100 percent of material passes the 3/8 inch sieve, and not more than 5 percent of material passes the No. 50 (300 µm) sieve, when sampled in accordance with ASTM D75 and D3665, and tested in accordance with ASTM C136.
 - b. Requirements for maximum percentage of impurities, abrasion loss, and soundness: As specified for coarse aggregate.
5. Coarse aggregate:
 - a. Materials graded such that not more than 10 percent of material passes the 3/8-inch sieve, when sampled in accordance with ASTM D75 and D3665, and tested in accordance with ASTM C136.
 - b. Consisting of gravel, crushed gravel, crushed stone, or a combination of these materials having clean, hard, durable particles free from calcareous coatings, organic matter, or other deleterious substances.

- c. Conforming to the requirements of ASTM C33, Class 4S for physical properties, deleterious substances, and alkali reactivity, except as modified in the following paragraphs:
 - 1) Grading:
 - a) Size number as specified in ASTM C33, and as indicated in Table 3 of this Section, except as otherwise specified or accepted by the Engineer.
 - b) Weights of flat or elongated particles (particles having a length greater than 3 times average width or thickness) not exceeding 15 percent when tested in accordance with ASTM D4791.
 - 2) Deleterious substances: Not in excess of the percentages by weight specified in Table 2 of this Section and having total of all deleterious substances exceeding 2 percent.

Table 2: Coarse Aggregate, Limits on Impurities		
Item	Test Method	Percent (maximum)
Clay lumps and friable particles	ASTM C142	0.50
Lightweight particles (SG < 2.40) • Chert or shale(1)	ASTM C123	1.25
	ASTM C295	1.00 ⁽¹⁾
Materials finer than No. 200 sieve	ASTM C117	0.50 ⁽²⁾
Coal and lignite	ASTM C123	0.25
Notes: (1) ASTM C123 tests for particles in the sample having a specific gravity less than 2.40. ASTM C295 is used to identify which of those lightweight particles are chert, shale, or coal and lignite. If testing under ASTM C123 indicates a combined percentage (sum of shale, chert, coal and lignite) not greater than 1.25, testing under ASTM C295 will not be required. (2) When material finer than No. 200 sieve consists of crusher dust, maximum percentage may be increased to 1.00 percent. When mix design complies with provisions of ASTM C33, Table 4, footnote C, the maximum percentage may be increased in accordance with the equation in footnote C, up to a maximum of 1.5 percent.		

- 3) Abrasion loss: Loss not greater than 45 percent after 500 revolutions when tested in accordance with ASTM C131.
- 4) Soundness: Loss not greater than 10 percent when tested in accordance with ASTM C88 using sodium sulfate solution.

2.04 MATERIALS FOR PLACING, CURING AND FINISHING

- A. General:
 1. Materials shall be compatible with concrete and with other materials.
 2. Materials for placing, curing and finishing concrete that will be in contact with potable water:
 - a. Non-toxic and shall not impart taste or odor to the water.
 - b. Listed under NSF-61 for use in contact with potable water.
- B. Cement grout:
 1. Use: For spreading over surface of construction and cold joints in concrete before placing additional concrete above those joints.

2. As specified in Section 03_60_00 - Grouting.
- C. Concrete sealer:
1. As specified in Section 03_35_29 - Tooled Concrete Finishing.
 2. Not for use in water-containment structures.
- D. Evaporation retardant:
1. Tested and listed under NSF-61 for use direct contact with potable water.
 2. Use: For mitigating surface moisture evaporation from freshly placed concrete during rapid drying conditions. Placed after screeding.
 3. Waterborne, monomolecular, spray-applied compound, with fugitive dye to indicate coverage.
 4. Manufacturers: One of the following or equal:
 - a. Master Builders Solutions, MasterKure ER 50.
 - b. Euclid Chemical Co., Eucobar.
- E. Nonslip abrasive:
1. Aluminum oxide abrasive size 8/16, having structure of hard aggregate that is, homogenous, nonglazing, rustproof, and unaffected by freezing, moisture, or cleaning compounds.
 2. Manufacturers: One of the following or equal:
 - a. Exolon Co.
 - b. Abrasive Materials, Inc.
 - c. "Non-Slip Aggregate", Euclid Chemical Co.
- F. Plastic membrane for curing:
1. Polyethylene film: In accordance with ASTM C171.
 2. Properties:
 - a. Color: White.
 - b. Thickness: Nominal thickness of polyethylene film shall not be less than 0.0040 inches when measured in accordance with ASTM D2103. Thickness of polyethylene film at any point shall not be less than 0.0030 inches.
 - c. Loss of moisture: Not exceed 0.055 grams per square centimeter of surface when tested in accordance with ASTM C156.
- G. Sprayed membrane curing compound:
1. Tested and listed under NSF-61 for use direct contact with potable water.
 2. Combination curing and sealing products ("cure and seal") will not be permitted.
 3. Properties:
 - a. Clear type with fugitive dye conforming with ASTM C309, Type 1D and containing no wax, paraffin, or oils.
 - b. For concrete placed or cured during hot weather, curing compound shall be as specified, except that:
 - 1) It shall include a white, reflective fugitive dye.
 - 2) Moisture loss during a 72-hour period shall not exceed 9 pounds per cubic yard when tested in accordance with ASTM C156.
- H. Surface-applied sealing system:
1. Tested and listed under NSF-61 for use direct contact with potable water.

2. Manufacturers: One of the following or equal:
 - a. Euclid Chemical Co., Vandex Super.
 - b. Kryton International, Inc., Krystol T1.
 - c. Xypex Chemical Corp., Xypex Concentrate.
3. Where surface-applied sealing system is placed over concrete containing permeability reducing admixture for concrete exposed to hydrostatic conditions (PRAH), provide products of same manufacturer providing the admixture.

2.05 EQUIPMENT

- A. General:
 1. Provide adequate equipment and facilities for accurate measurement and control of materials and for readily changing proportions of material into mixers.
- B. Batching equipment, or batch plant.
 1. Capable of controlling delivery of all material to mixer within 1 percent by weight of individual material.
- C. Mixing equipment:
 1. Mixers may be of stationary plant, paver, or truck mixer type, as appropriate to the Work.
 2. Capable of combining aggregates, water, and cementitious materials, and admixtures within specified time into a thoroughly mixed and uniform mass, and of discharging the mixture without segregation.
 - a. Maintain concrete mixing equipment in good working order, and operate at loads, speeds, and timing recommended by manufacturer or as specified.
 - b. Proportion cementitious materials and aggregate by weight.
 3. If bulk cementitious materials are used, weigh them on separate visible scale which will accurately register scale load at any stage of weighing operation from zero to full capacity.
 4. Prevent cementitious materials from coming into contact with aggregate or with water until materials are in mixer ready for complete mixing with all mixing water.
 5. Procedure of mixing cementitious materials with sand or with sand and coarse aggregate for delivery to project site, for final mixing and addition of mixing water will not be permitted.
 6. Retempering of concrete will not be permitted.
 7. Discharge entire batch before recharging.
 8. Volume of mixed material per batch: Not exceed manufacturer's rated capacity of mixer.
 9. Equip each mixer with device for accurately measuring and indicating quantity of water entering concrete, and operating mechanism such that leakage will not occur when valves are closed.
 10. Equip each mixer with device for automatically measuring, indicating, and controlling time required for mixing:
 - a. Interlock device to prevent discharge of concrete from mixer before expiration of mixing period.
 11. Transit-mixed concrete:
 - a. Mix and deliver in accordance with ASTM C94.

- b. Total elapsed time between addition of water at batch plant and discharging completed mix:
 - c. Not to exceed 90 minutes.
 - d. Elapsed time at project site shall not exceed 30 minutes.
 - e. Under conditions contributing to quick setting, total elapsed time permitted may be reduced by the Engineer.
 - f. Equip each truck mixer with device interlocked to prevent discharge of concrete from drum before required number of turns and furnish device that is capable of counting number of revolutions of drum.
12. Continuously revolve drum after it is once started until it has completely discharged its batch:
- a. Do not add water until drum has started revolving.
 - b. Right is reserved to increase required minimum number of revolutions or to decrease designated maximum number of revolutions allowed, if necessary, to obtain satisfactory mixing. The Contractor will not be entitled to additional compensation because of such increase or decrease.
- D. Other types of mixers: For other types of mixers, mixing shall be as follows:
- 1. Mix concrete until there is uniform distribution of materials, and discharge mixer completely before recharging.
 - 2. Neither speed nor volume loading of mixer shall exceed manufacturer's recommendations.
 - 3. Continue mixing for minimum of 1-1/2 minutes after all materials are in drum, and for batches larger than 1 cubic yard increase minimum mixing time 15 seconds for each additional cubic yard or fraction thereof.

2.06 CONCRETE MIXES

- A. General:
- 1. Develop and provide mix design for each Concrete Class listed in Table 3 of this Section.
 - 2. Select and proportion mixes and document properties using one of the two methods that follow. Procedures and requirements for use of each alternative are specified in subsequent paragraphs of this Section:
 - a. Field experience method.
 - b. Trial batch method.
 - 3. Organize and submit mix designs with data on all constituent materials and products for that mix, for Engineer's review.
 - 4. Do not place concrete until the mix design for that Concrete Class has been accepted by Engineer.
 - 5. After acceptance, do not modify accepted mixes or provide new mixes without Engineer's prior review and acceptance of the proposed alternative:
 - a. Exception: At all times, adjust batching of water to compensate for free moisture content of the fine aggregate used.
 - b. For any change to approved mixes, Engineer may require new trial batching and testing program as specified in this Section before acceptance and use.
 - c. For any change to approved mixes, make modifications within limits set forth in this Section.
 - d. If there is change in source or quality of any constituent of the concrete class or mix, the revised mix will be considered a new class of concrete

- and shall require full re-submittal of all data describing mix constituents, design, and testing.
6. Material sampling, mix designs, trial batch preparation and testing, modifications to mix designs, and any re-testing required to satisfy the requirements of this Section or to obtain satisfactory performance shall be at Contractor's expense and shall not be considered cause for delay.
- B. Measurements of materials:
1. Measure materials by weighing, except as otherwise specified or where other methods are specifically authorized in writing by the Engineer.
 2. Furnish apparatus for weighing aggregates and cementitious materials that is suitably designed and constructed for this purpose.
 3. Accuracy of weighing devices: Furnish devices that have capability of providing successive quantities of individual material that can be measured to within 1 percent of desired amount of that material.
 4. Measuring or weighing devices: Subject to review by the Engineer. Shall bear valid seal of the Sealer of Weights and Measures having jurisdiction.
 5. Weighing cementitious materials:
 - a. Weigh cementitious materials separately.
 - b. Cement in unbroken standard packages (sacks): Need not be weighed.
 - c. Weigh bulk cementitious materials and fractional packages.
 6. Measure mixing water by volume or by weight.
- C. Requirements for mix proportioning:
1. Develop and provide mixes that:
 - a. Can be readily worked into corners and angles of forms and around reinforcement, without excessive vibration, and without permitting materials to segregate or free water to collect on surface.
 - b. Prevent unnecessary or haphazard changes in the consistency of the concrete supplied.
 2. Constituent materials:
 - a. Provide concrete mixes composed of Portland cement, blended aggregates, admixtures and water.
 - 1) Admixtures required for each concrete class are indicated in Table 3 of this Section. Admixtures not specifically required by that table for a specific Concrete Class are optional and may be included at the discretion of the Contractor based on Contractor's planned means and methods of construction.
 - b. In no case shall returned fresh concrete or its constituents be incorporated into concrete batched for the Work.
 3. Minimum specified compressive strength:
 - a. Minimum specified compressive strength is designated at 28 days, unless otherwise indicated in Table 3 of this Section.
 - b. For locations where the placed concrete is adequately protected and is not subjected to loads for an extended period during construction, the Contractor may request that the period for achieving the minimum specified compressive strength be extended to 56 days. If accepted by the Engineer, provide mixes that achieve at least 75 percent of their minimum specified compressive strength after 28 days.

4. Proportions and consistency:
 - a. Ratio of water to cementitious materials, and cementitious materials content:
 - 1) Conform to maximum and minimum cementitious material content requirements specified in Table 3 of this Section.
 - 2) Cementitious materials content: Consisting of Portland cement as indicated in Table 3 of this Section, plus supplemental cementitious materials if aggregate testing indicates potentially reactive aggregates:
 - a) Fly ash content:
 - (1) Minimum: 15 percent of the total weight of cementitious materials.
 - (2) Maximum: 25 percent of the total weight of cementitious materials.
 - b) Slag cement content:
 - (1) Minimum: 20 percent of the total weight of cementitious materials.
 - (2) Maximum: 30 of the total weight of cementitious materials.
 - c) Silica fume content:
 - (1) Minimum: 4 percent of the total weight of cementitious materials.
 - (2) Maximum: 10 of the total weight of cementitious materials.
 - b. Aggregate size and content:
 - 1) Blend aggregates to produce an optimized gradation that combines well-graded coarse, intermediate, and fine aggregates in proportions that maximize the aggregate content of the mix, and that minimize the cement paste content of the mix.
 - a) Percentage of individual fractions of the combined aggregate gradation retained on individual sieve sizes: Within the range shown in Attachment C - Combined Aggregate Gradation Chart ("Tarantula Curve").
 - b) Sum of the percentages of individual fractions retained on the No. 8, No. 16, and No. 30 sieves: Greater than 20 percent.
 - c) Sum of the percentages of individual fractions retained on the No. 30, No. 50, No. 100, and No. 200 sieves: Within the range of 25 percent to 40 percent.
 - c. Determine bulk density and void content of the combined gradation of aggregates in accordance with ASTM C29. Results for combined aggregates shall not be the summation of results of testing of the individual gradations.
 - 1) Sample the combined aggregate from a flowing aggregate stream or conveyor in accordance with ASTM D75. Take care to ensure that the sample is representative of the proportions of the combined aggregate of the proposed mix.
 - 2) Reduce sample of combined aggregate to test sample size in accordance with ASTM C702, Method A - mechanical splitter or Method B - quartering.
 - 3) Perform bulk density test of combined aggregate in accordance with ASTM C29, Procedure A - rodding.
 - 4) Determine void content of the combined aggregate in accordance with ASTM C29, Procedure A - rodding. Specific gravity of the

combined aggregate shall be determined in accordance with ASTM C136.

- d. Paste content: Limited to the following:
 - 1) Class A mixes without air entrainment: Maximum 28 percent measured by volume.
 - 2) Class A mixes with air entrainment: Maximum 28 percent measured by volume plus the target air content.
 - 3) Paste content shall be limited to 175 percent of the void content of the combined aggregate gradation determined by ASTM C29.
- e. Total water content:
 - 1) Not exceeding the water to cementitious material ratio specified in Table 3 of this Section.
 - 2) Not exceeding 245 pounds of water per cubic yard of concrete for Class A mix.
- f. Coarseness/workability (Shilstone Method):
 - 1) Proportion mixes to fall into the "Optimal" zone (Zone II) when plotted on the Coarseness Factor Chart ("Coarseness Factor" versus "Workability Factor") included as Attachment B - Coarseness Factor Chart to this Section. Provide plot for each Class A mix to be used in the Work.
 - 2) Coarseness factor (CF) for each mix shall be calculated as the percent of the combined aggregate gradation retained on the 3/8 inch sieve, divided by the percent of the combined aggregate gradation retained on the Number 8 sieve, multiplied by 100: or:
$$CF = \frac{(\% \text{ retained on } 3/8" \text{ sieve})}{(\% \text{ retained on No. 8 sieve})} \times 100$$
 - 3) Workability factor (WF) for each mix shall be the percent of the combined aggregate gradation retained on the Number 8 sieve, adjusted for cement content in the mix.
 - a) Determine volume of total cementitious material in the mix.
 - b) For each 94 pounds of Portland cement content above 564 pounds per cubic yard, increase workability factor by 2.5 units.
 - c) For each 94 pounds of Portland cement below 564 pounds per cubic yard, decrease workability factor by 2.5 units.
 - d) Proportion adjustment factor by linear interpolation for each fraction of 94 pounds above or below the 564 pound basis.
 - e) Example:
650 pounds per cubic yard = 564 pounds + 86 pounds.
Adjustment = (86 lb / 94 lb) x 2.5 = + 2.28.

- D. Concrete Classes for use in the Work:
 - 1. Provide concrete classes listed in Table 3 of this Section.
 - 2. Provide normal weight concrete, having minimum weight of 140 pounds per cubic foot, unless otherwise noted.
 - 3. Pumped concrete:
 - a. Provide pumped concrete that complies with all requirements of this Section.
 - b. Mixes placed by pumping shall be considered a sub-class of each concrete class listed in Table 3 of this Section. Prepare and submit a separate mix design for each mix to be placed by pumping.

4. Class PM concrete: In addition to the requirements of Table 3 of this Section, conform to the following:
 - a. Minimum 28 day flexural strength: 650 psi when tested in accordance with ASTM C293.
 - b. Cementitious materials content: 75 percent Portland cement plus 25 percent Class F fly ash (by weight).
 - c. Aggregate:
 - 1) Minimum 55 percent coarse aggregate conforming to ASTM C33 size number 357 or size number 467.
 - 2) Substitute ASTM C33 size number 57 or size number 67 if mechanical paving equipment is not used.

Table 3: Concrete Classes									
Concrete Class ⁽¹⁾	Minimum Specified Compressive Strength at 28 days, f'c ⁽²⁾ (pounds per square inch)	Ratio of water to cementitious materials ⁽³⁾ (minimum - maximum).	Cementitious Materials Content (pounds per cubic yard of concrete by weight) ⁽⁴⁾	Cement Type	Maximum Chloride Content (percent by weight of cement)	Maximum Size of Coarse Aggregate (ASTM C33)	Air Entrainment (percent), (n/a : not applicable)	Admixtures required ^(4,5,6)	Slump Range (inches)
A	4,500	0.40 to 0.42	535 to 575	II	0.10	#57	6±1.5	AEA WRA PRAH	2 to 4
A-NA	4,500	0.40 to 0.45	535 to 575	II	0.10	#57	n/a	WRA PRAH	2 to 4
C	2,500	0.62 max.	min. 423	II	No limit	#57	6±1.5	AEA WRA	3 to 6
CE	3,000	0.62 max.	min 423	II	No limit	#8	5±1.5	AEA WRA	3 to 6
PM	5,000	0.40	535 to 575	II	0.15	#57	5+1.5	AEA WRA	3 to 6
M	4,500 at 56 days	0.40 to 0.42	535 to 575	II(MH)	0.10	#4	6±1.5	AEA WRA	2 to 4

Table 3: Concrete Classes									
Concrete Class ⁽¹⁾	Minimum Specified Compressive Strength at 28 days, f'c ⁽²⁾ (pounds per square inch)	Ratio of water to cementitious materials ⁽³⁾ (minimum - maximum).	Cementitious Materials Content (pounds per cubic yard of concrete by weight) ⁽⁴⁾	Cement Type	Maximum Chloride Content (percent by weight of cement)	Maximum Size of Coarse Aggregate (ASTM C33)	Air Entrainment (percent), (n/a : not applicable)	Admixtures required ^(4,5,6)	Slump Range (inches)
<u>Notes:</u> (1) Sub classes within major concrete classes are designated as follows: NA: Without air entrainment. (2) At locations where concrete will not be subjected to load from other elements of the structure or from Contractor's placing and/or backfilling operations, maximum time period for achievement of specified compressive strength may be extended to 56 days when accepted by the Engineer. (3) W/C Ratio = Ratio of water to cementitious materials (Portland cement plus supplemental cementitious material) by weight. Include weight of admixtures in the water content of the mix when the quantity of the admixtures exceeds 10 ounces per 100 pounds of cement. (4) Cementitious material includes Portland cement plus supplemental cementitious materials. If trial batch testing demonstrates that the required strength cannot be met at 28 or 56 days with the specified combined aggregate gradation and the paste content limits, cementitious material content may be increased with Engineer's approval if a shrinkage-reducing admixture (SRA) is included in the mix design.									

Table 3: Concrete Classes									
Concrete Class ⁽¹⁾	Minimum Specified Compressive Strength at 28 days, f'c ⁽²⁾ (pounds per square inch)	Ratio of water to cementitious materials ⁽³⁾ (minimum - maximum).	Cementitious Materials Content (pounds per cubic yard of concrete by weight) ⁽⁴⁾	Cement Type	Maximum Chloride Content (percent by weight of cement)	Maximum Size of Coarse Aggregate (ASTM C33)	Air Entrainment (percent), (n/a : not applicable)	Admixtures required ^(4,5,6)	Slump Range (inches)
(5) Admixtures are designated as follows: AEA: Air entraining admixture HRWR: High-range water-reducing admixture SRA: Shrinkage-reducing admixture. SFR: Synthetic fiber reinforcement. (6) At Contractor's option, each concrete class may include a high-range water reducing admixture (HRWR). Designate such mixes as the "class" specified followed by "SP" (e.g., A-SP, A-NA-SP, P-SP, etc.). Submit as separate mixes for review. Slump range after addition of HRWR: 4 to 6 inches.						WRA: Water-reducing admixture PRAH: Permeability-reducing admixture for concrete exposed to hydrostatic conditions.			

- E. Install Concrete Classes in accordance with the following requirements unless otherwise indicated on the Drawings.
1. Class A concrete: Structural concrete.
 - a. Use Class A concrete at all locations unless other Classes are specified or indicated on the Drawings.
 2. Class A-NA concrete: Structural concrete without air entrainment.
 - a. Class A-NA concrete may be used in lieu of Class A at indoor slabs (not subject to freezing and thawing) where inclusion of an air-entraining admixture makes it difficult to achieve the specified concrete finish.
 3. Class C concrete: Miscellaneous concrete fill and encasement.
 - a. Class C concrete may be used for fill for unauthorized excavation, for thrust blocks and ground anchors for piping, for bedding of pipe, and where indicated on the Drawings.
 4. Class CE concrete: Use Class CE for electrical conduit encasements.
 5. Class PM concrete: Use for concrete pavement, cart paths, curbs, gutters, and sidewalks.
- F. Concrete mix design documented by field experience:
1. Mix design:
 - a. Prepare preliminary mix design for each Concrete Class. Submit mix design with product and testing data for materials to be used in the mix for Engineer's review.
 2. Historical records for similar mix.
 - a. Determinations of similarity of materials and proportions between historical and proposed mixes shall be by the Engineer, and that shall be final.
 - b. Historical record - Materials:
 - 1) Submit with each mix design the following data for a previously-supplied concrete mix similar to that proposed for this Work.
 - 2) Records demonstrating that the previously supplied mix included similar materials and proportions as those of the proposed mix.
 - a) Documentation that the same concrete supplier will provide both mixes.
 - b) Documentation that the materials used was from the same suppliers and had essentially the same properties, demonstrated by test data, as those proposed.
 - c) Documentation that proportions of materials in the record mix are essentially the same as those proposed and that the specified compressive strength of the record mix is within 1,000 pounds per square inch of that required by this Section.
 - d) Concrete supplier's statement describing any changes made to production of the record mix during the time period reported.
 - e) Concrete supplier's statement that preparation and quality control procedures for the record mix were essentially the same as those to be employed for this Work.
 - c. Historical record - Testing:
 - 1) Submit with each record mix, corresponding test data for slump, compressive strength (with relationships for rate of strength gain between testing ages), and drying shrinkage.
 - 2) Only records satisfying the following requirements will be accepted.
 - a) All tests were conducted within a period of 1-year preceding the date of the submittal.
 - b) All tests were conducted over a period including not less than 45 days.

- c) The record of compressive strength testing includes at least 30 tests for slump and 28-day compressive strength.
- d) The record of compressive strength tests is consecutive. In other words, it includes all tests conducted on the subject mix within the 1-year time period described above (not just selected tests during that period).
- e) Submit concrete supplier's sworn statement confirming that all tests for the record mix have been reported.
- f) Tests for drying shrinkage are described in subsequent paragraphs of this Section for "concrete mix design documented by trial batch preparation and testing,"
- g) Provide supplementary testing if requested by Engineer.
- d. For mixes determined to be similar and to have an acceptable test history, acceptance criteria shall be as follows:
 - 1) Acceptance criteria:
 - a) Slump: All tests within limits specified for record mix.
 - b) Compressive strength: Average compression strength for tests, as determined by ACI 318 and ACI 350 not less than minimum required average strength.
 - c) Drying shrinkage: Within limits stated in subsequent paragraphs of this Section for "concrete mix design documented by trial batch preparation and testing."
 - d) Abrasion resistance: Within limits stated in subsequent paragraphs of this Section for "concrete mix design documented by trial batch preparation and testing."

G. Concrete mix design documented by trial batch preparation and testing:

- 1. Mix design and trial batches:
 - a. Prepare preliminary mix design for each Concrete Class. Submit mix design with product and testing data for each combination of materials and proportions to be used for Engineer's review.
 - 1) Determine water content of the mix based on curves showing the relation between water-cementitious materials ratio and the 7 and 28 day compressive strength of the concrete.
 - 2) Determine each curve using 4 or more points, each representing the average compressive strength value of at least 3 specimens tested at each age.
 - b. After materials and proposed mix designs have been accepted by Engineer, have trial batches for each concrete mix design prepared by Contractor's testing laboratory:
 - 1) Prepare trial batches using the cementitious materials, aggregates, and admixtures proposed to be used for the Work.
 - 2) Provide batches of sufficient quantity to determine slump, workability, consistency, setting time, and finishing characteristics, and to provide sufficient specimens for testing.
 - c. For each trial batch, make and test specimens to determine and report slump, compressive strength (with relationships for rate of strength gain between testing ages), and drying shrinkage:
 - 1) If trial batches do not produce concrete conforming to the specified requirements for slump, strength, workability, consistency, drying shrinkage, restrained shrinkage, and finishing, change mix proportions and, if necessary, sources of materials.

- 2) Make additional trial batches and perform additional tests until a batch that conforms to requirements of this Section is produced.
2. Testing - Slump:
 - a. Determine slump in accordance with ASTM C143.
 - b. Acceptance criterion: Slump within range specified.
3. Testing - Compressive strength:
 - a. Prepare 4 inch diameter by 8 inch long cylinders in accordance with ASTM C31 for tests specified in this Section.
 - b. Determine average compressive strength:
 - 1) Test at least 12 cylinders from each trial batch for compressive strength in accordance with ASTM C39.
 - 2) Test 4 cylinders at 7 days, another 4 at 28 days, and another 4 at 56 days.
 - 3) Calculate average compression strength for 7 day tests, for 28 day tests, and for 56 day tests.
 - 4) Calculate ratios for:
 - a) Average 7 day strength to average 28 day strength.
 - b) Average 28 day strength to average 56 day strength.
 - c. Determine the required average compressive strength for each mix, f'_{cr} , as described in the following paragraphs:
 - 1) Calculate required average compressive strength (f'_{cr}) based on the minimum specified 28-day compressive strength, f'_c , plus a standard deviation determined from the test history available for that mix.
 - 2) Determine f'_{cr} as specified in ACI 318 and ACI 350, except as modified in the following paragraphs.
 - a) Where 15 or more 28-day compressive strength tests are available, calculate standard deviation as described in the preceding paragraphs for "concrete mix design documented by field experience." Add this standard deviation to the specified minimum compressive strength to determine the required average compressive strength (f'_{cr}) for the mix.
 - b) Where fewer than 15 compressive strength tests at 28-days are available, determine minimum required compressive strength, (f'_{cr}) from Table 4 of this Section.

Table 4: Required Average Compressive Strength, Fewer than 15 Tests Available

Minimum Specified Compressive Strength, f'_c (pounds per square inch)	Required Average Compressive Strength, f'_{cr} (pounds per square inch)
Less than 3,000	$f'_c + 1,000$
3,000 to 5,000	$f'_c + 1,200$
Over 5,000	$f'_c + 1,400$

- d. Acceptance criterion: Average compressive strength of the 4 cylinders tested at 28 days, or of the 4 cylinders tested at 56 days when permitted by the Engineer, shall equal or exceed the required average compression strength, f'_{cr} for that concrete mix design.
4. Testing – Chloride content:
 - a. Submit test results showing that the concrete mix contains water-soluble chloride ion content contributed from the constituents including water, aggregates, cementitious materials, and admixtures is less than the limit specified in Table 3

of this Section. Test shall be performed in accordance with ASTM C1218 at age between 28 and 42 days.

5. Testing - Modulus of Rupture (28-day flexural strength):
 - a. Class PM: From trial batches, prepare flexural strength specimens in accordance with ASTM C293. Test and report modulus of rupture at 28 days.
6. Testing - Drying shrinkage - Prism specimens:
 - a. Class A (including A, A-NA, A-SP, and A-NA-SP) and Class PM: From trial batch for each mix, prepare 10 drying shrinkage specimens in accordance with ASTM C157. Divide specimens into 2 groups of 5 specimens each: One group including shrinkage-reducing admixture, and one group without shrinkage-reducing admixture.
 - b. Prepare, cure, and test both groups in accordance with ASTM C157, except as modified in the following paragraphs:
 - 1) Remove drying shrinkage specimens from molds at age of 23 hours plus or minus 1 hour after batching:
 - a) Immediately place them in lime-saturated water maintained at 73 degrees Fahrenheit plus or minus 3 degrees for at least 30 minutes.
 - b) Remove specimens from the water, and wipe with a damp cloth.
 - c) Measure to nearest 0.0001 inch to determine original length.
 - d) Record measurements and re-submerge specimens in lime-saturated water at 73 degrees Fahrenheit plus or minus 3 degrees for moist curing.
 - 2) Maintain submerged curing conditions at 73 degrees Fahrenheit plus or minus 3 degrees for 7 days. 7 days after batching, remove specimens from water and repeat measuring procedures.
 - 3) Immediately store specimens in a humidity controlled room maintained at 73 degrees Fahrenheit plus or minus 3 degrees, and at 50 percent relative humidity plus or minus 4 percent for remainder of the test.
 - 4) At periods of 14, 21, 28 and 56 days after batching, remove specimens from curing room and repeat measurements.
 - c. Drying shrinkage test report:
 - 1) Report measurements of all specimens at 1, 7, 14, 21, 28, and 56 days after batching.
 - 2) Using measured length at 7 days as base length for drying shrinkage, calculate the following for each measuring period:
 - a) Drying shrinkage of each specimen. Determine as difference between the 7-day base length and measured length for each period.
 - b) Average of these differences. If drying shrinkage of any specimen departs from the average of the measurements for each period by more than 0.0004 inch, disregard results obtained from that specimen.
 - c) Percentage of drying shrinkage from batching to date of measurement.
 - d. Drying shrinkage acceptance criteria:
 - 1) Average shrinkage of trial batch concrete specimen group at 28 days after batching, when measured and cured as indicated, shall not exceed 0.035 percent.
 - e. Mixes accepted by Engineer:
 - 1) Retain drying shrinkage test specimens. Bag in re-sealable plastic bags and submit to Engineer.
 - 2) Indicate trial batch identifier, specimen number, and date of final measurements on each specimen bag.

7. Modulus of elasticity: Tests: Test 2 cylinders at 28 days for static modulus of elasticity in compression in accordance with ASTM C469:
 - a. Required results: Modulus of elasticity shall not be less than 54,000 times square root of the 28-day strength of the cylinders.
8. NSF-61 certification:
 - a. Contact NSF International to obtain certification to NSF-61.
 - 1) Provide cylinders in sufficient quantity for testing.

2.07 SOURCE QUALITY CONTROL

- A. Sample and test materials in accordance with the following requirements:
 1. Sampling, testing, and reporting frequency:
 - a. In preparation for mix design submittals and trial batch tests.
 - b. Whenever there is a change in source of the material, or a significant change in the characteristics or quality of materials from the same source.
 - c. For each 10,000 cubic yards of concrete mix produced.
 - d. At intervals not exceeding 90 calendar days, unless otherwise specified in the following paragraphs.
 2. Supplemental cementitious materials.
 - a. Sample and test fly ash in accordance with ASTM C311.
 - b. Sample and test slag cement in accordance with ASTM C989.
 - c. Sample and test silica fume in accordance with ASTM C1240.
 3. Aggregate:
 - a. Sample combined aggregate in accordance with ASTM D75 and D3665, and test for gradation in accordance with ASTM C136.
 - b. At least once every 30 days, and when requested by the Engineer.
 - c. Submit test results.
 4. Portland cement:
 - a. Sample and test Portland cement and provide mill certificates demonstrating compliance with ASTM C150, and additional requirements of this Section:
 - 1) Determine alkali content by method set forth in ASTM C114.
 - b. At least once every 90 days, and when requested by the Engineer.
 - c. Submit test results.
- B. Batch materials in accordance with the following requirements:
 1. Concrete batch weights: Control and adjust so as to secure maximum yield, and at all times maintain proportions of concrete mix within specified limits.
 2. Aggregates:
 - a. Obtain aggregate from a source capable of providing uniform quality, moisture content, and grading during any single day's operation.
 - b. Furnish satisfactory means at batching plant for checking moisture content of fine aggregate for each batch.
 3. Admixtures:
 - a. Batch solutions using mechanical batcher capable of accurate measurement.
 - b. Air entraining admixture: Add to batch in portion of the mixing water, unless otherwise recommended by the admixture manufacturer.

PART 3 EXECUTION

3.01 PREPARATION

- A. Prepare and submit mix designs for each Concrete Class indicated in Table 3 of this Section.
- B. Submit proposed sequence of concrete placements. After acceptance, adhere to proposed sequence of placing concrete, except when specific changes are requested by the Contractor and accepted by the Engineer:
 - 1. Use construction methods and sequence work to allow concrete placement to reach adequate strength and to be constructed with required support to prevent overstress of the concrete structure during construction.
- C. Make provisions for monitoring weather conditions:
 - 1. Install an outdoor weather station capable of measuring and recording ambient temperature, wind speed, and humidity. Furnish instruments accurate to within 2 degrees Fahrenheit, 5 percent relative humidity, and 1 mile per hour wind speed.
 - 2. Monitor the weather forecast beginning at least 48 hours prior to any concrete placement and make provisions for cold weather concreting or hot weather concreting if those conditions exist or are forecast to exist during the period of placement, finishing, and curing:
 - a. Record temperature, relative humidity, and wind speeds for each placement beginning at least 24 hours before scheduled delivery of concrete.
- D. Place no concrete without Engineer's prior acceptance of conditions.
- E. Notify the Engineer in writing that all preparations are complete and ready for placement of concrete. Such notification shall indicate readiness - not just intention - to place concrete for the designated portion of the Work:
 - 1. Submit notification to Engineer on forms provided by or acceptable to the Engineer and bearing the signature of Contractor's superintendent:
 - a. Sample form is included at the end of this Section, see Attachment B - Coarseness Factor Chart.
 - 2. Submittal of notification will be Contractor's certification that preparations are complete and in accordance with the Contract Drawings and Specifications.
 - 3. Provide notification for Engineer to make final observations at the locations of concrete placements not less than 24 hours before commencing placement of concrete.

3.02 CONCRETE JOINTS

- A. Locations of joints are indicated on the Drawings:
 - 1. In order to preserve strength and watertightness of structures, make no other joints, except as authorized by the Engineer.
 - 2. Construct joints where indicated, and as indicated on the Drawings.
 - 3. Where joint locations are not indicated on the Drawings, submit Contractor's proposed locations for Engineer's review and acceptance. Provide construction joints in slabs and walls at intervals not greater than 35 feet.

- B. Time between placements of adjacent concrete separated by joints:
 - 1. Provide not less than 3 days (72 hours) between placement of adjacent sections for the following:
 - a. Slabs.
 - b. Walls.
 - 2. Provide not less than 7 days (168 hours) between placement of the lower and upper pours for the following:
 - a. Walls over slabs.
 - b. Slabs over walls.
 - c. Slabs keyed into the sides of walls.
- C. Edges of joints:
 - 1. Provide joints have edges detailed as indicated on the Drawings.
 - 2. Protect wall and slab surfaces at edges from concrete splatter. Thoroughly clean adjacent surfaces after completion of each placement.
- D. Keyways in joints:
 - 1. Provide keyways in joints unless specifically noted otherwise on the Drawings.
 - 2. Treat lumber keyway material with form release coating, applied in accordance with manufacturer's instructions.
- E. Joint construction:
 - 1. Preparation of forms:
 - a. Provide cleanout holes at base of each wall and column for inspection and cleaning.
 - b. Wash forms and adjacent joint surfaces of sawdust, chips, and other debris after forms are built, and immediately before concrete or grout placement.
 - c. Should formwork confine sawdust, chips, or other loose matter in such manner that it is impossible to remove them by flushing with water, use a vacuum cleaner for their removal, and then flush cleaned surfaces with water.
 - 2. Before placing concrete against previously placed concrete, thoroughly clean the prior placement of laitance, grease, oil, mud, dirt, curing compounds, mortar droppings, or other objectionable matter by means of pressure washing.
 - 3. Provide and install waterstops, expansion joint material, and other similar materials as indicated on the Drawings and as specified:
 - a. Take special care to ensure that waterstops are secured in proper position.
 - b. Take special care to ensure that concrete is well consolidated around and against waterstops during placement.
 - 4. Horizontal joints:
 - a. As initial placement over cold joints, thoroughly spread bed of cement grout as specified in Section 03_60_00 – Grouting:
 - 1) Thickness: not less than 1/2 inch nor more than 1 inch.
 - b. For wall placements above planned cold joints, placement of cement grout will not be required for locations where the wall mix includes high-range water-reducing admixture ("superplasticizers"), and the Contractor can demonstrate dense concrete joints without voids or honeycomb after the forms are removed.

3.03 MEASURING AND BATCHING MATERIALS

- A. Measurements of materials:
 - 1. Proportion and measure cementitious materials and aggregates by weight.
 - a. Weigh cementitious materials separately.

- b. If bulk cementitious materials are used, weigh them on separate visible scale that will accurately register scale load at any stage of weighing operation from zero to full capacity.
 - c. Cement in unbroken standard packages (sacks) need not be weighed.
 - 2. Mixing water: Measure by volume or by weight.
 - 3. Other mix constituents: Measure by weight, except as otherwise specified or accepted by the Engineer.
 - 4. Weighing and measuring devices:
 - a. Use equipment designed and constructed specifically for that purpose.
 - b. Furnish devices capable of weighing successive quantities of individual material measured to within 1 percent of desired weight of that material.
 - c. Bearing valid seal of the department of weights and measures for the authority having jurisdiction over the Work.
 - 5. Measurements and measuring devices:
 - a. Subject to review by the Engineer.
- B. Batching:
 - 1. Admixtures shall be added at the concrete batch plant.
 - 2. Addition of admixtures in the field is permitted only with prior acceptance by the Engineer, and only when the following conditions are satisfied:
 - a. The dosage and mixing is personally overseen by concrete supplier's trained technologist.
 - b. Adequate mixing is provided after addition.
 - c. The maximum time to placement of concrete remains 90 minutes after water added to mix - not 90 minutes after any field additions/adjustments.
 - d. Slump at discharge after additions/modifications conforms to the requirements of Table 3 of this Section.

3.04 MIXING AND TRANSPORTING

- A. Machine mixing:
 - 1. Prevent cementitious materials from coming into contact with aggregate or with water until materials are in mixer and ready for complete mixing with all mixing water.
 - 2. Procedure of mixing cementitious materials with sand, or with sand and coarse aggregate, for delivery to project site for final mixing and addition of mixing water is not permitted.
 - 3. Remixing of concrete that has started to take its initial set ("retempering") is not permitted.
 - 4. Discharge entire batch before recharging.
 - 5. Volume of mixed material per batch: Not exceeding manufacturer's rated capacity of mixer.
- B. Transit-mixed concrete:
 - 1. Mix and deliver in accordance with ASTM C94, except as modified in this Section.
 - 2. Total elapsed time between addition of water at batch plant and discharging completed mix:
 - a. Not to exceed 90 minutes nor 300 revolutions of the mixing drum.
 - b. Under conditions contributing to rapid setting, total elapsed time permitted may be reduced by the Engineer.
 - 3. Temperature - minimum and maximum allowable during mixing and transporting:
 - a. Minimum: 50 degrees Fahrenheit.
 - b. Maximum: 90 degrees Fahrenheit.

4. Continuously revolve drum after it is started until it has completely discharged its batch:
 - a. Do not add water until drum has started revolving.
 - b. Engineer reserves the right to increase required minimum number of revolutions or to decrease designated maximum number of revolutions allowed, if necessary, to obtain satisfactory mixing. Contractor will not be entitled to additional compensation because of such increase or decrease.

C. Concrete delivery:

1. Furnish to the Engineer a delivery ticket for each batch of ready mixed concrete within 24 hours after delivery. Include the following information on each ticket:
 - a. Time of day concrete was batched, and time of day that discharge from the truck is complete.
 - b. Printed record of the individual weight of each of the following constituents in the batch: fine aggregate, coarse aggregate, cement, pozzolan, and water.
 - c. Concrete Class as defined in Table 3 of this Section.
 - d. Type, brand, and quantity of each admixture in the batch.
 - e. Total volume of water allowed in the mix, volume of mixing water added at the batch plant, volume of mixing water withheld from the mix during batching, and total volume of any water added to the mix after leaving the batch plant:
 - 1) In no case shall volume of mixing water withheld result in a water/cementitious materials ratio less than the minimum values specified in Table 3 of this Section.
 - f. Number of revolutions of transit truck at arrival on site, and total number of revolutions when discharge is complete.
 - g. Volume of concrete delivered in the batch.
 - h. Numerical sequence of the batch delivered for that placement.
2. Additional water may be only be added to the mix when the following conditions are fully satisfied:
 - a. Batch ticket showing total volume of water already added and maximum volume of water that may be added is available for Engineer's observation before any additional water is added.
 - b. Total volume of water in the mix after the addition will be less than the maximum allowable volume of water indicated on the ticket.
 - c. The full concrete load is still within the truck's mixing drum, and truck has not begun to discharge the load. Under no conditions shall water be added in the field to a partial truckload of concrete.
 - d. Volume of water added, and time of addition are clearly marked for record on the batch ticket delivered to the Engineer.
3. Addition of admixtures in the field is permitted only with prior approval by the Engineer, and when the following conditions are satisfied:
 - a. Dosage and mixing is personally overseen by concrete supplier's trained technologist and admixtures supplier's representative.
 - b. Adequate mixing time is provided after addition of admixtures.
 - c. The maximum time to placement of concrete remains 90 minutes after water is added to the mix – not 90 minutes after any field additions/adjustments.
 - d. Slump at discharge after additions/modifications conforms to the requirements of Table 3 of this Section.

D. Conveying concrete:

1. Convey concrete from mixer to location of final deposit by methods that prevent separation or loss of materials.

2. Use equipment for chutes, pumps, and conveying of concrete of such size and design as to ensure practically continuous flow of concrete, from delivery to the point of placement, without separation of materials.
3. Design and use chutes and devices for conveying and depositing concrete that direct concrete vertically downward when discharged from chute or conveying device.
4. Keep equipment for conveying concrete thoroughly clean by washing and scraping upon completion of any day's placement.

3.05 PLACING AND CONSOLIDATING

A. Preparation:

1. Obtain Engineer's acceptance of completed preparations before placing concrete.
 - a. Notify Engineer in writing that all preparations are complete and ready for placement of concrete. Such indication shall indicate readiness, not just intention, to place concrete for the designated portion of the work.
 - b. Submit completed Attachment D - Contractor's Concrete Placement Checklist Form.
2. Confirm completeness of the following before notification of readiness is given to Engineer:
 - a. Place forms, reinforcement, screeds, anchors, ties, and inserts in final position.
 - b. Reinforcement is secure and properly fastened in its correct position.
 - c. Loose form ties at construction joints have been retightened.
 - d. Dowels, bucks, sleeves, hangers, pipes, conduits, anchor bolts, and any other fixtures required to be embedded in concrete have been placed and adequately anchored.
 - e. Forms have been cleaned of debris and form release agents are applied as specified.
3. Preparation for placement of footings and slabs on grade:
 - a. Do not place concrete on ground or compacted fill until subgrade is in moist condition acceptable to the Engineer.
 - b. If necessary, sprinkle subgrade with water not less than 6 or more than 20 hours in advance of placing concrete.
 - c. If subgrade surface becomes dry prior to actual placing of concrete, sprinkle again, without forming pools of water.
 - d. Do not place concrete if subgrade is muddy or soft.
4. Keep sufficient protective coverings on hand at all times for protection of concrete during and after placement:
 - a. Protect concrete placed before rain to prevent water from coming in contact with such concrete
 - b. Protect concrete placed before winds to prevent excessive drying or embedment of debris in the finished surfaces.

B. Concrete placement:

1. Do not place concrete:
 - a. With slump outside the limits specified in Table 3 of this Section.
 - b. In which initial set has occurred, or that has been retempered.
 - c. During rainstorms or high velocity winds.
2. Deposit concrete at or near its final position to avoid segregation caused by rehandling or flowing:
 - a. Do not deposit concrete in large quantities in one place, and then work material along forms with vibrator or by other methods.

3. Do not drop concrete freely into place from height greater than 5 feet. Use tremies for placing concrete where drop is over 5 feet.
 4. Place concrete on slopes starting from bottom of slope and working upward.
 5. Place concrete in horizontal lifts not exceeding 24 inches in depth and bring up evenly in all parts of forms.
 6. After concrete placement begins, continue in a continuous operation without significant interruption until the end of the placement. Plan and implement precautions to prevent any delay, between layers or adjacent volumes, from exceeding 20 minutes.
 7. If concrete is to be placed over previously placed concrete and more than 20 minutes has elapsed, spread layer of cement grout over surface before placing additional concrete. Provide grout layer thickness of not less than 1/2 inch, nor more than 1 inch.
 8. Placement of concrete for slabs, beams, or walkways:
 - a. If cast monolithically over walls or columns, do not commence until concrete in walls or columns has been allowed to set and shrink.
 - b. Allow set time of not less than 1 hour for shrinkage.
 - 1) During waiting time, keep top surface of concrete moist, but not wet.
 - 2) Do not permit water to pond or stand on the surface.
 - 3) Do not coat surface with evaporation retarders or curing agents.
 - c. Start placement above wall or column with layer of cement grout as described in the preceding paragraph.
- C. Consolidating concrete:
1. Consolidate concrete with aid of acceptable mechanical vibrators.
 2. Thoroughly consolidate concrete around reinforcement, pipes, or other shapes built into the work.
 3. Provide sufficiently intense vibration to cause concrete to flow and settle readily into place and to visibly affect concrete over radius of at least 18 inches.
 4. Vibrators:
 - a. Keep sufficient vibrators on hand at all times to vibrate concrete as placed.
 - b. In addition to vibrators in actual use while concrete is being placed, have on hand a minimum of 1 spare vibrator in operable condition.
 - c. Do not place concrete until it has been confirmed that all vibrating equipment, including spares, are in operable condition.
 5. Place concrete solidly against forms and concrete surfaces, leaving no voids or honeycomb.
 6. Make concrete solid, compact, and smooth. If for any reason surfaces or interiors have voids or are in any way defective, repair such concrete in manner acceptable to the Engineer.
 7. Do not over-vibrate so as to produce segregation.

3.06 FINISHING CONCRETE

- A. Provide concrete finishes in accordance with Section 03_35_29 - Tooled Concrete Finishing unless otherwise indicated on the Drawings.
- B. Liquid evaporation retardant:
1. Under conditions that result in rapid evaporation of moisture from the surface of the concrete, coat the surface of the concrete with a liquid evaporation retardant immediately after screeding.
 2. Conditions that result in rapid evaporation of moisture are defined as any combination of ambient temperature, concrete temperature, relative humidity, wind speed, and

solar radiation intensity that creates conditions that will evaporate water from a free concrete surface at a rate equal to or greater than 0.1 pounds per square foot per hour as determined by the Menzel Formula and nomograph published in ACI 305R, and included as Attachment A - Menzel Formula and Nomograph to this Section.

3. Apply evaporation retardant again after each finishing operation as necessary to prevent drying shrinkage cracks.
 4. Do not work evaporation retardant into the surface of the concrete.
 5. Do not use evaporation retardant as finishing aid (to rehydrate surface a creamy state for finishing).
 6. Concrete surfaces in direct contact with potable water in the finished work:
 - a. After curing is complete, pressure wash concrete, using equipment and procedures acceptable to the Engineer, to remove residual evaporation retardant and other compounds prior to cleaning structure for disinfection.
- C. Concrete sealer:
1. Floors and slabs to receive concrete sealer: See Room Finish Schedule on the Drawings, and Section 03_35_29 - Tooled Concrete Finishing.

3.07 CURING

- A. Cure concrete by methods specified in this Section.
- B. Keep concrete continuously moist and at an average daily temperature of at least 50 degrees Fahrenheit for a minimum of 7 days after placement:
1. Provide at least 350 degree days of curing (350 degrees times 7 days of 24 hours each).
 2. If hourly temperatures at any surface of a concrete placement drop below 50 degrees Fahrenheit during the curing period, count the period below 50 degrees Fahrenheit as zero degrees, and extend the curing time to compensate.
- C. Schedule of curing methods:
1. Cure the following concrete surfaces using water curing, or plastic membrane curing.
 - a. Floor surfaces of water containment structures.
 - b. Surfaces where additional concrete will be placed over or against the surface, including concrete joints.
 - c. Surfaces where grout or other toppings will be placed over the surface.
 - d. Slabs scheduled to receive concrete sealer, or other bonded or adhered architectural finishes.
 - e. Formed surfaces scheduled to receive coatings, paint, adhered masonry, cementitious materials, or other similar finishes, and where formwork is removed within 7 days after concrete placement.
 - f. Horizontal concrete surfaces at tops of walls.
 2. Cure the following concrete surfaces by water curing, plastic membrane curing, or sprayed curing membrane. Selection of methods shall be at the Contractor's option:
 - a. Surfaces not listed in the preceding paragraph.
- D. Water curing:
1. Keep surfaces of concrete constantly and visibly wet, day and night, for period of not less than 7 days:
 - a. Each day forms remain in place will be counted as 1 day of water curing.

- b. Do not loosen form ties during period when concrete is cured by leaving forms in place. No further curing credit will be allowed for forms remaining in place after contact has been broken between concrete surface and forms.
 - 2. Begin water curing as soon as concrete attains initial set.
 - 3. Maintain a wet surface by ponding, continuous sprinkling, covering with saturated burlap, or otherwise saturating the surface by means acceptable to Engineer:
 - a. Flood top of walls with water at least 3 times per day and keep surfaces moist at all times during 7 day curing period.
 - b. Provide plastic sheet material over surfaces if required to maintain a wet surface during arid or windy conditions. See plastic membrane curing requirements for additional details.
 - 4. Use water having a temperature within 20 degrees Fahrenheit of the temperature of concrete, and not lower than the minimum temperature allowed for the concrete surface during curing.
- E. Plastic membrane curing:
 - 1. Install plastic membrane as soon as concrete is finished and can support limited pedestrian traffic without damage.
 - 2. Cover entire surface of finished concrete with membrane.
 - 3. Anchor membrane to prevent uplift from wind or air trapped below the sheet.
 - 4. Fully seal joints and edges to provide full seal around perimeter.
 - 5. Keep concrete under plastic membrane moist, regularly monitoring surfaces and adding supplemental moisture if necessary. Add water as specified for water curing.
- F. Sprayed membrane curing compound:
 - 1. Apply curing compound to concrete surface after repairing and patching, and within 1 hour after forms are removed:
 - a. If more than 1 hour elapses after removal of forms, do not use membrane curing compound. Instead, provide water curing for not less than 7 days.
 - b. Do not remove sprayed membrane curing compound from concrete in less than 7 days after initial application.
 - c. When application of curing compound at concrete joints is accepted by Engineer, take care to apply curing compound to all surfaces along full profile of joints.
 - 2. Apply curing compound by mechanical, power operated sprayer with mechanical agitator that will uniformly mix all pigment and compound.
 - a. Apply curing compound in at least 2 coats.
 - b. Apply each coat in direction turned 90 degrees from application direction of the preceding coat.
 - c. Apply curing compound in sufficient quantity so that concrete has uniform appearance and its natural color is effectively and completely concealed immediately after spraying.
 - d. Continue to coat and recoat surfaces until specified coverage is achieved and until coating film remains on concrete surfaces.
 - 3. Thickness and coverage of curing compound:
 - a. Provide curing compound having film thickness that can be scraped from surfaces at any and all points after drying for at least 24 hours.
 - b. Contractor is cautioned that method of applying curing compound specified in this Section may require more curing compound than normally suggested by manufacturer of curing compound and is more than is customary in the trade. Apply amounts specified in this Section, regardless of manufacturer's recommendations or customary practice.

4. If Contractor desires to use a curing compound other than specified product, coat sample areas of concrete wall with proposed curing compound, and also coat similar adjacent area with the specified compound in the manner specified, for comparison:
 - a. If proposed sample is not equal or better, in opinion of the Engineer, the proposed substitution will not be allowed.
5. Removal of curing compound.
 - a. After curing period is complete, remove curing compound placed on surfaces that will receive additional concrete, including all concrete joint surfaces, by heavy sandblasting or by other means acceptable to Engineer. Complete removal and cleanup prior to placing any new concrete against the surface.
 - b. Where additional finishes will be applied over concrete surfaces, unless otherwise recommended by the manufacturer of the finish to be applied, remove curing compound by sandblasting. Provide blasting as necessary to fully remove curing compound.
6. Prior to final acceptance of the work, remove, by sandblasting or by other method acceptable to the Engineer, any curing compound on surfaces exposed to process water or exposed to view, so that only natural color of finished concrete is visible and uniform over the entire surface.

3.08 PROTECTION

- A. General:
 1. Keep forms in place, as specified in the following paragraphs, to provide curing and to protect concrete surfaces and edges from damage.
 2. Immediately after forms are removed, carefully examine concrete surfaces, and repair any irregularities in surfaces and finishes as specified.
- B. Form removal:
 1. Do not remove forms from concrete which has been placed when outside ambient air temperature is below 50 degrees Fahrenheit until the following conditions are satisfied:
 - a. Concrete has sufficient strength to allow form removal without damage to surfaces.
 - b. At least 48 hours have elapsed since the end of concrete placement.
 - c. Provisions are in place to maintain moisture for curing concrete, and temperature at or above the required minimum curing temperature specified.
 2. Vertical forms:
 - a. Retain in place for a minimum of 24 hours after concrete is placed.
 - b. If concrete has sufficient strength and hardness to resist surface or other damage after 24 hours, forms may be removed.
 3. Other forms supporting concrete, and shoring: Retain in place as follows:
 - a. Formed sides of footings: 24 hours minimum.
 - b. Formed vertical sides of beams, girders, and similar members: 48 hours minimum.
 - c. Forms below slabs, beams, and girders: Until concrete strength reaches specified strength f'_c or until shoring is installed:
 - 1) Shoring for slabs, beams, and girders: Shore until concrete strength reaches minimum specified 28-day compressive strength.
 4. Wall bracing: Brace walls until strength of concrete beams and slabs laterally supporting wall reaches minimum specified 28-day compressive strength.

- C. Loading of concrete members:
 - 1. Placement of loads on or against green concrete is not permitted.
 - 2. Do not place soil against walls, or fill over the top of concrete until conditions designated in the following paragraphs are satisfied:
 - a. Walls have been cast to their full height in the structure and have achieved their minimum specified 28-day compressive strength.
 - b. Connecting slabs and beams that brace the walls are in place, are complete, and (in the case of concrete) have achieved their minimum specified 28-day compressive strength.

3.09 COLD WEATHER CONCRETING

- A. Implement cold weather concreting procedures during periods of cold weather as defined in this Section:
 - 1. Comply with the recommendations of ACI 306R and this Section.
- B. Prepare a cold weather concreting plan. Maintain at least 1 copy of the plan on site. Provide plan for review if requested by the Engineer:
 - 1. Include procedures for batching, delivery, placement, curing, protection, and for monitoring and recording the temperature of the concrete and the surrounding environment.
 - 2. Describe procedure to be implemented in the event of abrupt changes in weather conditions or of equipment failure.
 - 3. Review cold weather concreting plan during pre-construction meeting. Make provisions to address any concerns expressed by Engineer before beginning concrete placements.
- C. Preparation:
 - 1. Do not place concrete over frozen subgrade materials. Provide insulating material and supplementary heat if required to maintain a thawed surface.
 - 2. Do not place concrete around metallic elements whose temperature is less than 40 degrees Fahrenheit. If heating is required, use processes that do not alter the metallurgical properties of the elements.
 - 3. Remove snow, ice, and frost from reinforcement, embedments and forms. Schedule such removal immediately before concrete placement so that surfaces do not refreeze.
- D. Batching, delivery, placement and finishing:
 - 1. Accelerating admixtures will not be permitted.
 - 2. Based on temperature of the environment and the surfaces where concrete will be placed, select and maintain mix temperature as recommended in ACI 306R:
 - a. Make provisions for temperature loss during delivery and placing.
 - b. Place concrete at or slightly above the minimum recommended batch temperatures. Do not exceed these minimum values by more than 20 degrees Fahrenheit.
 - 3. Heating: If temperature of water or aggregates is below 35 degrees Fahrenheit, heat the materials:
 - a. Mixing water: Do not heat above 140 degrees Fahrenheit.
 - b. Aggregates:
 - 1) Heat uniformly to eliminate ice, snow, and frozen lumps of material.
 - 2) Avoid overheating.

- 3) Do not exceed average temperature of 140 degrees Fahrenheit or spot temperature of 200 degrees Fahrenheit.

E. Protection and curing:

1. Protect concrete to provide continuous warm moist curing immediately after placement and during protection period.
2. Minimum protection period: 7 days.
3. During and immediately after the protection period, maintain temperature in accordance with Table 5 of this Section. Provide record of temperature during placement and curing as specified in the following paragraphs:
 - a. Furnish and locate maximum/minimum temperature recording thermometers in sufficient numbers to confirm concrete.

Table 5: Concrete Temperatures - Normal Weight Concrete			
Section Thickness (inches)	<12	12 to <36	36 to <72
During Protection Period: As maintained (minimum).	55°F	50°F	45°F
After Protection Period: Gradual drop during first 24 hours (maximum).	50°F	40°F	35°F

4. Provide plastic sheeting, polystyrene foam sheets, insulating blankets, and supplemental heating if required to maintain moisture and the specified temperatures during protection:
 - a. Protect insulating blankets from moisture in the concrete and from rain or snow using impermeable sheeting.
 - b. Supplemental heating units:
 - 1) Vent units to outside atmosphere. Do not exhaust heater flue gasses into the enclosed and protected area.
 - 2) Make provisions to heat the flow freely within protected area, and to maintain a uniform temperature throughout the space.
 - 3) Locate units to avoid local drying or uneven heating of concrete surfaces.
 - c. Pay particular attention to maintaining required temperature and moisture at edges and corners.
5. At the end of the protection period, allow concrete to cool gradually to the ambient temperature:
 - a. Maximum temperature drop over the first 24-hour period shall be as specified above.
 - b. Where temperature of concrete exceeds ambient by 20 degrees Fahrenheit or more, loosen forms and leave in place for at least 24 hours before removal.
 - c. If water curing has been used, maintain concrete temperature as specified in the following paragraphs for at least 24 hours after water curing is terminated. Allow water-cured concrete to air dry for at least 3 days before exposure to freezing temperatures.

F. Temperature records:

1. For each area of concrete placed or cured during cold weather, record the temperature of concrete and the ambient environment.
 - a. Maintain temperature records on site and make records available for review by the Engineer upon request.
 - b. Deliver a final copy of each record to Engineer for project files not more than 14 calendar days after the date concrete was placed.

2. Concrete delivered for placement.
 - a. Measure and record temperature at the point of discharge in accordance with ASTM C1064.
 - b. Note temperature on the batch ticket.
3. Concrete during the protection period:
 - a. Furnish and locate self-recording thermometers (maximum/minimum) around each placement. Number and location of thermometers shall be sufficient to represent temperatures around the entire concrete placement.
 - b. Position thermometers to record the temperature at each edge or corner and at the middle of the placement area.
4. Include in the temperature record of each placement the following information, recorded legibly on a single sheet.
5. In the event that evaluations of the efficacy of concrete protection and curing are required, the lowest temperature recorded in any placement during each 24 hour period will be assumed to be the temperature at which the entire placement was maintained. Protection periods with any temperature records will be assumed to have provided no protection or curing, and the protection period will be extended by 2 days for each day without protection.

3.10 HOT WEATHER CONCRETING

- A. Implement hot weather concrete procedures during periods of hot weather as defined in this Section:
 1. Comply with the recommendations of ACI 305R and this Section.
- B. If placements during hot weather are expected, and when requested by the Engineer, prepare a hot weather concreting plan. Maintain at least 1 copy on site. Provide plan for review if requested by the Engineer:
 1. Include procedures for batching, delivery, placement, curing, protection, and monitoring and recording the temperature of the concrete and the surrounding environment.
 2. Describe procedures to be implemented in the event of abrupt changes in weather conditions, or in the event of equipment failure.
 3. Review hot weather concreting plan during pre-construction meeting. Make provisions to address any concerns expressed by Engineer before beginning concrete placements.
- C. Preparation:
 1. Do not place concrete against forms, reinforcement, or embedments with a surface temperature greater than 120 degrees Fahrenheit:
 - a. If necessary, to maintain maximum concrete temperature during placing, cool forms and reinforcement to temperature below 90 degrees Fahrenheit using water or shades.
 - b. Do not allow water to puddle in forms or placement areas.
 2. Moisten forms or subgrade to maintain a saturated surface without standing water or soft spots.
 3. Provide windbreaks, shades, fog spray, sprinkling, wet cover, or other means required to protect concrete from premature loss of moisture and rapid temperature gain.
- D. Batching and delivery:
 1. Retarding admixtures will not be permitted.

2. Temperature of concrete delivered for placement shall not exceed 90 degrees Fahrenheit:
 - a. Maintain uniform temperature in the mix below this level during batching, delivery, placing, and consolidation.
 - b. Temperature of mix, even if below the maximum allowable temperature specified, shall be maintained at a level to avoid loss of slump, flash setting, or cold joints in placements.
 3. If necessary:
 - a. Mix water may be chilled or replaced with ice to maintain mix temperature. Where mix water is replaced with ice, provide replacement at a 1 to 1 ratio by weight.
 - b. Shade transit mixed concrete trucks, or cool mixing outside of container with water to control temperature of concrete.
- E. Placing and finishing:
1. Place and finish concrete promptly. Place so that vertical lift lines will not be visible in exposed concrete surfaces.
 2. Provide plastic sheeting, fog nozzles, shades or other means to reduce concrete temperature and protect from moisture loss.
- F. Protection and curing:
1. Furnish and locate maximum/minimum temperature recording thermometers in sufficient numbers to confirm concrete temperatures over full area and edges of concrete.
 2. Flatwork: Protect and cure using water curing methods as specified in this Section:
 - a. Water curing:
 - 1) Keep concrete continuously wet and make provisions for runoff.
 - 2) For sprinkling or soaker hoses, maintain temperature of water as close as possible to the temperature of the concrete to minimize effects of thermal shock.
 3. Formed surfaces: Protect and cure using forms left in place or membrane curing methods as specified in this Section:
 - a. Cover forms and keep continuously moist for at least 24 hours after placement.
 - b. Loosen forms as soon as this can be accomplished without damaging the concrete.
 - c. Maintain continuously moist surfaces by fogging or spraying with water, or by application of curing compound as specified.

3.11 FIELD QUALITY CONTROL BY CONTRACTOR

- A. Provide quality control over the Work of this Section as required by Section 01_45_00 - Quality Control.
- B. Field tests:
1. During progress of construction, provide testing to determine whether the concrete, as being produced, complies with requirements specified.
 2. Sampling and testing shall be performed by Contractor's testing laboratory. See Section 01_45_24 - Regulatory Quality Assurance - Special Tests and Inspections for requirements:
 - a. Cooperate in testing by allowing free access to the Work for testing laboratory to sample and test materials.
 - b. Provide full access for Engineer to observe concrete sampling and testing at any time.

- c. Contractor is responsible for providing care of and curing conditions for test specimens in accordance with ASTM C31 until specimens are collected by testing laboratory.
 - d. Provide 4 firmly braced, insulated, heated, closed wooden curing boxes, each sized to hold 10 specimens. Include cold weather temperature and hot weather temperature control thermostat for initial curing and storage from time of fabrication through shipment to Owner's testing laboratory.
3. Testing shall include:
- a. Sampling of concrete in accordance with ASTM C172.
 - b. Temperature of concrete at delivery in accordance with the requirements of ASTM C1064 and as specified in this Section.
 - c. Slump of concrete using slump cone in accordance with requirements of ASTM C143. Test slump at the following intervals:
 - 1) At the beginning of each placement.
 - 2) As often as necessary to keep slump within the specified range, but not less than every 6th truck.
 - 3) When requested to do so by the Engineer.
 - 4) Observe concrete during slump test for signs of segregation:
 - a) Observe concrete to see if mortar or moisture flows from slumped concrete.
 - b) Reject concrete if mortar or moisture flows out of mix.
 - d. Unit weight of concrete in accordance with ASTM C138.
 - e. Air entrainment in accordance with ASTM C173. Test air content at the following intervals:
 - 1) At beginning of each placement.
 - 2) As often as necessary to keep entrained air within specified range, but not less than every 6th truck.
 - 3) When requested to do so by the Engineer.
 - 4) Test air entrainment in concrete in accordance with ASTM C173. If air entraining admixtures used for the Work require alternate testing procedures, advise the independent testing laboratory well in advance of the dates of testing, and confirm that appropriate equipment and personnel are provided for the test.
 - 5) Make air test at point of delivery (discharge from mixer). For pumped concrete, make air tests at point of delivery and at point where expelled after pumping for placement.
 - f. Compressive strength in accordance with ASTM C39. Required number of cylinders is as follows:
 - 1) Not less than 6 cylinder specimens, 4 inches in diameter by 8 inches long, will be tested for each 150 cubic yards of each class of concrete, with minimum of 6 specimens for each class of concrete placed; not less than 6 specimens for each half day's placement; and not less than 2 sets of 6 specimens for each structure.
 - 2) 1 cylinder will be broken at 7 days, 1 at 14 days, and 3 at 28 days. The 6th cylinder may be used to evaluate strength after 28 days if requested by the Engineer.
 - 3) Retain and store "6th cylinders" (tested and untested) at testing laboratory until 56 days. Break "6th cylinder" when directed by the Engineer.
 - g. Provide full access for Engineer to observe concrete sampling and testing at any time.

- C. Test completed liquid containment structures listed in Section 01_75_19 - Water Leakage Test for Concrete Structures for watertightness.

3.12 FIELD QUALITY CONTROL BY OWNER

- A. Provide on-site inspection and field quality assurance for the Work of this Section as specified in Section 01_45_00 - Quality Control.
- B. Special tests and inspections: See Section 01_45_24 - Regulatory Quality Assurance.
- C. Field inspections:
 - 1. Required inspections:
 - a. Observe construction for conformance to the Contract Documents and the accepted submittals.
 - 2. Records of inspections:
 - a. Provide record of each inspection.
 - b. Submit copies to Contractor upon request.
- D. Field tests:
 - 1. Engineer may request, at any time, additional testing to confirm that materials being delivered and placed conform to the requirements of the Contract Documents:
 - a. If such additional testing shows that the material do not conform to the specified requirements, Contractor shall pay the cost of these tests.
 - b. If such additional testing shows that the materials do conform to the specified requirements, Owner will pay the cost of these tests.

3.13 NON-CONFORMING WORK

- A. Remove and replace or repair non-conforming and defective work:
 - 1. Provide repairs having strength equal to or greater than specified concrete for areas involved.
 - 2. Provide replacement or repair of non-conforming work by means acceptable to the Engineer and at no additional cost to Owner.
 - 3. Project schedule will not be extended based on work to address non-conforming concrete.
- B. Concrete not conforming to the specified requirements for properties of plastic concrete: Remove from the site and replace with conforming materials at no additional cost to Owner:
 - 1. Temperature: Do not use concrete having a temperature above or below the limits specified in this Section.
 - 2. Slump: Do not place concrete that does not conform to requirements for slump.
 - 3. Air entrainment: Do not use concrete that does not conform to requirements for percentage of entrained air.
- C. Concrete not conforming to the specified requirements for compressive strength:
 - 1. Concrete is expected to reach a compressive strength equal to or greater than the minimum specified compressive strength f'_c in Table 3 of this Section.
 - 2. Strength of concrete will be considered acceptable if following conditions are satisfied:
 - a. Averages of all sets of 3 consecutive strength test results is greater than or equal to the specified compressive strength f'_c .
 - b. No individual strength test (average of 3 cylinders) falls below the strength specified in Table 6 of this Section.

- c. Where relationships between 7-day and 28-day compressive strength, or between 28-day and 56-day compressive strength, have been provided as part of the mix design submittals:
 - 1) 7-day strength may be considered as an indication of 28 day strength provided effects of temperature and humidity between 7 day and 28 day are taken into account.
 - 2) 28-day strength may be considered as indication of 56 day strength provided effects of temperature and humidity between 28 days and 56 days are taken into account.

Table 6: Strength Compliance Requirements	
Minimum Specified Compressive Strength, f'c (pounds per square inch)	Lower Bound of an Individual Compressive Strength Test, (pounds per square inch)
Less than 5,000	f'c – 500
Over 5,000	f'c – (0.10 x f'c)

3. Non-compliant strength tests.
 - a. Mark non-compliant strength test reports to highlight the non-complying results, and immediately forward copies to all parties on the test report distribution list.
 - b. Initial treatment may consist of additional curing of affected portion(s) followed by not less than 3 cores at each affected area, taken in accordance with ASTM C42 and ACI 318. Obtain Engineer's acceptance of proposed coring locations before proceeding with that work.
 - c. Submit report of compressive strength testing for Engineer's review.
 - d. If requested by the Engineer, provide additional cores, and obtain petrographic testing in accordance with ASTM C856. Submit results for Engineer's review.
 - e. If additional curing does not bring the average strength of 3 cores taken in affected area to at least specified compressive strength f'c, designate such concrete in affected area will be considered defective.
 - f. Engineer may require the Contractor to strengthen defective concrete by means of additional concrete, additional reinforcing steel, or replacement of defective concrete, all at the Contractor's expense.
- D. Concrete sections or surfaces with honeycombing and voids:
 1. Provide repairs having surface appearance and finish consistent with that of the surrounding work and acceptable to the Engineer.
 2. Do not patch, repair, or cover defective Work without prior inspection by the Engineer.
 3. Preparation of concrete for repair:
 - a. Make no repair until Engineer has accepted methods for preparing surfaces and for making and curing repairs.
 - b. Chip out and key-in imperfections in the Work to make them ready for repair.
 - c. Coat bonding surfaces and edges of repair area with one of the following bonding agents as accepted by the Engineer.
 - 1) Epoxy bonding agent as specified in Section 03_63_01 - Epoxies; or
 - 2) Epoxy resin/Portland cement bonding agent as specified in Section 03_63_02 - Epoxy Resin/Portland Cement Bonding Agent.
 4. Methods of repair:
 - a. Dry pack mortar method:
 - 1) Use for holes having depth nearly equal to or greater than least surface dimension of hole, for cone-bolt holes, and for narrow slots cut for repair.

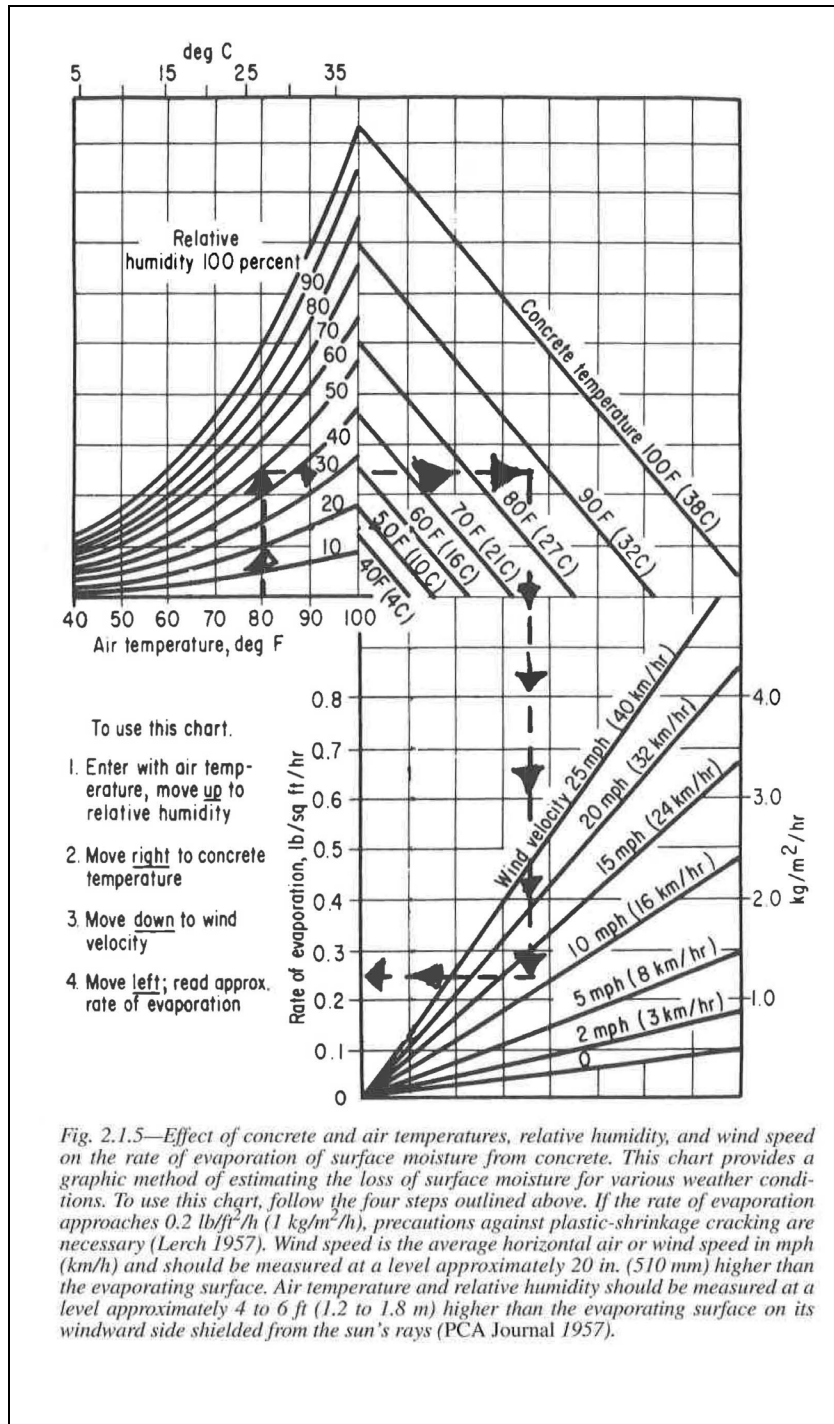
- 2) Smooth Holes: Clean and roughen by heavy sandblasting before repair.
 - 3) Install dry-pack mortar as specified in Section 03_60_00 - Grouting.
 - b. Cement mortar method:
 - 1) Use for holes too wide to dry pack and too shallow for concrete replacement; and for comparatively shallow depressions, large or small, that extend no deeper than nearest surface reinforcement.
 - 2) Install cement mortar as specified in Section 03_60_00 - Grouting.
 - c. Concrete replacement:
 - 1) Use when holes extend entirely through the concrete section or when holes are more than 1 square foot in area and extend halfway or more through the section.
 - 2) Form, place, consolidate, and cure concrete of same mix as the surrounding work.
- E. Leaking construction joints and cracks in concrete walls and slabs:
 - 1. Repair cracks that develop in walls or slabs, and repair cracks that show any signs of leakage until all leakage is stopped.
 - 2. Pressure inject visible cracks in the following areas, other than hairline cracks and crazing, with repair products and methods acceptable to the Engineer:
 - a. Floors and walls of water bearing structures.
 - b. Walls and overhead slabs of passageways and occupied spaces where the opposite face of the member is exposed to weather or may be washed down and where the opposite face does not receive a separate waterproofing membrane.
 - c. Other items not specified to receive separate waterproofing membrane including slabs over water channels, wet wells, reservoirs, and other similar surfaces.
 - 3. Continue pressure injection of cracks as specified until structure is watertight and remains watertight for not less than 1 year after date of Substantial Completion or date of final repair, whichever occurs later in time.
- F. Leaking expansion joints in concrete walls or slabs that include waterstops:
 - 1. Repair any signs of leakage until all leakage is stopped.
 - 2. Pressure inject visible leaks with hydrophilic polyurethane foam resin as specified in Section 03_64_25 - Hydrophilic and Hydrophobic Foam Polyurethane Resin Injection System.
 - 3. Continue pressure injection along joints lines as specified until structure is watertight and remains watertight for not less than 1 year after date of Substantial Completion or date of final repair, whichever occurs later in time.
- G. Walls and slabs at overhead channels that leak or sweat because of porosity or cracks too small for successful pressure injection with epoxy:
 - 1. Seal on water or weather side by coating using surface-applied sealing system as specified in this Section.
 - 2. Apply as recommended by manufacturer published instructions. Where concrete continues to sweat or leak, apply additional coats of surface-applied sealing system until the sweating or leaks stop.
 - 3. Continue application of surface-applied sealing system until structure is watertight and remains watertight for not less than 1 year after date of Substantial Completion, or date of final repair, whichever occurs later in time.

END OF SECTION

ATTACHMENT A - MENZEL FORMULA AND NOMOGRAPH

MENZEL FORMULA AND NOMOGRAPH

Source: ACI 350R



ATTACHMENT B - COARSENESS FACTOR CHART

COARSENESS FACTOR CHART

Source: ACI 302.1R-15, Figure 8.9.2.2.

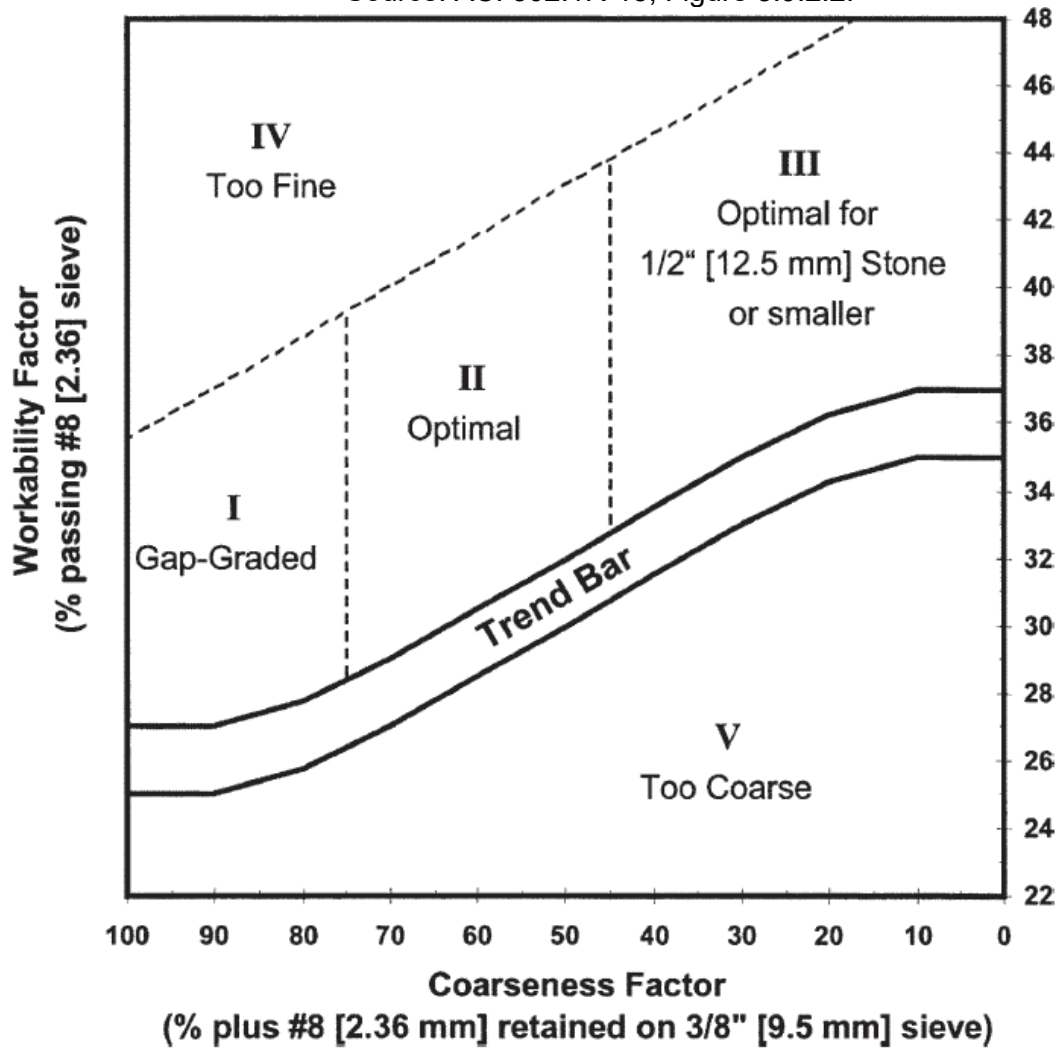
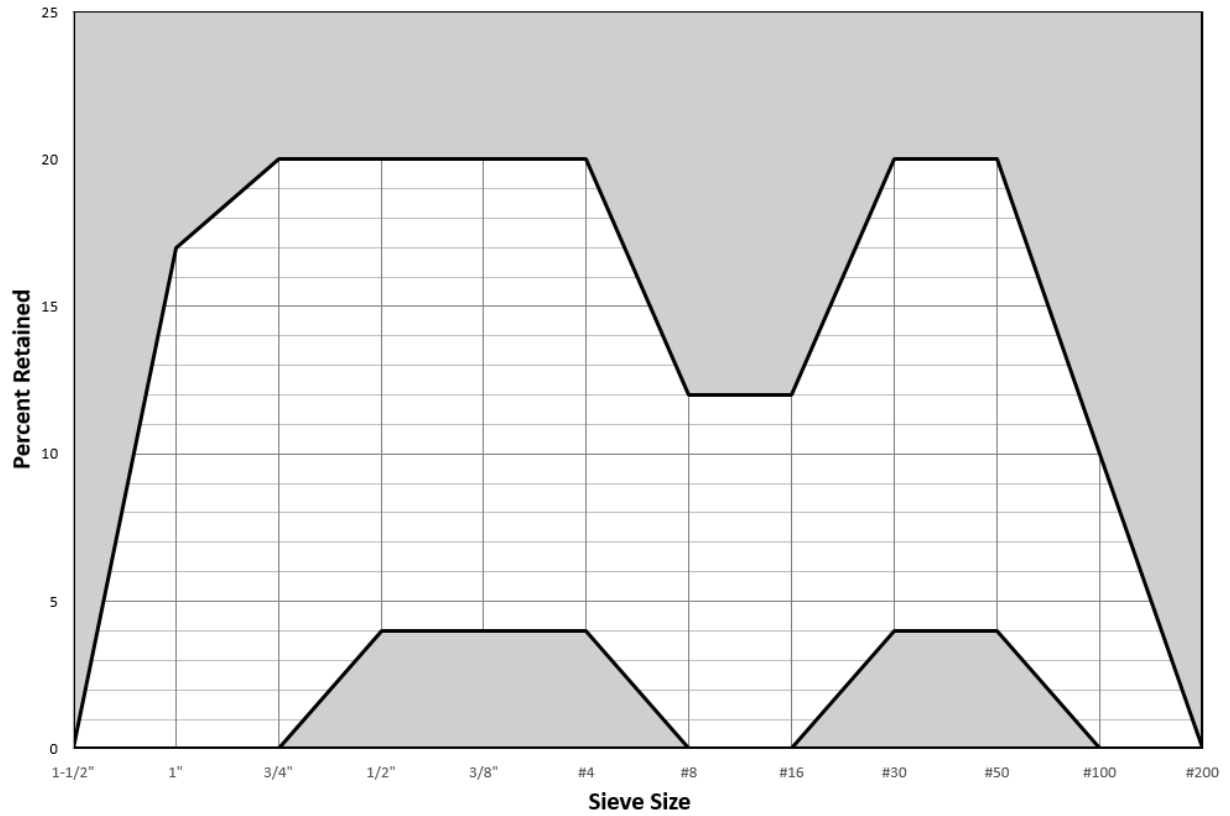


Fig. 8.9.2.2—Coarseness factor chart for evaluating potential performance of mixture.

ATTACHMENT C - COMBINED AGGREGATE GRADATION CHART

COMBINED AGGREGATE GRADATION CHART



ATTACHMENT D - CONCRETE PLACEMENT CHECKLIST

CONCRETE PLACEMENT CHECKLIST

Project: _____ Class of Concrete _____

Project No.: _____ Test Cylinders Taken? Yes _____ No _____

Location of Placement _____

The Contractor certifies the above-proposed concrete placement is prepared as indicated and is in

Preparation Slab	Contractor	N/A
Compaction Subgrade		
Filter Fabric/Drain Rock-ABC/Separator Fabric		
Drain Rock, Pea Gravel & Void Form		
Starter Wall Forms		
Reinforcing Steel		
Screeds		

Embedded Items	Contractor	N/A
A. Anchor Bolts		
B. Water Stop		
C. Rebar		
D. Electrical		
E. Plumbing Rough-in		
F. Mechanical		
G. HVAC		

Concrete Placement Equip.	Contractor	N/A
A. Crane		
B. Buckets		
C. Hoppers		
D. Vibrators		
E. Elephant trunks		
F. Floodlights		
G. Pump Truck		

Building Department Notification	
Date: _____	Time: _____

Prep Wall Concrete	Contractor	N/A
Access To Work		
Ladders Secured		
Clean up and Washed Out		
Reinforcing Steel		

Forms	Contractor	N/A
A. Alignment & Grade		
B. Scaffolding		
C. Sleeves & Wall Castings		
D. Embedded Items		
E. Electrical		
F. Plumbing Rough-in		
G. Piping		

Record of Curing Conditions During Placement	
	Start Finish
Date	
Time	
Weather	
Temperature	
Comments	

accord with the Contract Drawings and Specifications. The Contractor requests permission to begin placement of concrete on the date of _____ at _____. The estimated number of yards is: _____. The estimated duration of the placement is _____.

By: _____
Contractor

Released for placement by: _____
Engineer

SECTION 03_35_29

TOOLED CONCRETE FINISHING

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Tooled concrete finishes.

1.02 QUALITY ASSURANCE

- A. Mock-ups:
 - 1. Test panels for concrete finishes:
 - a. Prepare test panels for F4 and F5 finishes and tie-hole repairs for review by Engineer.
 - b. Accepted test panels serve as standard of quality and workmanship for project.
 - 2. Prepare test panel showing horizontal and vertical joints proposed for project for review by the Engineer. Refer to finishes specified in this Section.
 - 3. Test panels indicating methods for making concrete repairs: Prepare test panels for proposed repairs at beginning of project for review by Engineer:
 - a. Accepted test panels serve as standard for repairs during the project.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. Packing and shipping:
 - 1. Deliver and store packaged materials in original containers until ready for use.

PART 2 PRODUCTS

2.01 MIXES

- A. Mortar mix for F4 finish: Consist of 1 part cement and 1-1/2 parts of fine sand passing Number 100 screen. Mix with enough water and emulsified bonding agent to have consistency of thick cream.
- B. Mortar mix for F5 finish: Consist of 1 part cement to 1-1/2 parts of sand which passes Number 16 screen.

2.02 CONCRETE SEALER

- A. Manufacturers: One of the following or equal:
 - 1. Euclid Chemical Company: Diamond Hard.
 - 2. L&M Construction Chemicals: SealHard.

PART 3 EXECUTION

3.01 CONCRETE FINISHES

- A. Cement for finishes:
 - 1. Addition of white cement may be required to produce finish which matches color of concrete to be finished.
- B. Finish vertical concrete surfaces with one of the following finishes as indicated in the Finish Schedule:
 - 1. F1 finish: No special treatment other than repair defective work and fill depressions 1 inch or deeper and tie holes with mortar after removal of curing compound.
 - 2. F2 finish: No special treatment other than repair defective work, remove fins, fill depressions 1/2 inch or deeper and tie holes with mortar after removal of curing compound.
 - 3. F3 finish: Repair defective work, remove fins, offsets, and grind projections smooth. Fill depressions 1/4 inch or larger in depth or width and tie holes with mortar after removal of curing compound.
 - 4. F4 finish: Receive same finish as specified for F3 finish, and, in addition fill depressions and holes 1/16 inch or larger in width with mortar.
 - a. "Brush-Off" sandblast surfaces prior to filling holes to expose all holes near surface of the concrete.
 - b. Thoroughly wet surfaces and commence filling of pits, holes, and depressions while surfaces are still damp.
 - c. Perform filling by rubbing mortar over entire area with clean burlap, sponge rubber floats, or trowels.
 - d. Do not let any material remain on surfaces, except that within pits and depressions.
 - e. Wipe surfaces clean and moist cure.
 - 5. F5 finish: Receive same finish as specified for F3 finish, and, in addition, receive special stoned finish, in accordance with following requirements:
 - a. Remove forms and perform required repairs, patching, and pointing as specified in this Section.
 - b. Wet surfaces thoroughly with brush and rub with hard wood float dipped in water containing 2 pounds of portland cement per gallon.
 - c. Rub surfaces until form marks and projections have been removed.
 - d. Spread grindings from rubbing operations uniformly over surface with brush in such manner as to fill pits and small voids.
 - e. Moist cure brushed surfaces and allow to harden for 3 days:
 - 1) After curing, obtain final finish by rubbing with carborundum stone of approximately Number 50 grit until entire surfaces have smooth texture and are uniform in color.
 - 2) Continue curing for remainder of specified time.
 - f. If any concrete surface is allowed to become too hard to finish in above specified manner, sandblast and wash related surfaces exposed to view, whether finished or not:
 - 1) While still damp, rub over surface, plastic mortar, as specified for brushed surfaces and handstoned with Number 60 grit carborundum stone, using additional mortar for brushed surfaces until surface is evenly filled without an excess of mortar.

- 2) Continue stoning until surface is hard.
 - 3) After moist curing for 3 days, make surface smooth in texture and uniform in color by use of Number 50 or Number 60 grit carborundum stone.
 - 4) After stoning, continue curing until 7 day curing period is completed.
- C. Finish horizontal concrete surfaces with one of the following finishes as indicated in the Finish Schedule after proper and adequate vibration and tamping:
1. S1 finish: Screeded to grade and leave without special finish.
 2. S2 finish: Smooth steel trowel finish.
 3. S3 finish: Steel trowel finish free from trowel marks. Provide smooth finish free of all irregularities.
 4. S4 finish: Steel trowel finish, without local depressions or high points, followed by light hairbroom finish. Do not use stiff bristle brooms or brushes. Perform brooming parallel to slab-drainage. Provide resulting finish that is rough enough to provide nonskid finish. Finish is subject to review and acceptance by the Engineer.
 5. S5 finish: Nonslip abrasive: After concrete has been screeded level and hardened enough to support man standing on a board, sprinkle abrasive from shake screen into surface at uniform rate of 25 pounds for each 100 square feet of surface area, wood float into finish, then trowel abrasive into surface with steel trowel properly exposing abrasive in surface as required to provide nonslip surface.
 6. S6 finish: Roughened finish: After concrete has been screeded to grade, apply a roughened finish by use of a jitterbug roller or similar device.
- D. Finish concrete floor surfaces to which surfacing material is applied: Finish smooth with tolerance within 1/8 inch in 10 feet in any direction from lines indicated on the Drawings.

3.02 CONCRETE FINISH SCHEDULE

- A. Finish concrete surfaces as follows:
1. F4 finish for following vertical surfaces:
 - a. Concrete surfaces specified or indicated to be painted.
 - b. Concrete surfaces, interior or exterior, exposed to view.
 2. Surfaces in open channels, basins, and similar structures:
 - a. F3 finish for vertical surfaces which are normally below water surface.
 - b. F4 finish for vertical surfaces located above normal water surface and exposed to view.
 - c. Remove fins and fill tie holes from concrete surfaces located in closed boxes or channels where there is normally no access or passageway.
 3. S1 finish for following surfaces:
 - a. Projecting footings which are to be covered with dirt.
 - b. Slab surfaces which are to be covered with concrete fill.
 4. S2 finish for following surfaces:
 - a. Tops of corbels.
 - b. Tops of walls and beams not covered above in this Section.
 - c. Tops of slabs not covered above in this Section.
 - d. All other surfaces not specified to be finished otherwise.

5. S3 finish for following surfaces:
 - a. Building and machine room floors which are not covered with surfacing material: Provide floors that are free from trowel marks.
6. S4 finish for following surfaces:
 - a. Exterior walkways.
 - b. Tops of exterior walls or beams which are to serve as walkways.
 - c. Tops of exterior walls or beams which are to support gratings.
 - d. Top surface of slabs for basins, channels, digesters, and similar structures.
7. S6 finish for following surfaces:
 - a. Basin bottoms, or other similar slab surfaces, over which layer of basin bottom grout will be applied.

END OF SECTION

SECTION 03_60_00

GROUTING

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Cement grout.
 - 2. Cement mortar.
 - 3. Dry-pack mortar.
 - 4. Epoxy grout.
 - 5. Grout.
 - 6. Non-shrink epoxy grout.
 - 7. Non-shrink grout.

1.02 REFERENCES

- A. ASTM International (ASTM):
 - 1. C109 - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (using 2-inch cube specimens).
 - 2. C230 - Standard Specification for Flow Table for Use in Tests of Hydraulic Cement.
 - 3. C531 - Standard Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes.
 - 4. C579 - Standard Test Method for Compressive Strength of Chemical-Resistant Mortars, Grouts, and Monolithic Surfacing and Polymer Concretes.
 - 5. C939 - Standard Test Method for Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method).
 - 6. C942 - Standard Test Method for Compressive Strength of Grouts for Preplaced-Aggregate Concrete in the Laboratory.
 - 7. C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-shrink).
 - 8. C1181 - Standard Test Methods for Compressive Creep of Chemical-Resistant Polymer Machinery Grouts.
- B. International Concrete Repair Institute (ICRI):
 - 1. 310.2R - Selecting and specifying Concrete Surface Preparations for Sealers, Coatings, Polymer Overlays, and Concrete Repair.

1.03 SUBMITTALS

- A. Cement grout:
 - 1. Mix design.
 - 2. Material Submittals.

- B. Cement mortar:
 - 1. Mix design.
 - 2. Material Submittals.
- C. Non-shrink epoxy grout:
 - 1. Manufacturer's literature.
- D. Non-shrink grout:
 - 1. Manufacturer's literature.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to jobsite in their original, unopened packages or containers, clearly labeled with manufacturer's product identification and printed instructions.
- B. Store materials in cool dry place and in accordance with manufacturer's recommendations.
- C. Handle materials in accordance with the manufacturer's instructions.

PART 2 PRODUCTS

2.01 MANUFACTURED UNITS

- A. Non-shrink epoxy grout:
 - 1. Manufacturers: One of the following or equal:
 - a. Five Star Products, Inc., Five Star DP Epoxy Grout.
 - b. Master Builder Solutions, MasterFlow 648.
 - c. L&M Construction Chemicals, Inc., EPOGROUT.
 - 2. Non-shrink epoxy grout shall be 100 percent solid, premeasured, prepackaged system containing 2-component thermosetting epoxy resin and inert aggregate.
 - 3. Maintain flowable consistency for at least 45 minutes at 70 degrees Fahrenheit.
 - 4. Shrinkage or expansion: Less than 0.0006 inches per inch when tested in accordance with ASTM C531.
 - 5. Minimum compressive strength: 10,000 pounds per square inch at 24 hours and 14,000 pounds per square inch at 7 days when tested in accordance with ASTM C579, Method B.
 - 6. Compressive creep: Not exceed 0.0037 inches/per inch when tested under 400 pounds per square inch constant load at 140 degrees Fahrenheit in accordance with ASTM C1181.
 - 7. Coefficient of thermal expansion: Not exceed 0.000018 inches per inch per degree Fahrenheit when tested in accordance with ASTM C531, Method B.
- B. Non-shrink grout:
 - 1. Manufacturers: One of the following or equal:
 - a. Five Star Products, Inc., Five Star Grout.
 - b. Master Builder Solutions, MasterFlow 928.
 - c. L&M Construction Chemicals, Inc., CRYSTEX.
 - 2. In accordance with ASTM C1107.
 - 3. Preportioned and prepackaged cement-based mixture.

4. Contain no metallic particles such as aluminum powder and no metallic aggregate such as iron filings.
5. Require only addition of potable water.
6. Water for pre-soaking, mixing, and curing: Potable water.
7. Free from emergence of mixing water from within or presence of water on its surface.
8. Remain at minimum flowable consistency for at least 45 minutes after mixing at 45 degrees Fahrenheit to 90 degrees Fahrenheit when tested in accordance with ASTM C230.
 - a. If at fluid consistency, verify consistency in accordance with ASTM C939.
9. Dimensional stability (height change):
 - a. In accordance with ASTM C1107, volume-adjusting Grade B or C at 45 degrees Fahrenheit to 90 degrees Fahrenheit.
 - b. Have 90 percent or greater bearing area under bases.
10. Have minimum compressive strengths at 45 degrees Fahrenheit to 90 degrees Fahrenheit in accordance with ASTM C1107 for various periods from time of placement, including 5,000 pounds per square inch at 28 days when tested in accordance with ASTM C109 as modified by ASTM C1107.

2.02 MIXES

- A. Cement grout:
 1. Use same sand-to-cementitious materials ratio for cement grout mix that is used for concrete mix.
 2. Use same materials for cement grout that are used for concrete.
 3. Use water-to-cementitious materials ratio that is no more than that specified for concrete.
 4. For spreading over surfaces of construction or cold joints.
- B. Cement mortar:
 1. Use same sand-to-cementitious materials ratio for cement mortar mix that is used for concrete mix.
 2. Use same materials for cement mortar that are used for concrete.
 3. Use water-to-cementitious materials ratio that is no more than that specified for concrete being repaired.
 4. At exposed concrete surfaces not to be painted or submerged in water: Use sufficient white cement to make color of finished patch match that of surrounding concrete.
- C. Dry-pack mortar:
 1. Proportions by weight: 1 part Portland cement to 2 parts concrete sand.
 - a. Portland cement: As specified in Section 03_30_00 - Cast-in-Place Concrete.
 - b. Concrete sand: As specified in Section 03_30_00 - Cast-in-Place Concrete.
- D. Epoxy grout:
 1. Consist of mixture of epoxy or epoxy gel and sand.
 - a. Epoxy: As specified in Section 03_63_01 - Epoxies.
 - b. Epoxy gel: As specified in Section 03_63_01 - Epoxies.
 - c. Sand: Clean, bagged, graded, and kiln-dried silica sand.

- 2. Proportioning:
 - a. For horizontal work: Consist of mixture of 1 part epoxy with not more than 2 parts sand.
 - b. For vertical or overhead work: Consist of 1 part epoxy gel with not more than 2 parts sand.
- E. Grout:
 - 1. Mix in proportions by weight: 1 part Portland cement to 4 parts concrete sand.
 - a. Portland cement: As specified in Section 03_30_00 - Cast-in-Place Concrete.
 - b. Concrete sand: As specified in Section 03_30_00 - Cast-in-Place Concrete.
- F. Non-shrink epoxy grout:
 - 1. Mix in accordance with manufacturer's installation instructions.
- G. Non-shrink grout:
 - 1. Mix in accordance with manufacturer's installation instructions such that resulting mix has flowable consistency and is suitable for placing by pouring.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Inspect concrete surfaces to receive grout or mortar and verify that they are free of ice, frost, dirt, grease, oil, curing compounds, paints, impregnations, and loose material or foreign matter likely to reduce bond or performance of grout or mortar.

3.02 PREPARATION

- A. Surface preparation for grouting other baseplates:
 - 1. Remove grease, oil, dirt, dust, curing compounds, laitance, and other deleterious materials that may affect bond to concrete and bottoms of baseplates.
 - 2. Roughen concrete surfaces in contact with grout to ICRI CSP-6 surface profile or rougher:
 - a. Remove loose or broken concrete.
 - 3. Metal surfaces in contact with grout: Grit blast to white metal surface.

3.03 INSTALLATION

- A. Mixing:
 - 1. Cement grout:
 - a. Use mortar mixer with moving paddles.
 - b. Pre-wet mixer and empty out excess water before beginning mixing.
 - 2. Cement mortar:
 - a. Use mortar mixer with moving paddles.
 - b. Pre-wet mixer and empty out excess water before beginning mixing.

3. Dry-patch mortar:
 - a. Use only enough water so that resulting mortar will crumble to touch after being formed into ball by hand.
 4. Non-shrink epoxy grout:
 - a. Keep temperature of non-shrink epoxy grout from exceeding manufacturer's recommendations.
 5. Non-shrink grout:
 - a. May be drypacked, flowed, or pumped into place. Do not overwork grout.
 - b. Do not retemper by adding more water after grout stiffens.
- B. Placement:
1. Cement grout:
 - a. Exercise care in placing cement grout because it is required to furnish structural strength, impermeable water seal, or both.
 - b. Do not use cement grout that has not been placed within 30 minutes after mixing.
 2. Cement mortar:
 - a. Use mortar mixer with moving paddles.
 - b. Pre-wet mixer and empty out excess water before beginning mixing.
 3. Epoxy grouts:
 - a. Wet surfaces with epoxy for horizontal work or epoxy gel for vertical or overhead work prior to placing epoxy grout.
 4. Non-shrink epoxy grout:
 - a. Mix in complete units. Do not vary ratio of components or add solvent to change consistency of mix.
 - b. Pour hardener into resin and mix for at least 1 minute and until mixture is uniform in color. Pour epoxy into mortar mixer wheelbarrow and add aggregate. Mix until aggregate is uniformly wetted. Over mixing will cause air entrapment in mix.
 5. Non-shrink grout:
 - a. Add non-shrink cement grout to premeasured amount of water that does not exceed the manufacturer's maximum recommended water content.
 - b. Mix in accordance with manufacturer's instructions to uniform consistency.
- C. Curing:
1. Cement based grouts and mortars:
 - a. Keep continuously wet for minimum of 7 days. Use wet burlap, soaker hose, sun shading, ponding, and in extreme conditions, combination of methods.
 - b. Maintain above 40 degrees Fahrenheit until it has attained compressive strength of 3,000 pounds per square inch, or above 70 degrees Fahrenheit for minimum of 24 hours to avoid damage from subsequent freezing.
 2. Epoxy based grouts:
 - a. Cure grouts in accordance with manufacturers' recommendations.
 - 1) Do not water cure epoxy grouts.
 - b. Do not allow any surface in contact with epoxy grout to fall below 50 degrees Fahrenheit for minimum of 48 hours after placement.
- D. Grouting equipment bases, baseplates, soleplates, and skids: As specified in Section 46_05_10 - Common Work Results for Mechanical Equipment.

E. Grouting other baseplates:

1. General:

- a. Use non-shrink grout as specified in this Section.
- b. Baseplate grouting shall take place from 1 side of baseplate to other in continuous flow of grout to avoid trapping air in grout.
- c. Maintain hydrostatic head pressure by keeping level of grout in headbox above bottom of baseplate. Fill headbox to maximum level and work grout down.
- d. Vibrate, rod, or chain non-shrink grout to facilitate grout flow, consolidate grout, and remove trapped air.

2. Forms and headboxes:

- a. Build forms using material with adequate strength to withstand placement of grouts.
- b. Use forms that are rigid and liquidtight. Caulk cracks and joints with elastomeric sealant.
- c. Line forms with polyethylene for easy grout release. Coating forms with 2 coats of heavy-duty paste wax is also acceptable.
- d. Headbox shall be 4 to 6 inches higher than baseplate and shall be located on 1 side of baseplate.
- e. After grout sets, remove forms and trim back grout at 45 degree angle from bottom edges of baseplate.

3.04 FIELD QUALITY CONTROL

A. Non-shrink epoxy grout:

1. Test for 24-hour compressive strength in accordance with ASTM C579, Method B.

B. Non-shrink grout:

1. Test for 24-hour compressive strength in accordance with ASTM C942.

END OF SECTION

SECTION 03_63_01

EPOXIES

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Epoxy.
 - 2. Epoxy gel.
 - 3. Epoxy bonding agent.

1.02 REFERENCES

- A. ASTM International (ASTM):
 - 1. C881 - Standard Specification for Epoxy-Resin-Base Systems for Concrete.
 - 2. C882 - Standard Test Method for Bond Strength of Epoxy-Resin Systems Used with Concrete by Slant Shear.
 - 3. D638 - Standard Test Method for Tensile Properties of Plastics.
 - 4. D695 - Standard Test Method for Compressive Properties of Rigid Plastics.
- B. NSF International (NSF):
 - 1. 61 - Drinking Water System Components - Health Effects.

1.03 SUBMITTALS

- A. General: Submit as specified in Section 01_33_00 - Submittal Procedures.
- B. Product Data: Submit manufacturer's data completely describing epoxy materials:
 - 1. Submit evidence of conformance to ASTM C881. Include manufacturer's designations of Type Grade, Class, and Color.
 - 2. Submit documentation that materials meet or exceed the specified strength and performance characteristics. Indicate test methods and test results.
 - 3. Submit documentation confirming listing under NSF-61.
- C. Quality control submittals:
 - 1. Manufacturer's installation instructions.

PART 2 PRODUCTS

2.01 DESIGN AND PERFORMANCE CRITERIA

- A. Performance requirements:
 - 1. Provide epoxy materials that are new.
 - 2. Store and use products within limitations set forth by manufacturer.
 - 3. Perform and conduct work of this Section in neat orderly manner.

2.02 MATERIALS

A. General:

1. Moisture tolerant, water-insensitive, two-component epoxy resin adhesive material containing 100 percent solids, and meeting or exceeding the performance properties specified when tested in accordance with the standards specified.
2. Listed under NSF-61 for use in direct contact with potable water.

B. Epoxy: Low viscosity product in accordance with ASTM C881; Types I, II and IV; Grade 1; Class C , except as modified in this Section.

1. Manufacturers: One of the following or equal:
 - a. Dayton Superior, Unitex Pro-Poxy 100.
 - b. Sika Corporation, Sikadur 35 Hi-Mod LV.
2. Required properties:

Table 1 - Material Properties - Epoxy.		
Property	Test Method	Required Results ("neat")
Tensile Strength (7-day)	ASTM D638	7,000 pounds per square inch, minimum.
Compressive Yield Strength (7-day)	ASTM D695	10,000 pounds per square inch, minimum.
Bond Strength (hardened concrete to hardened concrete after 2-day cure)	ASTM C882	1,000 pounds per square inch, minimum. Concrete failure before failure of epoxy.
Viscosity (mixed)		250-550 centipoise
Notes:	Testing results are for materials installed and cured at a temperature between 72 and 78 degrees Fahrenheit for 7 days, unless otherwise noted.	

C. Epoxy gel: Non-sagging product in accordance with ASTM C881, Types I and IV, Grade 3, Class C.

1. Manufacturers: One of the following or equal:
 - a. Sika Corp., Sikadur 31, Hi-Mod Gel.
2. Required properties:

Table 2 - Material Properties - Epoxy Gel.		
Property	Test Method	Required Results ("neat")
Tensile Strength (7-day)	ASTM D638	2,000 pounds per square inch, minimum.
Compressive Yield Strength (7-day)	ASTM D695	8,000 pounds per square inch, minimum.

Table 2 - Material Properties - Epoxy Gel.		
Property	Test Method	Required Results ("neat")
Bond Strength (14-day)	ASTM C882	1,500 pounds per square inch, minimum.
Notes:	Testing results are for materials installed and cured at a temperature between 72 and 78 degrees Fahrenheit for 7 days, unless otherwise noted.	

- D. Epoxy bonding agent: Non-sagging product in accordance with ASTM C881, Type II, Grade 2, Class C.
1. Manufacturers: One of the following or equal:
 - a. Sika Chemical Corp., Sikadur 32 Hi-Mod LPL.
 2. Required properties.

Table 3 - Material Properties - Epoxy Bonding Agent		
Property	Test Method	Required Results
Tensile Strength (7-day)	ASTM D638	3,300 pounds per square inch, minimum.
Compressive Yield Strength (7-day)	ASTM D695	8,300 pounds per square inch, minimum.
Bond Strength (14-days)	ASTM C882	1,800 pounds per square inch, minimum. Concrete failure before failure of epoxy bonding agent.
Pot Life	-	Per manufacturer.
Notes:	Testing results are for materials installed and cured at a temperature between 72 and 78 degrees Fahrenheit for 7 days, unless otherwise noted.	

3. If increased contact time is required for concrete placement, epoxy resin/portland cement bonding agent as specified in Section 03_63_02 - Epoxy Resin/Portland Cement Bonding Agent may be used instead of epoxy bonding agent.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install and cure epoxy materials in accordance with manufacturer's installation instructions.
- B. Epoxy:
 1. Apply in accordance with manufacturer's installation instructions.

- C. Epoxy gel:
 - 1. Apply in accordance with manufacturer's installation instructions.
 - 2. Use for vertical or overhead work, or where high viscosity epoxy is required.
 - 3. Epoxy gel used for vertical or overhead work may be used for horizontal work.
- D. Epoxy bonding agent:
 - 1. Apply in accordance with manufacturer's installation instructions.
 - 2. Bonding agent will not be required for filling form tie holes or for normal finishing and patching of similar sized small defects.

END OF SECTION

SECTION 03_63_02

EPOXY RESIN/PORTLAND CEMENT BONDING AGENT

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Epoxy resin/portland cement bonding agent.

1.02 REFERENCES

- A. ASTM International (ASTM):
 - 1. C109 - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. Cube Specimens).
 - 2. C348 - Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars.
 - 3. C496 - Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens.
 - 4. C882 - Standard Test Method for Bond Strength of Epoxy-Resin Systems Used With Concrete By Slant Shear.
- B. Federal Highway Administration (FHWA):
 - 1. FHWA-RD-86-193 - Highway Concrete Pavement Technology Development and Testing Volume V: Field Evaluation of SHRP C9206 Test Sites (Bridge Deck Overlays).

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Sika Corp., Sika Armatec 110.
- B. Substitutions: The use of other than the specified product will be considered, providing the Contractor requests its use in writing to the Engineer. This request shall be accompanied by:
 - 1. A certificate of compliance from an approved independent testing laboratory that the proposed substitute product meets or exceeds specified performance criteria, tested in accordance with the specified test standards.
 - 2. Documented proof that the proposed substitute product has a 1-year proven record of performance of bonding portland cement mortar/concrete to hardened portland cement mortar/concrete, confirmed by actual field tests and 5 successful installations that the Engineer can investigate.

2.02 MATERIALS

- A. Epoxy resin/portland cement adhesive:
 - 1. Component "A" shall be an epoxy resin/water emulsion containing suitable viscosity control agents. It shall not contain butyl glycidyl ether.

2. Component "B" shall be primarily a water solution of a polyamine.
3. Component "C" shall be a blend of selected portland cements and sands.
4. The material shall not contain asbestos.

2.03 DESIGN AND PERFORMANCE CRITERIA

- A. Properties of the mixed epoxy resin/portland cement adhesive:
 1. Pot life: 75 to 105 minutes.
 2. Contact time: 24 hours.
 3. Color: Dark gray.
- B. Properties of the cured epoxy resin/portland cement adhesive:
 1. Compressive strength in accordance with ASTM C109:
 - a. 3 day: 4,500 pounds per square-inch minimum.
 - b. 7 days: 6,500 pounds per square-inch minimum.
 - c. 28 days: 8,500 pounds per square-inch minimum.
 2. Splitting tensile strength in accordance with ASTM C496:
 - a. 28 days: 600 pounds per square-inch minimum.
 3. Flexural strength:
 - a. 1,100 pounds per square-inch minimum in accordance with ASTM C348.
 4. Bond strength in accordance with ASTM C882 modified at 14 days:
 - a. 0 hours open time: 2,800 pounds per square-inch minimum.
 - b. 24 hours open time: 2,600 pounds per square-inch minimum.
 5. The epoxy resin/portland cement adhesive shall not produce a vapor barrier.
 6. Material must be proven to prevent corrosion of reinforcing steel when tested under the procedures as set forth by the FHWA Program Report Number FHWA-RD-86-193. Proof shall be in the form of an independent testing laboratory corrosion report showing prevention of corrosion of the reinforcing steel.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Mixing the epoxy resin: Shake contents of Component "A" and Component "B." Empty all of both components into a clean, dry mixing pail. Mix thoroughly for 30 seconds with a jiffy paddle on a low-speed with 400 to 600 revolutions per minute drill. Slowly add the entire contents of Component "C" while continuing to mix for a minimum of 3 minutes and until uniform with no lumps. Mix only the quantity that can be applied within its pot life.
- B. Placement procedure:
 1. Apply to prepared surface with stiff-bristle brush, broom, or "hopper-type" spray equipment:
 - a. For hand applications: Place fresh plastic concrete/mortar while the bonding bridge adhesive is wet or dry, up to 24 hours.
 - b. For machine applications: Allow the bonding bridge adhesive to dry for 12 hours minimum.

- C. Adhere to all limitations and cautions for the epoxy resin/portland cement adhesive in the manufacturer's current printed literature.

3.02 CLEANING

- A. Leave finished work and work area in a neat, clean condition without evidence of spillovers onto adjacent areas.

END OF SECTION

SECTION 03_64_25

HYDROPHILIC AND HYDROPHOBIC FOAM POLYURETHANE RESIN INJECTION SYSTEM

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Hydrophilic and hydrophobic foam polyurethane resin injection systems.

1.02 REFERENCES

- A. ASTM International (ASTM):
 - 1. D638 - Standard Test Method for Tensile Properties of Plastic.
 - 2. D3574 - Standard Test Methods for Flexible Cellular Materials-Slab, Bonded, and Molded Urethane Foams.
- B. NSF International (NSF):
 - 1. 61 - Drinking Water System Components - Health Effects.

1.03 SUBMITTALS

- A. General: Submit as specified in Section 01_33_00 - Submittal Procedures.
- B. Product data: Submit manufacturer's data completely describing polyurethane resin injection system materials.
- C. Quality control submittals:
 - 1. Certificates of Compliance.
 - 2. Manufacturer's Instructions.
 - 3. Protection plan for surrounding areas and non-cementitious surfaces.

1.04 QUALITY ASSURANCE

- A. Products:
 - 1. Provide materials that are new and use them within shelf life limitations set forth by the manufacturer.
- B. Qualifications:
 - 1. Installer:
 - a. Minimum 5 years' experience in concrete repair with focus on application of similar systems and products to projects of similar size and scope.
- C. Pre-installation meeting:
 - 1. At least 1 week prior to commencing work of this Section, convene a meeting at the project site to review and discuss the following:
 - a. Surface preparation.
 - b. Substrate conditioning and pre-treatment.
 - c. Installation procedures.

- d. Environmental conditions (including weather forecast) and curing requirements.
- e. Testing and inspection procedures.
- f. Protection of surrounding surfaces and equipment.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact. Labels shall indicate product identification, batch numbers, and shelf life.
- B. Store materials off the ground, away from moisture and direct sunlight, and at temperatures within manufacturer's recommended range.
- C. Pre-condition materials to manufacturer's recommended temperatures before using.

1.06 PROJECT CONDITIONS

- A. Take precautions to protect surfaces and equipment in the work area from damage and staining.

PART 2 PRODUCTS

2.01 MATERIALS

- A. General:
 - 1. Polyurethane resin injection systems that will be in direct contact with water after the Work is completed shall comply with applicable federal, state, or local regulations.
 - a. Confirm compliance by submitting documentation that products have been tested and listed in accordance with NSF-61 requirements. Provide testing by a nationally-recognized agency acceptable to Engineer.
 - 2. Repair materials shall be free of chlorides or alkalis (except for those attributed to water).
 - 3. To ensure that compatibility of materials and methods, a single manufacturer shall produce and provide all products used together in a single area of concrete repair.
- B. Manufacturers: One of the following or equal:
 - 1. Master Builders Solutions, MasterInject 1210 IUG (Formerly Concrecive 1210IUG).
 - 2. Sika Corp., SikaFix HH LV.
- C. Resin:
 - 1. Water-insensitive 1-part low-viscosity polyurethane resin adhesive material containing 100-percent solids and meeting or exceeding following characteristics when tested in accordance with standards specified:

Physical Characteristic	Required Results
Viscosity	400-600 CPS at 70 degrees Fahrenheit
Flash Point	greater than 200 degrees Fahrenheit
Corrosiveness	Non-corrosive
Reaction Time	75 - 90 seconds at 80 degrees Fahrenheit
Toxicity	Non-Toxic

- a. Uncured:
- b. Cured foam (1:1):

Physical Characteristic	Test Method	Required Results
Tensile Strength	ASTM D3574	150 - 400 pounds per square inch
Elongation	ASTM D3574	400 - 1200 percent

2.02 EQUIPMENT

- A. Pump unit:
 1. Furnish unit to be used for injection that is positive displacement type with interlock to provide in-line mixing and metering system for 1 component polyurethane resin.
 2. Furnish pressure hoses and injection nozzle of such design as to allow proper mixing of polyurethane resin.
 3. Standby injection unit may be required.
- B. Resin pump: Operating pressure in excess of 2,000 pounds per square inch with a variable pressure control trigger mechanism with attached pressure gauge, on the downstream end of the material supply hose.
- C. Water pump: High-pressure water blaster capable of 1,000 pounds per square inch or higher pressure.
- D. Incidentals: To be determined by site conditions and Contractor. See Installation Bulletin 6I12 - Urethane Injection, from Master Builders Solutions Construction Chemicals, LLC.

PART 3 EXECUTION

3.01 PREPARATION

- A. Surface preparation:
 - 1. Confirm that surface temperatures and moisture conditions are within manufacturer's recommended limits. Condition surfaces to within those limits before commencing urethane injection.
 - 2. Sweep or clean area in vicinity of cracks and joints that will be injected with polyurethane resin.
 - 3. Clean cracks and joints so they are free from dirt, laitance, and other loose matter.

3.02 INSTALLATION

- A. Install and cure polyurethane resin materials in accordance with manufacturer's installation instructions.
- B. Mixing:
 - 1. Mix urethane in accordance with manufacturer's installation instructions.
- C. Injection:
 - 1. Apply adequate surface seal to crack or joint to prevent escape of polyurethane resin.
 - 2. Establish injection ports along seal at a spacing not greater than the thickness of cracked member.
 - 3. Injection:
 - a. Inject polyurethane resin into crack or joint at first port with sufficient pressure to advance polyurethane resin to adjacent port. Start at lowest port along the injection line and work upwards.
 - b. Seal original port and shift injection to next adjacent port at which polyurethane resin appears.
 - c. Continue port-to-port injection until each crack or joint has been injected for its entire length.
 - 4. For small amounts of polyurethane, or where excessive pressures developed by injection pump unit might further damage the structure, material mixed and installed with a hand caulking gun may be used if acceptable to the Engineer.
 - 5. Seal ports, including adjacent locations where polyurethane resin seepage occurs, as necessary to prevent drips or run out.
 - 6. After injection is complete, remove surface seal material and re-finish concrete in the area where the polyurethane was injected to match surrounding concrete. Leave finished work and work area in a neat and clean condition.

3.03 FIELD QUALITY CONTROL

- A. Provide Contractor quality control as specified in Section 01_45_00 - Quality Control.
- B. Field inspections and tests:
 - 1. Submit records of inspections and test to Engineer within 24 hours after completion.

- C. Manufacturer's services.
 - 1. Pre-installation meeting. Provide manufacturer's technical representative to attend pre-installation meeting specified in Section 01_45_00 - Quality Control.

3.04 FIELD QUALITY ASSURANCE

- A. Provide Owner quality assurance as specified in Section 01_45_00 - Quality Control.
- B. Special inspections, special tests, and structural observation:
 - 1. Not required.
- C. Field inspections:
 - 1. Preparation.
 - a. Review manufacturer's product data and installation instructions.
 - 2. Required inspections:
 - a. Observe surfaces to be injected for temperature and moisture conditions.
 - b. Observe conditioning and preparation of urethane resin.
 - c. Observe injection procedures for filling cracks.
 - 3. Records of inspections:
 - a. Provide record of each inspection.
 - b. Submit to Engineer upon request.

3.05 NON-CONFORMING WORK

- A. Cracks, after injection, shall show no evidence of running or seeping water. Re-inject as necessary to provide watertight seal at no additional cost to Owner.
- B. Rework surface finishes that do not match surrounding concrete to the satisfaction of the Engineer at no additional cost to Owner.

END OF SECTION

SECTION 04_05_18

ADHESIVE BONDING REINFORCING BARS AND ALL THREAD RODS IN MASONRY

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Bonding reinforcing bars and all thread rods in masonry using injectable, 2-component adhesive.

1.02 REFERENCES

- A. American National Standards Institute (ANSI):
 - 1. Standard B212.15 - Carbide Tipped Masonry Drills and Blanks for Carbide Tipped Masonry Drills.
- B. ICC Evaluation Service, Inc. (ICC-ES):
 - 1. AC58 - Acceptance Criteria for Adhesive Anchors in Masonry Elements.
- C. Society for Protective Coatings (SSPC):
 - 1. Surface Preparation Standards (SP).
 - a. SP-1 - Solvent Cleaning.

1.03 DEFINITIONS

- A. Evaluation Report: Report prepared by ICC-ES, or by other testing agency acceptable to the Engineer and to the Authority Having Jurisdiction, that documents testing and review of the adhesive product to confirm that it conforms to the requirements of ICC-ES AC58.

1.04 SUBMITTALS

- A. Product data: Furnish technical data for adhesives, including:
 - 1. Independent testing laboratory results indicating allowable loads in tension and shear for masonry walls of the types included in the Work, with load modification factors for temperature, spacing, edge distance, and other installation variables.
 - 2. Handling and storage instructions.
 - 3. Installation instructions.
- B. Quality control submittals:
 - 1. Special inspection: Detailed instructions for special inspection to comply with the building code specified in Section 01_41_00 - Regulatory Requirements and as required by the Evaluation Report for each product.
 - 2. Evaluation Report confirming that the product complies with the requirements of ICC-ES AC58.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Store and protect as follows, unless manufacturer has more stringent requirements:
 - 1. Store adhesive components on pallets or shelving in a covered-storage area protected from weather.
 - 2. Control temperature to maintain storage within manufacturer's recommended temperature range:
 - a. If products are stored at temperatures outside manufacturer's recommended range, test components prior to use by methods acceptable to the Engineer to determine if the products still meet specified requirements.
 - 3. Dispose of products that have passed their expiration date.

1.06 PROJECT CONDITIONS

- A. As specified in Section 01_81_50 – Design Criteria.
- B. Seismic design category (SDC) for structures: As specified in Section 01_81_50 - Design Criteria.

PART 2 PRODUCTS

2.01 GENERAL

- A. Like items of materials: Use end products of one manufacturer to achieve structural compatibility and single-source responsibility.

2.02 ADHESIVE FOR SELF-CONTAINED CARTRIDGE SYSTEM

- A. Adhesive shall have a current Evaluation Report demonstrating compliance with the requirements of ICC-ES AC58.
- B. Materials:
 - 1. 2-component structural adhesive, insensitive to moisture, and gray in color.
 - 2. Cure temperature, pot life, and workability: Compatible with intended use and environmental conditions.
- C. Packaging:
 - 1. Furnished in disposable, side-by-side cartridges with resin and hardener components isolated until mixing through manufacturer's static mixing nozzle:
 - a. Nozzle designed to thoroughly blend the components, in the proper mixing ratio, for injection from the nozzle directly into prepared hole.
 - b. Provide nozzle extensions as required to allow full-depth insertion and filling from the bottom of the hole.
 - 2. Container markings: Include manufacturer's name, product name, batch number, mix ratio by volume, product expiration date, ANSI hazard classification, and appropriate ANSI handling precautions.

- D. For installation in solid masonry and solid-grouted masonry (concrete or brick):
 - 1. Manufacturers: One of the following or equal:
 - a. Hilti, Inc., HY-270 Adhesive Anchor System.
 - b. Simpson Strong-Tie Co., Inc., ET-HP Anchoring Adhesive.
 - c. USP Structural Connectors, CIA-GEL 7000 Masonry Epoxy Adhesive.
- E. For installation in un-grouted and partially-grouted masonry (concrete or brick) and in masonry containing voids or holes (concrete or brick):
 - 1. Manufacturers: The following or equal:
 - a. Hilti, Inc., HY-270 Adhesive Anchor System.
 - 1) Provide manufacturer's plastic mesh sleeve for bonding reinforcing bar(s) or all thread rod(s) of the size and embedment indicated on the Drawings.

2.03 ALL THREAD RODS

- A. Materials: As specified in Section 05_12_00 - Structural Steel Framing.

2.04 REINFORCING BARS

- A. As specified in Section 04_05_23 - Masonry Accessories.

PART 3 EXECUTION

3.01 GENERAL

- A. Unless otherwise required for "conditions of use" in the Evaluation Report submitted, prepare and install holes, adhesive, and inserts (all thread rods or reinforcing bars) in accordance with the manufacturer's recommendations and this Section.
 - 1. In the event of conflicts, the more restrictive provisions shall govern.
- B. Do not install adhesive-bonded all-thread rods or reinforcing bars in upwardly inclined and overhead applications.

3.02 PREPARATION

- A. Prior to completing manufacturer's on-site training specified in this Section, do not:
 - 1. Drill holes for reinforcing bars or all thread rods.
 - 2. Mix or install adhesive in holes.
- B. Review manufacturer's installation instructions and "conditions of use" stipulated in the Evaluation Report before beginning work.
- C. Confirm that adhesive and substrate receiving adhesive are within manufacturer's recommended temperature range and will remain so during the cure time for the product.

3.03 HOLE LAYOUT AND INSTALLATION

- A. Drilling holes:
 - 1. Determine location of reinforcing bars or other obstructions with a non-destructive indicator device. Mark locations with on the surface of the masonry using removable construction crayon, or other method acceptable to the Engineer.
 - 2. Do not damage or cut existing reinforcing bars, electrical conduits, or other items embedded in the masonry without prior acceptance by Engineer.
- B. Hole drilling equipment:
 - 1. Electric or pneumatic rotary impact type.
 - a. Set drill to “rotation only” mode, or to “rotation plus hammer” mode in accordance with manufacturer’s installation instructions and the requirements of the Evaluation Report.
 - 2. Where edge distances are less than 2 inches and “rotation plus hammer” mode is permitted, use lighter impact equipment to prevent micro-cracking and spalling from drilling.
 - 3. Drill bits: Carbide-tipped in accordance with ANSI B212-15.
 - 4. Hollow drill bits with flushing air systems are preferred. Air supplied to hollow drill bits shall be free of oil, water, or other contaminants that will reduce bond.
- C. Hole diameter: As recommend in the manufacturer’s installation instructions and the Evaluation Report.
- D. Hole depth: As recommended by the manufacturer’s installation instructions to provide minimum effective embedment indicated on the Drawings.
- E. Obstructions in drill path:
 - 1. If an existing reinforcing bar or other obstruction is hit while drilling hole, stop drilling and fill the hole with dry-pack mortar. Relocate the hole to miss the obstruction and drill to the required depth:
 - a. Allow dry-pack mortar to cure to strength equal to that of the surrounding masonry before resuming drilling in that area.
 - b. Epoxy grout may be substituted for dry-pack mortar when acceptable to the Engineer.
 - 2. Avoid drilling an excessive number of adjacent holes that would weaken the structural member and endanger the stability of the structure. Obtain Engineer’s acceptance of distance between abandoned and relocated holes.
 - 3. When existing reinforcing steel is encountered during drilling and when acceptable to Engineer, enlarge the hole by 1/8 inch, core through the existing reinforcing steel at the larger diameter, and resume drilling at original hole diameter.
 - 4. Bent bar reinforcing bars: Where edge distances are critical and interference with existing reinforcing steel is likely, and if acceptable to Engineer, drill hole at 10 degree angle (or less) from axis of reinforcing bar or all thread rod being installed.
- F. Cleaning holes:
 - 1. Insert air nozzle to bottom of hole and blow out loose dust.
 - a. Use compressed air that is free of oil, water, or other contaminants.

- b. Provide minimum air pressure of 90 pounds per square inch for not less than 4 seconds.
2. Using a stiff bristle brush of diameter that provides contact around the full perimeter of the hole, vigorously brush the hole to dislodge compacted drilling dust:
 - a. Insert brush to the bottom of the hole and withdraw using a simultaneous twisting motion.
 - b. Repeat at least 4 times.
3. Repeat the preceding steps as required to remove drilling dust or other material that will reduce bond, and as required by the manufacturer and the Evaluation Report.
4. Leave prepared hole clean and dry.

3.04 INSTALLATION OF ADHESIVE AND INSERTS

- A. Clean and prepare inserts:
 1. Prepare embedded length of reinforcing bars and all thread rods by cleaning to bare metal. The inserts shall be free of oil, grease, paint, dirt, mill scale, rust, or other coatings that will reduce bond.
 2. Solvent-clean prepared reinforcing bars and all thread rods over their embedment length in accordance with SSPC SP-1. Provide an oil and grease-free surface for bonding of adhesive to steel.
- B. Fill holes with adhesive: Solid or solid-grouted masonry:
 1. Starting at the bottom of the hole, fill hole with adhesive before inserting the reinforcing bar or all thread rod.
 2. Fill hole without creating air voids as nozzle is withdrawn.
 3. Fill hole with sufficient adhesive so that excess is extruded out of the hole when the reinforcing bar or all thread rod is inserted into the hole.
 4. Where metal or plastic screens are required for use in masonry (units with hollow cells or holes, and multi-wythe brick walls), fill screen with adhesive and insert into hole in accordance with manufacturer's recommendations.
- C. Fill holes with adhesive: Masonry with holes or un-grouted cells.
 1. Provide manufacturer's mesh screen tubes (steel or plastic mesh), fill with adhesive, and install in compliance with manufacturer's instructions.
- D. Install reinforcing bars and all thread rods:
 1. Install to depth, spacing, and locations as indicated on the Drawings.
 2. Insert bars and all thread rods into hole in accordance with manufacturer's recommended procedures. Confirm that insert has reached the designated embedment in the hole and that adhesive completely surrounds the embedded portion.
 3. Clean excess adhesive from the mouth of the hole.
- E. Curing and loading:
 1. Provide curing conditions recommended by the adhesive manufacturer for the period required to fully cure the adhesive at the actual temperature of the masonry.
 2. Do not disturb or load anchors until manufacturer's recommended cure time has elapsed.

3.05 FIELD QUALITY CONTROL

- A. Contractor shall provide field quality control as specified in Section 01_45_00 - Quality Control.
- B. Manufacturers' services:
 - 1. Before beginning installation, furnish adhesive manufacturer's representative to conduct on-site training in proper storage and handling of adhesive, drilling and cleaning of holes, and preparation and installation of reinforcing bars and all thread rods:
 - a. Provide notice of training to Engineer and Special Inspector not less than 10 working days before training occurs. Engineer and Special Inspector may attend training sessions.
 - 2. Submit record, signed by the Engineer, listing Contractor's personnel who completed the training. Only qualified personnel who have completed manufacturer's on-site training shall perform installations.
 - 3. Do not install holes or adhesive until training is complete.

3.06 FIELD QUALITY ASSURANCE

- A. Owner's representative will provide on-site inspection and field quality assurance.
- B. Special inspection:
 - 1. As specified in Section 01_45_24 - Regulatory Quality Assurance.
 - 2. Unless otherwise indicated on the Drawings or in this Section, provide periodic special inspection as required by the "Conditions of Use" in the Evaluation Report for the product installed:
 - a. Provide continuous inspection of placement of adhesive and insertion of reinforcing bars and all thread rods into adhesive.
 - 3. Provide a written record of each inspection using form acceptable to the Engineer and the Authority Having Jurisdiction.
 - 4. Preparation:
 - a. Review drawings and specifications for the Work being observed.
 - b. Review adhesive manufacturer's recommended installation and evaluation report's special inspection procedures.
 - 5. Provide an initial inspection by for each combination of masonry type and reinforcing bar or all thread rod being installed. During initial inspection, observe the following for compliance with installation requirements. Furnish report of inspection that includes the following items:
 - a. Masonry construction: Type and thickness; whether fully or partially grouted; locations and types of voids and holes in units.
 - b. Environment: Temperature and moisture conditions of masonry base material and work area.
 - c. Holes: Locations, spacing, edge distances; verification of drill bit compliance with ANSI B212.15; cleaning equipment and procedures; cleanliness of hole. Before placing adhesive, confirm that depth and preparation of holes conforms to requirements of the Contract Documents, installation recommendations of the manufacturer, and "conditions of use" specified in the Evaluation Report.

- d. Adhesive: Product manufacturer and name; lot number and expiration date; temperature of product at installation; installation procedures. Note initial set times observed during installation.
 - e. Embedded reinforcing bars and all thread rods: Material diameter and length; steel grade and/or strength; cleaning and preparation; cleanliness at insertion; minimum effective embedment.
6. Subsequent installations of the same reinforcing bars or threaded rods in the same masonry may be performed without the presence of the special inspector, provided that:
- a. There is no change in the personnel performing the installation, the type or details of the masonry receiving the insert, the adhesive or the reinforcing bars and all thread rods being used. Changes in any of these items shall require a new initial inspection.
 - b. For ongoing installations over a period of time, the special inspector visits the site at least once per day during each day of installation to observe the work for compliance with material requirements and installation procedures.

END OF SECTION

SECTION 04_05_23
MASONRY ACCESSORIES

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Adjustable wall ties.
 - 2. Control joint filler.
 - 3. Foamed-in place insulation.
 - 4. Loose fill insulation.
 - 5. Reinforcing bars.
 - 6. Sheet metal ties.
 - 7. Wall tie screws.
 - 8. Wire joint reinforcement, single Wythe type.
 - 9. Weep holes.

1.02 REFERENCES

- A. American Welding Society (AWS):
 - 1. D1.4 - Structural Welding Code - Reinforcing Steel.
- B. ASTM International (ASTM):
 - 1. A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - 2. A615 - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
 - 3. A641 - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
 - 4. A951 - Standard Specification for Masonry Joint Reinforcement.
 - 5. A1064 - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
 - 6. C549 - Standard Specification for Perlite Loose Fill Insulation.
 - 7. D2000 - Standard Classification System for Rubber Products in Automotive Applications.
 - 8. D2287 - Standard Specification for Nonrigid Vinyl Chloride Polymer and Copolymer Molding and Extrusion Compounds.

1.03 SUBMITTALS

- A. Reinforcing bars:
 - 1. Changes to reinforcing steel contract drawing requirements:
 - a. Indicate in separate letter submitted with shop drawings any changes of requirements indicated on the Drawings for reinforcing steel.
 - b. Such changes will not be acceptable unless the Engineer has accepted such changes in writing.

- c. Reinforcement detail drawings:
 - 1) Review of reinforcement shop drawings by the Engineer will be limited to general compliance with the Contract Documents.
- d. Welding procedures.

B. Product data.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Packing and shipping:
 - 1. Deliver bars bundled and tagged with identifying tags.

PART 2 PRODUCTS

2.01 DESIGN AND PERFORMANCE CRITERIA

- A. The Drawings contain general notes concerning amount of reinforcement and placing, details of reinforcement at wall corners and intersections, and details of extra reinforcement around openings in masonry.

2.02 MANUFACTURED UNITS

- A. Adjustable wall ties: 2-piece zinc coated fabrications, minimum 3/16-inch diameter steel wire formed into hook or pin and eye pieces, capable of restraining compression and tension forces from veneer.
 - 1. Manufacturers: One of the following or equal:
 - a. Hohmann & Barnard, Adjustable Wall Ties.
 - b. Heckmann Building Products, No. 262 and 263.
 - c. Wire-Bond, 1800 Hook and 1801 Eye.
- B. Anchor bolts:
 - 1. Cast-in/built-in steel anchors: As specified in Section 05_05_24 - Mechanical Anchoring and Fastening to Concrete and Masonry.
 - a. Includes: anchor bolts, anchor rods, deformed bar anchors, and welded studs).
 - 2. Post-installed steel anchors: As specified in Section 05_05_24 - Mechanical Anchoring and Fastening to Concrete and Masonry.
 - a. Includes concrete anchors for concrete masonry, and screw anchors for concrete masonry.
- C. Control joint filler: The key shall be of the width and shape as indicated on the Drawings. In accordance with ASTM D2000 or ASTM D2287.
 - 1. Manufacturers: One of the following or equal:
 - a. Hohmann & Barnard, VS Standard.
 - b. Wire-Bond, No. 2901.
 - c. Southern Metals and Plastics, No. CJ1.
- D. Loose fill insulation:
 - 1. Perlite: In accordance with ASTM C549, Type IV, surface-treated for water repellency and to limit dust generation during installation.

- E. Foamed-in-place masonry insulation:
 - 1. Manufacturers: The following or equal:
 - a. Tailored Chemical Products: Core-Fill 500™.
- F. Reinforcing bars:
 - 1. Deformed bars in accordance with ASTM A615, Grade 60.
 - 2. Provide reinforcing steel that is of quality specified, free from excessive rust or scale or any defects affecting its usefulness.
- G. Sheet metal ties: Minimum 22 gauge corrosion resistant corrugated sheet metal, minimum 7/8 inch wide by 7 inches long, pre-punched for wire ties to wire joint reinforcement.
- H. Wall tie screws.
- I. Wire joint reinforcement, single Wythe type: In accordance with ASTM A951 with ASTM A1064, 9-gauge wire side rails and 9-gauge cross ties, sized to suit application, and galvanized in accordance with ASTM A153, Class B (minimum 1.5 ounces zinc per square foot).
 - 1. Manufacturers: One of the following or equal:
 - a. Heckmann Building Products, No. 1100 Ladder Type Wall Reinforcement (9 gauge standard, other diameters special order).
 - b. Hohmann & Barnard, 220 Ladder Mesh Reinforcement.
 - c. Wire-Bond, Ladder Type, Series 200.
- J. Weep holes: 3/8 inch cellular drainage structure to fit in head joint of veneer units to promote drainage of the air space cavity.
 - 1. Manufacturers: One of the following or equal:
 - a. Hohmann & Barnard, Quadro-Vent.
 - b. Wire-Bond, #3601 Cell-Vent.
 - 2. Weep holes shall be manufactured of ultraviolet-light resistant polypropylene cellular 3/8 inch thick.
 - 3. Color shall be selected from manufacturer's standard colors to most closely match the selected mortar color.
 - 4. Size shall match the depth and height of the veneer units selected.

2.03 FABRICATION

- A. Reinforcing bars:
 - 1. Cut and bend bars in accordance with building code as specified in Section 01_41_00 - Regulatory Requirements.
 - 2. Bend bars cold.
 - 3. Provide bars free from defects and kinks and from bends not indicated on the Drawings.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of conditions:
 - 1. Reinforcing bars:
 - a. Verify that bars are new stock free from rust scale, loose mill scale, excessive rust, dirt, oil, and other coatings which adversely affect bonding capacity when placed in the work.

3.02 PREPARATION

- A. Reinforcing bars:
 - 1. Thin coating of red rust resulting from short exposure will not be considered objectionable. Thoroughly clean any bars that have rust scale, loose mill scale, or thick rust coat.
 - 2. Remove concrete or other deleterious coatings from dowels and other projecting bars by wire brushing or sandblasting before bars are embedded in subsequent masonry placement.

3.03 INSTALLATION

- A. Reinforcing bars:
 - 1. No field bending of bars will be allowed.
 - 2. Welding:
 - a. Weld reinforcing bars where indicated on the Drawings or acceptable to the Engineer.
 - b. Perform welding in accordance with AWS D1.4.
 - c. Submit welding procedures.
 - d. Do not tack weld reinforcing bars.
- B. Placing reinforcing bars:
 - 1. Accurately place bars and adequately secure them in position.
 - 2. Overlap bars at splices as indicated on the Drawings or specified.
 - 3. If not indicated on the Drawings, lap splice bars in masonry in accordance with the building code as specified in Section 01_41_00 - Regulatory Requirements.

END OF SECTION

SECTION 04_22_00
CONCRETE UNIT MASONRY

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
1. Concrete masonry units and accessories.

1.02 REFERENCES

- A. ASTM International (ASTM):
1. C90 - Standard Specification for Loadbearing Concrete Masonry Units.
 2. C140 - Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.
 3. C426 - Standard Test Method for Linear Drying Shrinkage of Concrete Masonry Units.
- B. The Masonry Society (TMS):
1. TMS 602 - Specification for Masonry Structures.

1.03 TERMINOLOGY

- A. The words and terms listed below, are not defined terms that require initial capital letters, but, when used in this Section have the indicated meaning.
1. Grout Lift Height: The height of grout placed in a single continuous operation within the grout pour height.
 2. Grout Pour Height: Entire height of the masonry to be grouted prior to the construction of additional masonry.
 3. Mortar Smears: Mortar paste smeared across the permanent masonry construction during construction and absorbed into the masonry pores.
 4. Mortar Splash: Mortar dropped splashed onto the permanent masonry construction at the base of the wall or off the scaffolding.
 5. Mortar Stains: Mortar paste left after mortar tags are removed.
 6. Mortar Tag: Excess mortar between masonry units worked out of the joints during tooling or striking.

1.04 SUBMITTALS

- A. Product data:
1. Submit manufacturer's product data for split face block.
 2. Submit manufacturer's product data for proposed cleaning agent.
- B. Shop drawings: Include elevations of each wall indicating type and layout of units, including type of mortar joints, bond pattern, reinforcing steel, connecting dowels, joint reinforcement, grouted cells, and control joints.

- C. Samples: Include samples of stretcher units in sufficient quantity to illustrate color range.
- D. Test reports:
 - 1. Compressive strength.
 - 2. Linear shrinkage.
 - 3. Moisture content as a percentage of total absorption.
 - 4. Total absorption.
 - 5. Unit weight.
- E. Manufacturer's instructions:
 - 1. Submit printed or written recommendations from the masonry unit manufacturer of the cleaning procedures and cleaning agents appropriate for each type of masonry unit included in the work.
- F. Quality assurance submittals:
 - 1. If requested by the Engineer, submit a record of the Installer's evidence of qualifications.
 - 2. If requested by the Engineer, submit a record of the Masonry Cleaner's evidence of qualifications.

1.05 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Installer qualifications:
 - a. The mason shall hold an appropriate contractor's license in the State where the work will be constructed.
 - b. The mason shall have not less than 5 years' experience and completed a minimum of 20 projects and at least 5 of which included the type of masonry units specified for this Work.
 - a. The mason shall hold current certification demonstrating successful completion of the quality certification program administered by the Rocky Mountain Masonry Institute or the Mason Contractors Association of America.
 - 2. Masonry cleaner qualifications:
 - a. The masonry cleaner shall have not less than 5 years' experience and completed a minimum of 20 projects and at least 5 of which included the type of masonry units specified for this Work.
- B. Mockup:
 - 1. A minimum 2 weeks to starting construction of masonry, construct minimum 4 foot inches by 4 foot inches square mockup. The mockup shall be constructed by the mason who will be performing the Work.
 - 2. Mockup is intended for use as the project standard of workmanship, construction, quality, appearance, and material selection.
 - 3. Use accepted materials containing each different kind and color of concrete masonry units to illustrate wall design.
 - 4. The mockup shall be constructed by the mason who will be performing the work.
 - 5. The mockup shall be cleaned with the exact equipment, products, and methods submitted and cleaned by the individual who will perform the Work.

6. When accepted, mockup will be standard of comparison for remainder of masonry work.
 - a. The mockup may be accepted by the Engineer with exceptions that will not be accepted in the final construction.
 - 1) In such cases, those areas of the mockup not accepted will be clearly identified by the Engineer.
 7. When not accepted by the Engineer, construct another mockup.
 8. Upon completion of Project, dispose of mockups in legal manner at offsite location.
- C. Pre-installation conference: Conduct as specified in Section 01_31_19 - Project Meetings.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Transport and handle concrete masonry units as required to prevent discoloration, chipping, and breakage.
- B. Store masonry units off the ground in a dry location, covered and protected from absorbing moisture.
 1. Locate storage piles, stacks, and bins to protect materials from heavy traffic.
 2. If masonry units are delivered in shrink-wrapped packaging and condensation develops, remove shrink-wrap packaging.
- C. Remove chipped, cracked, and otherwise defective units from jobsite upon discovery.

1.07 ENVIRONMENTAL REQUIREMENTS

- A. Cold weather requirements:
 1. In accordance with building code as specified in Section 01_41_00 - Regulatory Requirements, provide adequate equipment for heating masonry materials when air temperature is below 40 degrees Fahrenheit.
- B. Hot weather requirements:
 1. In accordance with building code as specified in Section 01_41_00 - Regulatory Requirements, when ambient air temperature exceeds 100 degrees Fahrenheit, or when ambient air temperature exceeds 90 degrees Fahrenheit and wind velocity is greater than 8 miles per hour, implement hot weather protection procedures.
 2. Wet mortarboard before loading and cover mortar to retard drying when not being used.
 3. Do not spread mortar beds more than 48 inches ahead of placing masonry units.
 4. Place masonry units within one minute of spreading mortar.

1.08 SEQUENCING AND SCHEDULING

- A. Order concrete masonry units well before start of installation to ensure adequate time for manufacturing and minimum 28 days for curing and drying before start of installation. Protect from weather after curing period to avoid moisture increase.

PART 2 PRODUCTS

2.01 MANUFACTURED UNITS

- A. Hollow load bearing concrete masonry units:
 - 1. Class: In accordance with ASTM C90, Class 2 (medium weight) with minimum compressive strength of 2500 pounds per square inch.
 - 2. Surface texture: Standard and split face.
 - 3. Color: Integral, Match existing and verify with Owner.
 - 4. Typical size: 8 inches wide by 8 inches high by 16 inches long, unless otherwise indicated on the Drawings, or other sizes as needed to minimize cutting.
 - 5. Special sizes and shapes: As required for window and door openings, bond beams, piers, lintels, control joints, and other special applications to minimize cutting.
- B. Anchor bolts: As specified in Section 05_12_00 - Structural Steel Framing.
- C. Steel reinforcement: As specified in Section 04_05_23 - Masonry Accessories.
- D. Wall ties: As specified in Section 04_05_23 - Masonry Accessories.
- E. Wire joint reinforcement: As specified in Section 04_05_23 - Masonry Accessories.
- F. Loose fill insulation: As specified in Section 04_05_23 - Masonry Accessories.

PART 3 EXECUTION

3.01 PREPARATION

- A. Protection:
 - 1. Protect adjacent construction with appropriate means from mortar droppings and other effects of laying of concrete masonry units.
- B. Surface preparation:
 - 1. Thoroughly clean foundations of laitance, grease, oil, mud, dirt, mortar droppings, and other matter that will reduce bond.

3.02 INSTALLATION

- A. Forms and shores:
 - 1. Where required, construct forms to the shapes indicated on the Drawings:
 - a. Construct forms sufficiently rigid to prevent deflection which may result in cracking or other damage to supported masonry and sufficiently tight to prevent leakage of mortar and grout.
 - b. Do not remove supporting forms or shores until the supported masonry has acquired sufficient strength to support safely its weight and any construction loads to which it may be subjected:
 - 1) Wait at least 24 hours after grouting masonry columns or walls before applying uniform loads.

2. Wait at least 72 hours before applying concentrated loads.
- B. Concrete masonry units:
1. Lay concrete masonry units dry.
 2. Lay units in uniform and true courses, level, plumb, and without projections or offset of adjacent units.
 3. Lay units to preserve unobstructed vertical continuity of cells to be filled with grout or insulation.
 4. Align vertical cells to be filled with grout to maintain clear, unobstructed continuous vertical cell measuring not less than 2.5 inches by 3 inches.
 5. Place mortar with full coverage of joints at webs of all cells and face shells.
 6. Butter vertical head joints for thickness equal to face shell thickness of units, and shove joints tightly together so that mortar bonds to both masonry units.
 7. Solidly fill joints from face of units to inside face of cells.
 8. Lay units to desired height with joints of uniform thickness.
 9. Bond shall be plumb throughout.
 10. Lay units to avoid formation of cracks when units are placed.
 11. Keep cells of units as free of mortar as possible as masonry wall height increases.
 12. When positions of units shift after mortar has stiffened, bond is broken, or cracks are formed, relay units in new mortar.
 13. Remove mortar, mortar droppings, debris, and other obstructions and materials from inside of cell walls.
 14. Remove mortar tags and smears daily with a non-metallic tool:
 - a. Mortar tags and smears shall be removed after they initially set but shall not be permitted to remain more than 24 hours.
 15. Where practical, protect completed work from mortar splash by placing thin plastic sheeting around the base of walls:
 - a. Place sand, straw, sawdust or other similar material on the floor around the base of walls to protect floors and walls.
 16. Turn scaffold planks over at the end of the workday to avoid mortar splashes from wet weather:
 - a. Cover tops of walls at the end of the workday and other work stoppages to prevent entry of water into the partially completed masonry.
 17. Seal cleanouts after inspection and before grouting or placing insulation.
- C. Bond pattern:
1. Lay concrete masonry units in running bond pattern, unless otherwise indicated on the Drawings.
- D. Mortar joints:
1. Make joints straight, clean, smooth, and uniform in thickness.
 2. Tool exposed joints, slightly concave. Strike concealed joints flush.
 3. Make vertical and horizontal joints 3/8-inch thick.
 4. Where fresh masonry joins totally or partially set masonry, clean and roughen set masonry before laying new units.
- E. Wire joint reinforcement:
1. Lap splice longitudinal wire joint reinforcement minimum 75 wire diameters.
 2. Place longitudinal wires in approximate centers of mortar beds with minimum 5/8-inch mortar cover on exposed faces.

3. Provide intersecting masonry walls with prefabricated wire joint reinforcement tees.
 4. Rake intersecting joints 1/2 inch and caulk joints.
- F. Grouting and reinforcement:
1. Where horizontal and vertical bars are spliced and adjacent lap splices are separated by more than 3 inches, the lap splice length shall be 72 bar diameters:
 - a. Where adjacent lap splices are separated by 3 inches or less, the lap splice length shall be increased by 1.3 times or the lap splices shall be staggered at least 24 bar diameters with no increase in length.
 2. Hold vertical reinforcing bars in position at top and bottom and at intervals not exceeding 200 bar diameters:
 - a. Use steel wire bar positioners to position bars.
 - b. Tie reinforcing bars to dowels with wire ties.
 3. Obtain acceptance of reinforcement placement before grouting:
 - a. Grouting:
 - 1) Grout pour height shall be limited to a maximum of 5.33 feet, unless the Contractor submits sufficient evidence to the Engineer for review and acceptance that the requirements of TMS 602 as it relates to grout pour height can be met.
 - 2) Grout lift height shall be limited to a maximum of 5.33 feet, unless the Contractor submits sufficient evidence to the Engineer for review and acceptance that the requirements of TMS 602 as it relates to grout lift height can be met.
 - 3) Slushing with mortar will not be permitted.
 - 4) Allow hollow unit masonry to cure at least 24 hours prior to grouting.
 - 5) Each lift shall be allowed to set for 10 minutes after initial consolidation of grout before successive lift is placed.
 - 6) The full height of each section of wall shall be grouted in 1 day.
 4. Placement:
 - a. Use a hand bucket, concrete hopper, or grout pump.
 - b. Place grout so as to completely fill the grout spaces without segregation of the aggregates.
 - c. Remove grout spills immediately by hand washing with a bucket and brush.
 - d. Fill all spaces and cells solidly with grout.
 - e. Grout in cells shall have full contact with surface of concrete footings.
 - f. Time constraints:
 - 1) When grouting stops for 1 hour or longer, form horizontal construction joints by stopping grout placement 1-1/2 inches below top of uppermost unit containing grout.
 - 2) Place grout in final position within 1-1/2 hours after mixing. Place grout so as to completely fill the grout spaces without segregation of the aggregates.
 - g. Consolidation:
 - 1) Do not insert vibrators into lower grout placements that are in a semi-solidified state.

- G. Cutting concrete masonry units:
1. When possible, use full units of the proper size in lieu of cut units. Cut units as required to form chases, openings, for anchorage, and for other appurtenances.
 2. Cut and fit units with power-driven carborundum or diamond disc blade saw.
- H. Control joints:
1. Provide in masonry walls at locations indicated on the Drawings.
 2. Make full height and continuous in appearance.
 3. Run bond beams and bond beam reinforcing bars continuously through control joints.
 4. Insert control joint filler in joints as wall is constructed.
 5. Apply sealant as specified in Section 07_92_00 - Joint Sealants.
- I. Steel door frames:
1. Anchor and fully grout jambs and head of steel doorframes connected to concrete unit masonry.
 2. Fill frames with grout as each 2 feet of concrete unit masonry is laid.
- J. Anchor bolts:
1. Hold anchor bolts in place with template during grouting to ensure precise alignment.
 2. Do not cut or ream members being anchored or use other means to accommodate misaligned anchor bolts in roof deck support angles.
- K. Enclosures:
1. Where concrete masonry units enclose conduit, pipes, stacks, ducts, and similar items, construct chases, cavities, and similar spaces as required, whether or not such spaces are indicated on the Drawings.
 2. Point openings around flush mounted electrical outlet boxes with mortar, including flush joints above boxes.
 3. Do not cover enclosures until inspected and when appropriate, tested.
- L. Other embedded items:
1. Build in wall plugs, accessories, flashings, pipe sleeves, and other items required to be built-in as the masonry work progresses.
- M. Patching:
1. Patch exposed concrete masonry units at completion of the Work and in such manner that patching will be indistinguishable from similar surroundings and adjoining construction.
- N. Water curing:
1. Protect concrete masonry units from drying too rapidly by frequently fogging or sprinkling so walls will always be visibly damp for minimum 3 days.
- O. Miscellaneous:
1. Build in required items, such as anchors, flashings, sleeves, frames, structural steel, lintels, anchor bolts, and metal fabrications, as required for complete installation.

- P. Water repellent:
 - 1. Apply water repellent as specified in Section 07_19_00 - Water Repellents.
- Q. Anti-graffiti coating:
 - 1. Apply anti-graffiti coating as specified in Section 07_19_00 - Water Repellents.
- R. Grouting equipment:
 - 1. Grout pumps:
 - a. Do not pump grout through aluminum tubes.
 - b. Operate pumps to produce a continuous stream of grout without air pockets.
 - c. Upon completion of each days pumping, eject grout from pipeline without contamination or segregation of the grout:
 - 1) Remove waste materials and debris from the equipment.
 - 2) Dispose of waste materials, debris, and all flushing water outside the masonry.
 - 2. Vibrators:
 - a. Internal vibrators shall maintain a speed of not less than 5,000 impulses per minute when submerged in the grout.
 - b. Maintain at least 1 spare vibrator, at the site at all times.
 - c. Apply vibrators at uniformly spaced points not further apart than the visible effectiveness of the machine.
 - d. Limit duration of vibration to time necessary to produce satisfactory consolidation without causing segregation.

3.03 CONSTRUCTION

- A. Site tolerances: Lay masonry plumb, true to line, and with courses level. Keep bond pattern plumb throughout. Lay masonry within the following tolerances:
 - 1. Maximum variation from the plumb in the lines and surfaces of columns, walls, and in the flutes and surfaces of fluted or split faced blocks:
 - a. In adjacent masonry units: 1/8 inch.
 - b. In 10 feet: 1/4 inch.
 - c. In any story or 20 feet maximum: 3/8 inch.
 - d. In 40 feet or more: 1/2 inch.
 - 2. Maximum variations from the plumb for external corners, expansion joints, and other conspicuous lines:
 - a. In any story or 20 feet maximum: 1/4 inch.
 - b. In 40 feet or more: 1/2 inch.
 - 3. Maximum variations from the level or grades indicated on the Drawings for exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines:
 - a. In any bay or 20 feet maximum: 1/4 inch.
 - b. In 40 feet or more: 1/2 inch.
 - 4. Maximum variations of the linear building lines from established position in plan and related portion of columns, walls, and partitions:
 - a. In any bay or 20 feet maximum: 1/2 inch.
 - b. In 40 feet or more: 3/4 inch.

5. Maximum variation in cross sectional dimensions of columns and in thickness of walls:
 - a. Minus: 1/4 inch.
 - b. Plus: 1/2 inch.

3.04 FIELD QUALITY CONTROL

- A. Site tests:
 1. Owner will have tests performed by an independent laboratory.
 2. Have minimum 3 concrete masonry units of each type proposed for Project tested in accordance with ASTM C90, C140, and C426 to verify conformance to Specifications.
 3. Tests shall include compressive strength, linear shrinkage, moisture content as percent of total absorption, total absorption, and unit weight.
- B. Special inspection:
 1. Special inspection shall be as specified in Section 01_45_24 - Regulatory Quality Assurance.
 2. Owner will employ a qualified masonry special inspector for continuous special inspection of the masonry work. Acceptance by a state or municipality having a program of examining and certifying masonry inspectors will be considered adequate qualifications. The masonry inspector shall be at the site during all masonry construction and perform the following duties:
 - a. Review Drawings and Specifications and meet with the Contractor to discuss requirements before work commences.
 - b. Before masonry work commences, Contractor and the Contractor's Quality Control Representative shall attend meeting with Engineer to review the requirements for surveillance and quality control of the masonry work.
 - c. Check brand and type of cement, lime (if used), and source of sand.
 - d. Verify that foundation is clean, rough, and ready to receive units.
 - e. Check reinforcing steel dowels for correct location, straightness, proper alignment, spacing, size, and length.
 - f. Observe field proportioning of mortar. Visually check aggregate to determine uniformity of grading, cleanliness, and moisture.
 - g. Verify that joints are full of mortar and kept tight during work. Inspect grout cells to verify that fins will not interfere with grouting. Verify that masons keep grout cells clean of mortar droppings and inspect to determine compliance.
 - h. Continuously observe placing of grout.
 - i. Perform or supervise performance of required sampling and testing.
 3. Keep complete record of inspections. Report daily to the Building Official, Contractor's Quality Control Representative, Engineer, and Owner the progress of the masonry inspection.

3.05 FINAL CLEANING

- A. General:
 1. Final cleaning shall be performed within 7 to 14 days after construction of masonry work.
 2. Protect adjacent materials and equipment that may be damaged by cleaning.

3. Pre-wet masonry before applying cleaning agent, but do not saturate masonry.
4. Remove mortar stains, smears, and splash, efflorescence, and grout stains on exposed surfaces with the submitted cleaning agent as directed by the masonry unit manufacturer's recommendations.
5. Do not use muriatic acid as cleaning agent.
6. Cleaning agents shall be applied when the masonry surface and air temperatures are at least 50 degrees Fahrenheit.
 - a. Dilute cleaning agents in accordance with manufacturer's recommendations.
 - b. Do not allow cleaning agents to dry on the masonry.
7. Clean wall from the top to the bottom, without overlapping areas being cleaned for consistency.
8. If pressure cleaning equipment is used, the following limitations shall be observed:
 - a. Apply cleaning agent to pre-wetted wall with low pressure (less than 50 pounds per square inch).
 - b. Use a 25° to 50° flared-tip nozzle (not a pointed tip).
 - c. Maintain a consistent distance from the spray nozzle to the masonry surface no closer than 12 inches:
 - 1) Masonry cleaner shall use a combination of pressure, nozzle, and distance from tip to masonry that does not damage the masonry surface.
9. Rinse cleaning agents off the wall with potable water.
10. Dispose of debris, refuse, and surplus material offsite legally.

3.06 PROTECTION

- A. Provide temporary protection for exposed masonry corners subject to damage.
- B. Bracing:
 1. Unless wall is adequately supported by permanent supporting elements so wall will not overturn or collapse, adequately brace masonry walls over 8 feet in height to prevent overturning and to prevent collapse.
 2. Keep bracing in place until permanent supporting elements of structure are in place.
- C. Limited access zone:
 1. Establish limited access zone prior to start of masonry wall construction.
 2. Zone shall be immediately adjacent to wall and equal to height of wall to be constructed plus 4 feet by entire length of wall on unscaffolded side of wall.
 3. Limit access to zone to workers actively engaged in constructing wall. Do not permit other persons to enter zone.
 4. Keep zone in place until wall is adequately supported or braced by permanent supporting elements to prevent overturning and collapse.

END OF SECTION

SECTION 05_05_24

MECHANICAL ANCHORING AND FASTENING TO CONCRETE AND MASONRY

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PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Cast-in anchors and fasteners:
 - a. Anchor bolts.
 - b. Anchor rods.
 - c. Concrete inserts.
 - d. Deformed bar anchors.
 - e. Welded studs.
 - 2. Post-installed steel anchors and fasteners:
 - a. Concrete anchors.
 - b. Sleeve anchors.
 - c. Screw anchors.
 - d. Undercut concrete anchors.
 - 3. Appurtenances for anchoring and fastening:
 - a. Anchor bolt sleeves.
 - b. Isolating sleeves and washers.
 - c. Thread coating for threaded stainless steel fasteners.

1.02 REFERENCES

- A. American Concrete Institute (ACI):
 - 1. 355.2 - Qualification of Post-Installed Mechanical Anchors in Concrete & Commentary.
- B. American National Standards Institute (ANSI):
 - 1. B212.15 - Cutting Tools - Carbide-tipped Masonry Drills and Blanks for Carbide-tipped Masonry Drills.
- C. American Welding Society (AWS):
 - 1. D1.1 - Structural Welding Code - Steel.
 - 2. D1.6 - Structural Welding Code - Stainless Steel.
- D. ASTM International (ASTM):
 - 1. A29 - Standard Specification for Steel Bars, Carbon and Alloy, Hot-Wrought, General Requirements for.
 - 2. A36 - Standard Specification for Carbon Structural Steel.
 - 3. A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 - 4. A108 - Standard Specification for Steel Bars, Carbon and Alloy, Cold Finished.
 - 5. A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - 6. A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - 7. A240 - Standard Specification for Chromium and Chromium Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
 - 8. A380 - Standard Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems.

9. A563 - Standard Specification for Carbon and Alloy Steel Nuts.
 10. A1064 - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
 11. B633 - Standard Specification for *Electrodeposited* Coatings of Zinc on Iron and Steel.
 12. B695 - Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel.
 13. E488 - Standard Test Methods for Strength of Anchors in Concrete Elements.
 14. F436 - Standard Specification for Hardened Steel Washers.
 15. F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws and Studs.
 16. F594 - Standard Specification for Stainless Steel Nuts.
 17. F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55 and 105-ksi Yield Strength.
 18. F2329 - Standard Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners.
- E. International Code Council Evaluation Service, Inc. (ICC-ES):
1. AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements.
 2. AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry.
 3. AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements.

1.03 DEFINITIONS

- A. Built-In Anchor: Headed bolt or assembly installed in position before filling surrounding masonry units with grout.
- B. Cast-In Anchor: Headed bolt or assembly installed in position before placing plastic concrete around.
- C. Overhead Installations: Fasteners installed on overhead surfaces where the longitudinal axis of the fastener is more than 60 degrees above a horizontal line so that the fastener resists sustained tension loads.
- D. Passivation: Chemical treatment of stainless steel with a mild oxidant for the purpose of enhancing the spontaneous formation of the steel's protective passive film.
- E. Post-Installed Anchor: Fastener or assembly installed in hardened concrete or finished masonry construction, typically by drilling into the structure and inserting a steel anchor assembly.
- F. Terms relating to structures or building environments as used with reference to anchors and fasteners:
1. Corrosive locations: Describes interior and exterior locations as follows:
 - a. Locations used for delivery, storage, transfer, or containment (including spill containment) of chemicals used for plant treatment processes.
 - b. Exterior and interior locations at the following treatment structures:
 - a) Water and Wastewater treatment facilities

2. Wet and moist locations: Describes locations, other than “corrosive locations,” that are submerged, are immediately above liquid containment structures, or are subject to frequent wetting, splashing, or wash down. Includes:
 - a. Exterior portions of buildings and structures.
 - b. Liquid-containing structures:
 - 1) Locations at and below the maximum operating liquid surface elevation.
 - 2) Locations above the maximum operating liquid surface elevation and:
 - a) Below the top of the walls containing the liquid.
 - b) At the inside faces and underside surfaces of a structure enclosing or spanning over the liquid (including walls, roofs, slabs, beams, or walkways enclosing the open top of the structure).
 - c. Liquid handling equipment:
 - 1) Bases of pumps and other equipment that handles liquids.
 - d. Indoor locations exposed to moisture, splashing, or routine wash down during normal operations, including floors with slopes toward drains or gutters.
 - e. Other locations indicated on the Drawings.
3. Other locations:
 - a. Interior dry areas where the surfaces are not exposed to moisture or humidity in excess of typical local environmental conditions.

1.04 SUBMITTALS

- A. General:
 1. Submit as specified in Section 01_33_00 - Submittal Procedures.
 2. Submit information listed for each type of anchor or fastener to be used.
- B. Action submittals:
 1. Product data:
 - a. Cast-in anchors:
 - 1) Manufacturer’s data including catalog cuts showing anchor sizes and configuration, materials, and finishes.
 - b. Post-installed anchors:
 - 1) For each anchor type, manufacturer’s data including catalog cuts showing anchor sizes and construction, materials and finishes, and load ratings.
 2. Samples:
 - a. Samples of each type of anchor, including representative diameters and lengths, if requested by the Engineer.
 3. Certificates:
 - a. Cast-in anchors:
 - 1) Mill certificates for steel anchors that will be supplied to the site.
 - b. Post-installed anchors:
 - 1) Manufacturer’s statement or certified test reports demonstrating that anchors that will be supplied to the site comply with the materials properties specified.

4. Test reports:
 - a. Post-installed anchors: For each anchor type used for the Work:
 - 1) Current ICC-ES Report (ESR) demonstrating:
 - a) Acceptance of that anchor for use under the building code specified in Section 01_41_00 - Regulatory Requirements.
5. Manufacturer's instructions:
 - a. Requirements for storage and handling.
 - b. Recommended installation procedures including details on drilling, hole size (diameter and depth), hole cleaning and preparation procedures, anchor insertion, and anchor tightening.
 - c. Requirements for inspection or observation during installation.
6. Qualification statements:
 - a. Post-installed anchors: Installer qualifications:
 - 1) Submit list of personnel performing installations and include date of manufacturer's training for each.

1.05 QUALITY ASSURANCE

- A. Qualifications:
 1. Post installed anchors shall be in accordance with building code specified in Section 01_41_00 - Regulatory Requirements.
- B. Special inspection:
 1. Provide special inspection of post-installed anchors as specified in Section 01_45_24 - Regulatory Quality Assurance and this Section.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver post-installed anchors in manufacturer's standard packaging with labels visible and intact. Include manufacturer's installation instructions.
- B. Handle and store anchors and fasteners in accordance with manufacturer's recommendations and as required to prevent damage.
- C. Protect anchors from weather and moisture until installation.

1.07 PROJECT CONDITIONS

- A. Seismic Design Category (SDC) for structures is indicated on the Drawings.

PART 2 PRODUCTS

2.01 MANUFACTURED UNITS

- A. General:
 1. Furnish threaded fasteners with flat washers and hex nuts fabricated from materials corresponding to the material used for threaded portion of the anchor.
 - a. Cast-in anchors: Provide flat washers and nuts as listed in the ASTM standard for the anchor materials specified.

- b. Post-installed anchors: Provide flat washers and nuts supplied for that product by the manufacturer of each anchor.
 - 2. Size of anchors and fasteners, including diameter and length or minimum effective embedment depth: As indicated on the Drawings or as specified in this Section. In the event of conflicts, contact Engineer for clarification.
 - 3. Where anchors and connections are not specifically indicated on the Drawings or specified, their material, size and form shall be equivalent in quality and workmanship to items specified.
- B. Materials:
- 1. Provide and install anchors of materials as in this Section.

2.02 CAST-IN ANCHORS AND FASTENERS

- A. Anchor bolts:
- 1. Description:
 - a. Straight steel rod having one end with an integrally forged head, and one threaded end. Embedded into concrete with the headed end cast into concrete at the effective embedment depth indicated on the Drawings or specified, and with the threaded end left to project clear of concrete face as required for the connection to be made.
 - b. Furnish anchor bolts with heavy hex forged head or equivalent acceptable to Engineer.
 - 1) Rods or bars with angle bend for embedment in concrete (i.e., "L" or "J" shaped anchor bolts) are not permitted in the Work.
 - 2. Materials:
 - a. Ship anchor bolts with properly fitting nuts attached.
 - b. Type 316 stainless steel:
 - 1) Surfaces descaled, pickled, and passivated in accordance with ASTM A380.
 - 2) Bolts: ASTM F593, Group 2, Condition CW, coarse threads.
 - 3) Nuts: ASTM F594. Match alloy (group and UNS designation) and threads of bolts.
 - 4) Washers: Type 316 stainless steel.
 - c. Type 304 stainless steel:
 - 1) Surfaces descaled, pickled, and passivated in accordance with ASTM A380.
 - 2) Bolts: ASTM F593, Group 1, Condition CW, coarse threads.
 - 3) Nuts: ASTM F594. Match alloy (group and UNS designation) and threads of bolts.
 - 4) Washers: Type 304 stainless steel.
 - d. Galvanized steel:
 - 1) Hot-dip galvanized coating in accordance with ASTM F2329.
 - 2) Bolt: ASTM F1554, Grade 36, heavy hex, coarse thread.
 - 3) Nuts: ASTM A563, Grade A, heavy hex, threads to match bolt.
 - 4) Washers: ASTM F436, Type 1.
- B. Anchor rods:
- 1. Description: Straight steel rod having threads on each end or continuously threaded from end to end. One threaded end is fitted with nuts or plates and embedded in concrete to the effective depth indicated on the Drawings,

leaving the opposite threaded end to project clear of the concrete face as required for the connection to be made at that location.

2. Materials:

- a. Stainless steel: Type 316:
 - 1) Surfaces descaled, pickled, and passivated in accordance with ASTM A380.
 - 2) Rod: ASTM F593, Group 2, Condition CW, coarse threads.
 - 3) Nuts: ASTM F594. Match alloy (group and UNS designation) and threads of rods.
 - 4) Washers: Type 316 stainless steel.
 - 5) Plates (embedded): ASTM A240.
- b. Stainless steel: Type 304:
 - 1) Surfaces descaled, pickled, and passivated in accordance with ASTM A380.
 - 2) Rod: ASTM F593, Group 1, Condition CW, coarse threads.
 - 3) Nuts: ASTM F594. Match alloy (group and UNS designation) and threads or rods.
 - 4) Washers: Type 304 stainless steel.
 - 5) Plates (embedded): ASTM A240.
- c. Galvanized: steel:
 - 1) Hot-dip galvanized with coating in accordance with ASTM F2329.
 - 2) Rod: ASTM F1554, Grade 36 coarse thread.
 - 3) Nuts: ASTM A563, Grade A, threads to match rod.
 - 4) Washers: ASTM F436, Type 1.
 - 5) Plates (embedded): ASTM A36.

C. Concrete insert: Ductile embed:

- 1. Description: 1-piece, integrally hot forged sleeve for embedment in concrete. Provided with flange for nailing to forms and female threaded coupler at the exposed concrete face, and washer-faced hex headed foot to resist pullout from concrete at the embedded end.
- 2. Manufacturers: The following or equal:
 - a. Dayton Superior, F-54 Ductile Embed Insert.
- 3. Materials:
 - a. Galvanized steel:
 - 1) Hot-dip galvanized coating in accordance with ASTM A123 or A153
 - 2) Steel: ASTM A29 hot rolled, Grade 1045.

D. Deformed bar anchors:

- 1. Description: Steel rod with rebar-like deformations along its length and welding ferrule at one end for attachment to structural steel members (plates or shapes).
- 2. Manufacturers: One of the following or equal:
 - a. Nelson Stud Welding Co., D2L Deformed Bar Anchors (D2L-DBA).
 - b. Stud Welding Products, Inc., Deformed Anchor Studs.
 - c. Galvanized steel:
 - 1) Hot-dip galvanized coating in accordance with ASTM A153
 - 2) Steel: ASTM A1064 wire deformed for concrete reinforcement.

- E. Welded studs:
 - 1. Description: Anchor with forged head for embedment into concrete on one end, and welding ferrule for attachment to steel on the other. Welded to steel members or plates to provide anchorage for steel connections to concrete.
 - 2. Acceptance criteria:
 - a. Welded studs in accordance with AWS D1.1, Type B.
 - 3. Manufacturers: One of the following or equal:
 - a. Nelson Stud Welding Co., H4L Concrete Anchors or S3L Shear Connectors as indicated on the Drawings.
 - b. Stud Welding Products, Headed Concrete Anchors (HCA) or Headed Shear Connectors (HSC) as indicated on the Drawings.
 - c. Galvanized steel:
 - 1) Hot-dip galvanized after fabrication with coating in accordance with ASTM A123.
 - 2) Steel: Carbon steel in accordance with ASTM A108 with 50,000 pounds per square inch minimum yield strength, and 60,000 pounds per square inch minimum tensile strength.

- F. Steel plates or shapes for fabrications including assemblies with welded studs or deformed bar anchors:
 - 1. Stainless steel: Type 316L or Type 304L:
 - a. Plates (embedded): ASTM A240.
 - 2. Galvanized steel:
 - a. Hot dip galvanized in accordance with ASTM A123.
 - b. Steel: ASTM A36.

2.03 POST-INSTALLED ANCHORS AND FASTENERS - ADHESIVE

- A. Epoxy bonding of reinforcing bars, all thread rods, and threaded inserts in concrete: As specified in Section 03_21_17 - Adhesive-Bonded Reinforcing Bars and All Thread Rods in Concrete.

- B. Epoxy bonding of reinforcing bars, all thread rods, and threaded inserts in masonry: As specified in Section 04_05_18 - Adhesive Bonding Reinforcing Bars and All Thread Rods in Masonry.

2.04 POST-INSTALLED ANCHORS AND FASTENERS - MECHANICAL

- A. General:
 - 1. Post-installed anchors used for the Work shall hold a current ICC Evaluation Service Report demonstrating acceptance for use under the building code specified in Section 01_41_00 - Regulatory Requirements.
 - a. Conditions of use: The acceptance report shall indicate acceptance of the product for use under the following conditions:
 - 1) In regions of concrete where cracking has occurred or may occur.
 - 2) To resist short-term loads due to wind forces.
 - 3) To resist short-term loading due to seismic forces for the Seismic Design Category of the structure where the product will be used.
 - 2. Substitutions: When requesting product substitutions, submit calculations, indicating the diameter, effective embedment depth and spacing of the proposed anchors, and demonstrating that the substituted product will provide

load resistance that is equal to or greater than that provided by the anchors listed in this Section.

- a. Calculations shall be prepared by and shall bear the signature and seal of a Professional Engineer licensed in the State of Oklahoma.
- b. Decisions regarding the acceptability of proposed substitutions shall be at the discretion of the Engineer.

B. Concrete anchors:

1. Description. Post-installed anchor assembly consisting of a threaded stud and a surrounding wedge expansion sleeve that is forced outward by torquing the center stud to transfer loads from the stud to the concrete through bearing, friction, or both. (Sometimes referred to as “expansion anchors” or “wedge anchors.”)
 - a. Do not use slug-in, lead cinch, and similar systems relying on deformation of lead alloy or similar materials to develop holding power.
2. Concrete anchors for anchorage to concrete:
 - a. Acceptance criteria:
 - 1) Concrete anchors shall have a current ICC-ES Report demonstrating that the anchors have been tested and qualified for performance in both cracked and un-cracked concrete, and for short-term loading due to wind and seismic forces for Seismic Design Categories A through F in accordance with ACI 355.2 and with ICC-ES AC193 (including all mandatory tests and optional tests for seismic tension and shear in cracked concrete).
 - 2) Concrete anchor performance in the current ICC-ES Report shall be “Category 1” as defined in ACI 355.2.
 - b. Manufacturers: One of the following or equal:
 - 1) Hilti, Kwik Bolt TZ Expansion Anchor.
 - 2) DEWALT/Powers, PowerStud.
 - 3) Simpson Strong-Tie, Strong Bolt 2 Wedge Anchor.
 - c. Materials. Integrally threaded stud, wedge, washer, and nut:
 - 1) Stainless steel: Type 316.
 - a) Type 304 stainless steel acceptable for use at wet and moist locations when accepted in writing by the Engineer.
 - 2) Galvanized: Carbon steel, zinc plated in accordance with ASTM B633, minimum 5 microns (Fe/Zn 5).
3. Concrete anchors for anchorage to concrete masonry (fully grouted cells):
 - a. Acceptance criteria: Concrete anchors shall have a current ICC-ES Report demonstrating that the anchors have been tested and qualified in accordance with ICC-ES AC01, including all mandatory tests and optional seismic tests.
 - b. Manufacturers: One of the following or equal:
 - 1) Hilti, Kwik Bolt 3 Expansion Anchor.
 - 2) DEWALT/Powers, Power-Stud+ SD1.
 - 3) Simpson Strong-Tie, Wedge-All Anchor.
 - c. Materials. Integrally threaded stud, wedge, washer, and nut:
 - 1) Stainless steel: Type 316.
 - a) Type 304 stainless steel acceptable for use at wet and moist locations when accepted in writing by the Engineer.

- 2) Galvanized: Carbon steel, zinc plated in accordance with ASTM B633, minimum 5 microns (Fe/Zn 5) or mechanically galvanized in accordance with ASTM B695, Class 55, Type 1.
- C. Flush shells:
1. Description: Post-installed anchor assembly consisting of an internally threaded mandrel that is forced into a pre-drilled concrete hole with a setting tool until the top of the anchor is flush with the face of the concrete. Once installed, a removable threaded bolt is installed in the mandrel.
 2. Flush shell anchors are not permitted in the Work.
- D. Sleeve anchors:
1. Description: Post-installed, torque-controlled anchor assembly consisting of an externally threaded stud with a spacer sleeve near the surface of the base material, and an expansion sleeve on the lower part of the stud. The expansion sleeve is forced outward by torquing of the center stud to transfer load.
 - a. Do not use slug-in, lead cinch, and similar systems relying on deformation of lead alloy or similar materials in order to develop holding power.
 2. Sleeve anchors for anchorage to concrete:
 - a. Acceptance criteria:
 - 1) Sleeve anchors shall have a current ICC-ES Report demonstrating that the anchors have been tested and qualified for performance in both cracked and un-cracked concrete, and for short-term loading due to wind and seismic forces for Seismic Design Categories A through F in accordance with ACI 355.2 and with ICC-ES AC193 (including all mandatory tests and optional tests for seismic tension and shear in cracked concrete).
 - 2) Sleeve anchor performance in the current ICC-ES Report shall be "Category 1" as defined in ACI 355.2.
 - b. Manufacturers: One of the following or equal:
 - 1) Hilti, HSL-3 Heavy Duty Expansion (sleeve) Anchor.
 - 2) DEWALT/Powers, Power Bolt+ Heavy Duty Sleeve Anchor.
 - c. Materials:
 - 1) Galvanized steel: Carbon steel, zinc plated in accordance with ASTM B633, minimum 5 microns (Fe/Zn 5).
 3. Sleeve anchors for anchorage to concrete masonry (fully grouted only):
 - a. Acceptance criteria: Sleeve anchors shall have a current ICC-ES Report demonstrating that anchors have been tested and qualified for performance in masonry, including short-term loading due to wind and seismic forces in accordance with ICC-ES AC01.
 - b. Materials:
 - 1) Galvanized steel: Carbon steel, zinc plated in accordance with ASTM B633, minimum 5 microns (Fe/Zn 5).
- E. Screw anchors:
1. Description: Post-installed concrete anchor that develops tensile strength from mechanical interlock provided by creating a helical "key" that is larger than the diameter of the bolt itself along the length of the anchor shaft.

2. Screw anchors for anchorage to concrete:
 - a. Acceptance criteria:
 - 1) Screw anchors shall have a current ICC-ES Report demonstrating that the anchors have been tested and qualified for performance in both cracked and un-cracked concrete, and for short-term loading due to wind and seismic forces for Seismic Design Categories A through F in accordance with ACI 355.2 and ICC ES AC193 (including all mandatory tests and optional tests for seismic tension and shear in cracked concrete).
 - 2) Screw anchor performance in the current ICC-ES Report shall be "Category 1" as defined in ACI 355.2.
 - b. Manufacturers: Screw anchor: One of the following or equal:
 - 1) Hilti, Hex head, HUS-EZ Screw Anchor:
 - a) With internally threaded head: HUS-EZ I Hanger Anchor.
 - 2) DEWALT/Powers, Screwbolt+ Screw Anchor:
 - a) With internally threaded head: Vertigo+ Rod Hanging System.
 - 3) Simpson Strong-Tie, Titen® HD Screw Anchor:
 - a) With internally threaded head: Titen® HD Rod Hanger.
 - c. Materials:
 - 1) Galvanized steel: Carbon steel, zinc plated in accordance with ASTM B633, minimum 5 microns (Fe/Zn 5) or equal.
3. Screw anchors for anchorage to concrete masonry (fully grouted only):
 - a. Acceptance criteria:
 - 1) Acceptance criteria. Screw anchors shall have a current ICC-ES Report demonstrating that anchors have been tested and qualified for performance in masonry, including short-term loading due to wind and seismic forces in accordance with ICC-ES AC106.
 - b. Manufacturers: One of the following or equal:
 - 1) Hilti, HUS-EZ Screw Anchor.
 - 2) Simpson Strong-Tie, Titen® HD Screw Anchor.
 - 3) DEWALT/Powers: Screwbolt+ Screw Anchor.
 - c. Materials:
 - 1) Galvanized steel: Carbon steel. Zinc plated in accordance with ASTM B633, minimum 5 microns (Fe/Zn 5); or mechanically galvanized in accordance with ASTM B695; Class 55, Type I.

F. Undercut concrete anchors:

1. Description: Post-installed concrete anchor that develops tensile strength from mechanical interlock provided by creation of an undercut "key" at the embedded end of the anchor. The undercut may be achieved with a special drill before anchor installation, or by the anchor itself during installation.
2. Acceptance criteria:
 - a. Acceptance criteria:
 - 1) Undercut concrete anchors shall have a current ICC-ES Report demonstrating that the anchors have been tested and qualified for performance in both cracked and un-cracked concrete, and for short-term loading due to wind and seismic forces for Seismic Design Categories A through F in accordance with ACI 355.2 and ICC ES AC193 (including all mandatory tests and optional tests for seismic tension and shear in cracked concrete).

- 2) Undercut anchor performance in the current ICC-ES Report shall be "Category 1" as defined in ACI 355.2.
- b. Use pre-setting units.
3. Manufacturers: One of the following or equal:
 - a. Hilti, HDA (carbon steel) or HDA-R (stainless steel) Undercut Anchor.
 - b. Powers Fasteners, Atomic+ Undercut Anchor.
 - c. Simpson Strong-Tie, Torq-Cut Anchor.
 - d. USP Structural Connectors, DUC-L Undercut Anchors.
4. Materials:
 - a. Stainless steel: Corrosive, wet, and moist and locations: Type 316.
 - b. Galvanized: Carbon steel, zinc plated in accordance with ASTM B633, minimum 5 microns (Fe/Zn 5).

2.05 APPURTENANCES FOR ANCHORING AND FASTENING

- A. Anchor bolt sleeves:
 1. Having inside diameter approximately 2 inches greater than bolt diameter and minimum 10-bolt diameters long.
 2. Plastic sleeves:
 - a. High-density polyethylene, corrugated sleeve, threaded to provide adjustment of location on the anchor bolt.
 - b. Manufacturers: The following or equal:
 - 1) Portland Bolt & Manufacturing Co.
 3. Fabricated steel sleeves: Construct as specified in Section 05_50_00 - Metal Fabrications:
 - a. At galvanized carbon steel anchor bolts, provide galvanized carbon steel sleeves.
 - b. At stainless steel anchor bolts, provide stainless steel sleeves of same Type (304 or 316) as bolt, except that sleeves shall be constructed from low carbon stainless steel for welding (Type 304L or 316L).
- B. Forged steel hardware:
 1. See Section 05_12_00 - Structural Steel for forged steel hardware connectors, including clevises, turnbuckles, eye bolts, eye nuts, and sleeve nuts.
- C. Isolating sleeves and washers:
 1. Manufacturers: One of the following or equal:
 - a. Central Plastics Co.
 - b. Allied Corrosion Industries.
 2. Sleeves: Mylar, 1/32-inch thick, 4,000 volts per mil dielectric strength, of proper size to fit bolts and extending half way into both steel washers.
 3. One sleeve required for each bolt.
 4. Washers: The inside diameter of all washers shall fit over the isolating sleeve, and both the steel and isolating washers shall have the same inside diameter and outside diameter.
 - a. Proper size to fit bolts.
 - b. Two 1/8-inch thick steel washers for each bolt.
 - c. G3 Phenolic: 2 insulating washers are required for each bolt:
 - 1) Thickness: 1/8 inch.
 - 2) Base material: Glass.
 - 3) Resin: Phenolic.

- 4) Water absorption: 2 percent.
 - 5) Hardness (Rockwell): 100.
 - 6) Dielectric strength: 450 volts per mil.
 - 7) Compression strength: 50,000 pounds per square inch.
 - 8) Tensile strength: 20,000 pounds per square inch.
 - 9) Maximum operating temperature: 350 degrees Fahrenheit.
- D. Coating for repair of galvanized surfaces:
- 1. Manufacturers: The following or equal:
 - a. Jelt, Galvinox.
- E. Thread coating: For use with threaded stainless steel fasteners:
- 1. Manufacturers: One of the following or equal:
 - a. Bostik, Never-Seez.
 - b. Oil Research, Inc., WLR No. 111.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine Work in place to verify that it is satisfactory to receive the Work of this Section. If unsatisfactory conditions exist, do not begin this Work until such conditions have been corrected.

3.02 INSTALLATION: GENERAL

- A. Where anchors and fasteners are not specifically indicated on the Drawings or specified, make attachments with materials specified in this Section.
- B. Substitution of anchor types:
- 1. Post-installed anchors may not be used as an alternative to cast-in/built-in anchors at locations where the latter are indicated on the Drawings.
 - 2. Cast-in/built-in anchors may be used as an alternative to post-installed mechanical anchors at locations where the latter are indicated on the Drawings.
- C. Protect products from damage during installation. Take special care to protect threads and threaded ends.
- D. Accurately locate and position anchors and fasteners:
- 1. Unless otherwise indicated on the Drawings, install anchors perpendicular to the surfaces from which they project.
 - 2. Install anchors so that at least 2 threads, but not more than 1/2 inch of threaded rod, projects past the top nut.
- E. Interface with other products:
- 1. Where steel anchors come in contact with dissimilar metals (aluminum, stainless steel, etc.), use stainless steel anchors and separate or isolate dissimilar metals using isolating sleeves and washers.

2. Prior to installing nuts, coat threads of stainless steel fasteners with thread coating to prevent galling of threads.

3.03 INSTALLATION: CAST-IN ANCHORS

A. General:

1. Accurately locate cast-in and built-in anchors.
 - a. Provide anchor setting templates to locate anchor bolts and anchor rods. Secure templates to formwork.
 - b. Brace or tie off embedments as necessary to prevent displacement during placement of plastic concrete or of surrounding masonry construction.
 - c. Position and tie cast-in and built-in anchors in place before beginning placement of concrete or grout. Do not “stab” anchors into plastic concrete, mortar, or grout.
 - d. Do not allow cast-in anchors to touch reinforcing steel. Where cast-in anchors are within 1/4 inch of reinforcing steel, isolate the metals by wrapping the anchors with a minimum of 4 wraps of 10-mil polyvinyl chloride tape in area adjacent to reinforcing steel.
2. For anchoring at machinery bases subject to vibration, use 2 nuts, with 1 serving as a locknut.
3. Where anchor bolts or anchor rods are indicated on the Drawings as being for future use, thoroughly coat exposed surfaces that project from concrete or masonry with non-oxidizing wax. Turn nuts down full length of the threads, and neatly wrap the exposed thread and nut with a minimum of 4 wraps of 10-mil waterproof polyvinyl tape.

B. Anchor bolts:

1. Minimum effective embedment: 10-bolt diameters, unless a longer embedment is indicated on the Drawings.
2. Where indicated on the Drawings, set anchor bolts in plastic, galvanized steel or stainless steel sleeves to allow for adjustment. Seal top of sleeve to prevent grout from filling sleeve.

C. Anchor rods:

1. Install as specified for anchor bolts.

D. Concrete inserts:

1. Provide inserts with minimum clear concrete cover not less than that specified for reinforcing bars.

E. Deformed bar anchors:

1. Butt weld to steel fabrications with automatic stud welding gun as recommended by manufacturer.
2. Ensure that butt weld develops the full strength of the anchor.

F. Welded studs:

1. Butt weld to steel fabrications with automatic stud welding gun as recommended by the manufacturer.
2. Ensure that butt weld develops full strength of the stud.

3.04 INSTALLATION: POST-INSTALLED ADHESIVE ANCHORS

- A. Epoxy and acrylic adhesive bonding of reinforcing bars, all thread rods, and internally threaded inserts in concrete: As specified in Section 03_21_17 - Adhesive-Bonded Reinforcing Bars and All Thread Rods in Concrete.
- B. Epoxy and acrylic adhesive bonding of reinforcing bars, all thread rods, and internally threaded inserts in masonry: As specified in Section 04_05_18 - Adhesive Bonding Reinforcing Bars and All Thread Rods in Masonry.

3.05 INSTALLATION: POST-INSTALLED MECHANICAL ANCHORS

- A. General:
 - 1. Install anchors in accordance with the manufacturer's instructions, ACI 355.2, the anchor's ICC-ES Report. Where conflict exists between the ICC-ES Report and the requirements in this Section, the requirements of the ICC-ES Report shall control.
 - 2. Where anchor manufacturer recommends the use of special tools and/or specific drill bits for installation, provide and use such tools.
 - 3. After anchors have been positioned and inserted into concrete or masonry, do not:
 - a. Remove and reuse/reinstall anchors.
 - b. Loosen or remove bolts or studs.
- B. Holes drilled into concrete and masonry:
 - 1. Do not drill holes in concrete or masonry until the material has achieved its minimum specified compression strength (f'_c or f'_m).
 - 2. Accurately locate holes:
 - a. Before drilling holes, use a reinforcing bar locator to identify the position of all reinforcing steel, conduit, and other embedded items within a 6-inch radius of each proposed hole.
 - b. If the hole depth exceeds the range of detection for the rebar locator, the Engineer may require radiographs of the area designated for investigation before drilling commences.
 - 3. Exercise care to avoid damaging existing reinforcement and other items embedded in concrete and masonry.
 - a. If embedments are encountered during drilling, immediately stop work and notify the Engineer. Await Engineer's instructions before proceeding.
 - 4. Unless otherwise indicated on the Drawings, drill holes perpendicular to the concrete surface into which they are placed.
 - 5. Drill using anchor manufacturer's recommended equipment and procedures:
 - a. Unless otherwise recommended by the manufacturer, drill in accordance with the following:
 - 1) Drilling equipment: Electric or pneumatic rotary type with light or medium impact. Where edge distances are less than 2 inches, use lighter impact equipment to prevent micro-cracking and concrete spalling during drilling process.
 - 2) Drill bits: Carbide-tipped in accordance with ANSI B212-15. Hollow drills with flushing air systems are preferred.
 - 6. Drill holes at manufacturer's recommended diameter and to depth required to provide the effective embedment indicated.

7. Clean and prepare holes as recommended by the manufacturer and as required by the ICC-ES Report for that anchor.
 - a. Unless otherwise recommended by anchor manufacturer, remove dust and debris using brushes and clean compressed air.
 - b. Repeat cleaning process as required by the manufacturer's installation instructions.
 - c. When cleaning holes for stainless steel anchors, use only stainless steel or non-metallic brushes.
- C. Insert and tighten (or torque) anchors in full compliance with the manufacturer's installation instructions.
 1. Once anchor is tightened (torque), do not attempt to loosen or remove its bolt or stud.
- D. Concrete anchors: Minimum effective embedment lengths unless otherwise indicated on the Drawings:

Concrete Anchors			
Nominal Diameter	Minimum Effective Embedment Length		Minimum Member Thickness
	In Concrete	In Grouted Masonry	
3/8 inch	2 1/2 inch	2 5/8 inch	8 inch
1/2 inch	3 1/2 inch	3 1/2 inch	8 inch
5/8 inch	4 1/2 inch	4 1/2 inch	10 inch
3/4 inch	5 inch	5 1/4 inch	12 inch

- E. Flush shell anchors:
 1. Flush shell anchors are not permitted in the Work.
 2. If equipment manufacturer's installation instructions recommend the use of flush shell anchors, contact Engineer for instructions before proceeding.
- F. Sleeve anchors:
 1. Minimum effective embedment lengths unless otherwise indicated on the Drawings:

Sleeve Anchors			
Nominal Diameter	Minimum Effective Embedment Length		Minimum Member Thickness
	In Concrete	In Grouted Masonry	
M8 (1/2 inch)	70 mm (2 3/4 inch)	Not accepted	100 mm (8 inch)
M10 (5/8 inch)	76 mm (3 inch)	Not accepted	250 mm (10 inch)
M12 (3/4 inch)	80 mm (3 1/4 inch)	Not accepted	300 mm (12 inch)

2. Install with the sleeve fully engaged in the base material.

G. Screw anchors:

1. Minimum effective embedment lengths unless otherwise indicated on the Drawings:

Screw Anchors			
Nominal Diameter	Minimum Effective Embedment Length		Minimum Member Thickness
	In Concrete	In Grouted Masonry	
3/8 inch	2 1/2 inch	3 1/4 inch	8 inch
1/2 inch	3 1/4 inch	4 1/2 inch	8 inch
5/8 inch	4 inch	5 inch	10 inch
3/4 inch	5 1/2 inch	6 1/4 inch	12 inch

2. Install screw anchors using equipment and methods recommended by the manufacturer. Continue driving into hole until the washer head is flush against the item being fastened.

H. Undercut concrete anchors:

1. Minimum effective embedment lengths unless otherwise indicated on the Drawings:

Undercut Anchors			
Nominal Diameter (bolt)	Minimum Effective Embedment Length		Minimum Member Thickness ⁽¹⁾
	In Concrete	In Grouted Masonry	
M10 (3/8 inch)	100 mm (4 inch)	Not accepted	200 mm (8 inch)
M12 (1/2 inch)	125 mm (5 inch)	Not accepted	350 mm (14 inch)
M16 (5/8 inch)	190 mm (7 1/2 inch)	Not accepted	460 mm (18 inch)
M20 (7/8 inch)	250 mm (10 inch)	Not accepted	510 mm (20 inch)

Notes:

(1) Thickness indicated is for pre-set units. If through-set units are accepted, obtain minimum member thickness requirements from the Engineer.

2. Installations of undercut anchors shall not be allowed where edge distances are less than 12 times the nominal diameter of the anchor stud.
3. Undercut bottom of hole using cutting tools manufactured for this purpose by the manufacturer of the undercut anchors being placed.

3.06 FIELD QUALITY CONTROL

A. Contractor shall provide quality control over the Work of this Section as specified in Section 01_45_00 - Quality Control.

1. Expenses associated with work described by the following paragraphs shall be paid by the Contractor.

- B. Post-installed anchors:
 - 1. Review anchor manufacturer's installation instructions and requirements of the Evaluation Service Report (hereafter referred to as "installation documents") for each anchor type and material.
 - 2. Observe hole-drilling and cleaning operations for conformance with the installation documents.
 - 3. Certify in writing to the Engineer that the depth and location of anchor holes, and the torque applied for setting the anchors conforms to the requirements of the installation documents.
 - a.

3.07 FIELD QUALITY ASSURANCE

- A. Owner's Representative will provide on-site observation and field quality assurance for the Work of this Section.
 - 1. Expenses associated with work described by the following paragraphs shall be paid by the Owner.
- B. Field inspections and special inspections:
 - 1. Required inspections: Observe construction for conformance to the approved Contract Documents, the accepted submittals, and manufacturer's installation instructions for the products used.
 - 2. Record of inspections:
 - a. Maintain record of each inspection.
 - b. Submit copies to Engineer upon request.
 - 3. Statement of special inspections: At the end of the project, prepare and submit to the Engineer and the authority having jurisdiction inspector's statement that the Work was constructed in general conformance with the approved Contract Documents, and that deficiencies observed during construction were resolved.
- C. Special inspections: Anchors cast into concrete and built into masonry.
 - 1. Provide special inspection during positioning of anchors and placement of concrete or masonry (including mortar and grout) around the following anchors:
 - a. Anchor bolts.
 - b. Anchor rods.
 - c. Concrete inserts (all types).
 - d. Deformed bar anchors.
 - e. Welded studs.
 - 2. During placement, provide continuous special inspection at each anchor location to verify that the following elements of the installation conform to the requirements of the Contract Documents.
 - a. Anchor:
 - 1) Type and dimensions.
 - 2) Material: Galvanized steel, Type 304 stainless steel, or Type 316 stainless steel as specified in this Section or indicated on the Drawings.
 - 3) Positioning: Spacing, edge distances, effective embedment, and projection beyond the surface of the construction.
 - 4) Reinforcement at anchor: Presence, positioning, and size of additional reinforcement at anchors indicated on the Drawings.

3. Following hardening and curing of the concrete or masonry surrounding the anchors, provide periodic special inspection to observe and confirm the following:
 - a. Base material (concrete or grouted masonry):
 - 1) Solid and dense concrete or grouted masonry material within required distances surrounding anchor.
 - 2) Material encapsulating embedment is dense and well-consolidated.
- D. Special Inspections: Post-installed mechanical anchors placed in hardened concrete and in grouted masonry.
 1. Provide special inspection during installation of the following anchors:
 - a. Concrete anchors.
 - b. Sleeve anchors.
 - c. Screw anchors.
 2. Undercut concrete anchors. Unless otherwise noted, provide periodic special inspection during positioning, drilling, placing, and torquing of anchors.
 - a. Provide continuous special inspection for post-installed anchors in "overhead installations" as defined in this Section.
 3. Requirements for periodic special inspection:
 - a. Verify items listed in the following paragraphs for conformance to the requirements of the Contract Documents and the Evaluation Report for the anchor being used. Observe the initial installation of each type and size of anchor, and subsequent installation of the same anchor at intervals of not more than 4 hours.
 - 1) Any change in the anchors used, in the personnel performing the installation, or in procedures used to install a given type of anchor shall require a new "initial inspection."
 - b. Substrate: Concrete or masonry surfaces receiving the anchor are sound and of a condition that will develop the anchor's rated strength.
 - c. Anchor:
 - 1) Manufacturer, type, and dimensions (diameter and length).
 - 2) Material (galvanized, Type 304 stainless steel, or Type 316 stainless steel).
 - d. Hole:
 - 1) Positioning: Spacing and edge distances.
 - 2) Drill bit type and diameter.
 - 3) Diameter, and depth.
 - 4) Hole cleaned in accordance with manufacturer's required procedures. Confirm multiple repetitions of cleaning when recommended by the manufacturer.
 - 5) Anchor's minimum effective embedment.
 - 6) Anchor tightening/installation torque.
 4. Requirements for continuous special inspection:
 - a. The special inspector shall observe all aspects of anchor installation, except that holes may be drilled in his/her absence provided that he/she confirms the use of acceptable drill bits before drilling, and later confirms the diameter, depth, and cleaning of drilled holes.

- E. Field tests:
1. Owner's Representative may, at any time, request testing to confirm that materials being delivered and installed conform to the requirements of the Specifications.
 - a. If such additional testing shows that the materials do not conform to the specified requirements, the Contractor shall pay the costs of these tests.
 - b. If such additional testing shows that the materials do conform to the specified requirements, the Owner shall pay the costs of these tests.

3.08 NON-CONFORMING WORK

- A. Remove misaligned or non-performing anchors.
- B. Fill empty anchor holes and repair failed anchor locations as specified using high-strength, non-shrink, non-metallic grout.
- C. If more than 10 percent of all tested anchors of a given diameter and type fail to achieve their specified torque or proof load, the Engineer will provide directions for required modifications. Make such modifications, up to and including replacement of all anchors, at no additional cost to the Owner.

3.09 SCHEDULES

- A. Provide and install anchor materials as scheduled in the following Table.

Table - Required Anchoring Materials by Location			
Location/Exposure		Materials	Notes
1.	Anchors into concrete and grouted masonry for attachment of carbon steel, including structural steel and other steel fabrications:		
a)	Interior dry areas	Carbon steel - galvanized	
b)	Locations with galvanized steel structures or fabrications	Stainless steel - Type 304 or 316	1
c)	Exterior and interior wet and moist locations	Stainless steel - Type 316	1
d)	Corrosive locations	Stainless steel - Type 316	1
2.	Anchors into concrete and grouted masonry for attachment of aluminum, stainless steel, or fiber-reinforced plastic (FRP) shapes and fabrications:		
a)	Interior dry areas	Stainless steel - Type 304 or 316	1
b)	Exterior and interior wet and moist locations	Stainless steel - Type 316	1
c)	Corrosive locations	Stainless steel - Type 316	1

Table - Required Anchoring Materials by Location			
Location/Exposure		Materials	Notes
3.	Anchors for attaching equipment and its appurtenances:		
a)	All locations	Stainless steel - Type 316 (unless Type 304 is specifically indicated in the specifications for the equipment.)	1
<u>Notes:</u> (1) Where anchors are in contact with a metal that differs from that of the anchor, provide isolation sleeves and washers.			

END OF SECTION

SECTION 05_12_00
STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Structural steel shapes and plate.
 - 2. Fasteners and structural hardware:
 - a. All thread rods.
 - b. All thread rods, high-strength.
 - c. Forged steel structural hardware.
 - d. High-strength bolts.
 - 3. Welding.
 - 4. Bolting.

1.02 REFERENCES

- A. American Institute of Steel Construction (AISC):
 - 1. 303 - Code of Standard Practice for Steel Buildings and Bridges.
 - 2. 360 - Specification for Structural Steel Buildings.
- B. American Iron and Steel Institute (AISI):
 - 1. Steel and stainless steel alloys ("types") as indicated.
- C. American Welding Society (AWS):
 - 1. A5.1 - Specification for Carbon Steel Electrodes for Shielded Metal Arc Welding.
 - 2. A5.17 - Specification for Carbon Steel Electrodes and Fluxes for Submerged Arc Welding.
 - 3. A5.20 - Specification for Carbon Steel Electrodes for Flux Cored Arc Welding.
 - 4. D1.1 - Structural Welding Code - Steel.
 - 5. D1.6 - Structural Welding Code - Stainless Steel.
- D. ASTM International (ASTM):
 - 1. A6 - Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.
 - 2. A36 - Standard Specification for Carbon Structural Steel.
 - 3. A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - 4. A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - 5. A194 - Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both.
 - 6. A240 - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.

7. A276 - Standard Specification for Stainless Steel Bars and Shapes.
 8. A380 - Standard Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems.
 9. A489 - Standard Specification for Carbon Steel Lifting Eyes.
 10. A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
 11. A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
 12. A563 - Standard Specification for Carbon and Alloy Steel Nuts.
 13. A992 - Standard Specification for Structural Steel Shapes.
 14. B695 – Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel.
 15. F436 - Standard Specification for Hardened Steel Washers.
 16. F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
 17. F594 - Standard Specification for Stainless Steel Nuts.
 18. F959 - Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners.
 19. F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105 ksi Yield Strength.
 20. F2329 - Standard Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners.
 21. F3125 - Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi and 150 ksi Minimum Tensile Strength.
- E. Research Council on Structural Connections (RCSC):
1. Specification for Structural Joints Using High-Strength Bolts (RCSC Specification).

1.03 DEFINITIONS

- A. Snugtight: At bolted joints, the tightness attained with a few impacts of an impact wrench, or by the full effort of an ironworker using a spud wrench to bring the connected plies into firm contact.
- B. Stainless steel related terms:
1. Descaling: Removal of heavy, tightly adherent oxide films resulting from hot-forming, heat-treatment, welding, and other high-temperature operations.
 2. Pickling: Chemical descaling of stainless steel using aqueous solutions of nitric and hydrofluoric acid, or various proprietary formulations as specified.
 3. Passivation: Chemical treatment of stainless steel with a mild oxidant for the purpose of enhancing the spontaneous formation of the steel's protective passive film.

1.04 SUBMITTALS

- A. Product data:
1. Welding electrodes for field welds: Electrode manufacturer's data.

2. Compressible-washer-type direct tension indicators: Manufacturer's detailed installation instructions including:
 - a. Requirements for type and frequency of pre-installation verification.
 - b. Requirements for coordination with regular washers.
 - c. Instructions for assembling and tightening the joint so that work progresses from the most rigid part until the connected plies are in firm contact.
 3. Stainless steel: Fabricator name and qualifications, member dimensions and structural section properties, and specifications and procedures used for pickling and passivating members.
- B. Shop drawings:
1. Fabrication and erection drawings.
- C. Quality control submittals:
1. Welding procedure specifications (WPS) in accordance with AWS D1.1 and D1.6:
 - a. Submit WPS for each type of welded joint used, whether prequalified or qualified by testing.
 - 1) State electrode manufacturer and specific electrodes used.
 - 2) Indicate required AWS qualification for joint.
 - b. Submit WPS with shop drawings that indicate those welds.
 - c. Submit Procedure Qualification Record (PQR) in accordance with AWS D1.1 and D1.6 for welding procedures qualified by testing.
 2. Welder qualifications: For each welding process and position:
 - a. Welder's qualification certificates.
 - b. Contractor's statement that certificate will be "in effect" at the time(s) welding will be performed based on the "Period of Effectiveness" provisions of AWS D1.1 and D1.6.
 3. Steel fabricator's AISC certification.
- D. Test reports:
1. Certified copies of mill tests and analyses made in accordance with applicable ASTM standards, or reports from a recognized commercial laboratory, including chemical and tensile properties of each shipment of structural steel or part thereof having common properties.

1.05 QUALITY ASSURANCE

- A. Certification:
1. Steel fabricators shall be certified by the AISC or other certification acceptable to the Engineer and the building official having jurisdiction.
- B. Welding:
1. Perform welding of structural metals in accordance with AWS D1.1 and D1.6 using welders who have current AWS qualification certificate for the process, position, and joint configuration to be welded.
 2. Make Welding Procedure Specifications available at the locations where welding is performed.
 3. Notify Engineer at least 24 hours before starting shop or field welding.
 4. Engineer may check materials, equipment, and qualifications of welders.

5. Remove welders performing unsatisfactory Work, or require requalification.
6. Engineer may use gamma ray, magnetic particle, dye penetrant, trepanning, or other aids to visual inspection to examine any part of welds or all welds.
7. Contractor shall bear costs of retests on defective welds.
8. Contractor shall also bear costs in connection with qualifying welders.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Packing and shipping: Deliver structural steel free from mill scale, rust, and pitting.
- B. Storage and protection: Until erection and painting, protect from weather items not galvanized or protected by a shop coat of paint.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Unless otherwise specified or indicated on the Drawings, materials shall conform to the following:

Item	ASTM Standard	Class, Grade, Type, or Alloy Number
Carbon Steel		
Plate, bars, rolled shapes (except W and WT shapes), and miscellaneous items	A36	--
Rolled W and WT shapes	A992	Grade 50
Hollow structural sections/HSS: Round, square, or rectangular (including "pipe" where indicated for structural members and supports)	A500	Grade C
Stainless steel		
Plate, sheet, and strip	A240	Type 304* or 316**
Bars and shapes	A276	Type 304* or 316**
* Use Type 304L (low-carbon stainless steel) if material will be welded.		
** Use Type 316L (low carbon stainless steel) if material will be welded.		

2.02 FASTENERS AND STRUCTURAL HARDWARE

- A. General:
 1. Materials: Of domestic manufacture.
 2. Where fasteners and hardware are specified to be galvanized, hot-dip galvanize in accordance with ASTM A153 or ASTM F2329, unless otherwise specified.

- B. All thread rods:
1. Carbon steel:
 - a. In accordance with ASTM A36 unless otherwise indicated on the Drawings.
 - b. High strength all thread rods: In accordance with ASTM F1554, Grade 55.
 - c. Nuts: ASTM A194.
 - d. Washers: ASTM F436.
 2. Galvanized carbon steel:
 - a. In accordance with ASTM A36 unless otherwise indicated on the Drawings, and hot dip galvanized in accordance with ASTM A153.
 - b. High strength galvanized all thread rods: In accordance with ASTM F1554, Grade 55, and galvanized in accordance with ASTM F2329.
 - c. Nuts: ASTM A194, hot-dip galvanized in accordance with ASTM A153.
 - d. Washers: ASTM F436, hot-dip galvanized in accordance with ASTM A153.
 3. Stainless steel:
 - a. Units descaled, pickled, and passivated as specified in "Fabrication" in this Section.
 - b. Threaded rods and nuts to be the products of a single manufacturer/fabricator to ensure proper fit without galling. Ship all thread rods with properly fitting nuts attached.
 - c. Alloy Type 304 or Type 316 as indicated on the Drawings.
 - d. Type 304:
 - 1) Rod: ASTM F593, Group 1, Condition CW, coarse threads.
 - 2) Nuts: ASTM F594. Match alloy of rod (group and UNS designation).
 - 3) Washers: Type 304 stainless steel.
 - e. Type 316:
 - 1) Rod: ASTM F593, Group 2, Condition CW, coarse threads.
 - 2) Nuts: ASTM F594. Match alloy of rod (group and UNS designation).
 - 3) Washers: Type 316 stainless steel.
- C. Anchor bolts, anchor rods, and post-installed steel anchors: As indicated on the Drawings and as specified in Section 05_05_24 - Mechanical Anchoring and Fastening to Concrete and Masonry.
- D. Forged steel structural hardware - carbon steel:
1. Clevises and turnbuckles: Forged steel in accordance with AISI C-1035.
 2. Eye nuts / Eye bolts: Forged steel in accordance with AISI C-1030:
 - a. Having geometric and strength characteristics (including proof load, breaking strength, tensile strength, bend test, and impact strength) of eyebolts in accordance with ASTM A489, Type 1.
 3. Sleeve nuts: Forged steel in accordance with AISI C-1018 Grade 2.
- E. High-strength bolts:
1. Provide high-strength bolt assembly, with nuts, hardened flat washers, and compressible-washer-type direct tension indicators. Provide uncoated components unless galvanized coating is indicated on the Drawings.
 2. Carbon steel - Uncoated:
 - a. Bolts: Plain heavy hex structural bolts in accordance with ASTM F3125, Grade A325, Type 1, or ASTM F3125, Grade A490, Type 1 where Grade A490 bolts are indicated on the Drawings.

- b. Nuts: Heavy hex nuts in accordance with ASTM A563, Grade C.
 - c. Washers:
 - 1) Adjacent to normal, oversized, and short-slotted holes: Circular, square or rectangular beveled, clipped, or extra thick washers in accordance with ASTM F436, Type 1. Flat circular washers unless otherwise indicated on the Drawings.
 - 2) Adjacent to long slotted holes: Fabricated from 5/16-inch thick plate conforming to ASTM A36 or 3/8-inch plate where Grade A490 bolts are indicated on the Drawings.
 - d. Load indicator devices: At slip critical connections, provide one of the following devices at each bolt:
 - 1) Compressible washer type direct tension indicators ("DTI"): In accordance with ASTM F959, Type 325-1, or ASTM F959, Type 490-1 where Grade A490 bolts are indicated on the Drawings.
 - 2) Twist-off type tension-control bolt assemblies: ASTM F3125, Grade F1852 or ASTM F3125, Grade F2280 where Grade A490 bolts are indicated on the Drawings.
3. Carbon steel - Galvanized:
- a. Bolt and nut assemblies fabricated, galvanized, tested for rotational capacity, and shipped in accordance with the provisions ASTM F3125, Grade A325 and the RCSC Specification.
 - b. Bolts, nuts, and washers: Hot-dip galvanized in accordance with ASTM F2329.
 - c. Bolts: Plain heavy hex structural bolts in accordance with ASTM F3125, Grade A325, Type 1 and galvanized as specified.
 - d. Nuts: Heavy hex nuts in accordance with ASTM A563, Grade DH, galvanized as specified, and lubricated in accordance with ASTM A563, Supplementary Requirement S1 to minimize galling.
 - e. Washers:
 - 1) Adjacent to normal, oversized, and short-slotted holes: Circular, square or rectangular beveled, clipped, or extra thick washers in accordance with ASTM F436, Type 1 and galvanized as specified. Flat circular washers unless otherwise indicated on the Drawings.
 - 2) Adjacent to long slotted holes: 5/16-inch thick plate washer fabricated from steel conforming to ASTM A36, and galvanized in accordance with ASTM A123.
 - f. Load indicator devices: At slip critical connections, provide one of the following devices at each bolt:
 - 1) Compressible washer type direct tension indicators ("DTI"): In accordance with ASTM F959, Type 325-1, with mechanically deposited zinc coating conforming to ASTM B695, Class 55.
 - 2) Twist-off type tension-control bolt assemblies: ASTM F3125, Grade F1852 with mechanically deposited zinc coating conforming to ASTM B695, Class 55.
- F. Stainless steel bolts (for use in stainless steel structures):
- 1. General:
 - a. Bolts and nuts shall be the products of a single manufacturer/fabricator to ensure proper fit without galling. Ship bolts with properly fitting nuts attached.
 - b. Units descaled, pickled and passivated as specified in "Fabrication."

2. Alloy: Type 304 or Type 316 to match alloy of structural members being connected.
3. Type 304:
 - a. Bolts: ASTM F593, Group 1, Condition CW, coarse threads.
 - b. Nuts: ASTM F594. Match alloy (group and UNS designation) and threads of bolts.
 - c. Washers: Type 304 stainless steel.
4. Type 316:
 - a. Bolts: ASTM F593, Group 2, Condition CW, coarse threads.
 - b. Nuts: ASTM F594. Match alloy (group and UNS designation) and threads of bolts.
 - c. Washers: Type 316 stainless steel.
5. Welded studs: As indicated on the Drawings and as specified in Section 05_05_24 - Mechanical Anchoring and Fastening to Concrete and Masonry.

2.03 ISOLATING SLEEVES AND WASHERS

- A. As indicated on the Drawings and as specified in Section 05_05_24 - Mechanical Anchoring and Fastening to Concrete and Masonry.

2.04 GALVANIZED SURFACE REPAIR

- A. Manufacturers: The following or equal:
 1. Jelt, Galvinox.

2.05 THREAD COATING

- A. Manufacturers: One of the following or equal:
 1. Bostik, Never-Seez.
 2. Oil Research, Inc., WLR No. 111.

2.06 SUPPLEMENTARY PARTS

- A. Furnish as required for complete structural steel erection, whether or not such parts and Work are specified or indicated on the Drawings.

2.07 FABRICATION

- A. Shop assembly:
 1. Fabricate structural steel in accordance with AISC 360 and AISC 303 unless otherwise specified or modified by applicable regulatory requirements.
 2. Where anchors, connections, or other details of structural steel are not specifically indicated on the Drawings or specified, their material, size and form shall be equivalent in quality and workmanship to items specified.
 3. Round off sharp and hazardous projections and grind smooth.
 4. Take measurements necessary to properly fit work in the field. Take responsibility for and be governed by the measurements and proper working out of all the details.
 5. Take responsibility for correct fitting of metalwork.

6. Welded connections:
 - a. Comply with AWS requirements for the metals to be welded.
 - b. Weld only in accordance with approved Welding Procedure Specifications.
 - c. Keep Welding Procedure Specifications readily available for welders and inspectors during fabrication processes.
- B. Stainless steel shapes and assemblies:
 1. For structural members such as W shapes, S shapes, channels, angles, and similar rolled shapes not available in quantity, size, and type of stainless steel specified or indicated on the Drawings:
 - a. Fabricate shapes using laser-fused, full penetration welds between pieces of plate to attain same or higher section modulus and moment of inertia as that of members indicated on the Drawings.
 - b. Fabricate shapes from dual grade stainless steel.
 - c. Fabricate beams and channels to ASTM A6 tolerances.
 - d. Manufacturers: The following or equal:
 - 1) Stainless Structural, LLC.
 2. Cleaning and passivation:
 - a. Following shop fabrication of stainless steel members and bolts, clean and passivate fabrications at point of manufacture.
 - b. Finish requirements: Remove free iron, heat tint oxides, weld scale and other impurities, and obtain a bright passive finished surface with no etching, pitting, frosting, or discoloration.
 - c. Provide quality control testing to verify effectiveness of cleaning agents and procedures and to confirm that finished surfaces are clean and passivated:
 - 1) Conduct sample runs using test specimens with proposed cleaning agents and procedures as required to avoid adverse effects on surface finishes and base materials.
 - d. Pre-clean, chemically de-scale ("pickle"), passivate, and final-clean fabrications in accordance with the requirements of ASTM A380.
 - 1) If degreasing is required before cleaning (pickling) to remove scale or iron oxide, cleaning with citric acid treatments is permissible; however, such treatments shall be followed inorganic cleaners.
 - 2) Pickle and passivate stainless steel using a nitric acid solution in accordance with ASTM A380, Annex A2, Table A2.1, Part II.
 - 3) Pickling by citric acid treatment or sulfuric acid treatment is not considered to satisfy the requirements of this Section.
 - e. Inspect after cleaning using methods specified for "gross inspection" in ASTM A380.
 - f. Improperly or poorly cleaned and passivated materials shall not be shipped and will not be accepted at the site.
- C. Galvanized carbon steel:
 1. Where galvanizing is required, hot-dip structural steel after fabrication in accordance with ASTM A123:
 2. Do not electro-galvanize or mechanically-galvanize unless specified or accepted by Engineer.
 3. Re-straighten galvanized items that bend or twist during galvanizing.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of conditions: Examine Work in place to verify that it is satisfactory to receive the Work of this Section. If unsatisfactory conditions exist, do not begin this Work until such conditions have been corrected.

3.02 ERECTION

- A. General:
 - 1. Fabricate structural and foundry items to true dimensions without warp or twist.
 - 2. Form welded closures neatly, and grind off smooth where weld material interferes with fit or is unsightly.
 - 3. Install structural items accurately and securely, true to level, plumb, in correct alignment and grade, with all parts bearing or fitting structure or equipment for which intended.
 - 4. Do not shift out of alignment, re-drill, re-shape, or force fit fabricated items.
 - 5. Place anchor bolts or other anchoring devices accurately and make surfaces that bear against structural items smooth and level.
 - 6. Rigidly support and brace structural items needing special alignment to preserve straight, level, even, and smooth lines. Keep structural items braced until concrete, grout, or dry pack mortar has hardened for 48 hours minimum.
 - 7. Erect structural steel in accordance with AISC 303 unless otherwise specified or modified by applicable regulatory requirements.
 - 8. Where anchors, connections, and other details of structural steel erection are not specifically indicated on the Drawings or specified, form, locate, and attach with equivalent in quality and workmanship to items specified.
 - 9. Round off sharp or hazardous projections and grind smooth.
 - 10. Paint or coat steel items as specified.
- B. Stainless steel. Take all necessary precautions to avoid iron contamination of stainless steel during delivery, storage, and handling.
 - 1. Segregate stainless steel from iron.
 - 2. Tools and handling devices.
 - a. Do not use iron tools clamps, chokes, working surfaces, or brushes when fabricating, handling, and erecting stainless steel.
 - b. Do not use tools that have been contaminated by contact with iron.
 - c. Use stainless steel, polymer coated, or wood tools and handling equipment. Do not use tools that have been contaminated by contact with iron or steel.
- C. Welding: General:
 - 1. Make welds full penetration type, unless otherwise indicated on the Drawings.
 - 2. Remove backing bars and weld tabs after completion of weld. Repair defective welds observed after removal of backing bars and weld tabs.
- D. Welding: Carbon steel:
 - 1. General: In accordance with AWS D1.1:
 - a. Weld ASTM A36 and A992 structural steel, and ASTM A500 and A501 structural tubing with electrodes in accordance with AWS A5.1, using

- E70XX electrodes; AWS A5.17, using F7X-EXXX electrodes; or
AWS A5.20, using E7XT-X electrodes:
- b. Field repair cut or otherwise damaged galvanized surfaces to equivalent original condition using a galvanized surface repair.
- E. Welding - stainless steel:
- 1. General: In accordance with AWS D1.6.
- F. Interface with other products:
- 1. Where steel members and fasteners come in contact with dissimilar metals (aluminum, stainless steel, etc.), separate or isolate the dissimilar metals with isolating sleeves and washers as specified in Section 05_05_24 - Mechanical Anchoring and Fastening to Concrete and Masonry.
- G. Fasteners: General:
- 1. Install bolts to project 2 threads minimum, but 1/2 inch maximum beyond nut.
 - 2. Anchor bolts and anchor rods: Install as specified in Section 05_05_24 - Mechanical Anchoring and Fastening to Concrete and Masonry.
 - a. Unless otherwise specified, tighten nuts on anchor bolts and anchor rods specified in Section 05_05_24 - Mechanical Anchoring and Fastening to Concrete and Masonry to the "snugtight" condition.
 - 3. All thread rods in drilled holes bonded to concrete with adhesive: Install as specified in Section 03_21_17 - Adhesive-Bonded Reinforcing Bars and All Thread Rods in Concrete.
 - 4. All thread rods in drilled holes bonded to masonry with adhesive: Install as specified in Section 04_05_18 - Adhesive Bonding Reinforcing Bars and All Thread Rods in Masonry.
- H. Fasteners: High-strength carbon steel bolts:
- 1. Connections with high-strength bolts shall in accordance with RCSC Specification for Structural Joints Using High-Strength Bolts.
 - 2. Provide slip-critical joints at bolted connections.
 - 2. Joints: Slip-critical.
 - a. Confirm that faying surfaces at connections are free of dirt and other foreign material, have been blast cleaned, and are free of coatings and inadvertent overspray in accordance with RCSC Specification.
 - b. Furnish hardened flat washers in accordance with ASTM F436:
 - 1) On outer plies with slotted holes.
 - 2) When 1 or more plies of the connected material has a yield strength less than 40 ksi.
 - 3) Under element, nut, or bolt head, turned in tightening.
 - c. Install tension indicator washers, placed in accordance with ASTM F959 Figure X1, to confirm adequate tightening of bolts.
 - d. Tighten bolts to full pretension.
- I. Fasteners: Stainless steel bolts:
- 1. Connections shall be snugtight joints unless otherwise indicated on the Drawings.
 - 2. Prior to installing nuts, coat threads of stainless steel fasteners with thread coating to prevent galling of threads.

3. Rotate nuts using a slow, smooth action without interruptions. Avoid over-tightening.

3.03 FIELD QUALITY CONTROL

- A. Provide quality control as specified in Section 01_45_00 - Quality Control.

3.04 FIELD QUALITY ASSURANCE

- A. Provide quality assurance as specified in Section 01_45_00 - Quality Control.
- B. Special inspections, special tests, and structural observation:
 1. Provide as specified in Section 01_45_24 - Regulatory Quality Assurance.

END OF SECTION

SECTION 05_14_05
STRUCTURAL ALUMINUM

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Structural aluminum products, including sheet, pipe, extrusions, and associated accessories.

1.02 REFERENCES

- A. ASTM International (ASTM):
1. B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 2. B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
 3. B308 - Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles.
- B. American Welding Society (AWS):
1. A5.10 - Specification for Bare Aluminum and Aluminum-Alloy Welding Electrodes and Rods.
 2. D1.2 - Structural Welding Code - Aluminum.

1.03 SUBMITTALS

- A. Quality control submittals:
1. Test Reports: Certified copies of mill tests or reports from a recognized commercial laboratory including chemical and tensile properties of each shipment of structural metal or part thereof having common properties. Tests and analyses shall be made in accordance with applicable ASTM Standards.
 2. Welder's certificates.

1.04 QUALITY ASSURANCE

- A. Qualifications:
1. Perform welding of structural metals with welders who have current AWS certificate for the type of welding to be performed.
 2. Notify Engineer 24 hours minimum before starting shop or field welding.
 3. Engineer may check materials, equipment, and qualifications of welders.
 4. Remove welders performing unsatisfactory work, or require to requalify.
 5. Engineer may use gamma ray, magnetic particle dye penetrant, or other aids to visual inspection to examine any part of welds or all welds.
 6. Contractor shall bear costs of retests on defective welds.
 7. Contractor shall bear costs in connection with qualifying welders.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Structural sheet aluminum: ASTM B209, Alloy 6061-T6.
- B. Structural aluminum: ASTM B308, Alloy 6061-T6.
- C. Extruded aluminum: ASTM B221, Alloy 6063-T42.
- D. Isolating sleeves and washers:
 - 1. As indicated on the Drawings and as specified in Section 05_05_24 - Mechanical Anchoring and Fastening to Concrete and Masonry.
- E. Miscellaneous materials:
 - 1. Furnish supplementary parts necessary to complete each item even where such work is neither definitely indicated on the Drawings nor specified.
 - 2. Size, form, attachment, and location shall conform to the best of current practice.
 - 3. Conform to applicable ASTM Standards for materials not otherwise specified.

2.02 FABRICATION

- A. Aluminum layout:
 - 1. Center punch hole centers, and punch or scribe cutoff lines, except where marks would remain on fabricated material.
 - 2. Apply temperature correction where necessary in layout of critical dimensions. Use a coefficient of expansion of 0.000013 per degree of Fahrenheit.
- B. Cutting aluminum:
 - 1. Material 1/2-inch thick or less: Shear, saw, or cut with a router.
 - 2. Material more than 1/2-inch thick: Saw or rout.
 - 3. Make cut edges true and smooth, free from excessive burrs or ragged breaks.
 - 4. Avoid reentrant cuts wherever possible. Where used, fillet by drilling prior to cutting.
 - 5. Do not flame cut aluminum alloys.
 - 6. Punch or drill rivet or bolt holes to finished size before assembly:
 - a. Make finished diameter of holes for bolts 1/16-inch maximum larger than nominal bolt diameter.
 - b. Make holes cylindrical and perpendicular to principal surface.
 - c. Do not permit holes to drift in a manner to distort metal.
- C. Aluminum forming and assembly:
 - 1. Do not heat structural aluminum, except as follows:
 - a. Heat aluminum to 400 degrees Fahrenheit for 30 minutes maximum, to facilitate bending or welding.
 - b. Heat only when proper temperature controls and supervision can ensure that limitations on temperature and time are observed.
- D. Before assembly, remove chips lodged between contacting surfaces.

- E. Welding aluminum:
1. Perform welding of aluminum in accordance with AWS D1.2.
 2. Weld aluminum in accordance with the following:
 - a. Preparation:
 - 1) Remove dirt, grease, forming or machining lubricants, and organic materials from areas to be welded by cleaning with a suitable solvent or by vapor degreasing.
 - 2) Additionally, etch or scratch brush to remove oxide coating just prior to welding when inert gas tungsten arc welding method is used.
 - 3) Oxide coating may not need to be removed if welding is performed by automatic or semi-automatic inert gas shielded metal arc.
 - 4) Suitably prepare edges to ensure 100 percent penetration in butt welds by sawing, chipping, machining, or shearing. Do not cut with oxygen.
 - b. Filler metal: Aluminum alloys conforming to the requirements of AWS A5.10 and AWS classification ER 4043, ER 5654, ER 5554, ER 5183, ER 5356, or ER 5556.
 - c. Perform welding of structures which are to be anodized using filler alloys which will not discolor when anodized, AWS ER 5654, ER 5554, ER 5183, ER 5356, or ER 5556.
 - d. Perform welding by using a non-consumable tungsten electrode with filler metal in an inert gas atmosphere (TIG) or using a consumable filler metal electrode in an inert gas atmosphere (MIG).
 - e. Do not use welding process that requires use of a welding flux.
 - f. Neatly make welded closures.
 - g. Where weld material interferes with fit or is unsightly in appearance, grind it smooth.
 - h. Make welds full penetration welds unless otherwise indicated on the Drawings.

2.03 FINISHES

- A. Coating for Aluminum in contact with concrete or masonry:
1. Epoxy mastic.
 - a. As specified in Section 09_96_01 - High-Performance Coatings, coating system EPX-M-5.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of conditions: Examine Work in place to verify that it is satisfactory to receive the Work of this Section. If unsatisfactory conditions exist, do not begin this Work until such conditions have been corrected.

3.02 INSTALLATION

- A. Install structural aluminum products as indicated on the Drawings and specified.

- B. Install structural aluminum products accurately and securely, true to level, plumb, in correct alignment and grade, with all parts bearing or fitting structure or equipment for which intended.
- C. Do not cock out of alignment, redrill, reshape, or force fit fabricated items.
- D. Place anchor bolts or other anchoring devices accurately and make surfaces that bear against structural items smooth and true to level.
- E. Rigidly support and brace structural products needing special alignment to preserve straight, level, even, smooth lines, and keep braced until concrete, grout, or dry pack mortar has hardened for a minimum 48-hour period.
- F. Interface with other products:
 - 1. Where aluminum comes in contact with dissimilar metals, use stainless steel bolts or anchors and separate or isolate the dissimilar metals with isolating sleeves and washers as specified in Section 05_05_24 - Mechanical Anchoring and Fastening to Concrete and Masonry.
 - 2. Coat those parts of aluminum that will be cast into concrete or that will be in contact with concrete, grout, masonry, wood, or other materials that will cause the aluminum to corrode, as specified in Section 09_96_01 - High-Performance Coatings.

END OF SECTION

SECTION 05_21_19
OPEN WEB STEEL JOIST FRAMING

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
1. Open web steel joists, joist girders, and accessories.
 2. Welding and bolts for connections at joists and joist girders.

1.02 REFERENCES

- A. American Welding Society (AWS):
1. A2.4 - Standard Symbols for Welding, Brazing, and Non-Destructive Examination.
 2. B2.1 - Specification for Welding Procedure and Performance Qualification.
 3. D1.1 - Structural Welding Code - Steel.
- B. ASTM International (ASTM):
1. A123 -Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Irons and Steel Products.
 2. A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 3. A563 - Standard Specification for Carbon and Alloy Steel Nuts.
 4. A780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
 5. F436 - Standard Specification for Hardened Steel Washers.
 6. F2329 - Standard Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts and Special Threaded Fasteners.
 7. F3125 - Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi and 150 ksi Minimum Tensile Strength.
- C. Occupational Safety and Health Administration (OSHA):
1. Code of Federal Regulations, Title 29 – Labor, Chapter XVII.
 - a. Part 1926.757 - Steel Erection; Open Web Steel Joists.
- D. Society for Protective Coatings (SSPC):
1. Paint 15 - Steel Joist Shop Primer/Metal Building Primer.
 2. SP-15 - Commercial Grade Power tool Cleaning.
- E. Steel Joist Institute (SJI):
1. Code of Standard Practice:
 - a. COSP - Code of Standard Practice for Steel Joists and Joist Girders.
 2. Standard Specifications:
 - a. K Series - Standard Specifications for Open Web Steel Joists.

- b. LH/DLH Series - Standard Specifications for Longspan Steel Joists, LH-Series and Deep Longspan Steel Joists, DLH-Series.
 - c. JG Series - Standard Specification for Joist Girders.
- 3. Standard Load Tables:
 - a. Standard Specification Load Tables and Weight Tables for Steel Joists and Joists Girders.
- 4. Technical Digests:
 - a. TD 8 - Welding of Open-Web Steel Joists and Joist Girders.
 - b. TD 9 - Handling and Erection of Steel Joists and Joist Girders.

1.03 DEFINITIONS

- A. SJI Standard Specifications: Refers to one or more of the following documents corresponding to the joist type indicated on the Drawings:
 - 1. K Series - Standard Specifications for Open Web Steel Joists.
 - 2. Steel trusses
- B. SJI Standard Load Tables: Refers to one of the following documents corresponding to the joist type indicated on the Drawings:
 - 1. Standard Load Tables, Open Web Steel Joists, K-Series (LRFD & ASD).
- C. Steel Joists: As referred to in this Section, includes joists, K series joist substitutes, joist girders, and joist headers.

1.04 SUBMITTALS

- A. General: Submit as specified in Section 01_33_00 - Submittal Procedures.
- B. Product data:
 - 1. Manufacturer's specifications and installation instructions for each type of joist and accessories.
 - 2. Coatings:
 - a. Shop coating. Manufacturer's product data sheets indicating type and characteristics of applied coatings, and recommendations for preparation and materials for finished coatings.
 - b. Galvanizing. Galvanizing contractor's information regarding procedures for hot-dip galvanizing and for inspecting and repairing coatings.
- C. Shop drawings:
 - 1. General:
 - a. Provide fabrication drawings/schedules, and erection/layout drawings for joists and related miscellaneous metal work.
 - b. Clearly indicate portion of the Work covered by each submittal, and location of each member in the work.
 - c. Mark number or tags on joists and fabrications shall be the same mark numbers indicated on fabrication schedules and erection drawings.
 - d. Indicate shop and field welds using symbols in accordance with AWS A2.4. Indicate net weld lengths.
 - 2. Fabrication drawings/schedules:
 - a. Detail each piece or assembly to be incorporated into the work.

- b. For each joist type and size, and for each accessory, indicate:
 - 1) SJI standard designations including depth and chord size.
 - 2) Identification mark number.
 - 3) Loading criteria and camber.
 - 4) Configuration and details including joist elevation view; bearing seats; end conditions; chord extensions; and details of internal joints, welds, and splices (if any).
 - 5) Dimensions, both overall and internal.
 - 6) Methods of connecting, anchoring, fastening, bracing, bridging, and attaching.
 - 7) Coatings and surface preparation.
 - 3. Erection/layout drawings:
 - a. Indicate placement of each piece shown in the fabrication drawings/schedules or listed in the bill of materials.
 - b. Show layout of joists with mark numbers; methods of framing at openings; locations, types, and connection details for bridging; details of connections between joists and supporting joist girders, joist headers, framing, or structures; and accessories.
 - c. Indicate erection sequence and requirements for temporary bracing.
 - d. Show requirements for field welding and bolting.
 - e. Show profiles and deflection criteria under live and total loads for joist configurations not specifically listed in SJI Standard Load Tables.
 - f. List loads used in the design of steel joists.
 - 1) Show loads and position of loads from mechanical and electrical equipment supported by the joists and framing.
- D. Calculations:
 - 1. Submit calculations for each joist type and span, documenting adequacy to resist uniform and concentrated loads indicated on the Drawings; locations, sizes and types of bridging for resisting downward and uplift loads; and adequacy of connections of joists and bridging.
 - 2. Provide calculation cover letter sealed and signed by the joist manufacturer's qualified registered design professional licensed in the state where the Project is located.
- E. Certificates/certifications:
 - 1. SJI membership. Submit evidence of manufacturer's current membership in SJI and of manufacturer's qualifications to produce members of the types specified and required for the Work.
 - 2. SJI compliance. At the completion of manufacturer, for each joist type and load case provided, submit manufacturer's certificate of compliance stating that design and fabrication of members was performed in accordance with SJI Standard Specifications and the approved shop drawings. Include manufacturer's statements that:
 - a. Welders performing shop welding for joists hold current qualification for the types of welding and welding positions required for the Work.
 - b. Manufacturer has completed in-plant before shipment to verify compliance of materials and workmanship with the requirements of SJI Standard Specifications for the products produced.
 - 3. Quality control program: Submit evidence of active participation in a nationally recognized program for quality control of steel fabrication.

4. Field welding. Submit welder qualification certificates in accordance with AWS D1.1 for the types of welding and welding positions required for the Work.
- F. Test and inspection reports:
1. Mill test reports: Submit manufacturer's certificates, indicating ASTM standards, structural strength, and material properties for steel used in the joists and bridging.
 2. Inspections:
 - a. Source quality control.
 - 1) Submit reports of manufacturer's in-plant inspections for compliance with SJI Standard Specifications.
 - 2) Independent inspections to satisfy requirements of Authority Having Jurisdiction. Submit reports of independent inspector's shop inspections.
 - b. Field quality control:
 - 1) Submit Installation and Welding Inspection Report as specified in Attachment A - Installation and Welding Inspection Report.

1.05 QUALITY ASSURANCE

- A. Design and fabricate joists in compliance with the following and as specified in this Section:
1. SJI Standard Specifications.
 2. SJI Standard Load Tables.
 3. SJI Code of Standard Practice.
- B. Qualifications:
1. Manufacturers:
 - a. Holding current membership in the Steel Joist Institute and a recognized fabricator of structural steel joists conforming to the SJI Standard Specifications, the SJI Standard Load Tables, and the SJI Code of Practice.
 2. Installer/Erector:
 - a. Field Welding: Qualified procedures and welders in accordance with AWS D1.1. Provide welders qualified within the last 12 months preceding the date of joist erection.
- C. Regulatory requirements:
1. In accordance with OSHA requirements for steel erection, including specific requirements for joists and framing.
- D. Inspection:
1. Inspect joists in accordance with SJI Standard Specifications.
 2. Inspect fabrication as specified in Part 2, Source Quality Control.
 3. Provide inspections for Field Quality Control and Field Quality Assurance as specified in Part 3, Execution.
- E. Pre-installation conference: Steel joists and deck.
1. Coordinate with the requirements of Section 05_31_00 - Steel Deck.

2. Schedule and conduct pre-installation conference at least 2 weeks prior to installation of joists.
 - a. Provide additional conferences if necessary to discuss or coordinate specific conditions of installation.
3. Required attendees:
 - a. Contractor.
 - b. Steel joist manufacturer's technical representative.
 - c. Steel joist installer's job superintendent.
 - d. Subcontractor(s) providing and installing coatings under Division 9.
4. Agenda:
 - a. Joist submittals.
 - b. Deck placing and fastening procedures.
 - c. Manufacturer's recommended inspections and inspection procedures.
 - d. Requirements and coordination for quality control inspections and quality assurance (including special inspections).
 - e. Other Specification requirements requiring coordination between parties to the work.
5. Prepare and submit minutes of the pre-installation conference as specified in Section 01_31_19 - Project Meetings.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Transport, deliver, store, and handle steel joists as recommended in SJI specifications, and as required to avoid stresses and to prevent damage to materials and coatings.
- B. Observe delivered materials for damage before and after unloading, and note any permanent bends, deformations, broken welds, or other damage on the receiving documents.
- C. Store joists off the ground, protected from weather and corrosion, and under watertight covering sloped to drain.
 1. Support by means that will protect members from distortion and damage.
 2. Store joists with top chord down and with plane of joist vertical.
 3. For deep joists that shipped on their sides, store joists with plane of joist horizontal.

1.07 WARRANTY

- A. As specified in Section 01_78_36 - Warranties and Bonds.
- B. Special warranty:
 1. Duration: 5 years warranty on joists.

PART 2 PRODUCTS

2.01 DESIGN AND PERFORMANCE CRITERIA

- A. Pre-engineered, pre-fabricated open-web steel joists, joist girders, and accessories designed and fabricated to the requirements of the Steel Joist Institute and details as specified in this Section and indicated on the Drawings.
- B. Design requirements:
 - 1. Design joists and bridging in accordance with current SJI Specifications and load tables to support loads indicated based on the depth, spacing, and deflections, indicated.
 - a. Maximum deflection under live load:
 - 1) As indicated on the drawings
 - b. Minimum design loads as indicated on the Drawings:
 - 1) Dead load.
 - 2) Live load.
 - 3) Wind load (net uplift).
 - 4) Axial tension and compression forces applied to the truss at end connections.
 - c. Camber: Provide standard camber based on SJI Standard Specifications unless otherwise indicated on the Drawings.
 - 1) In no case shall joists be manufactured with negative (downward) camber.
 - 2) Where a joist will be installed parallel to and within 6 feet of a wall, decrease camber in that joist nearest the wall to one-half of the standard camber.
 - 2. Joist chord extensions:
 - a. Top chord extensions. Capable of withstanding the loads indicated for the joist plus any concentrated loads indicated. Brace to prevent lateral torsional buckling of the extension under loads.
 - b. Bottom chord extensions. Capable of supporting weight of ceilings or other items indicated. Extending to within 1 inch of interior finished wall surface unless otherwise indicated on the Drawings.
 - 3. Bridging: Provide horizontal and diagonal bridging as required by the SJI Standard Specifications, as indicated on the Drawings, and as required to maintain stability under gravity, uplift, erection, and construction loadings.
 - 4. End anchorage: Provide end anchorage details to secure and/or stabilize joists at supports, and to transfer any loads indicated on the Drawings.
 - 5. Header units: Provide header units to support joists at openings in floor or roof framing not framed with structural steel shapes.
 - 6. Accessories:
 - a. Provide miscellaneous items including splice plates, reinforcing angles, and bolts required to complete the installation.
 - b. Provide supplemental steel framing to support steel deck where normal deck bearing is precluded by other framing members and minor openings.

2.02 MATERIALS

- A. Steel joists:
 - 1. Provide joist type, chord configuration, depth, and bearing as indicated on the Drawings.
 - 2. Comply with SJI Standard Specifications for joist series indicated and for joist girders.
 - 3. Details: Provide the following.
 - a. Chord members: Rolled double angle sections only. Rod or bar members are not permitted.
 - b. Chord extensions - Joists:
 - 1) Top chord extensions: "S-Type" or "R-Type" as indicated on the Drawings.
 - c. Chord extensions: Joist girders.
 - 1) Joist girder bottom chord extension with vertical slip connection at and stabilizer plate that is fastened to supporting structure.
- B. Bridging:
 - 1. In accordance with SJI Standard Specifications for type of joist, chord size, spacings, spans and uplift loads indicated on the Drawings.
 - 2. Anchored to walls, girders, and roof deck as indicated.
- C. Coatings:
 - 1. Hot dip galvanize joists, bridging, and accessories in conformance with ASTM A123.
- D. Fasteners:
 - 1. Anchor bolts and anchor rods to concrete and masonry: As specified in Section 05_05_24 - Mechanical Anchoring and Fastening to Concrete and Masonry.
 - 2. Bolts: pre-tensioned bolted connections.
 - a. Provide high-strength bolt assembly with hardened flat washers and nuts. Provide uncoated components unless galvanized coating is indicated on the Drawings.
 - b. Uncoated:
 - 1) Bolts: Plain, heavy hex structural bolts conforming to ASTM F3125, Grade A325, Type 1.
 - 2) Nuts: Heavy hex nuts conforming to ASTM A563, Grade C.
 - 3) Washers: Circular flat washers conforming to ASTM F436.
 - 3. Galvanized:
 - a. Bolts, nuts, and washers: As specified for uncoated assemblies, and with the following provisions:
 - 1) Hot dip galvanized in accordance with ASTM A153, Class C or ASTM F2329.
 - 2) Nuts: In accordance with ASTM A563, Grade DH, galvanized as specified and lubricated in accordance with ASTM A563 Supplementary Requirement S1 to minimize galling.
- E. Accessories:
 - 1. Bearing plates: As specified in Section 05_12_00 - Structural Steel Framing.

2.03 FABRICATION

- A. Open web steel joists:
 - 1. Fabricate steel joist in accordance with SJI Standard Specifications to details indicated on the Drawings.
- B. Cross bridging: Provide horizontal or diagonal type bridging for joists.
- C. End anchorage: Provide end anchorage, including bearing plates, to secure joists to adjacent construction as indicated on the Drawings.

2.04 SOURCE QUALITY CONTROL

- A. Tests and inspections:
 - 1. Provide joist manufacturer's inspection as required by SJI Standard Specifications. Submit inspection results.
 - 2. Special inspection - Fabrication. To satisfy requirements of the authority having jurisdiction, materials, fabrication, and welds for joists and accessories shall be independently inspected at the manufacturer's fabrication facility by the Owner's special inspector:
 - a. Independent inspectors observing work in the fabricator's shop shall be hired and paid Owner.
 - b. Inspector minimum qualifications:
 - 1) Qualified to visually inspect welding in accordance with the general requirements of AWS D1.1.
 - 2) Qualified to visually inspect structural steel fabrication.
 - 3) Qualified to the satisfaction of the building official and the Engineer.
 - c. Advise inspector of scheduled fabrication and completion dates. Cooperate in making access available so that inspections can be accomplished safely.
 - d. Inspections will be visual; however, the special inspector shall have the right to perform additional inspections and non-destructive tests on work that is questionable or suspect:
 - 1) If inspections and tests reveal that work fails to comply with the requirements of these Specifications, costs of additional inspections and testing to observe corrections will be deducted from the Contractor's fee for the Work.

PART 3 EXECUTION

3.01 GENERAL

- A. Furnish and erect steel joists accordance with the requirements of SJI's Code of Standard Practice for Steel Joists and Joist Girders.

3.02 PREPARATION

- A. Field verify dimensions and elevations of structural elements supporting the joists and joist girders:
 - 1. Establish lines and elevations within tolerances before beginning erection.

2. Make bearing surfaces true and uniform.
 3. Do not begin placement of steel joists until supporting work is in place and secured.
- B. Clean bearing surfaces of joists and supporting members before erection and as required during erection to maintain solid contact between members.
- C. Do not permit erection of steel deck until joists are connected and bridging is in place.

3.03 INSTALLATION

- A. Erection:
1. Place and secure steel joists in accordance with SJI Standard Specifications, approved erection drawings, and these Specifications.
 2. Allow for loads from erection procedures, but do not load joists until fastening is complete.
 3. Provide sufficient temporary bracing to maintain joists and supporting framing safe, plumb, and in true alignment until completion of erection and installation of permanent bridging and bracing.
- B. Installation of joists and bridging:
1. Do not start placement of steel joists until supporting work is in place, adjusted to specified tolerances, and secured.
 2. Do not field modify, alter, or repair joists unless specific written instructions have been received from the joist manufacturer and submitted to the Engineer. Such instructions shall bear the seal and signature of the joist manufacturer's registered design professional licensed in the state where the joists are installed.
 3. Place joists on supporting surfaces, adjust, and accurately align to required elevation, location and spacing before permanently fastening.
 - a. Set joists plumb and level (with indicated allowances for camber).
 - b. Set "tag end" of joists at location shown on the erection plans.
 - c. Ensure that "square-end" joists are erected with the right side at the top.
 - d. Adjust bearing shoe elevations to provide full bearing after joists and supporting members have been plumbed and positioned, but before final tightening of connections and before any loads are imposed.
 - e. Solidly pack areas under bearing plates using materials and procedures indicated on the Drawings.
 4. Install bridging in accordance with OSHA 29CFR-1926.757d and SJI Standard Specifications to provide lateral stability for the joists before slacking of hoisting lines. Quantity of bolted diagonal erection bridging shall be in accordance with SJI Standard Specifications.
 5. Install bridging simultaneously with joist erection and before construction loads are applied. Anchor ends of bridging lines at top and bottom chords where terminating at walls or beams. Quantity, size, and sequence for installing bridging shall be in accordance with SJI Standard Specifications.
 6. Erection stability and handling shall be in accordance with SJI Standard Specifications.

- C. Fastening joists:
 - 1. Each joist must be attached at a minimum of one end immediately upon placement in the final erection position and before additional joists are placed.
 - 2. When field welding joists, weld to supporting steel framework in accordance with SJI Standard Specifications and as indicated on the Drawings.
 - a. Coordinate welding sequence and procedure with placing of joists.
 - b. In accordance with AWS D1.1.
 - c. Length of field welds applied to the top and bottom chords of joists shall not exceed 1/2 of the width of the steel member.
 - 3. When bolting joists, bolt to supporting steel framework in accordance with SJI Standard Specifications.
- D. Coating:
 - 1. Deliver joists coated or uncoated as indicated on the Drawings and specified.
 - 2. Where members are painted or coated in place, do not begin preparation or coating until units are in place; properly, completely, and permanently fastened, and accepted by the Engineer.
 - 3. Prepare, prime, and finish as specified in Section 09_96_01 - High-Performance Coatings.
 - 4. Perform surface preparation and coating application under environmentally controlled field conditions, or in an off-site paint shop.

3.04 TOLERANCES

- A. As indicated in SJI Standard Specifications, unless otherwise noted.
- B. Deviation from straight line between opposite ends of any installed joist: Maximum 3/8 inch in 10 feet.

3.05 REPAIR

- A. Do not install damaged joists or accessories. Remove such materials from the site and replace with sound materials at no additional cost to the Owner.
- B. Repair rust spots and coatings damaged by handling, welding, or other erection and fastening processes.
- C. After erection, touch-up rust spots, connections, field welds, and abraded areas of members using specified coatings. Clean and prepare damaged areas. Apply coating at the same thickness as that applied before erection. Feather edges of repairs to provide a uniform appearance after repair.
 - 1. Clean and prepare surfaces using SSPC-SP 15 procedures.
 - 2. Apply coating of same product and color as member. Apply primer and finish coat(s).
- D. Galvanized surfaces: Repair in accordance with ASTM A780.

3.06 FIELD QUALITY CONTROL

- A. Provide field quality control over the Work of this Section as required by Section 01_45_00 - Regulatory Requirements.

- B. Field tests and inspections:
 - 1. High-strength bolting:
 - a. Confirm use of specified bolts and nuts.
 - b. Pre-tensioned connections:
 - 1) Confirm that plies of the connected elements have been brought into firm contact by the tightened connection.
 - 2) Confirm bolts pretension using turn-of-the nut method, twist-off type tension controlled nut, or direct-tension indicator washer. Do not use calibrated wrench.
 - 2. Welding - Field welds.
 - a. Perform observations and testing in the presence of the Engineer.
 - b. Visual observation:
 - 1) Visually examine welds in accordance with AWS D1.1.
 - 2) Quality of welds and standards for acceptance shall be in accordance with AWS D1.1, "Visual Inspection Acceptance Criteria" Table.
 - c. Test results:
 - 1) Submit records of testing to Engineer within 24 hours after testing.
 - 3. After erection, observe installation for conformance with this specification.

3.07 FIELD QUALITY ASSURANCE

- A. Provide field quality assurance over the Work of this Section as required by Section 01_45_00 - Regulatory Requirements.
- B. Special inspections, special tests and structural observation:
 - 1. Provide as required by Section 01_45_24 - Regulatory Quality Assurance.
- C. Field inspections:
 - 1. Required inspections:
 - a. Observe construction for conformance to the Contract Documents and the accepted Shop Drawings.
 - 1) Confirm that joist and accessory locations and tags (marks) match those indicated on the erection drawings.
 - 2) Confirm that joists are installed in vertical alignment and without lateral sweep.
 - 3) Confirm that joist spacing conforms to erection drawings.
 - 4) Confirm that bridging lines, spacing, and connections/anchoring conform to erection drawings.
 - b. Visually inspect field bolting, including bolt tightness.
 - c. Visually inspect field welding using AWS certified welding inspectors in accordance with AWS D1.1.
 - 1) In accordance with AWS D1.1.
 - 2) Mark welds observed.
 - 2. Records of inspections:
 - a. Provide record of each inspection.
 - b. Submit copies to Engineer upon request.
- D. Field testing.

3.08 NON-CONFORMING WORK

- A. Remove and replace damaged and non-conforming work to the satisfaction of the Engineer.

END OF SECTION

ATTACHMENT A - INSTALLATION AND WELDING INSPECTION REPORT

INSTALLATION AND WELDING INSPECTION REPORT

ELEMENTS INSPECTED	REF ⁽¹⁾	CONFORMS?		
		Yes	No	Comments ⁽²⁾
Member Installation:				
Joist and accessory locations, tags, and tagged end locations conform to erection drawings.	1			
Joist spacing conforms to erection drawings.	1			
Joists and accessories are installed in horizontal and vertical alignment and without lateral sweep.	1			
Joist bearing length on supporting members conforms to erection drawings and details.	1a			
Joist and accessory installations conform to specified tolerances.				
Bridging:				
Bridging locations, types (horizontal or diagonal), and member sizes conform to erection drawings.	1b			
Bridging connections to joists conforms to erection drawings.	1b			
Bridging connections to and terminations at ends/walls conforms to erection drawings.	1b			
Field Welding:				
Welds at locations indicated on erection drawings.				
Weld size and length as indicated on erection drawings.	1a			
Quality of welds complies with AWS D1.1 - "Visual Inspection Acceptance Criteria" Table	1a			
(Continued, next page)				
Field Bolting:				
Bolts at locations indicated on erection drawings.	1a			
Bolts, nuts and washers of sizes and materials specified.	1a			
Bolts tightened as specified. All plies of connection have been brought into firm contact.	1a			
Other:				

		CONFORMS?	
Notes: (1) Reference: 2015 IBC Table 7105.2.3 . (2) Comments: Insert comment number from page 2 this form.			
Comments: 			
Inspector: Name (printed): _____ Signature: _____ Date: _____ Company (printed): _____			

SECTION 05_31_00

STEEL DECKING

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Steel deck for floors and roofs, and associated accessories.

1.02 REFERENCES

- A. ASTM International (ASTM):
 - 1. A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- B. American Welding Society (AWS):
 - 1. D1.3 - Structural Welding Code - Sheet Steel.

1.03 SUBMITTALS

- A. Product data.
- B. Shop drawings.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Storage and protection:
 - 1. Store steel deck at the site stacked on platforms or pallets and covered with tarpaulins or other suitable weathertight covering.
 - 2. Do not use steel deck for storage or working platform.
 - 3. Remove damaged, unlabeled, untagged, rusty, and deteriorated steel deck material from the job site.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. One of the following or equal:
 - 1. ASC Profiles.
 - 2. Verco Manufacturing Co.
 - 3. Canam Steel Corp.

2.02 MATERIALS

- A. Sheet steel: ASTM A653, G 90 minimum coating designation.

2.03 FABRICATION

- A. Steel deck shall be formed:
 - 1. So every sheet is identical and will register perfectly with adjacent sheets.
 - 2. In accordance with building code as specified in Section 01_41_00 - Regulatory Requirements.
- B. Decking used with concrete fill shall be deformed to develop composite action between the deck and the concrete.
- C. Furnish minimum gauge, deck thickness, section modulus, moment of inertia, and allowable diaphragm shear per foot of deck width that is not less than for type deck sections indicated on the Drawings.
- D. Treat exposed roof deck with phosphate.
- E. Furnish roof deck ready to receive field painting without further pretreatment. Paint exposed roof deck in accordance with Contract Documents.
- F. Accessories:
 - 1. Furnish all accessories indicated on the Drawings or needed to completed work.
 - 2. Minimum required gauges:
 - a. Sump pans: 14 gauge.
 - b. All other accessories: 20 gauge unless otherwise indicated on the Drawings.
- G. Welding and electrodes: In accordance with AWS D1.3.
- H. Furnish roof decking in lengths to minimize number of splices.
- I. Furnish steel deck complete, including cutting, shaping, fitting, drilling, welding, ridge plates, valley plates, reinforcing plates for openings, and miscellaneous pieces necessary for proper installation.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of conditions: Examine work in place to verify that it is satisfactory to receive the work of this Section. If unsatisfactory conditions exist, do not begin this work until such conditions have been corrected.

3.02 INSTALLATION

- A. Decking shall span over at least 3 spans wherever possible.
- B. Do not damage or overload roof deck during installation.
- C. Do not use steel deck for storage or as a working platform until sheets have been welded in position.

- D. Do not exceed maximum uniformly distributed load of 20 pounds per square foot.
- E. Install decking in straight and continuous rows as far as practicable, with ribs at right angles to supporting members.
- F. For each end of deck section, provide 3 inches minimum bearing on supports. For sections that abut each other, each piece shall bear a minimum of 3 inches on the support. This requires a 6 inch minimum flange width. For cases where the minimum bearing cannot be obtained, notify the Engineer.
- G. Electric arc weld deck sections to bearing plates, supports at butt joints, at intermediate supports, side supports, and at end supports as indicated on the Drawings. Do not burn through the deck. Remove all slag.
- H. Fasten the longitudinal joints between deck sections together by the method indicated on the Drawings.
- I. Neatly cut and fit openings in roof deck, and reinforce with structural steel members as indicated on the Drawings.
- J. Paint welds as specified.
- K. Install roof deck free of dents and bent members.
- L. Reinforce all holes and openings in steel deck as indicated on the Drawings.
- M. Piping, conduit, equipment, and other services: Do not hang from decking.
- N. Install all accessories required to complete work.

3.03 REPAIR OF GALVANIZING AND COATING

- A. Touch-up damage to galvanized surfaces, including cut edges and holes, with zinc rich primer.
- B. Repair damage to factory-applied coating system in accordance with the manufacturer's printed recommendations.

3.04 CLEANUP

- A. After erection, remove weld spatter, grease, and oil from decking.

END OF SECTION

SECTION 05_50_00
METAL FABRICATIONS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Aluminum grating stair tread.
 - 2. Aluminum stair nosing.
 - 3. Cast iron stop plank grooves.
 - 4. Concrete inserts.
 - 5. Handrails and guardrails.
 - 6. Ladders.
 - 7. Manhole frames and covers.
 - 8. Metal gratings.
 - 9. Metal tread plate.
 - 10. Preformed channel pipe supports.
 - 11. Stairs.
 - 12. Miscellaneous metals.
 - 13. Associated accessories to the above items.

1.02 REFERENCES

- A. Aluminum Association (AA):
 - 1. DAF-45: Designations from Start to Finish.
 - a. M12-C22-A41.
- B. American Association of State Highway and Transportation Officials (AASHTO):
 - 1. Standard Specifications for Highway Bridges.
- C. ASTM International (ASTM):
 - 1. A36 - Standard Specification for Carbon Structural Steel.
 - 2. A48 - Standard Specification for Gray Iron Castings.
 - 3. A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded, and Seamless.
 - 4. A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - 5. A240 - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels for General Applications.
 - 6. A276 - Standard Specification for Stainless Steel Bars and Shapes.
 - 7. A307 - Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - 8. A380 - Standard Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems.
 - 9. A489 - Standard Specification for Carbon Steel Lifting Eyes.
 - 10. A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

11. A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
 12. A635 - Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Hot-Rolled, Alloy, Carbon, Structural, High-Strength Low-Alloy, and High-Strength Low-Alloy with Improved Formability, General Requirements for.
 13. A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 14. A992 - Standard Specification for Structural Steel Shapes.
 15. B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 16. B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
 17. B308 - Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles.
 18. B429 - Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
 19. F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws and Studs.
 20. F3125 - Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi and 150 ksi Minimum Tensile Strength.
- D. American Welding Society (AWS):
1. A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
- E. National Association of Architectural Metal Manufacturers (NAAMM):
1. Metal Finishes Manual.
- F. Occupational Safety and Health Administration (OSHA).

1.03 DEFINITIONS

- A. Passivation: Removal of exogenous iron or iron compounds from the surface of a stainless steel by means of chemical dissolution resulting from treatment with an acid solution that removes the surface contamination but does not significantly affect the stainless steel itself.

1.04 SUBMITTALS

- A. Product Data:
1. Aluminum grating stair tread.
 2. Aluminum stair nosing.
 3. Cast iron stop plank grooves.
 4. Handrails and guardrails.
 5. Manhole frames and covers.
 6. Metal grating.
- B. Shop drawings:
1. Handrails and guardrails:
 - a. Including details on connection attachments, gates, kick plates, ladders, and angles.

- b. Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.
 - c. Include erection drawings, elevations, and details where applicable.
 - d. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
 - 2. Ladders.
 - 3. Metal grating.
 - 4. Metal tread plate.
 - 5. Stairs.
 - 6. Miscellaneous metals.
- C. Samples:
- 1. Guardrails with specified finishes.
- D. Quality control submittals:
- 1. Design data.
 - 2. Test reports:
 - a. Guardrails: 3 copies of certified tests performed by an independent testing laboratory certifying that guardrails meet current State and OSHA strength requirements.
 - b. Gratings:
 - 1) Grating manufacturers' calculations showing that gratings will meet specified design load, stress, and deflection requirements for each size grating for each span.
 - 2) Reports of tests performed.
 - c. Planks:
 - 1) Plank manufacturers' calculations showing that planks will meet specified load-bearing and deflection requirements for each size plank for each span.
 - 2) Reports of tests performed.

PART 2 PRODUCTS

2.01 MATERIALS

- A. General: Unless otherwise specified or indicated on the Drawings, structural and miscellaneous metals in accordance with the standards of the ASTM, including the following:

Item	ASTM Standard No.	Class, Grade Type or Alloy No.
Cast Iron		
Cast Iron	A48	Class 40B
Steel		
Galvanized sheet iron or steel	A653	Coating G90
Coil (plate)	A635	--
Structural plate, bars, rolled shapes, and miscellaneous items (except W shapes).	A36	--
Rolled W shapes	A992	Grade 50
Standard bolts, nuts, and washers	A307	--
High strength bolts, nuts, and hardened flat washers	F3125, Grade A325	--
Eyebolts	A489	Type 1
Tubing, cold-formed	A500	--
Tubing, hot-formed	A501	--
Steel pipe	A53	Grade B
Stainless Steel		
Plate, sheet, and strip	A240	Type 304* or 316**
Bars and shapes	A276	Type 304* or 316**
Bolts (Type 304)	F593	Group 1 Condition CW
Bolts (Type 316)	F593	Group 2 Condition CW
Aluminum		
Flashing sheet aluminum	B209	Alloy 5005-H14, 0.032 inches minimum thickness

Item	ASTM Standard No.	Class, Grade Type or Alloy No.
Structural sheet aluminum-	B209	Alloy 6061-T6
Structural aluminum	B209 B308	Alloy 6061-T6
Extruded aluminum	B221	Alloy 6063-T42
* Use Type 304L if material will be welded. ** Use Type 316L if material will be welded.		

1. Stainless steels are designated by type or series defined by ASTM.
2. Where stainless steel is welded, use low-carbon stainless steel.

2.02 MANUFACTURED UNITS

- A. Aluminum grating stair tread:
 1. Manufacturers: One of the following or equal:
 - a. Harsco Industrial IKG, Aluminum Grating Stair Tread with Mebac® nosing.
 - b. McNichols Co., Type A-Standard with Corrugated Angle Nosing.
 2. Material: Welded aluminum grating tread with non-slip nosing and integral end plates for bolt on attachment to stair stringers.
 3. Size:
 - a. Tread width: To equal tread spacing plus 1 inch minimum.
 - b. Tread length: Length to suit stringer-to-stringer dimension on the Drawings.
 - c. Depth: 1-3/4 inches.
 4. Bolts: Type 316 stainless steel.
- B. Aluminum stair nosing:
 1. Manufacturers: One of the following or equal:
 - a. Wooster Products, Inc., Type 101 Nosing.
 - b. American Safety Tread Co., Inc., Style 801 Nosing.
 2. Material: Cast aluminum abrasive nosings with aluminum oxide granules integrally cast into metal, forming permanent, nonslip, long-wearing surface.
 3. For installation in cast-in-place stairs.
 4. Configuration: 4 inches wide, fabricated with integrally cast stainless steel anchors at approximately 12-inch centers. Length to extend within 3 inches of stair edge on each side.
- C. Cast iron stop plank grooves:
 1. Manufacturers: One of the following or equal:
 - a. Neenah Foundry Co., R-7500 Series, Type A.
 - b. McKinley Iron Works, Type L.
 2. Size: 2-inch wide groove opening by 1-1/2 inch deep, unless otherwise indicated on the Drawings.

3. Recess groove with the cast iron surface of the groove set flush with the concrete surface.
- D. Concrete inserts:
 1. Concrete inserts for supporting pipe and other applications are specified in Section 40_05_07.01 - Pipe Supports.
- E. Handrails and guardrails:
 1. General:
 - a. Design and fabricate assemblies to conform to current local, State, and OSHA standards and requirements.
 - b. Coordinate layout of assemblies and post spacings to avoid conflicts with equipment and equipment operators:
 - 1) Indicate on the shop drawings locations of such equipment.
 - 2) Highlight locations where railings cannot be made continuous, and obtain Engineer's directions on how to proceed before fabricating or installing railings.
 2. Aluminum handrails and guardrails (nonwelded pipe):
 - a. Rails, posts, and fitting-assembly spacers:
 - 1) In accordance with ASTM B429, 6005, 6063 or 6105, minimum Schedule 40, extruded aluminum pipe of minimum 1.89-inch outside diameter and 0.14-inch wall thickness.
 - b. Kick plates: 6061 or 6105 aluminum alloy.
 - c. Fastenings and fasteners: As recommended or furnished by the manufacturer.
 - d. Other parts: 6063 extruded aluminum, or F214 or F514.0 aluminum castings:
 - 1) Fabrications: In accordance with ASTM B209 or ASTM B221 extruded bars:
 - a) Bases: 6061 or 6063 extruded aluminum alloy.
 - 2) Plug screws or blind rivets: Type 305 stainless steel.
 - a) Other parts: Type 300 series stainless steel.
 - e. Finish of aluminum components:
 - 1) Anodized finish, 0.7 mil thick, applied to exposed surfaces after cutting. Aluminum Association Specification M12-C22-A41, mechanical finish non specular as fabricated, chemical finish-medium matte, anodic coating-clear Class I Architectural.
 - 2) Pretreat aluminum for cleaning and removing markings before anodizing.
 - f. Fabrication and assembly:
 - 1) Fabricate posts in single, unspliced pipe length.
 - 2) Perform without welding.
 - 3) Do not epoxy bond the parts.
 - 4) Maximum clear opening between assembled railing components as indicated on the Drawings.
 - g. Manufacturers: One of the following or equal:
 - 1) Moultrie Manufacturing Co., Wesrail.
 - 2) Golden Railings, Riveted System.
 - 3) Craneveyor Corp. Enerco Metals, C-V Rail.
 3. Picket railing: Manufacturers: One of the following or equal:
 - a. Julius Blum and Co., equivalent product.

- b. Craneveyor Corp., RailTec 400.
- 4. Steel pipe handrails and guardrails:
 - a. Schedule 40 black steel pipe with minimum 1.9-inch outside diameter, or larger where indicated on the Drawings.
 - b. Fabricate posts in single, unspliced pipe length.
 - c. Kick plates: Galvanized steel.
 - d. Attachment devices: Provide clip angles and other fasteners necessary for securing handrails and guardrails to other construction as indicated on the Drawings.
 - e. Continuously weld joints and grind smooth.
 - f. Bend rails to profile indicated on the Drawings, without sharp bends or flat spots. Rails shall be round after bending.
 - g. Neatly weld intersection of rails and posts, and grind surfaces smooth.
- 5. Stainless steel pipe handrails and guardrails:
 - a. Manufacturers: One of the following or equal:
 - 1) R & B Wagner, Inc.
 - 2) Julius Blum and Co.
 - b. General: Prefabricated shop-assembled type, field welded type, or mechanically joined type.
 - c. Materials: Type 304 or Type 316 stainless steel posts, rails, brackets, and accessory parts:
 - 1) Railings and posts: Nominal 1-1/2 inch, Schedule 5 pipe with minimum 1.90-inch outer diameter and 0.065-inch wall thickness.
 - 2) Post insert reinforcing for all posts: 1.750 inch outside diameter pipe, of 0.083-inch wall thickness, and 26 inches long.
 - 3) Fasteners, connection plates, splice bars, and fittings: Type 304 or Type 316 stainless steel.
 - 4) Stainless steel finish: Number 4 satin finish in accordance with NAAMM Metal Finishes Manual.
 - d. Fabrication:
 - 1) Fabricate guardrails and posts to be in same plane.
 - 2) Fabricate posts in single, unspliced pipe length.
 - 3) Make handrail and guardrail sections with 20 feet maximum between splices.
 - 4) Form bends in pipe without use of fittings where practical. Form with internal mandrels on power benders.
 - 5) Where handrail and guardrail are welded, make intersections and joints with continuous 360-degree welds and grind welds smooth.
 - 6) Where handrail and guardrail are mechanically joined, make joints with mechanical connections utilizing stainless steel machine screws with lock washers and threaded tubular rivets.
- 6. Guardrail gates:
 - a. Supplied by guardrail manufacturer:
 - 1) Of same material, quality, and workmanship as specified for guardrail system in which they will be installed.
 - 2) Of design similar to that of handrail or railing system in which they will be installed.
 - b. Components: Gate frame, stainless steel self-closing device, hinges, gate stops, and durable self-locking type latch. Fabricate components in conformance with OSHA minimum strength requirements.

7. Fastenings and fasteners: As recommended or furnished by guardrail manufacturer for use with this system.
- F. Ladders:
1. General:
 - a. Type: Safety type conforming to local, State, and OSHA standards as minimum. Furnish guards for ladder wells.
 - b. Size: 18 inches wide between side rails of length, size, shape, detail, and location indicated on the Drawings.
 2. Aluminum ladders:
 - a. Materials: 6063-T5 aluminum alloy.
 - b. Rungs:
 - 1) 1-inch minimum solid square bar with 1/8-inch grooves in top and deeply serrated on all sides.
 - 2) Capable of withstanding 1,000 pound load without failure.
 - c. Side rails: Minimum 4-inch by 1/2-inch flat bars.
 - d. Finish of aluminum components:
 - 1) Anodized finish, 0.7 mil thick, applied to exposed surfaces after cutting. Aluminum Association Specification M12-C22-A41, mechanical finish non specular as fabricated, chemical finish-medium matte, anodic coating-clear Class I Architectural.
 - 2) Pretreat aluminum for cleaning and removing markings before anodizing.
 - e. Fabrication:
 - 1) Welded construction, of size, shape, location, and details indicated on the Drawings.
 - 2) For ladders over 20 feet high, furnish standard ladder cages or fall prevention system designed in accordance with State and OSHA requirements.
 - f. Fall prevention system: Include but not limit to railing, brackets, clamps, 2 sleeves, and 2 belts, satisfying OSHA safe climbing requirements:
 - 1) Manufacturers: One of the following or equal:
 - a) North Consumer Products, Saf-T-Climb.
 - b) Swager Communications, Climbers Buddy System.
- G. Manhole frames and covers:
1. Material: Gray iron castings, in accordance with ASTM A48, Class 30-B.
 2. Type: Heavy-duty traffic type, with combined minimum set weight of 265 pounds.
 3. Machine horizontal and vertical bearing surfaces to fit neatly, with easily removable cover bearing firmly in frame without rocking.
 4. Frame:
 - a. Bottom flange type.
 - b. Approximately 4-1/2 inches frame height.
 - c. Dimensions as indicated on the Drawings.
 - 1) Minimum inside clear dimension may not be smaller than nominal diameter minus 2 inches.
 5. Cover:
 - a. Skid-resistant grid pattern design stamped with name of utility service provided by manhole, such as "ELECTRICAL," "SEWER," "TELEPHONE," or "WATER."

- b. Solid type without ventilation holes.
 - 6. Finish: Unpainted.
- H. Metal gratings:
 - 1. General:
 - a. Fabricate grating to cover areas indicated on the Drawings.
 - b. Unless otherwise indicated on the Drawings, grating over an opening shall cover entire opening.
 - c. Make cutouts in grating where required for equipment access or protrusion, including valve operators or stems, and gate frames.
 - d. Band ends of grating and edges of cutouts in grating:
 - 1) End banding: 1/4 inch less than height of grating, with top of grating and top edge of banding flush.
 - 2) Cutout banding: Full-height of grating.
 - 3) Use banding of same material as grating.
 - 4) Panel layout: Enable installation and subsequent removal of grating around protrusions or piping.
 - 5) Openings 6 inches and larger: Lay out grating panels with edges of 2 adjacent panels located on centerline of opening.
 - 6) Openings smaller than 6 inches: Locate opening at edge of single panel.
 - 7) Where an area requires more than 1 grating section to cover area, clamp adjacent grating sections together at 1/4-points with fasteners acceptable to Engineer.
 - 8) Fabricate steel grating sections in units weighing not more than 50 pounds each.
 - 9) Fabricate aluminum grating sections in units of weighing not more than 50 pounds each.
 - 10) Gaps between adjacent grating sections shall not be more than the clear spacing between bearing bars.
 - e. When requested by Engineer, test 1 section of each size grating for each span length involved on the job under full load:
 - 1) Furnish a suitable dial gauge for measuring deflections.
 - f. Grating shall be aluminum, unless otherwise specified or indicated on the Drawings.
 - 2. Aluminum grating:
 - a. Material for gratings, shelf angles, and rebates: 6061-T6 or 6063-T6 aluminum alloy, except crossbars may be 6063-T5 aluminum alloy.
 - b. Shelf angle concrete anchors: Type 304 or Type 316 stainless steel.
 - c. Grating rebate rod anchors: 6061-T6 or 6063-T6 aluminum alloy.
 - d. Bar size and spacing: As determined by manufacturer to enable grating to support design load.
 - e. Design live load: A minimum of 100 pounds per square foot uniform live load on entire grating area, but not less than the live load indicated on the Drawings for the area where grating is located.
 - f. Maximum fiber stress for design load: 12,000 pounds per square inch.
 - g. Maximum deflection due to design load: 1/240 of grating clear span.
 - h. Maximum spacing of main grating bars: 1-1/8 inches clear between bars.
 - i. Minimum grating height: 1-1/2 inches.

- j. Manufacturers: The following or equal:
 - 1) Harsco Industrial IKG, Swaged Aluminum I-Bar with striated finish.
- 3. Aluminum grating planks:
 - a. Materials: Meet requirements previously specified for aluminum grating.
 - b. Fabrication:
 - 1) Meet requirements previously specified for aluminum grating.
 - c. Have unpunched surface with cross hatched anti-skid surface.
 - d. Minimum weight of 3-1/4 pounds per square foot.
 - e. Provide 1 inch diameter hole with smooth edges at each end for each plank.
 - f. Furnish planks in 2 foot widths.
 - g. Manufacturers: The following or equal:
 - 1) Harsco Industrial IKG, Heavy Duty Aluminum Plank Grating HD-P.
 - h. Planks shall not lock with adjacent planks allowing the removal of individual planks without disturbing the adjacent planks.
- 4. Steel gratings:
 - a. Hot-dip galvanized in accordance with ASTM A123.
 - b. Bar size and spacing: As determined by the manufacturer to support design load.
 - c. Design live load: A minimum of 100 pounds per square foot uniform live load on the entire area of the grating area, but not less than the live load indicated on the Drawings for the area where the grating is located.
 - d. Maximum fiber stress for design load: 18,000 pounds per square inch.
 - e. Maximum deflection under design load: 1/240 of grating clear span.
 - f. Bar spacing: Maximum of 1-1/8 inches clear between bars.
 - g. Manufacturers: The following or equal:
 - 1) Harsco Industrial IKG, IKG Weldforged.
- 5. Heavy-duty steel grating:
 - a. Heavy-duty type, fabricated from structural steel and designed in accordance with AASHTO Standard Specifications for Highway Bridges, using H-20 loading.
 - b. Hot-dip galvanized after fabrication in accordance with ASTM A123.
 - c. Manufacturers: One of the following or equal:
 - 1) Reliance Steel Products Co., Heavy-Duty Steel Grating.
 - 2) Seidelhuber Metal Products, Inc., equivalent product.
- I. Metal tread plate:
 - 1. Plate having a raised figured pattern on 1 surface to provide improved traction.
- J. Preformed channel pipe supports:
 - 1. Preformed channel pipe supports for pipe supports and other applications are specified in Section 26_05_29 - Hangers and Supports.
- K. Stairs:
 - 1. Aluminum stairs:
 - a. Stringers: 6061-T6 aluminum alloy.
 - b. Stair treads:
 - 1) Aluminum of same type specified under Aluminum Grating.
 - 2) Of sizes indicated on the Drawings, and 1-3/4 inch minimum depth with cast abrasive type safety nosings.

- c. Provide a vertical close piece between each riser. Fabricate, install, and fasten close pieces as indicated on the Drawings.
- d. Handrails and guardrails: Aluminum pipe specified under Aluminum Handrails and Guardrails (Nonwelded Pipe).
- e. Fasteners: Type 304 or Type 316 stainless steel.
- 2. Steel stairs:
 - a. Ships ladders shall conform to local, State, and OSHA as minimum.
 - b. Stringers: Structural steel channels or plates.
 - c. Treads: Open type attached to stringers with support angles and clips.
Manufacturers: One of the following or equal:
 - 1) Harsco Industrial IKG, "Welded Tread" with Algrip® nosing.
 - d. Railings: Steel pipe, sized as indicated on the Drawings.
 - e. Anchors: Welded or bolted brackets designed for support and anchorage at top and bottom.
 - f. Finish: Prime paint finish for interior locations.
- L. Miscellaneous aluminum:
 - 1. Fabricate aluminum products, not covered separately in this Section, in accordance with the best practices of the trade and field assemble by riveting or bolting.
 - 2. Do not weld or flame cut.
- M. Miscellaneous cast iron:
 - 1. General:
 - a. Tough, gray iron, free from cracks, holes, swells, and cold shuts.
 - b. Quality such that hammer blow will produce indentation on rectangular edge of casting without flaking metal.
 - c. Before leaving the foundry, clean castings and apply 16-mil dry film thickness coating of coal-tar epoxy, unless otherwise specified or indicated on the Drawings.
- N. Miscellaneous stainless steel:
 - 1. Provide miscellaneous stainless steel items not specified in this Section as indicated on the Drawings or specified elsewhere.
 - a. Fabricate and install in accordance with the best practices of the trade.
 - 2. Cleaning and passivation:
 - a. Following shop fabrication of stainless steel members, clean and passivate fabrications.
 - b. Finish requirements: Remove free iron, heat tint oxides, weld scale and other impurities, and obtain a passive finished surface.
 - c. Provide quality control testing to verify effectiveness of cleaning agents and procedures and to confirm that finished surfaces are clean and passivated.
 - 1) Conduct sample runs using test specimens with proposed cleaning agents and procedures as required to avoid adverse effects on surface finishes and base materials.

- d. Pre-clean, chemically descale (pickle), and final clean fabrications in accordance with the requirements of ASTM A380 to remove deposited contaminants before shipping.
 - 1) Passivation by citric acid treatment is not allowed.
 - a) If degreasing is required before cleaning to remove scale or iron oxide, cleaning (pickling) treatments with citric acid are permissible; however, these treatments shall be followed by inorganic cleaners such as nitric-hydrofluoric acid.
 - 2) Provide acid descaling (pickling) in accordance with Table A1.1 of Annex A1 of ASTM A380.
 - 3) After pickling, final cleaning of stainless steel shall conform to Part II of Table A2.1 of Annex A2 of ASTM A380.
 - e. After cleaning, inspect using methods specified for "gross inspection" in ASTM A380.
 - f. Improperly or poorly cleaned and passivated materials shall not be shipped and will not be accepted at the job site.
- O. Miscellaneous structural steel:
- 1. Provide miscellaneous steel items not specified in this Section as indicated on the Drawings or specified elsewhere.
 - a. Fabricate and install in accordance with the best practices of the trade.
- P. Isolating sleeves and washers:
- 1. As indicated on the Drawings and as specified in Section 05_05_24 - Mechanical Anchoring and Fastening to Concrete and Masonry.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of conditions:
- 1. Examine work in place to verify that it is satisfactory to receive the work of this Section.
 - 2. If unsatisfactory conditions exist, do not begin this work until such conditions have been corrected.

3.02 INSTALLATION

- A. General:
- 1. Install products as indicated on the Drawings, and in accordance with shop drawings and manufacturer's printed instructions, as applicable except where specified otherwise.
 - 2. Interface between materials:
 - a. Dissimilar metals: Where steel comes in contact with dissimilar metals (aluminum, stainless steel, etc.), separate or isolate the dissimilar metals.
 - 1) Make application so that the isolating or protective barrier is not visible in the completed construction.
 - 2) Isolating sleeves and washers: As specified in Section 05_05_24 - Mechanical Anchoring and Fastening to Concrete and Masonry.

- b. Aluminum in contact with concrete or masonry: Coat aluminum surfaces as specified in Section 09_96_01 - High Performance Coatings.
 - c. Aluminum in contact with concrete or masonry.
- B. Aluminum stair nosing:
 - 1. Install stair nosings on treads of concrete stairs, including top tread on upper concrete slab.
 - 2. Omit stair nosings where concrete is submerged.
 - 3. Cast stair nosings in fresh concrete, flush with tread and riser faces. Install nosing in center of step.
- C. Cast iron stop plank grooves:
 - 1. Recess stop plank grooves with cast iron surfaces of groove set flush with concrete surface.
- D. Handrails and guardrails:
 - 1. General:
 - a. Fasten pipe rails to fittings with Series 300 stainless steel pop rivets or flush set screws.
 - b. Make pipe cuts clean and straight, free of burrs and nicks, and square and accurate for minimum joint-gap.
 - c. Drill and countersink holes to proper size, as required for a tight flush fit of screws and other component parts.
 - d. Space attachment brackets as indicated in the manufacturer's instructions.
 - 2. Aluminum pipe handrails and guardrails:
 - a. During construction, keep exterior surfaces of handrails and guardrails covered with minimum 0.4 millimeters of heat shrink polyethylene film.
 - b. Do not remove protective film before handrails and guardrails have been accepted by Engineer nor before other work in proximity of handrails and guardrails has been completed.
 - c. Discontinue handrails and guardrails at lighting fixtures.
 - d. Provide 1/8-inch diameter weep hole at base of each post.
 - e. Space posts as indicated on the Drawings.
 - f. Anchor posts into concrete by grouting posts into formed holes in concrete, into stainless steel sleeves cast in concrete; or bracket mount to face of concrete surfaces as specified and indicated on the Drawings.
 - g. Space rails as indicated on the Drawings.
 - h. Make adequate provision for expansion and contraction of kick plates and rails.
 - 1) Make provisions for removable sections where indicated on the Drawings.
 - i. Make lower rails a single, unspliced length between posts, or continuous.
 - j. Make top rails continuous whenever possible, and attach single, unspliced lengths to 3 posts minimum.
 - k. Draw up fasteners tight with hand wrench or screw driver.
 - l. Space attachment brackets as indicated on shop drawings or in manufacturer's installation instructions.
 - m. Completed installation shall have handrails and railings rigid and free of play at joints and attachments.

- n. Protect handrail and guardrail finish from scratches, gouges, dents, stains, and other damage.
 - o. Replace damaged or disfigured handrails and guardrails with new.
 - p. Shortly before final acceptance of the work, and after removal of protective polyethylene film, clean handrails and guardrails with mild detergent or with soap and water.
 - 1) After cleaning, thoroughly rinse handrails and guardrails and wipe with soft cloth.
 - q. Erect guardrail straight, level, plumb, and true to the positions as indicated on the Drawings. Correct deviations from true line of grade, which are visible to the eye.
3. Stainless steel pipe handrails and guardrails:
- a. During construction, keep exterior surfaces of handrails and guardrails covered with minimum 0.4 millimeters of heat shrink polyethylene film.
 - b. Do not remove protective film before handrails and guardrails have been accepted by Engineer nor before other work in proximity of handrails and guardrails has been completed.
 - c. Discontinue handrails and guardrails at lighting fixtures.
 - d. Provide 1/8-inch diameter weep hole at base of each post.
 - e. Space posts as indicated on the Drawings.
 - f. Anchor posts into concrete by grouting posts into formed holes in concrete, into stainless steel sleeves cast in concrete; or bracket mount to face of concrete surfaces as specified and indicated on the Drawings.
 - g. Space rails as indicated on the Drawings.
 - h. Make adequate provision for expansion and contraction of kick plates and rails.
 - 1) Make provisions for removable sections where indicated on the Drawings.
 - i. Make lower rails a single, unspliced length between posts, or continuous.
 - j. Make top rails continuous whenever possible, and attach single, unspliced lengths to 3 posts minimum.
 - k. Draw up fasteners tight with hand wrench or screw driver.
 - l. Space attachment brackets as indicated on shop drawings or in manufacturer's installation instructions.
 - m. Completed installation shall have handrails and railings rigid and free of play at joints and attachments.
 - n. Protect handrail and guardrail finish from scratches, gouges, dents, stains, and other damage.
 - o. Replace damaged or disfigured handrails and guardrails with new.
 - p. Shortly before final acceptance of the work, and after removal of protective polyethylene film, clean handrails and guardrails with mild detergent or with soap and water.
 - 1) After cleaning, thoroughly rinse handrails and guardrails and wipe with soft cloth.
 - q. Erect guardrail straight, level, plumb, and true to the positions as indicated on the Drawings.
 - 1) Correct deviations from true line of grade that are visible to the eye.
4. Steel pipe handrail and guardrail:
- a. Anchor posts into concrete by grouting posts into galvanized steel sleeves embedded in concrete as indicated on the Drawings.
 - 1) Do not cut reinforcing bars in concrete.

- 2) Where required to fasten guardrail to other construction, fasten as indicated on the Drawings.
5. Guardrail gates:
 - a. Install gate to be a vertical plane with the guardrail when in the closed position.
 - b. Install hinges so that each gate can swing 180 degrees from the closed position to the fully open position.
 - c. Install so that the gates swing to the walkway side of the guardrail only.
 - 1) Install gate stops on the stationary railing posts to prohibit gates from swinging in the wrong direction.
 - d. Install gate frames, hinges, stops, and latches in conformance with OSHA minimum strength requirements.
- E. Ladders:
 1. Secure to supporting surface with bent plate clips providing minimum 8 inches between supporting surface and center of rungs.
 2. Where exit from ladder is forward over top rung, extend side rails 3 feet 3 inches minimum above landing, and return the rails with a radius bend to the landing.
 3. Where exit from ladder is to side, extend ladder 5 feet 6 inches minimum above landing and rigidly secure at top.
 4. Erect rail straight, level, plumb, and true to position indicated on the Drawings:
 - a. Correct deviations from true line or grade which are visible to the eye.
- F. Manhole frames and covers:
 1. Installation: As recommended by Manufacturer.
- G. Metal gratings:
 1. General:
 - a. Allow 1/8-inch maximum clearance between ends of grating and inside face of vertical leg of shelf angles.
 - b. Horizontal bearing leg of shelf angles shall be 2 inches minimum.
 - c. Install aluminum plate or angles where necessary to fill openings at changes in elevation and at openings between equipment and grating.
 - d. Install angle stops at ends of grating.
 - e. Installed grating shall not slide out of rebate or off support.
 - f. Weld stops in place, unless otherwise specified or indicated on the Drawings.
 - g. Top surfaces of grating sections adjacent to each other shall lie in same plane.
 2. Aluminum grating:
 - a. Aluminum grating: Support on aluminum shelf angles or rebates.
 3. Aluminum grating planks:
 - a. Support and install planks as specified for aluminum grating.
 4. Steel grating:
 - a. Support on hot-dip galvanized structural steel shelf angles or rebates.
 5. Heavy-duty steel grating:
 - a. Support on hot-dip galvanized structural steel rebates embedded and anchored in concrete.
 - b. Use for roadways, traffic areas, and where indicated on the Drawings.

- H. Stairs:
 - 1. General:
 - a. Install guard railings around stair wells as indicated on the Drawings or specified.
- I. Stainless Steel:
 - 1. Welding:
 - a. Passivate field-welded surfaces:
 - 1) Provide cleaning, pickling and passivating as specified in this Section.
 - 2) Clean using Derustit Stainless Steel Cleaner, or equal.

END OF SECTION

SECTION 07_11_00

DAMPPROOFING

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Dampproofing.

1.02 REFERENCES

- A. ASTM International (ASTM):
 - 1. D1227 - Standard Specification for Emulsified Asphalt Used as a Protective Coating for Roofing.

1.03 SUBMITTALS

- A. Product data.
- B. Shop drawings.
- C. Manufacturer's Installation Instructions.
- D. Warranty.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Store materials in original, unopened containers in compliance with manufacturer's printed instructions.

1.05 ENVIRONMENTAL REQUIREMENTS

- A. Do not apply bituminous dampproofing when temperatures are 40 degrees Fahrenheit or lower or when rain is forecast for the 24 hours following application.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Dampproofing: ASTM D1227, Asbestos Free, Emulsified Asphalt Coatings:
 - 1. Manufacturers: One of the following or equal:
 - a. Karnak Corp., Karnak 220 AF.
 - b. W.R. Meadows, Inc., Sealmastic Type 2 Asphalt Emulsion Dampproofing.
- B. Sealing mastic: Type compatible with dampproofing and free of toxic solvents with thick mastic consistency and smooth and uniform in composition product as recommended by dampproofing manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that conditions are satisfactory for application of products in accordance with manufacturer's recommendations.
- B. Verify that surfaces to receive dampproofing are clean, dry, reasonably smooth, free of dust, dirt, voids, cracks, or sharp projections.

3.02 APPLICATION

- A. Completely cover surfaces to receive dampproofing with 2 coats:
 - 1. Applied by brush or spray.
 - 2. Apply dampproofing at manufacturer's recommended rate of application or minimum 2 gallons per 100 square feet, whichever is greater.
- B. Extend dampproofing to 6 inches above finish grade.
- C. Apply each coat evenly so surfaces have uniform black appearance.
- D. Apply second coat at right angles to first, allowing not less than 24 hours between coats.
- E. Seal around items and services projecting through dampproofing surfaces in accordance with manufacturer's recommendations.
- F. Ensure sealed areas are moisture tight.
- G. Backfill completely against dampproofing application within time recommended by manufacturer.

END OF SECTION

SECTION 07_19_00

WATER REPELLENTS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Water repellent for concrete masonry.

1.02 REFERENCES

- A. International Union of Testing and Research Laboratories for Materials and Structures:
 - 1. RILEM Test Method No. 11.4 - Measurement of Water Absorption Under Low Pressure.

1.03 DEFINITIONS

- A. Water Repellent: Resistance to penetration of water from rainfall.

1.04 SUBMITTALS

- A. Product Data.
- B. Samples: Water repellent applied on 8-inch by 8-inch substrates to receive water repellent, marked with application date and application rate.
- C. Manufacturer's Application Instructions.

1.05 QUALITY ASSURANCE

- A. Manufacturer qualifications: Manufacturer of water repellents for minimum of 5 years with satisfactory performance record.
- B. Applicator qualifications: Trained, approved, and accepted by water repellent manufacturer.
- C. Spray personnel qualifications: Minimum 2 years of experience spraying exotic coatings.
- D. Regulatory requirements: Comply with volatile organic compound regulations.
- E. Mock-ups:
 - 1. Apply water repellent on 8-foot by 8-foot mock-up walls. Use same equipment and procedures that will be used in applying material on walls.
 - 2. Test mock-up for water penetration 30 days after applying water repellent in accordance with field quality control.
 - 3. When accepted by the Engineer, mock-up walls will be standard for walls.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to site in manufacturer's original containers with seals unbroken and labeled with manufacturer's batch number.
- B. Store materials in original, unopened containers in compliance with manufacturer's printed instructions.

1.07 ENVIRONMENTAL REQUIREMENTS

- A. Apply water repellent under temperature and relative humidity conditions before, during, and after application in accordance with manufacturer's instructions.
- B. Allow surfaces to dry for minimum 5 days after rains.

1.08 PROJECT CONDITIONS

- A. Make proper material allowance based upon substrate material and surface configuration when determining quantities of material.

1.09 WARRANTY

- A. Warrant to furnish and apply water repellent on walls that experience water penetration because of failure of water repellent for minimum 5 years.

1.10 MAINTENANCE

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Water repellent sealer:
 - 1. One of the following or equal:
 - a. Rainguard Products.
 - b. ProSoCo, Inc.

2.02 DESIGN AND PERFORMANCE CRITERIA

- A. Performance requirements: Surfaces with water repellent shall be uniform in color with unaltered texture.

2.03 MATERIALS

- A. Water repellent sealer for concrete and concrete masonry: Silane/siloxane; volatile organic compound compliant; free of silicone oils, paraffin wax, or urethanes.
 - 1. Manufacturers: The following or equal:
 - a. Rainguard, Blok-Lok™.

2.04 PROSOCO, EQUIVALENT PRODUCT EQUIPMENT

- A. Spray equipment: High-volume, low-pressure, airless, with maximum 60 pounds per square inch pressure:
 - 1. Pump: Non-atomizing, able to flow material on walls at minimum 1 to 1-1/2 gallons per minute.
 - 2. Orifice size for concrete, slump block, exposed concrete aggregate, and cement plaster: 0.060 to 0.110 inches.
 - 3. Orifice size for brick, clay brick tile, brick veneer, stone, and wood: 0.060 inches.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Carefully inspect installed construction. Verify that construction is ready for repellent application.
- B. Require manufacturer's representative to verify that water repellent may be installed.

3.02 PREPARATION

- A. Allow concrete or masonry walls to cure at least 30 days before applying water repellent.
- B. Clean wall surfaces of soil, mud, efflorescence, or other detrimental materials.
- C. Tuck-point or caulk cracks, other than hairline cracks.
- D. Route out defective mortar joints, point with mortar and tool.
- E. Moisture content: Apply water repellent sealer when moisture content of substrate is 15 percent or less.

3.03 APPLICATION CONCRETE MASONRY

- A. Apply water repellent in accordance with manufacturer's printed instructions.
- B. Apply flood coat using low-pressure spray equipment.
- C. Start at top of wall and work down using overlapping horizontal passes.
- D. Hold spray head 8 to 10 inches from surface so saturation coat runs freely down wall 6 to 10 inches below point of application on most substrates.
- E. Spray by traveling horizontally to ensure uniform coverage.
- F. Overlap each following pass by centering spray head on bottom line of the previous pass.

- G. Trigger gun off at end of each pass to avoid applying excessive amount of material. Do not over apply.
- H. Avoid application in hot or windy weather as premature drying can cause whitish residue on walls.

3.04 FIELD QUALITY CONTROL

- A. 20 days after application, test water repellent on CMU surfaces using RILEM Test Method No. 11.4:
 - 1. Contractor shall perform a 20-minute RILEM baseline test on dry untreated CMU units of each type to receive water repellent. Test results (water loss in milliliter) shall be compared to CMU units in walls after water repellent application.
 - 2. On water repellent coated CMU, a RILEM tube test resulting in 5 milliliter or less after 20 minutes is necessary to qualify for 5-year warranty.
- B. Notify the Engineer and manufacturer at least 72 hours in advance of test.
- C. Where tested wall areas fail to pass RILEM tube test, apply additional coat of water repellent on entire wall from corner to corner.
- D. Test all locations where directed by the Engineer.

3.05 CLEANING

- A. Concrete, concrete masonry, exposed concrete aggregate, and cement plaster: Clean drips, runs, and overspray residue while still wet, using detergent and water. Clean application and spray equipment with detergent and water immediately following use.
- B. Brick, clay brick tile, brick veneer, stone, and wood: Clean drips, runs, and overspray residue with petroleum type thinner following application.
- C. Clean application and spray equipment according to the manufacturer's recommendations.
- D. Remove excess materials, equipment, and debris incidental to water repellent application upon completion.

3.06 PROTECTION

- A. During application, protect water repellent treated and adjacent surfaces from damage.
- B. Protect glass, aluminum, and other surfaces from overspray.

- C. Protect concrete sidewalks from runoff. Soak with water immediately prior to application on adjacent walls.
- D. Repair damaged areas promptly.

END OF SECTION

SECTION 07_21_17

BATT INSULATION

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Batt or blanket type insulation.

1.02 REFERENCES

- A. ASTM International (ASTM):
 - 1. C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

1.03 SUBMITTALS

- A. Product data.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver insulation to project site in unopened containers labeled with the manufacturer's name, brand designation, and R-value rating.
- B. Store insulation in a dry, well ventilated, and watertight enclosure providing protection from damage.

1.05 PROJECT/SITE CONDITIONS

- A. Do not install insulation until the building has been made substantially water and weathertight.

PART 2 PRODUCTS

2.01 DESIGN AND PERFORMANCE CRITERIA

- A. Thermal resistance of ceiling and soffit insulation: Minimum R-30 unless otherwise indicated on the Drawings for 9-1/4-inch minimum thickness space.
- B. Thermal resistance of wall insulation: Minimum R-3 for 1-3/4-inch spaces, R-11 for 3-1/2-inch spaces, R-19 for 5-1/2-inch spaces, and R-30 for 9-1/4-inch spaces, unless otherwise indicated on the Drawings.

2.02 BATT INSULATION

- A. Manufacturers: One of the following or equal:
 - 1. Owens-Corning Fiberglas.

2. John Manville, Inc.
 3. U. S. Gypsum.
- B. Unfaced insulation: ASTM C665, Type I; fiberglass batts:
1. Thickness as indicated on the Drawings.
 2. Flame spread: 25 or less.
- C. Foil-faced insulation: ASTM C665, Type III; fiberglass batts:
1. Thickness: As indicated on the Drawings, aluminum foil vapor barrier faces and nailing flanges.
 2. Flame spread: 25 or less.

2.03 ACCESSORIES

- A. Welded impaling pins:
1. Manufacturers: The following or equal:
 - a. Owens-Corning Fiberglas, Pinwelding System.
- B. Adhesive applied impaling pin system:
1. Manufacturers: The following or equal:
 - a. Stic-Klips Manufacturing Co., Type B Stic-Klips with locking plates, holding plates, and Type S adhesive.
- C. Wiring or netting: As recommended by insulation manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that conditions are satisfactory for installation of products.
- B. Verify that construction required to be in place before application of insulation has been completed, that available space has sufficient depth for required insulation thickness, and that substrate is clean and dry.

3.02 PREPARATION

- A. Remove cover projections in construction framing that may damage or prevent proper installation of insulation.
- B. Weld impaling pins to steel in accordance with manufacturer's instructions.
- C. Apply adhesive-applied impaling pins to concrete:
1. Apply thin coat of adhesive to impaling pin bases with putty knife.
 2. Press pin bases on clean surface until adhesive fills holes.
 3. Remove excess adhesive.
 4. Allow adhesive to cure overnight before proceeding.

3.03 APPLICATION

- A. Install unfaced insulation wherever insulation will be in direct contact with covering material.
- B. Install foil-faced insulation wherever insulation will not be in direct contact with covering material.

3.04 INSTALLATION

- A. Install insulation when construction has progressed to point that inclement weather will not damage or wet insulation material.
- B. Install Insulation in accordance with manufacturer's recommendations.
- C. Install insulation to attain minimum R-values.
- D. Exercise care to maintain vapor barrier integrity:
 - 1. Patch and seal punctures, tears, and voids.
- E. Install foil-faced insulation with vapor barrier toward warm-in-winter side of assembly.
- F. Maintain integrity of insulation over entire insulated area, including contiguous breaks, corners, pockets, voids, and offsets.
- G. Place insulation between exterior wall and pipes and conduit.
- H. Carefully cut and fit insulation around pipes, conduit, and other obstructions, compressing insulation where necessary.
- I. Do not block or restrict air ventilation devices.
- J. Provide 3-inch clearance between insulation and lighting fixtures, fans, and operating equipment.
- K. Impale insulation over clips:
 - 1. Install washer and bend prongs over in opposite direction where indicated on the Drawings.
 - 2. Friction fit insulation between studs.
 - 3. Fill space between studs with as thick as possible insulation.
 - 4. Provide supplementary support where insulation is over 8 feet high to hold insulation in place until interior finish is applied.
- L. Support ceiling and soffit insulation with wire at maximum 24 inches on center or netting attached to structure.

3.05 CLEANING

- A. Remove insulation damaged by construction and replace with new undamaged insulation.

END OF SECTION

SECTION 07_22_00
ROOF AND DECK INSULATION

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Roof and deck insulation and associated accessories.

1.02 REFERENCES

- A. ASTM International (ASTM):
1. A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 2. D41- Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing.
 3. D312 - Standard Specification for Asphalt Used in Roofing.
- B. National Roofing Contractors Association (NRCA).
- C. Underwriters Laboratories, Inc. (UL).

1.03 SUBMITTALS

- A. Product data.
- B. Samples. Include 6-inch square samples of each type and thickness of insulation required.
- C. State thickness and R-value of insulation to be provided at each building.
- D. Manufacturer's installation instructions: Include the following:
1. Indicate special environmental conditions required for installation.
 2. Indicate adhesive recommendations.
 3. Indicate fastener recommendations and attachment pattern to meet specified FM 1-90 requirements.
 4. Indicate installation techniques.
- E. Certificates:
1. Certify that products meet or exceed specified requirements.
 2. Certify that insulation is approved by manufacturer for use with specified roofing materials.
- F. Manufacturer's field reports.
- G. Warranty.

1.04 QUALITY ASSURANCE

- A. Manufacturer qualifications: Manufacturer of proposed product for minimum 5 years with satisfactory performance record.
- B. Installer qualifications:
 - 1. Manufacturer-approved installer of products similar to specified products on minimum 5 projects of similar scope as Project with satisfactory performance record.
 - 2. Committed to complying with manufacturer's specifications and NRCA recommendations.
 - 3. Committed to assuming undivided responsibility for roof insulation, roofing membrane and sheet metal flashing, and trim associated with roofing.
- C. Product compatibility: Provide roofing manufacturer approved roof insulation.
- D. Pre-installation conference: Conduct as specified in Section 01_31_19 - Project Meetings

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products in accordance with manufacturer's instructions.
- B. Label asphalt containers with certification of full compliance with requirements of ASTM D312, Table 1, and indicating equiviscous temperature, finished flowing temperature, and flash point.
- C. Store roof system materials on pallets or dunnage at least 4 inches above ground and suitably covered to protect from weather.

1.06 SEQUENCING AND SCHEDULING

- A. Apply no more insulation than can be completely covered with roofing membrane on the same day.
- B. When installation of insulation and roof membrane cannot be completed within same day, install temporary water cutoffs at end of day's work and remove cutoffs prior to resumption of work.

1.07 WARRANTY

- A. Furnished by metal roof manufacturer, as specified in Section 07_41_14 Metal Roofing and Soffit Panels.

PART 2 PRODUCTS

2.01 DESIGN AND PERFORMANCE CRITERIA

- A. Roof insulation system: As follows with UL Class A and FM Class 1A fire classification and meeting FM 1-90 wind up-lift requirements.
 - 1. Where 3-inch rigid foam roof insulation is indicated on the Drawings, insulation shall be as follows:
 - a. First layer: 2-inch thick foam insulation having an R-Value of 11.4.
 - b. Second layer: 2.5-inch thick foam insulation having an R-Value of 14.4.
 - c. Total system thickness shall be 4 1/2 inches and have a minimum R-Value of 25.8.

2.02 MATERIALS

- A. Base felt: ASTM D4601, Type II; glass mat coated with filled asphalt and surfaced one side with mineral non-blocking agent; minimum 27 pounds per square foot:
 - 1. Manufacturers: One of the following or equal:
 - a. John Manville, Inc., GlasBase.
 - b. Atlas Roofing Corp., equivalent product.
- B. Rigid foam roof insulation:
 - 1. Closed cell polyisocyanurate foam core bonded to universal fiberglass reinforced facers.
 - 2. Utilizing environmentally compliant blowing agent.
 - 3. Manufacturers: One of the following or equal:
 - a. Johns Manville, Inc., ENRGY 3.
 - b. Atlas Roofing Corp., AC Foam II.

2.03 ACCESSORIES

- A. Screw fastener system for steel decks:
 - 1. Self-drilling and self-tapping, zinc plated or stainless steel screws, sized for 1/2- to 3/4-inch exposure on exposed to view underside of deck, with minimum 3-inch square or diameter ribbed steel stress plates, hot-dip galvanized with minimum G-60 coating in accordance with ASTM A123.
 - 2. Manufacturers: One of the following or equal:
 - a. Tru Fast.
 - b. TW Buildex.
- B. Base felt fasteners:
 - 1. Manufacturers: One of the following or equal:
 - a. Berryfast, Tapefast.
 - b. Bostitch, Disc-A-Matic Systems.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that deck is properly graded to outlets.

- B. Verify that deck surfaces are clean, dry, and where required, coated with primer.

3.02 INSTALLATION OVER STEEL DECK

- A. Install roof insulation over base felt in accordance with manufacturer's specifications.
- B. Secure wood nailers to roof deck adjoining eaves, at roof curbs for attachment of flashing and counterflashing, and at other locations indicated on the Drawings:
 - 1. Nailers shall be built up of pressure treated wood to match the thickness of the insulation.
- C. Apply layers of roof insulation with long joints continuous, and parallel to ribs of deck. Stagger joints of the 2 layers.
- D. Form joints over solid bearing, stagger end joints.
- E. Secure with approved mechanical fasteners in FM I-90 pattern:
 - 1. Space fasteners as recommended by insulation manufacturer.
 - 2. Drive fasteners through tin caps or plastic fastener/cap assemblies, unless they are provided with integral flat cap not less than 1 inch across.
 - 3. Install screw fastener system in top rib of steel deck in accordance with manufacturer's instructions. Where underside of metal deck is exposed to view, size fasteners to penetrate deck from 1/2- to 3/4-inch, unless otherwise recommended by fastener manufacturer.
- F. Before application of roofing, turn over and solidly mop projecting felt to insulation at vertical surfaces and edges.
- G. Do not leave insulation exposed to weather.

3.03 FIELD QUALITY CONTROL

- A. Roof insulation which becomes wet or damaged shall be removed and replaced with solid, dry insulation, unless installer provides written acceptance of the damaged insulation from the roofing manufacturer, whose warranty shall cover the system.
- B. Inspections: Roof membrane manufacturer, whose warranty shall cover complete roof assembly, shall provide supervision and inspection necessary to secure warranty.

END OF SECTION

SECTION 07_41_14

STANDING SEAM SHEET METAL ROOFING

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: This section specifies factory-formed, standing seam, metal roof, gutters, downspouts, and trim.

1.02 REFERENCES

- A. ASTM International:
 - 1. ASTM A653/A653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 2. ASTM A792/A792M Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot Dip Process.
 - 3. ASTM B209 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 - 4. ASTM E283 Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
 - 5. ASTM E331 Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
 - 6. ASTM E1592 Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference.
 - 7. ASTM E1646 Standard Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference.
 - 8. ASTM E1680 Standard Test Method for Rate of Air Leakage Through Exterior Metal Roof Panel Systems.
- B. FM Global (Factory Mutual):
 - 1. FM Class I-90.
- C. Sheet Metal and Air Conditioning Contractor's National Association (SMACNA):
 - 1. SMACNA Architectural Sheet Metal Manual.
- D. Underwriters Laboratories, Inc. (UL):
 - 1. UL 263 Fire Tests of Building Construction and Materials.
 - 2. UL 580 Tests for Uplift Resistance of Roof Assemblies.
 - 3. UL 790 Standard Test Methods for Fire Tests of Roof Coverings.
 - 4. UL 1897 Uplift Tests for Roof Covering Systems.
 - 5. UL 2218 Impact Resistance of Prepared Roof Covering Materials.

1.03 SYSTEM DESCRIPTION

- A. Materials:
 - 1. G90 hot-dipped galvanized Grade A structural quality steel in compliance with ASTM A653.

- B. Performance Requirements:
 - 1. Wind uplift in compliance with UL Classification 580 for UL Classified 90 rated assemblies.
 - 2. Static air infiltration of 0.06 cfm/sf (0.028 liters/second) with 6.24 psi (43 kPa) air pressure differential as tested in accordance with ASTM E283.
 - 3. No water infiltration at inward static air pressure differential of not less than 6.24 psi (43 kPa) and not more than 12 psi (83 kPa) as tested in accordance with ASTM E331.

1.04 ACTION SUBMITTALS

- A. General: Submit listed action submittals in accordance with Conditions of the Contract and Section 01_33_00 - Submittal Procedures.
- B. Shop Drawings: Indicate information on shop drawings as follows:
 - 1. Layout, profiles, and product components including dimensions, anchorage, erection details, flashing details, elevations, plans, and sections required to indicate conditions.
- C. Samples: Submit as follows:
 - 1. 12 inch × 12 inch (305 × 305 mm) samples of each Roofing and Flashing product to show selected Colors, Finishes, and Textures used on project.
- D. Product Data: Submit product data, including manufacturer's SPEC-DATA® product sheet, for specified products:
 - 1. Material Safety Data Sheets (MSDS).

1.05 INFORMATION SUBMITTALS

- A. Quality Assurance:
 - 1. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.
 - 2. Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
 - 3. Manufacturer's Instructions: Manufacturer's installation instructions.
- B. Manufacturer's Field Reports: Manufacturer's field reports specified.

1.06 CLOSEOUT SUBMITTALS

- A. Warranty: Submit warranty documents specified.
- B. Operation and Maintenance Data: Submit operation and maintenance data for installed products:
 - 1. Include:
 - a. Manufacturer's instructions covering maintenance requirements.

1.07 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project.

2. Manufacturer Qualifications: Manufacturer capable of providing field service representation during construction and approving erection method.
- B. Regulatory Requirements:
1. FM Class I-90.
 2. SMACNA Architectural Sheet Metal Manual.
 3. UL 263.
 4. UL 580.
 5. UL 790.
 6. UL 1897.
 7. UL 2218.
- C. Preinstallation Meetings: Conduct preinstallation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements. Comply with Section 01_31_19 - Project Meetings.

1.08 DELIVERY, STORAGE & HANDLING

- A. Delivery:
1. Deliver materials in manufacturer's original packaging with identification labels intact.
- B. Storage and Protection:
1. Store materials protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.
 2. Stack prefinished material to prevent twisting, bending, abrasion, scratching and denting.
 3. Elevate one end of each skid to allow for moisture runoff.
 4. Prevent contact with material that may cause corrosion, discoloration, or staining.
 5. Provide factory installed strippable vinyl film protective coating to panels.

1.09 PROJECT AMBIENT CONDITIONS

- A. Installation Location: Assemble and erect components only when temperatures are above 40 degrees F (4 degrees C).

1.10 SEQUENCING

- A. Sequence With Other Work: Comply with manufacturer's written recommendations for sequencing construction operations.

1.11 WARRANTY

- A. Project Warranty: Refer to Conditions of the Contract for project warranty provisions.
- B. Provide 20-year finish warranty.
- C. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under Contract Documents.

- D. Warranty: Commencing on date of Substantial Completion.

1.12 MAINTENANCE

- A. Comply with manufacturer's written instructions to maintain installed product.

1.13 EXTRA MATERIALS

- A. Provide maintenance materials in accordance with Section 01_33_00 - Submittal Procedures.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Ensure manufacture has minimum 5 years' experience in manufacturing components similar to or exceeding requirements of project.

2.02 SHEET METAL ROOFS

- A. Manufacturer: Petersen Aluminum Corp., or equal.
- B. Products/Systems:
 - 1. Roof Panels:
 - a. Panel Description: TITE-LOC PLUS mechanically seamed:
 - 1) Width: 16 inches (406 mm).
 - 2) Height: 2 inches (51 mm).
 - b. Material: 22 gauge (0.85 mm) hot-dipped galvanized steel.
 - c. Type: Standing seam.
 - d. Sealant: Factory applied.
 - e. Stiffening Beads: None manufacturer applied.
 - f. Texture: Smooth.
 - g. Topside Panel Finish: Kynar; Owner selected color from manufacturer's standard colors. Provide manufacturer's standard 20-year finish warranty.
 - h. Panel Underside Finish: Polyester wash coat with dry film thickness of 0.3 mil.
 - i. Eave notched where indicated.
 - 2. Flashing and trim, including fascia, gutters and downspouts:
 - a. Material: To match roofing, gage as recommended by roofing manufacturer.
 - b. Profiles: use manufacturer's standard flashing and trim profiles.
 - c. Size gutters and downspouts per SMACNA standards.
 - d. Color and finish to match roof.

2.03 SOURCE QUALITY CONTROL

- A. Ensure cladding/roofing components and materials are from single manufacturer.

PART 3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

- A. Compliance: Comply with manufacturer's written data, including product technical bulletins, product catalog installation instructions, product carton installation instructions, and Petersen Aluminum Corp. specification sheets.

3.02 EXAMINATION

- A. Site Verification of Conditions:
 - 1. Verify that substrate conditions, which have been previously installed under other sections or contracts, are acceptable for product installation in accordance with manufacturer's instructions prior to installation of Roof and Soffit panels.

3.03 PREPARATION

- A. Ensure surfaces are clean and free of dirt and other foreign matter harmful to performance of Roof Soffit materials.
- B. Remove manufacturer's protective film from panel surfaces.
- C. Coordinate panel installation with work of other trades to provide a noncorrosive and leakproof installation.
- D. Prevent galvanic action of dissimilar metals in proximity to one another.

3.04 INSTALLATION

- A. Install roofing and accessories, using manufacturer's standard details, at locations indicated on the Drawings.
- B. Seams: Provide uniform, neat seams.
- C. Fasteners: Conceal fasteners where possible in exposed work. Cover and seal fasteners and anchors for watertight and leak-proof installation.
- D. Sealant-Type Joints: Provide sealant-type joint where indicated. Form joints to conceal sealant.

3.05 FINAL CLEANING

- A. Upon completion, remove surplus and excess materials, rubbish, tools, and equipment.

3.06 PROTECTION

- A. Protect installed product from damage during construction.

END OF SECTION

SECTION 07_92_00

JOINT SEALANTS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Acrylic-Latex sealant.
 - 2. Precast concrete joint sealant.
 - 3. Silicone sealant.
 - 4. Synthetic rubber sealing compound.
 - 5. Synthetic sponge rubber filler.
 - 6. Related materials.

1.02 REFERENCES

- A. American Association of State Highway and Transportation Officials (AASHTO):
 - 1. M198 - Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants.
- B. ASTM International (ASTM):
 - 1. C920 - Standard Specification for Elastomeric Joint Sealants.
 - 2. C990 - Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants.
 - 3. C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants.
 - 4. C1521 - Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints.
 - 5. D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension.
 - 6. D624 - Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomer.

1.03 SUBMITTALS

- A. Product data.
- B. Samples, include color selections.
- C. Manufacturer's Installation Instructions.
- D. Warranty.

1.04 QUALITY ASSURANCE

- A. Manufacturer qualifications: Manufacturer of proposed product for minimum 5 years with satisfactory performance record.

- B. Installer qualifications: Manufacturer approved installer of products similar to specified products on minimum 5 projects of similar scope as Project with satisfactory performance record.

1.05 PROJECT/SITE CONDITIONS

- A. Environmental requirements: Do not apply sealant on wet or frosty surfaces or when surface temperature is higher than 100 degrees Fahrenheit or lower than recommended by the manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products in accordance with manufacturer's recommendations.
- B. Code date packages. Do not use material older than manufacturer's published shelf life. Store materials at temperatures lower than 80 degrees Fahrenheit. Condition materials in accordance with manufacturer's instructions prior to installation.

1.07 SEQUENCING AND SCHEDULING

- A. Caulk joints prior to painting.

1.08 WARRANTY

- A. Warrant to correct defective products for minimum 1 year in accordance with manufacturer's standard warranty.

PART 2 PRODUCTS

2.01 SEALANTS

- A. General:
 - 1. Provide colors matching materials being sealed.
 - 2. Where compound is not exposed to view in finished work, provide manufacturer's color which has best performance.
 - 3. Nonsagging sealant for vertical and overhead horizontal joints.
 - 4. Sealants for horizontal joints: Self-leveling pedestrian/traffic grade.
 - 5. Joint cleaner, primer, bond breaker: As recommended by sealant manufacturer.
 - 6. Sealant backer rod and/or compressible filler made from closed cell polyethylene, polyethylene jacketed polyurethane foam, or other flexible, nonabsorbent, non-bituminous material recommended by sealant manufacturer to:
 - a. Control joint depth.
 - b. Break bond of sealant at bottom of joint.
 - c. Provide proper shape of sealant bead.
 - d. Serve as expansion joint filler.

2.02 ACRYLIC-LATEX SEALANT

- A. Permanently flexible, nonstaining, and nonbleeding latex modified acrylic sealant compound, colors as selected by Engineer from manufacturer's standard options:
 - 1. Manufacturers: One of the following or equal:
 - a. Tremco, Tremflex 834.
 - b. Pecora Corp., Number AC-20.
 - c. Sonneborn, Sonolac.

2.03 PRECAST CONCRETE JOINT SEALANT

- A. Preformed, cold-applied, ready-to-use, flexible joint sealant in accordance with ASTM C990 and AASHTO M 198:
 - 1. Manufacturers: One of the following or equal:
 - a. Henry Corp., Ram-Nek.
 - b. Concrete Sealants Division, ConSeal.

2.04 SILICONE SEALANT

- A. ASTM C920, Type S, Grade NS, Class 25, single component silicone sealant:
 - 1. Manufacturers: One of the following or equal:
 - a. Tremco, Proglaze.
 - b. Pecora Corp., Number 864.
 - c. Dow Corning, Number 795.
 - d. General Electric, Number 1200 Series.

2.05 SYNTHETIC RUBBER SEALING COMPOUND

- A. Manufacturer: One of the following or equal:
 - 1. Sika Corporation, Sikaflex 2c NS or SL
 - 2. Sika Corporation, Sikaflex 2c NS EZ Mix for potable water applications.
 - 3. Pacific Polymers, Elastothane 227R.
- B. Material: In accordance with ASTM C920 Type M, Grade P (pourable), Class 25 and Type M, Grade NS (non-sag), Class 25; multi-part polyurethane; able to cure at room temperature to firm, highly resilient polymer; able to perform satisfactory when continuously submerged in water or sewage and exposed to direct sunlight in dry condition; with the following properties determined at 75 degrees Fahrenheit and 50 percent relative humidity:
 - 1. Base: Polyurethane rubber.
 - 2. Application time: Minimum 2 hours.
 - 3. Cure time: Maximum 3 days.
 - 4. Tack free time: Maximum 24 hours.
 - 5. Ultimate hardness: Non-sag 25, Pourable/SL 40, within 5 Shore A.
 - 6. Tensile strength: Non-sag 95 pounds per square inch minimum and self-leveling minimum 170 pounds per square inch when tested in accordance with ASTM D412.
 - 7. Ultimate elongation: Minimum 340 percent when tested in accordance with ASTM D412.

8. Tear resistance: Non-sag 45 pounds per inch minimum and self-leveling minimum 85 pounds per inch when tested in accordance with ASTM D624, Die C.
 9. Service temperature range: Minus 25 degrees to 158 degrees Fahrenheit.
- C. Color: Gray to match concrete, unless indicated on the Drawings.

2.06 SYNTHETIC SPONGE RUBBER FILLER

- A. Closed-cell expanded sponge rubber manufactured from synthetic polymer neoprene base, or resilient polyethylene foam backer rod. In accordance with ASTM C1330, Type C:
1. Manufacturers: The following or equal:
 - a. Presstite, No. 750.3 Ropax Rod Stock.
- B. Characteristics:
1. Suitable for application intended.
 2. Strength: As necessary for supporting sealing compound during application.
 3. Resiliency: Resistance to environmental conditions of installation.
 4. Bonding: No bonding to the sealing compound.
 5. Structure: Cellular, prevents absorption of water.
 6. Compatibility with other materials in joint and acceptance by manufacturer of sealing compound.
 7. Size: Minimum 25 percent greater than nominal joint width.

2.07 RELATED MATERIALS

- A. Primer: Nonstaining type, recommended by sealant manufacturer to suit application.
- B. Joint cleaner: Noncorrosive, nonstaining, compatible with joint forming materials and as recommended by sealant manufacturer.
- C. Bond breaker tape: Pressure-sensitive tape recommended by sealant manufacturer to suit application.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify acceptability of joint dimensions, physical, and environmental conditions.
- B. Verify that surfaces are dry, clean, and free of dirt, grease, curing compound, and other residue which might interfere with adhesion of sealants.

3.02 PREPARATION

- A. Allow concrete to cure thoroughly before caulking.
- B. Synthetic sponge rubber filler:
1. Prepare surfaces designated to receive filler in accordance with manufacturer's installation instructions.

2. Do not stretch filler beyond its normal length during installation.
- C. Caulking:
1. Verify that surfaces are dry, clean, and free of dirt, grease, curing compounds, and other residue that might interfere with adhesion of sealant.
 2. Concrete, masonry, wood, and steel surfaces: Clean and prime in accordance with manufacturer's instructions prior to caulking.
- D. Synthetic rubber sealing compound:
1. Ensure surfaces to which synthetic rubber must bond are dry and free of dust, dirt, and other foreign residue.
 2. Heavy sandblasted caulking groove to sound surface, and prime with manufacturer's recommended primer for particular surface.
- E. For sidewalks, pavements, and similar joints sealed with elastomeric sealants and subject to traffic and other abrasion and indentation exposures, fill joints to depth equal to 75 percent of joint width, but neither more than 5/8 inches deep nor less than 3/8 inches deep.
- F. For normal moving building joints sealed with elastomeric sealants not subject to traffic, fill joints to depth equal to 50 percent of joint width, but neither more than 1/2 inch deep nor less than 1/4 inch deep.
- G. For joints sealed with acrylic-latex sealants, fill joints to depth in range of 75 percent to 125 percent of joint width.
- H. Use joint filler to achieve required joint depths, to allow sealants to perform properly.
- I. Prepare surfaces and install synthetic sponge rubber filler in accordance with manufacturer's recommendations.
- J. Do not stretch filler beyond normal length during installation.
- K. Apply bond breaker when recommended by joint sealer manufacturer.

3.03 INSTALLATION

- A. Synthetic sponge rubber filler: Install filler in accordance with manufacturer's installation instructions.
- B. Caulking, joints, and sealing:
1. Construct expansion, contraction, and construction joints as indicated on the Drawings.
 2. Install pipe and conduit in structures as indicated on the Drawings.
 3. Caulk doors, windows, louvers, and other items installed in or over concrete openings inside and out.
 4. Use synthetic rubber sealing compound for caulking where indicated on the Drawings or as specified, except for masonry construction and where specified otherwise.
 5. Complete caulking prior to painting.
 6. Verify that concrete is thoroughly cured prior to caulking.

7. When filler compressible material is used, use untreated type.
8. Apply caulking with pneumatic caulking gun.
9. Use nozzles of proper shape and size for application intended.
10. Maintain continuous bond between caulking and sides of joint to eliminate gaps, bubbles, or voids and fill joint in continuous operation without layering of compound.
11. Employ experienced applicators to caulk joints and seams in neat workmanlike manner.
12. To hasten curing of compound when used on wide joints subject to movement, apply heat with infrared lamps or other convenient means.
13. Apply synthetic rubber sealing compound with pneumatic caulking tool or other acceptable method.

3.04 CLEANING

- A. Clean surfaces adjacent to sealant as work progresses.
- B. Remove excess uncured sealant by soaking and scrubbing with sealant cleaning solvent.
- C. Remove excess cured sealant by sanding with Number 80 grit sandpaper.
- D. Leave finished work in neat, clean condition.

3.05 SCHEDULE

- A. Acrylic latex:
 1. Use where indicated on the Drawings.
 2. Interior joints with movement less than 7.5 percent and not subject to wet conditions.
- B. Silicone:
 1. Use where indicated on the Drawings.
 2. Joints and recesses formed where window, door, louver and vent frames, and sill adjoin masonry, concrete, stucco, or metal surfaces.
 3. Door threshold bedding.
 4. Moist or wet locations, including joints around plumbing fixtures.
 5. Stainless steel doors and frames, including joints between applied stops and frames, and around anchor bolts.
 6. Plenum joints.
- C. Synthetic rubber sealing compound, non-sag Type II:
 1. Use where indicated on the Drawings.
 2. Water-bearing and earth-bearing concrete structures.
 3. Joints in masonry, concrete vertical surfaces, and metal-faced panels in vertical surfaces.
 4. Joints between sheet metal flashing and trim.
 5. Joints between sheet metal flashing and trim, and vertical wall surfaces.
 6. Small voids between materials requiring filling for weathertight performance in vertical surfaces.

7. Perimeters of frames of doors, windows, louvers, and other openings where bonding is critical to airtight performance.
 8. Expansion and control joints in masonry vertical surfaces.
- D. Synthetic rubber sealing compound, self-leveling Type I:
1. Use where indicated on the Drawings.
 2. Expansion and control joints in masonry, concrete horizontal surfaces, and metal panels in horizontal surfaces.
 3. Small voids between materials requiring filling for weathertight performance in horizontal surfaces.
 4. Pavement joints.
 5. Perimeters of frames of doors, windows, louvers, and other openings in horizontal surfaces where bonding is critical to airtight performance.

3.06 FIELD QUALITY CONTROL

- A. Adhesion testing:
1. Perform adhesion tests in accordance with ASTM C1521 per the following criteria:
 - a. Water bearing structures: 1 test per every 1,000 LF of joint sealed.
 - b. Exterior precast concrete wall panels: 1 test per every 2,000 LF of joint sealed.
 - c. Chemical containment areas: 1 test per every 1,000 LF of joint sealed.
 - d. Building expansion joints: 1 test per every 500 LF of joint sealed.
 - e. All other type of joints except butt glazing joints: 1 test per every 3,000 LF of joint sealed.
 - f. Manufacturer's authorized factory representative provide written recommendations for remedial measures on failing tests.

END OF SECTION

SECTION 08_11_13

HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Steel Non-Fire Resistive Rated:
 - 1. Doors.
 - 2. Door frames.
 - 3. Window frames.

1.02 REFERENCES

- A. American National Standards Institute (ANSI):
 - 1. A250.6 - Hardware on Steel Doors (Reinforcement Application).
 - 2. A250.8 - Recommended Specification for Standard Steel Doors and Frames.
- B. ASTM International (ASTM):
 - 1. A653 - Standard Specification for Sheet Steel, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 2. A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
 - 3. A1008 - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy With Improved Formability, Solution Hardened, and Bake Hardenable.
 - 4. A1011 - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy With Improved Formability, and Ultra-High Strength.
 - 5. E413 - Classification for Rating Sound Insulation.
- C. National Association of Architectural Metal Manufacturers (NAAMM)/Hollow Metal Manufacturers Association (HMMA):
 - 1. HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames.
- D. National Fire Protection Association (NFPA):
 - 1. 80 - Standard for Fire Doors and Other Opening Protectives.
 - 2. 252 - Standard Methods of Fire Tests of Door Assemblies.
- E. Steel Door Institute (SDI):
 - 1. SDI-111 - Recommended Details for Standard Steel Doors, Frame, Accessories and Related Components.
 - 2. SDI-117 - Manufacturing Tolerances Standard Steel Doors and Frames.
- F. Underwriters' Laboratories, Inc., (UL):
 - 1. UL 10C - Positive Pressure Fire Tests of Door Assemblies.
 - 2. UL 102 - Sustainability Assessment for Swinging Door Leafs.

1.03 SUBMITTALS

- A. Product data.
- B. Shop drawings: Show the following with references to the Engineer's door marks and hardware groups:
 - 1. Location of door and frame types.
 - 2. Details of fabrication, including core construction, glass lights, louvers, weatherstripping, and factory finish for each door.
 - 3. Cutouts and reinforcements for hardware.
 - 4. Methods of installation and anchorage to adjacent construction.
- C. Certificates documenting:
 - 1. Fire-rated units have been successfully tested as specified in this Section.
- D. Manufacturer's instructions: Submit manufacturer's installation instructions.
- E. Pre-Submittal Conference:
 - 1. Conduct conference in compliance with requirements in Section 01_31_19 - Project Meetings with attendance by representatives of Supplier, Installer.
 - 2. Contractor to review proper methods and procedures for installing hollow metal doors and frames.

1.04 QUALITY ASSURANCE

- A. Testing agency qualifications: Approved by ultimate enforcing authority for the Project; regularly engaged in inspection of materials and workmanship at factory.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Before delivery, identify type and size of each door and frame in such a way that markings will not damage finish.
- B. Preassemble doorframes in shop and deliver to Project site with spreader bar at sill or tie them in pairs to form box.
- C. Protect doors and frames with resilient packaging sealed with heat shrunk plastic. Break seal on-site to permit ventilation.
- D. Protect doors and frames during shipment and storage to prevent warping, bending, and corrosion.

1.06 SEQUENCING AND SCHEDULING

- A. Ensure timely delivery of reviewed hardware schedule and hardware templates such that no delay occurs in the work of the Contract.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Sheet steel: ASTM A1008, commercial quality, level, cold rolled steel, or ASTM A1011, hot rolled, pickled and oil rolled steel. Galvanize by hot-dip process with zinc-coating in accordance with ASTM A924 or with ASTM A653 and the coating designation A60.
- B. Clips, bolts, screws, and rivets: sized as recommended by manufacturer.
- C. Primer: Rust- inhibitive epoxy primer compatible with high-solids epoxy finish coating system as specified in Section 09_96_01 - High-Performance Coatings.
- D. Touch-up materials: Primer as recommended by manufacturer.
- E. Door hardware: As specified in Section 08_71_00 - Door Hardware.
- F. Grout: As specified in Section 04_22_00 - Concrete Unit Masonry.
- G. Glass and glazing materials: As specified in Section 08_80_00 - Glazing.

2.02 DOOR AND FRAME TYPES

- A. Interior doors: ANSI 250.8, Grade III, Model 3 or NAAMM HMMA 810 Type A and NAAMM HMMA 861, flush steel rib-stiffened, minimum 18-gauge face sheets.
- B. Exterior doors: ANSI 250.8, Grade III, Model 3, or NAAMM HMMA 810 Type A and NAAMM HMMA 861, flush steel rib-stiffened, minimum 16-gauge face sheets.
- C. Interior frames: ANSI 250.8 or NAAMM HMMA 861, fully welded frames, minimum 16-gauge, sizes and shapes as indicated on the Drawings.
- D. Exterior frames: ANSI 250.8 or NAAMM HMMA 861, fully welded frames HMMA 861, except minimum 14-gauge sizes and shapes as indicated on the Drawings.

2.03 FABRICATION OF FRAMES

- A. Galvanize all frames installed in exterior openings.
- B. Frames: Sheet steel, integral type, welded continuous to full depth of frames with minimum 5/8-inch deep stops, unless otherwise indicated on the Drawings.
- C. Hardware reinforcements: Fabricate according to SDI A250.6 with reinforcing plates from same material as door face sheets.
- D. Jamb Anchors: As required for adjacent wall construction, minimum 3 per jamb, unless otherwise indicated on the Drawings.
- E. Floor anchors: Fixed type, except where adjustable anchors are indicated on the Drawings, 1 per jamb, with minimum 2 holes for anchorage. Where floor fill occurs,

terminate bottom of frames at indicated finished floor level and support by adjustable extension clips resting on and anchored to structural slabs.

- F. Anchors at masonry: Adjustable strap and stirrup, minimum 16-gauge corrugated or perforated steel at maximum of 30 inches on center and extending minimum 8 inches into masonry.
- G. Anchors at previously placed concrete: Countersink machine screws through the frame into expansion devices spaced at maximum 30 inches on center.
- H. Anchors at structural steel framing: Welded or otherwise securely fastened with stainless steel screws.
- I. Anchors for fire resistive frames: Conform to requirements of labeling authority having jurisdiction.
- J. Masonry angle stiffeners: Factory welded into heads of frames for installation in openings more than 48 inches wide.
- K. Mullions, muntins, and transom bars: Minimum 18-gauge, tubular sheet steel matching, and butt-welded to head and jamb members.
- L. Removable stops: Fasten at approximately 12 to 16 inches on center.

2.04 FABRICATION OF DOORS

- A. Galvanize all doors installed in exterior openings.
- B. Reinforce face sheets with steel rib stiffeners, spaced at maximum 6 inches apart, and securely attached to face sheets by spot welds at maximum 5 inches on center.
- C. Fill voids between face sheets and stiffeners with fiberglass insulation having a minimum density of 0.8 pounds per cubic foot.
- D. Edges: Full weld without visible joints. Bevel striking edge 1/8 inch in 2 inches.
- E. Door cores:
 - 1. Stiffeners: Vertical steel ribs formed from minimum 22-gauge plain sheet steel, spaced at maximum 6 inches apart and securely attached to face sheets by spot welds at maximum 5 inches on center.
 - 2. Core fillers: Insulation, minimum 0.60 pound density noncombustible type, installed in spaces between stiffeners for full height of door; labeled door core material shall conform to requirements of labeling authority.
- F. Tops and bottoms of doors: Close with continuous recess steel channel of minimum 16-gauge, extending full width of door and spot welded to both faces.
- G. Tops and bottoms of exterior doors: Flush closing channels welded to make tops and bottoms waterproof with weep holes for escape of moisture.
- H. Hardware reinforcements: Fabricate according to SDI A250.6 with reinforcing plates from same material as door face sheets.

- I. Astragals:
 - 1. Install on active leaf of double doors in accordance with UL listing requirements for fire resistive ratings as indicated on the Drawings, and for exterior pairs of doors.
 - 2. Do not install on doors swinging in pairs with rating of 90 minutes or less in means of egress where both leaves are required to provide building code required exiting widths.
 - 3. Do not provide astragal cutouts for hardware operations.
- J. Astragal clearances for fire resistive rated doors:
 - 1. Door bottoms at doors designated to receive non-combustible threshold: Not to exceed 3/8 inch between threshold and door bottom.
 - 2. Door bottoms where there is no threshold: Maximum clearance between door and floor not to exceed 1/2 inch.
 - 3. Door bottoms at doors designated to receive combustible floor coverings: Not to exceed 1/2 inch between floor covering and door bottom.
 - 4. Clearance between door and frame and between meeting edges of pairs of doors: Not to exceed 1/8 inch.
- K. Astragal clearances for non-fire resistive rated doors: Same as fire resistive rated doors, unless otherwise indicated on the Drawings.

2.05 LIGHT OPENINGS AND GLAZING

- A. Materials:
 - 1. As specified in Section 08_80_00 - Glazing.
- B. Stops and moldings:
 - 1. Provide stops and moldings around glazed lites where indicated.
 - 2. Form corners of stops and moldings with butted or mitered hairline joints at fabricator's shop.
 - 3. Fixed and removable stops to allow multiple glazed lites each to be removed independently.
 - 4. Coordinate frame rabbet widths between fixed and removable stops with the type of glazing and installation indicated.
- C. Moldings for glazed lites in doors and loose stops for glazed lites in frames:
 - 1. Minimum 20 gauge thick, fabricated from same material as door face sheet in which they are installed.
- D. Fixed frame moldings:
 - 1. Formed integral with hollow metal frames, a minimum of 5/8 inch (16 mm) high unless otherwise indicated.
 - 2. Provide fixed frame moldings and stops on outside of exterior and on secure side of interior doors and frames.
- E. Preformed metal frames for light openings:
 - 1. Manufacturer's standard frame formed of 0.048-inch-thick, cold-rolled steel sheet; with baked enamel or powder coated finish; and approved for use in doors of fire protection rating indicated.
 - 2. Match pre-finished door paint color where applicable.

2.06 ACCESSORIES

- A. Mullions and transom bars: Join to adjacent members by welding or rigid mechanical anchors.
- B. Grout guards: Formed from same material as frames, not less than 0.016 inches thick.
- C. Silencers:
 - 1. Drill single leaf doorframe jamb stops for minimum 3 silencers.
 - 2. Drill double-leaf doorframe head stops for minimum 2 silencers.
 - 3. Do not drill doorframes for silencers when weatherstripping is to be installed.

2.07 FINISHING

- A. Thoroughly clean surfaces of oil, grease, and other impurities; touch-up abraded galvanizing; and chemically etch.
- B. Fill irregularities and sand smooth finish surface. Apply 1 coat of manufacturer's standard rust inhibitive baked-on primer.
- C. Finish painting: High solids epoxy polyurethane system:
 - 1. Exterior doors and interior doors: As specified in Section 09_96_01 - High-Performance Coatings.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine reviewed hardware schedules and verify proper coordination of hardware and doors and frames.
- B. Examine opening locations and verify the following:
 - 1. Correctness of dimensions, backing, or support conditions.
 - 2. Absence of defects that would adversely affect frame or door installation.

3.02 INSTALLATION

- A. Install doors and frames in accordance with approved shop drawings and manufacturer's instructions.
- B. Frames:
 - 1. Set accurately in position, plumb, align, and attach securely to structure.
 - 2. Set in place before construction of adjacent masonry or framed walls.
 - 3. Anchor frames to previously placed concrete.
 - 4. Set frames before removing spreader bars.
 - 5. Fully grout frames in masonry as the Work progresses.
 - 6. Grout frames at concrete through keyways provided at head and jambs.

- C. Doors:
 - 1. Install at correct openings, ensure smooth swing and proper closure with frame.
- D. Fire resistive frames and doors:
 - 1. Install to conform to NFPA 80 for fire resistive rated class as indicated on the Drawings.
- E. Door hardware:
 - 1. Install in accordance with Section 08_71_00 - Door Hardware.
 - 2. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.
- F. Separate or isolate dissimilar metals with neoprene gaskets, sleeves, and washers, or with coatings acceptable to the Engineer.

3.03 TOLERANCES

- A. Manufacturing and installation tolerances: As indicated on the Drawings or in conformance to SDI 117 as minimum.

3.04 ADJUSTING AND CLEANING

- A. Prime coat touch-up: Immediately after installation, sand smooth and touch-up rust areas, and other areas where primer has been damaged, with prime touch-up paint.
- B. Make adjustments as required for correct, proper, and free function and smooth operation without binding of hardware or doors and frames.
- C. Protect doors and frames from damage to surface or profile.

END OF SECTION

SECTION 08_31_14
FLOOR ACCESS DOORS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Non-fire-rated floor access doors.

1.02 REFERENCES

- A. American Association of State Highway and Transportation Officials (AASHTO):
 - 1. Standard Specifications for Highway Bridges.
- B. Occupational Safety and Health Administration (OSHA):
 - 1. 29 CFR 1910-Occupational Safety and Health Standards.

1.03 SUBMITTALS

- A. Product data.
- B. Shop drawings that include the following:
 - 1. Floor access door installation recommendations.
 - 2. Locations of floor access doors.
 - 3. Door size and configuration.
 - 4. Live load capacity.
 - 5. Materials of construction and finishes provided.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Identify type and size of each floor access door in way not to damage finish prior to delivery.
- B. Deliver products only after proper facilities are available.
- C. Deliver and store packaged products in original containers with seals unbroken and labels intact until time of use.
- D. Handle carefully to prevent damage and store on clean concrete surface or raised platform in safe, dry area.
 - 1. Do not dump onto ground.
- E. Protect floor access doors during shipment and storage to prevent warping, bending, and corrosion.

1.05 WARRANTY

- A. Provide manufacturer's warranty against defects in material and workmanship for a period of 5 years.

1.06 MAINTENANCE

- A. Deliver 2 keys for each cylinder lock to Owner.

PART 2 PRODUCTS

2.01 MEDIUM-DUTY FLOOR ACCESS DOORS

- A. Manufacturers: One of the following or equal:
 - 1. The Bilco Co., Model J or JD (double leaf).
 - 2. Babcock Davis Associates, Inc., Model BFDDP-SAL or BFDDP-DAL (double leaf).
- B. Style: Single leaf or double leaf as indicated on the Drawings, aluminum, capable of withstanding minimum live load of 300 pounds per square foot, channel frame, with drainage couplings.
- C. Door leaf: Minimum 1/4-inch, diamond-pattern plate reinforced with stiffeners as required to meet specified live load.
- D. Frame: 1/4-inch channel with anchor flange around perimeter.
- E. Hardware:
 - 1. Hinges: Each leaf equipped with a minimum of 2 heavy forged-brass hinges with stainless steel pins.
 - 2. Lock: Snap lock with removable handle mounted on door leaf.
 - 3. Grip handle: Provide vinyl grip handle designed to release cover for closing.
 - 4. Operating mechanism: Spring operators designed for ease of operation and automatic hold-open arm with release handle.
 - 5. Drainage assembly: Provide 1-1/2-inch drainage coupling located in corner of the channel frame.

2.02 FINISHES

- A. Floor access door finishes:
 - 1. Aluminum: Manufacturer's standard mill finish.
 - 2. Aluminum in contact with dissimilar metals and concrete: Manufacturer's standard bituminous coating.
 - 3. Steel: Manufacturer's standard red oxide primer.
- B. Hardware finishes:
 - 1. Provide optional Type 316 stainless steel hardware throughout, including parts of the latch and lifting mechanism assemblies, hold-open arms, and all brackets, hinges, pins, and fasteners.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine construction to receive floor access door and verify correctness of dimensions and other supporting or adjoining conditions.

3.02 PREPARATION

- A. Coordinate details with other work supporting, adjoining, or requiring floor access doors.
- B. Verify dimensions and profiles for each opening.
- C. Verify that location will serve portion of work to which access is required.
 - 1. Where proposed functional location conflicts with other work, notify the Engineer before installation.
- D. Apply coating to aluminum surfaces that will be in contact with dissimilar metals or concrete when there is none.

3.03 INSTALLATION

- A. Install floor access doors in accordance with manufacturer's instructions.
- B. Ensure correct types and adequate sizes at proper locations.
- C. Securely attach frames to supporting work and ensure doors, frames, and hardware operate smoothly and are free from warp, twist, and distortion.
- D. Attach drain pipe to coupling provided.
 - 1. Unless noted or indicated on the Drawings, provide 1-inch PVC (Sch. 80) drain line for access door.
 - 2. Provide necessary fittings to connect and route at least 5 feet away from door and vault perimeter.
 - 3. Terminate drain line 1 foot below final grade with 3 cubic feet of drain rock beneath the termination point of the drain line.

3.04 ADJUSTING

- A. Adjust doors, frames, and hardware to operate smoothly, freely, and properly without binding.

3.05 CLEANING

- A. Thoroughly clean surfaces of grease, oil, or other impurities; touch up abraded prime coat where applicable.

END OF SECTION

SECTION 08_33_23
OVERHEAD COILING DOORS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Non-fire rated and insulated overhead coiling doors.

1.02 REFERENCES

- A. National Electrical Manufacturers Association (NEMA):
1. 250 - Enclosures for Electrical Equipment (1000 V Maximum).
- B. ASTM International:
1. A123 - Standard specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 2. A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
 3. A666 - Standard specification for Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
 4. A924 - Standard Specification for General Requirements of Steel Sheet, Metallic-Coated by the Hot-Dip Process (Referenced by ASTM A653).

1.03 SUBMITTALS

- A. Product data:
1. General: Submit data completely describing products, including rough-in diagrams.
 2. Electrical operators: Submit complete manufacturer's data for all components for electric door operators. Show motor size and characteristics. Show manufacturer's verification that motor has been adequately sized for each size and type of door required. Submit electrical schematic diagrams.
- B. Shop drawings:
1. Drawings showing complete installation details, required clearances, relation to building structure, complete electrical rough-in requirements required for installation of motor operators for doors and for connection of such doors to fire alarm system, referenced to the door mark number.
 2. Show location and size of access doors required to perform maintenance on doors and auxiliary equipment.
- C. Samples: Submit samples of finishes for finish selection.
- D. Quality control submittals:
1. Manufacturer's instructions:
 - a. Installation instructions for each type and size of door, including manufacturer's data, operating instructions, and maintenance data.

- b. Furnish installer copy of diagrams and installation instructions.
- E. Contract closeout submittals:
 - 1. Project record documents:
 - a. Operation and maintenance data: Provide manufacturer's operation and maintenance data for each different type of door specified, complete with manufacturer's list of recommended spare parts and their prices, electrical schematic diagrams, and name and address of nearest maintenance organization approved by door manufacturer.
 - b. Warranty: Provide manufacturer's standard warranty.

1.04 QUALITY ASSURANCE

- A. Regulatory requirements:
 - 1. Wind loading as specified in Section 01_81_50 - Design Criteria.
 - 2. Seismic requirements for door anchorage and support systems as specified in Section 01_81_50 - Design Criteria.
 - 3. Provide electrical materials in NEMA Type enclosures as specified.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Packing, shipping, and storage: Protect doors during shipment and storage to prevent warping, bending, and corrosion.
- B. Deliver materials only after proper facilities are available: Provide clean dry surfaces or platform as required and protect from deterioration and foreign matter.

1.06 PROJECT CONDITIONS

- A. Field measurements: Field verify all opening dimensions and clearances prior to fabricating doors. Fitting doors to openings is the responsibility of the Contractor.

1.07 SEQUENCING AND SCHEDULING

- A. Inserts and anchorages: Furnish inserts and anchoring devices which must be set into concrete or built into masonry. Provide setting drawings, templates, and directions for installation of anchorage devices. Coordinate delivery with other work to avoid delay to the Contract.

PART 2 PRODUCTS

2.01 DESIGN AND PERFORMANCE CRITERIA

- A. Design requirements:
 - 1. Compatibility with space and service requirements:
 - a. Doors and equipment items provided shall be compatible with space limitations specified and indicated on the Drawings.
 - b. Make modifications to doors and equipment items necessary to conform with space limitations or with utility services specified for rough-in.

- c. Provide items complete including all necessary ancillary equipment as may be required for complete and trouble-free operation.
- 2. Maintenance requirements: For ease of maintenance, provide overhead coiling doors complying with following requirements:
 - a. Provide each door assembly as complete unit produced or supplied by a single manufacturer, including frames, sections, brackets, operating mechanisms, hardware, except hardware items specified in Section 08_71_00 - Door Hardware, and all necessary accessories for installation of complete in openings indicated.
 - b. Unless otherwise specified, all doors of particular type throughout the entire project shall be as manufactured or supplied by a single manufacturer.

2.02 MANUFACTURED UNITS

- A. Manufacturers: One of the following or equal:
 - 1. Overhead Door Corp.
 - 2. Wayne-Dalton Corp.
 - 3. The Cookson Co., Inc.
- B. Steel overhead coiling door:
 - 1. Mounting: Face of wall.
 - 2. Operation: As indicated on the Drawings.
 - 3. Curtain:
 - a. Exterior slats: Manufacturer's standard, minimum 20-gauge steel galvanized in accordance with ASTM A653, interlocking flat-faced slats with ends of alternate slats fitted with metal end locks to hold curtain in alignment.
 - b. Bottom bar: Steel galvanized in accordance with ASTM A123, fitted with 2 equal-sized steel angles minimum 1/8-inch thick, with lift handle and slide bolt at either end and provided with a flexible PVC bulb type astragal to ensure a consistent seal along the floor. Extrusion designed to interlock with door curtain.
 - c. Weatherstripping:
 - 1) Bottom bar: Manufacturer's standard, provided with a flexible PVC bulb type astragal to ensure a consistent seal along the floor. Extrusion designed to interlock with door curtain.
 - 2) Door jambs: Manufacturer's standard vinyl extrusion seals, manufacturer's standard.
 - 3) Hood: Manufacturer's standard vinyl air baffle.
 - 4. Guides: Steel galvanized in accordance with ASTM A123, formed of roll formed steel channels and angles or structural angles of sufficient depth to provide a groove of adequate depth on each jamb to hold curtain firmly in guides under design wind pressure.
 - 5. Brackets: Steel galvanized in accordance with ASTM A123, steel plate with permanently sealed ball bearings designed to enclose ends of coil and provide support for counterbalance pipe at each end.
 - 6. Barrel and counterbalance mechanism: Steel pipe of sufficient size to carry door load with maximum deflection of 0.03 inch per foot of opening width and counterbalanced by helical springs, oil tempered torsion type designed with

minimum safety factor of 1.25 percent, and having cast iron barrel plugs that anchor springs to tension shaft and pipe.

7. Hood: Manufacturer's standard, minimum 24-gauge steel galvanized in accordance with ASTM A653, designed to enclose curtain coil and counterbalance mechanism.

C. Insulation:

1. Interior slats: Material to match exterior slats as specified in previous article, interlocking flat-faced slats, manufacturer's standard size with ends of alternate slats fitted with metal end locks to hold curtain in alignment.
2. Insulation: CFC-free Polyethylene foam yielding a minimum R-value of 6.20.

D. Door operators:

1. Motor operator: Unless otherwise indicated on the Drawings, provide a heavy-duty type motor operator.
 - a. High starting torque type motor having sufficient power to operate the load at an average speed of 1 foot per second.
 - b. Totally enclosed, fan cooled, continuous-duty motor, sized to suit door size (1 horsepower minimum), with Class B insulation.
 - c. 480 volt, 3-phase operation.
 - d. Controlled by momentary contact 3-button station marked OPEN, CLOSE, and STOP. As indicated on the Drawings.
 - e. Provide automatic screw-type limit switch to break circuit at termination of travel.
 - f. Provide gear reducer consisting of high efficiency worm gearing running in an oil bath and a spring set, solenoid-operated brake designed to hold the load when power is off.
 - g. Provide emergency hand chain operator which does not affect the time of the limit switch, to operate the load in case of power failure.
 - h. Operator to have reversing NEMA Size 1 starter having mechanical and electrical interlocks, properly sized 24-volt control transformer, and other controls necessary for proper operation, completely assembled and wired to a terminal strip to facilitate field wiring of the power source, pushbutton stations, and/or other remote devices.
 - i. Unless otherwise indicated on the Drawings, all electrical material supplied shall be in NEMA Type 12 enclosures for interior locations and in NEMA Type 4X enclosure or NEMA Type 4 enclosures for exterior or wet locations.
 - j. Provide electronic safety edge to reverse direction of door if obstruction is encountered.

2.03 ACCESSORIES

- A. Fasteners: Sizes and types as recommend by reviewed door manufacturer.

2.04 FINISHES

- A. Slats, hood and bottom bar:

1. Galvanized steel: Manufacturer's standard rust inhibitive prime coat and with powder coat finish as selected by Owner from manufacturer's standard colors.

- B. Guides and bracket plates:
 - 1. Galvanized steel: manufacturer's standard rust inhibitive prime coat in a flat black finish.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of conditions: Examine openings to receive overhead coiling doors and verify:
 - 1. Dimensions and correctness of backing or support conditions.
 - 2. Absence of defects that would adversely affect installation.
- B. Do not start the work until unsatisfactory conditions are corrected.

3.02 PREPARATION

- A. Verify dimensions and design for each opening.
- B. Coordinate details with other work supporting or adjoining coiling doors.
- C. Furnish fastening devices as required to mount doors properly.

3.03 INSTALLATION

- A. Install doors in strict accordance with manufacturer's installation instructions, unless specifically otherwise indicated on the Drawings.
- B. Install assemblies plumb, square, and level at their proper elevations and in their proper planes.
- C. Securely anchor assemblies to interior face of openings, in manner that provides full opening clearance, perfectly aligned and adjusted for smooth operation.
- D. Interface with other products: Separate or isolate dissimilar metals with neoprene gaskets, sleeves, or washers, or with an acceptable coating.

3.04 ADJUSTING

- A. Verify that door assemblies are securely anchored to structure, guides are perfectly aligned, and doors are adjusted for smooth operation.
- B. Upon completion of installation, ensure doors are free from warp, twist, or distortion and are lubricated and properly adjusted to operate freely.

3.05 CLEANING

- A. Thoroughly clean surfaces of grease, oil, and other impurities.
- B. Replace any damaged or otherwise disfigured doors with new prior to final acceptance.

3.06 DEMONSTRATION

- A. Provide Owner's maintenance employees with minimum of 8 hours of maintenance instruction.

3.07 PROTECTION

- A. Protect installed doors from damage until final acceptance.

END OF SECTION

SECTION 08_71_00

DOOR HARDWARE

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Door hardware.

1.02 REFERENCES

- A. Builders Hardware Manufacturers Association (BHMA):
 - 1. A156.1 - Butts and Hinges.
 - 2. 156.2 - Bored and Preamsembled Locks and Latches.
 - 3. A156.3 - Exit Devices.
 - 4. A156.4 - Door Controls.
 - 5. A156.13 - Mortise Locks and Latches.
 - 6. A156.18 - Materials and Finishes.
- B. International Building Code (ICC):
 - 1. A117.1 - Accessible and Usable Buildings and Facilities.
- C. National Fire Protection Association (NFPA):
 - 1. 80 - Fire Doors and Windows.
 - 2. 105 - Installation of Smoke Door Assemblies.
 - 3. 252 - Standard Methods of Fire Tests of Door Assemblies.
- D. Underwriters Laboratories, Inc. (UL):
 - 1. 10C - Positive Pressure Fire Tests of Door Assemblies.
 - 2. 1784 - Standard for Air Leakage Tests of Door Assemblies and Other Opening Protectives.

1.03 SUBMITTALS

- A. Product data:
 - 1. Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
 - 2. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.
- B. Hardware schedule:
 - 1. Include references to Engineer's hardware group number, door type designations, locations, other pertinent data, and manufacturer names or suitable abbreviation opposite items scheduled.
 - 2. Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate

the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware:

- a. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
 - b. Organization:
 - 1) Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening.
 - 2) Organize door hardware sets in same order as in the Door Hardware Sets at the end of this Section.
 - 3) Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
 - c. Content: Include the following information:
 - 1) Type, style, function, size, label, hand, and finish of each door hardware item.
 - 2) Manufacturer of each item.
 - 3) Fastenings and other pertinent information.
 - 4) Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
 - 5) Explanation of abbreviations, symbols, and codes contained in schedule.
 - 6) Mounting locations for door hardware.
 - 7) Door and frame sizes and materials.
 - 8) Warranty information for each product.
 - d. Submittal Sequence:
 - 1) Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule.
 - 2) Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- C. Keying schedule:
1. After a keying meeting with the owner has taken place prepare a separate keying schedule detailing the final instructions.
 2. Submit the keying schedule in electronic format.
 3. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions.
 4. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.
- D. Samples: Include for each different type and manufacturer for review of finish.
- E. Construction key distribution list: Submit upon Owner's request.
- F. Templates:
1. Furnish hardware templates to fabricators of doors, frames, and other work to be factory-prepared for hardware.
 2. Check shop drawings of other work to confirm that adequate hardware backing is available.

- G. Project record documents: Include corrected hardware schedule.
- H. Operating and Maintenance Manuals:
 - 1. Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation.
 - 2. As specified in Section 01_78_24 - Operation and Maintenance Manuals.

1.04 REGULATORY REQUIREMENTS

- A. Provide hardware for fire-resistive rated openings that complies with UL and listed by UL.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hardware where directed in unopened packages with items packed separately, complete and ready for installation with necessary fittings, trim, fasteners, and accessories.
- B. Provide packages bearing the manufacturers' labels with each item or group of items identified according to the accepted hardware schedule.

1.06 QUALITY ASSURANCE

- A. Certified products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).
- B. Installer qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- C. Door hardware supplier qualifications:
 - 1. Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project.
 - 2. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity.
 - 3. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.
- D. Source limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated:
 - 1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
- E. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.

- F. Pre-submittal conference:
1. Conduct coordination conference in compliance with requirements in Section 01_31_19 - Project Meetings with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.
 2. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products.
 3. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
 4. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
 5. Review sequence of operation narratives for each unique access controlled opening.
 6. Review and finalize construction schedule and verify availability of materials.
 7. Review the required inspecting, testing, commissioning, and demonstration procedures.

1.07 MAINTENANCE

- A. Provide locksets compatible with existing keying system.
- B. Require lockset manufacturers to deliver permanent keys and minimum 2 extractor keys to Owner directly.

1.08 SCHEDULING AND SEQUENCING

- A. Upon receipt of accepted hardware schedule, coordinate accepted hardware schedule, templates, reinforcing units, and template instructions to door and frame sections.
- B. Restrict distribution of construction keys to superintendents and foremen. Maintain record of persons who have received keys on construction distribution list.

1.09 MAINTENANCE TOOLS AND INSTRUCTIONS

- A. Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

1.10 WARRANTY

- A. Provide warranty as specified in Section 01_78_36 - Warranties and Bonds:
1. Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:
 - a. Structural failures including excessive deflection, cracking, or breakage.
 - b. Faulty operation of the hardware.

- c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - d. Electrical component defects and failures within the systems operation.
- B. Special warranty:
 - 1. Duration for electromechanical door hardware: 2 years.
 - 2. Duration for standard duty cylindrical (bored) locks and latches: 5 years.
 - 3. Duration for exit hardware: 5 years.
 - 4. Duration for mortise locks and latches: 10 years.
 - 5. Duration for manual overhead door closer bodies: 10 years.
 - 6. Duration for heavy duty floor closers: 10 years.

PART 2 PRODUCTS

2.01 GENERAL

- A. Door hardware includes, but is not necessarily limited to, the following:
 - 1. Mechanical door hardware.
 - 2. Electromechanical door hardware.
 - 3. Automatic operators.
 - 4. Cylinders.

2.02 FASTENERS

- A. Types:
 - 1. To concrete, marble, or masonry: Machine screws and flush shells.
 - 2. To wood: Wood screws.
 - 3. On gypsum board or plaster: Screws of sufficient length to provide solid connection to framing or backing behind gypsum board or plaster.
 - 4. To mineral and hollow core doors: Hex bolts.
 - 5. Of exit devices to doors: Thru-bolts, unless otherwise specified.
- B. Screws exposed: Phillips-head type, full-threaded screws, not combination type.
- C. Sizes: Suitable for heavy use.
- D. Finish: Stainless steel, unless otherwise required to match material and hardware finish.

2.03 HANGING DEVICES

- A. Hinges: BHMA A156.1 certified butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets:
 - 1. Quantity: Provide the following hinge quantity:
 - a. 2 Hinges: For doors with heights up to 60 inches.
 - b. 3 Hinges: For doors with heights 61 to 90 inches.
 - c. 4 Hinges: For doors with heights 91 to 120 inches.
 - d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.

- e. Hinge size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
 - 1) Widths up to 3 feet 0 inches: 4-1/2 inches standard or heavy weight as specified.
 - 2) Sizes from 3 feet 1inch to 4 feet 0 inched: 5inches standard or heavy weight as specified.
- f. Hinge weight and base material: Unless otherwise indicated, provide the following:
 - 1) Exterior doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
 - 2) Interior doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.
- g. Hinge options: Comply with the following:
 - 1) Non-removable pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.
- h. Manufacturers: One of the following or equal:
 - 1) Hager Companies (HA).
 - 2) Ives (IV).
 - 3) McKinney Products; ASSA ABLOY Architectural Door Accessories (MK).

2.04 MECHANICAL LOCKS AND LATCHING DEVICES

- A. Mortise Locksets, Grade 1 (Heavy Duty): BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed. Locksets are to be manufactured with a corrosion resistant steel case and be field-reversible for handing without disassembly of the lock body:
 - 1. Manufacturers: One of the following or equal:
 - a. Corbin Russwin Hardware (RU) – ML2000 Series.
 - b. Sargent Manufacturing (SA) – 8200 Series.
 - c. Schlage (SC) – L9000 Series.
- B. Cylindrical Locksets, Grade 1 (Heavy Duty): BHMA A156.2, Series 4000, Operational Grade 1 Certified Products Directory (CPD) listed:
 - 1. Furnish with solid cast levers, standard 2-3/4 inch backset, and 1/2 inch (3/4 inch at rated paired openings) throw brass or stainless steel latchbolt.
 - 2. Locks are to be non-handed and fully field reversible.
 - 3. Manufacturers: One of the following or equal:
 - a. Corbin Russwin Hardware (RU) - CL3300 Series.
 - b. Sargent Manufacturing (SA) - 10 Line.
 - c. Schlage (SC) – ND Series.

2.05 LOCK AND LATCH STRIKES

- A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:
 - 1. Flat-lip strikes: For locks with 3-piece antifriction latch-bolts, as recommended by manufacturer.

2. Extra-long-lip strikes: For locks used on frames with applied wood casing trim.
 3. Aluminum-frame strike box: Provide manufacturer's special strike box fabricated for aluminum framing.
 4. Double-lipped strikes:
 - a. For locks at double acting doors.
 - b. Furnish with retractable stop for rescue hardware applications.
- B. Standards: Comply with the following:
1. Strikes for Mortise Locks and Latches: BHMA A156.13.
 2. Strikes for Bored Locks and Latches: BHMA A156.2.
 3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
 4. Dustproof Strikes: BHMA A156.16.

2.06 CONSTRUCTION KEYING

- A. Type: Removable core system.
- B. Cylinder manufacturer to have minimum 10-years' experience designing secured master key systems and have on record a published security keying system policy.

2.07 PERMANENT CYLINDERS AND KEYING

- A. Manufacturers: One of the following or equal:
1. Corbin Russwin Hardware (RU).
 2. Sargent Manufacturing (SA).
 3. Schlage (SC).
- B. Cylinders: Original manufacturer cylinders complying with the following:
1. Mortise type: Threaded cylinders with rings and cams to suit hardware application.
 2. Bored-lock type: Cylinders with tailpieces to suit locks.
 3. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
 4. Keyway: Manufacturer's Standard. Match Facility Standard.
- C. Removable cores: Provide removable cores as specified, core insert, removable by use of a special key, and for use with only the core manufacturer's cylinder and door hardware.
- D. Keying system: Each type of lock and cylinders to be factory keyed:
1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.
 2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
 3. New system: Key locks to a new key system as directed by the Owner.
- E. Key quantity: Provide the following minimum number of keys:
1. Change keys per cylinder: 2.
 2. Master keys (per master key level/group): 5.
 3. Construction control keys (where required): 2.
 4. Permanent control keys (where required): 2.

- F. Construction keying: Provide temporary keyed construction cores.
- G. Key registration list (biting list):
 - 1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
 - 2. Provide transcript list in writing or electronic file as directed by the Owner.

2.08 CLOSERS

- A. Manufacturers:
 - 1. Features:
 - a. Heavy-duty.
 - b. Non-handed and non-sized.
 - c. Adjustable spring power from size 1 through 4.
 - d. Hold open feature where specified.
 - 2. One of the following or equal:
 - a. Sargent, 351 Series.
 - b. LCN, Super Smoothee Model 4041 Series.
 - c. Norton Door Controls, Multi-Size Door Closers Model 7500BF Series.
- B. Type: Full rack and pinion type with steel spring and non-gumming, non-freezing hydraulic fluid.
- C. Controls: Separate set for regulating sweep speed, latch speed, backcheck and backcheck positioning, or where schedules, spring power.
- D. Sizes: As recommended by accepted manufacturer.
- E. Covers: Metal, capable of receiving finishes to match adjacent hardware finishes, unless otherwise specified.
- F. Narrow frame provisions: Drop plates.
- G. Effort to operate: As follows:
 - 1. Exterior: Maximum 8-1/2 pounds.
 - 2. Interior: Maximum 5 pounds.
 - 3. Fire-resistive rated doors: Maximum 15 pounds.
- H. Adjust closers in accordance with manufacturer's directions for size of door.

2.09 EXIT DEVICES

- A. Lever design:
 - 1. Manufacturers: The following or equal:
 - a. Von Duprin, Lever Model 06.
- B. Mortise lock device, non-fire-resistive rated:
 - 1. Manufacturers: The following or equal:
 - a. Von Duprin Inc., Model Series 9875L.

- C. Mortise lock device, fire-resistive rated:
 - 1. Manufacturers: The following or equal:
 - a. Von Duprin Inc., Model Series 9875L-F.
- D. Material: As scheduled.
- E. Corrosive environment provisions: Zinc dichromate coated internal parts.

2.10 MISCELLANEOUS DOOR HARDWARE

- A. Wall stops: As scheduled.
 - 1. Manufacturers: One of the following or equal:
 - a. Ives.
 - b. Trimco.
 - c. Rockwood.
- B. Floor stops: As scheduled with strike of suitable height to compensate for clearance between door and floor:
 - 1. Manufacturers: One of the following or equal:
 - a. Ives.
 - b. Trimco.
 - c. Rockwood.
- C. Mechanical holders: Foot-operated plunger with instant release by touch of toe and integral spring to keep constant shoe pressure against floor; brass:
 - 1. Manufacturers: The following or equal:
 - a. Glynn-Johnson.
- D. Flush bolts and surface bolts:
 - 1. BHMA A156.3 and A156.16, Grade 1, certified:
 - a. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately 6 feet from the floor.
 - b. Furnish dust proof strikes for bottom bolts.
 - c. Surface bolts to be minimum 8 inches in length, UL listed for labeled fire doors, and UL listed for windstorm components where applicable.
 - d. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.
 - e. Manufacturers: One of the following or equal:
 - 1) Ives (IV).
 - 2) Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
 - 3) Trimco (TC).
- E. Kick plates:
 - 1. As scheduled, 0.050-inch thick, beveled edges, 10 inches high, 1-1/2 inches narrower than single doors, 1 inch narrower than leaf of door pairs.
 - 2. Manufacturers: One of the following or equal:
 - a. Ives.
 - b. Trimco.

F. Architectural seals:

1. General:

- a. Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets.
- b. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated.
- c. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

2. Smoke labeled gasketing:

- a. Assemblies in accordance with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing in accordance with UL 1784.
- b. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

3. Fire labeled gasketing:

- a. Assemblies in accordance with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing in accordance with UL 10C.
- b. Provide intumescent seals as indicated to meet UL 10C, and NFPA 252.

4. Sound-rated gasketing:

- a. Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.

5. Replaceable seal strips:

- a. Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

6. Manufacturers: One of the following or equal:

- a. National Guard Products (NG).
- b. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE).
- c. Zero (ZE).

G. Thresholds:

1. As scheduled, extruded aluminum, maximum 1/2-inch high, maximum slope of 1 foot in 2 feet.
2. Manufacturers: One of the following or equal:
 - a. National Guard Products Inc.
 - b. Pemko Mfg. Co.

H. Dustproof strike:

1. As scheduled.
2. Manufacturers: One of the following or equal:
 - a. Ives.
 - b. Trimco.

I. Door bottoms:

1. As scheduled, extruded aluminum with vinyl insert, surface mounted, length equal to door width minus 2 inches, automatic, recessed in bottom of door.
2. Manufacturers: One of the following or equal:
 - a. Pemko.
 - b. Reese.

- J. Astragals:
 - 1. As specified in Sections 08_11_13 - Hollow Metal Doors and Frames.
- K. Silencers:
 - 1. As scheduled, pneumatic gray rubber.
 - 2. Manufacturers: One of the following or equal:
 - a. Trimco.
 - b. Ives.
 - c. Rockwood.

2.11 FINISHES

- A. Brass and bronze: BHMA A156.18 626 (US26D), satin chrome.
- B. Steel: BHMA A156.18 652 (US26D), satin chrome.
- C. Stainless steel: BHMA A156.18 630 (US32D), satin stainless steel.
- D. Aluminum: BHMA A156.18 628 (US28).
- E. Plastic closer covers: Spray paint to match typical door hardware finish.
- F. Metal closer covers: Plate covers to match typical door hardware finish.
- G. Electromagnetic hold open devices: Manufacturer's standard brushed zinc finish.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Inspect doors and door frames for damage or defects and examine hardware for compatibility with receiving conditions and suitable to intended use.
- B. Verify that required wall backing has been installed.

3.02 INSTALLATION

- A. Install finish hardware in accordance with manufacturer's templates and instructions:
 - 1. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.
 - 2. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: Hanging devices; locking devices; closing devices; and seals.
- B. Accurately and properly fit hardware.
- C. Securely fasten fixed parts for smooth, trouble-free, non-binding operation.
- D. Fit faces of mortise parts snug and flush.

- E. Ensure that operating parts move freely and smoothly without binding, sticking, or excessive clearance.
- F. Mounting heights:
 - 1. Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations.
 - 2. Standard steel doors and frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 - 3. Wood doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
 - 4. Where indicated to comply with accessibility requirements, in accordance with ICC A117.1 "Accessibility Guidelines for Buildings and Facilities."
 - 5. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.
- G. Retrofitting:
 - 1. Install door hardware to comply with manufacturer's published templates and written instructions.
 - 2. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Section 09_96_01 - High-Performance Coatings.
 - 3. Do not install surface-mounted items until finishes have been completed on substrates involved.
- H. Protection:
 - 1. Protect door hardware from damage or marring of finish during construction, use strippable coatings, removable tapes, or other acceptable means.
 - 2. Ensure door hardware displays no evidence of finish paint after final building cleanup.
- I. Latch guard and dead bolts: Install so that bolts automatically engage in keeper, whether activated by closer or by manual pressure.
- J. Closers:
 - 1. Mount on opposite sides of corridors or vestibules, except at exterior doors.
 - 2. Mount for 180-degree swing wherever possible.
 - 3. Mount with drop plates at narrow top rail doors.
 - 4. Adjust to operate noiselessly and evenly.
 - 5. Have closer manufacturer regulate closers prior to final acceptance of project.
- K. Kick plates: Screw on push side of doors, unless otherwise indicated on the Drawings.
- L. Gasketing: Mount to provide complete contact between door and frame, finished floor, or both; and weathertight enclosure.

- M. Thresholds:
 - 1. Install immediately before inspection for Substantial Completion or protect from heavy traffic damage during construction.
 - 2. Cope to fit door frame profile and drill to suit required flush bolts and panic bolts.
 - 3. Unless indicated on the Drawings to be set in grout, set in double bead of sealant, tightly fit at jambs, and make waterproof.
 - 4. Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Section 07_92_00 - Joint Sealants.
 - 5. Fasten to concrete slab with 5/16-inch stainless steel flat head countersunk machine screws and concrete anchors at 8-inch centers.
- N. Silencers:
 - 1. Insert into predrilled holes in frames.
- O. Storage:
 - 1. Provide a secure lock up for hardware delivered to the project but not yet installed.
 - 2. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.03 DOOR HARDWARE SETS

- A. They are a guideline only and should not be considered a detailed hardware schedule.
- B. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.
- C. Quantities listed are for each pair of doors, or for each single door.
- D. The Supplier is responsible for handling and sizing all products.
- E. Where multiple options for a piece of hardware are given in a single line item, the Supplier shall provide the appropriate application for the opening.
- F. Provide a list of Manufacturer's Abbreviations.

3.04 CONSTRUCTION KEYING

- A. Insert construction cores in cylinders of exterior doors, and doors requiring security and access for workman, unless otherwise directed by the Engineer.

3.05 ADJUSTING

- A. Examine hardware in place for complete and proper installation. Lubricate bearing surfaces for proper function.
- B. Replace, rework or otherwise correct defective door hardware, including incorrect hand or function.

3.06 CLEANING

- A. Remove protective materials and devices and thoroughly clean exposed surfaces of hardware.
- B. Check for surface damage prior to final cleaning for acceptance of project.

3.07 PERMANENT KEYING

- A. Insert permanent cylinders with cores.
- B. Inspect each lockset to ensure permanent cylinders with cores are operating satisfactorily.
- C. Test keys for proper conformance with keying system.

3.08 HARDWARE SCHEDULE

- A. Locksets:
 - 1. L-1: Sargent, cylinder only, for associated device.
- B. Hinges:
 - 1. H-1: Stanley, FBB 199 NRP, US32D.
 - 2. H-2: Stanley, FBB 199 US32D.
- C. Closers:
 - 1. C-1: Sargent, EN-351, parallel arm, EDA.
- D. Thresholds:
 - 1. T-1: Pemko, 170A.
- E. Weatherstripping:
 - 1. W-1: Pemko, 303AS.
 - 2. W-2: By Coiling Door manufacturer.
- F. Silencers:
 - 1. Q-1: Ives, SR64, grey.
- G. Flush bolts:
 - 1. B-1: Ives, FB358, manual type, with dustproof strike, US26D (inactive leaf only).
- H. Rain drip:
 - 1. R-1: Pemko, P346C.
- I. Astragals:
 - 1. A-1: By Door manufacturer.
- J. Door bottoms:
 - 1. D-1: Pemko, 216AV.
 - 2. D-2: By Coiling Door manufacturer.

- K. Exit devices
 - 1. E-1: Von Duprin, 9875L, mortised type, US26D (active leaf only at pairs).
- L. Stops:
 - 1. S-1: Ives, FS18L floor stop or WS401 wall stop, US26D, to suit field conditions.

END OF SECTION

SECTION 08_80_00

GLAZING

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Glass and glazing.

1.02 REFERENCES

- A. American National Standards Institute (ANSI):
 - 1. Z97.1 - Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.
- B. ASTM International (ASTM):
 - 1. C1036 - Standard Specification for Flat Glass.
 - 2. C1048 - Standard Specification for Heat-Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass.
 - 3. E773 - Standard Test Method for Accelerated Weathering of Sealed Insulating Glass Units.
- C. Glass Association of North America (GANA):
 - 1. GANA Glazing Manual.
- D. Insulating Glass Certification Council (IGCC):
 - 1. Certified Products Directory.
- E. U.S. Consumer Product Safety Commission (CPSC):
 - 1. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials.

1.03 DEFINITIONS

- A. Full Height Windows: Windows meeting the following conditions:
 - 1. Lowest edge is less than 18 inches above floor.
 - 2. Area is greater than 9 square feet.
 - 3. Walking surface is on both sides either of which is within 36 inches of window.
 - 4. Window has no minimum 1-1/2-inch railing or mullion at from 24 to 36 inches above floor.

1.04 SUBMITTALS

- A. Product data.
- B. Shop drawings: Locations of glass types and typical glazing details.
- C. Samples: As follows:
 - 1. Glazing sealants, 2-inch long beads, for color selection.
 - 2. Glass, 1 square foot of each type specified.

- D. Certificates of compliance: Certification that tempered glass in accordance with ANSI Z97.1 and CPSC 16 CFR 1201.
- E. Manufacturer's Installation Instructions.

1.05 DESIGN AND PERFORMANCE CRITERIA

- A. Comply with the requirements of the building code specified in Section 01_41_00 - Regulatory Requirements.
- B. Provide glass and glazing that conforms to CPSC 16 CFR, Part 1201, and exit requirements of the building code.
- C. Design and fabricate glazing for resistance to the following loads, as specified in Section 01_81_50 - Design Criteria:
 - 1. Seismic loading.
 - 2. Wind loading, based on the requirements for "components and cladding."

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle materials in manner to prevent damage.
- B. Deliver and store packaged materials in original containers bearing manufacturer's name.
- C. Deliver glass affixed with manufacturer's labels showing strength, grade, thickness, type and quality of glass, and for insulating glass, IGCC certification label.
- D. Remove labels after installation, inspection, and final acceptance.

1.07 PROJECT CONDITIONS

- A. Perform glazing when ambient air temperature is 40 degrees Fahrenheit or above.

PART 2 PRODUCTS

2.01 GLASS

- A. Clear monolithic: ASTM C1036, Type I, Class 1, Quality q3; minimum 1/4-inch thick.
 - 1. Manufacturers: One of the following or equal:
 - a. PPG Industries, Inc.
 - b. Guardian Industries Corp., Sunguard, Clear.
- B. Tinted monolithic: ASTM C1036, Type I, Class 2, Quality q3; tinted light bronze; minimum 1/4-inch thick:
 - 1. Manufacturers: One of the following or equal:
 - a. PPG Industries, Inc., Solarbronze.
 - b. Guardian Industries Corp., Sunguard, bronze.

- C. Tempered: ASTM C1048, Kind FT, Condition A, Type I, Class 1 or Class 2 as scheduled below, Quality q3; tempered without visible tong marks when installed; minimum 1/4-inch thick:
 - 1. Manufacturers: One of the following or equal:
 - a. PPG Industries, Inc., Herculite.
 - b. Guardian Industries Corp., equivalent product.
- D. Insulating glass units: IGCC Rating Level CBA when tested in accordance with ASTM E773 and E774; hermetically sealed units consisting of minimum 1/4-inch thick, tinted exterior light, minimum 1/4-inch thick, clear interior light, and 1/2-inch wide air space, dehydrated with blended molecular sieve and silica gel desiccant, with metal spacer channel with bent corners and welded splice on 1 vertical side, and polyisobutylene primary and silicone secondary seals.
 - 1. Manufacturers: One of The following or equal:
 - a. PPG Industries, Inc., Twindow.
 - b. Guardian Industries Corp., equivalent product.
- E. Wired monolithic: ASTM C1036, Type II, Class 1, Form 1, Quality q8, Mesh m2; minimum 1/4-inch thick.

2.02 GLAZING MATERIALS

- A. Setting blocks: Neoprene, 80 to 90 durometer.
- B. Spacer blocks: 30 to 40 durometer, thickness equal or greater than insulated window thickness by minimum 6 inches long.
- C. Pressure tape: Butyl rubber tape:
 - 1. Manufacturers: One of the following or equal:
 - a. Tremco Mfg. Co., Tremco 440 Tape.
 - b. 3-M Co., Weatherban 5422.
- D. Sealant: Silicone:
 - 1. Manufacturers: One of the following or equal:
 - a. General Electric Co., Silicone Construction Sealant Series SCS-1200.
 - b. Dow Corning Corp., 999-A, Silicone Building and Glazing Sealant.

2.03 SOURCE QUALITY CONTROL

- A. Allowable bow and warp tolerances: As measured with glass resting on edge upon two 1 inch wide supports:
 - 1. Typical: Maximum 1/8 inch in 48 inches.
 - 2. Tempered glass: Maximum allowed in accordance with ASTM C1048.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine openings to receive glass for defects that would affect glass and glazing work.

- B. Verify removal of rivets, screws, bolts, welding fillets, or other projections from clearances in glazing rabbets.

3.02 PREPARATION

- A. Examine frames receiving glass and ensure surfaces are clean and dry.
- B. Remove dust and oil from glass by wiping clean immediately before installation.
- C. Verify that sealants are compatible with glazing materials.

3.03 INSTALLATION OF MONOLITHIC GLASS

- A. In accordance with GANA Glazing Manual, manufacturer's instructions, and accepted shop drawings by the Engineer.
- B. Glaze doors in closed position after hanging and adjustment.
- C. Accurately size and cut glass clean for each glazing condition:
 - 1. Do not nip edges.
- D. Cut and set glass to full fit and play consistent with expansion and contraction requirements and at exterior for absolute security under maximum high velocity wind and vacuum stresses.
- E. Maintain edge clearance at least equal to glass thickness from perimeter of glass to inside of rabbet.
- F. Maintain 1/8-inch clearance between faces of glass and adjacent stop or bead.
- G. Maintain minimum bite of 3/8 inch.
- H. Set glass as required to ensure against optical distortion.

3.04 INSTALLATION OF INSULATED GLASS UNITS

- A. In accordance with GANA Glazing Manual, manufacturer's instructions, and accepted shop drawings by the Engineer.
- B. Use wet and dry glazing method.
- C. Cut glazing tape to length and set against permanent stops to project 1/16 inch above sight line.
- D. Place setting blocks at quarter points and no closer than 6 inches from corners.
- E. Rest glazing on setting blocks and push against tape for full contact at perimeter of unit.
- F. Place glazing gasket.
- G. Install removable stop with concealed leg notched to accommodate setting blocks.

- H. Align top of gasket with stops.

3.05 INSTALLATION OF GASKETS

- A. Gaskets: Install in accordance with manufacturer's instructions.
- B. Glazing of interior metal frames: Use pressure or foamed tape and sealant as indicated as required to eliminate rattle and reduce sound transmission.

3.06 SEALANT APPLICATION

- A. As specified in Section 07_92_00 - Joint Sealants, unless specifically noted otherwise.
- B. Ensure protective coatings have been removed from aluminum surfaces.
- C. Where setting blocks and spacer shims are required to be set in sealant, butter with sealant, place into position, and allow to set prior to installation of glass.
- D. Neatly tool sealant or compound joints to compress material and improve adhesion. Repair or replace pockets exposed by tooling.

3.07 CLEANING

- A. After inspection by Engineer, remove labels and marks from glass in accordance with manufacturer's published recommendations.
- B. Clean glass and surrounding surfaces from spatter and blemishes resulting from glazing operations.
- C. Clean and polish glass inside and outside.
- D. Clean glass with a soft, clean, grit-free cloth and mild soap, detergent, or slightly acidic cleaning solution:
 - 1. Immediately rinse with clean water and remove excess rinse water with a clean squeegee.
 - 2. Do not use an abrasive cleaner.
- E. Remove grease and miscellaneous glazing materials with commercial solvent. Follow with normal wash and rinse.
 - 1. Be careful not to damage joint sealers.

3.08 GLASS AND LOCATION SCHEDULE

- A. Exterior locations: Glass as follows, unless otherwise scheduled or indicated on the Drawings:
 - 1. Typical: Insulating, tinted.
 - 2. Non-fire-rated doors: Tinted and tempered.
 - 3. Fire-rated doors: Wired.
 - 4. Fire-rated windows: Wired.
 - 5. Entrance doors: Tempered and tinted.
 - 6. Windows within 48 inches of doors: Insulating, tinted, and tempered.

7. Full height windows: Insulating, tinted, and tempered.
- B. Interior locations: Glass as follows, unless otherwise scheduled or indicated on the Drawings:
1. Typical: Clear, non-tempered.
 2. Non-fire-rated doors: Clear and tempered.
 3. Fire-rated doors: Wired.
 4. Fire-rated windows: Wired.
 5. Windows within 48 inches of doors: Clear and tempered.
 6. Full-height windows: Clear and tempered.

END OF SECTION

SECTION 08_91_00

LOUVERS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: stationary louvers.

1.02 REFERENCES

- A. Air Movement and Control Association International, Inc. (AMCA):
 - 1. 500-L - Laboratory Methods of Testing Louvers for Rating.
 - 2. 500-D - Laboratory Methods of Testing Dampers for Rating.
 - 3. 511 - Certified Ratings Program - Product Rating Manual for Air Control Devices.
- B. ASTM International (ASTM):
 - 1. D4385 – Standard Practice for Classifying Visual Defects in Thermosetting Reinforced Plastic Pultruded Products.
- C. Underwriters Laboratories, Inc. (UL).

1.03 SUBMITTALS

- A. As specified in Section 46_05_10 - Common Work Results for Mechanical Equipment.

1.04 QUALITY ASSURANCE

- A. Provide louvers with the following, unless otherwise specified:
 - 1. AMCA certification and rating in accordance with AMCA 511 for air performance and water penetration.

PART 2 PRODUCTS

2.01 GENERAL

- A. Louver types: As indicated on the Drawings:
 - 1. Identify individual louver size and airflow rates.
- B. Accessories:
 - 1. Provide installation clips and flanged or jamb-mounting styles suitable for the mounting locations.
 - 2. As indicated on the Drawings.
 - 3. Provide extended sills for louvers indicated as installed recessed from the exterior wall surface.
 - 4. Provide stainless steel fasteners unless noted otherwise.

5. Corrosion protection.
 6. Provide gravity damper for all outside air intake and exhaust louvers unless noted otherwise.
- C. Protective coatings for aluminum in contact with concrete or masonry:
1. Manufacturers: One of the following or equal:
 - a. Koppers Co., Inc.
 - b. Tarmastic 100.
 - c. Porter Coatings.

2.02 DESIGN AND PERFORMANCE REQUIREMENTS

- A. Performance: In accordance with AMCA 511 when tested in accordance with AMCA 500.
- B. Designed for 20 pounds per square foot wind load.
- C. Louvers for severe windstorm applications:
1. Louvers shall resist the cyclic pressures, static pressures, and missile impact loads in accordance with:
 - a. Requirements for wind-borne debris regions:
 - 1) ASTM E330.
 - 2) ASTM E1886.

2.03 STATIONARY WEATHER LOUVERS, TYPE L-1

- A. Manufacturers: One of the following or equal:
1. Greenheck. Model, ESD-635.
 2. Ruskin.
 3. Airolite Co.
- B. Requirements:
1. Type: Stationary louver with drainable blades.
 2. Frame: 6 inches deep, minimum 0.125-inch thick, Type 6063-T5 aluminum with downspouts and caulking channel provided.
 3. Blades: Minimum 0.125-inch thick, Type 6063-T5 aluminum drainable blades spaced at 6-inch centers, stationary mounted at 37 degrees.
 4. Screens: Removable aluminum frame with aluminum wire; insect screens on intakes and bird screens on exhausts.
 5. Pressure drop (without screen): Maximum 0.15-inch water column for exhaust service and 0.15-inch water column for intake service at 1,000 feet per minute free area velocity.
 6. Water penetration: Maximum 0.01-ounce water per square foot at 1,027 feet per minute free area velocity.
 7. Mullions: Hidden.
 8. Finish: Kynar finish; color as selected.

PART 3 EXECUTION

3.01 INSTALLATION

- A. As specified in Section 46_05_10 - Common Work Results for Mechanical Equipment.

END OF SECTION

SECTION 09_22_17

NON-LOAD BEARING WALL FRAMING

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Light gauge, screwable type, non-load bearing, metal framing systems for interior walls and partitions.

1.02 REFERENCES

- A. ASTM International (ASTM):
 1. A653- Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanized) by the Hot-Dip Process.
 2. C645 - Standard Specification for Nonstructural Steel Framing Members.
 3. C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
 4. C954 - Standard Specification for Steel Drilled Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84mm) to 0.112 in. (2.84mm) in Thickness.
 5. C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.

1.03 SUBMITTAL

- A. Product data: Product data for all proposed material for framing system.

1.04 QUALITY ASSURANCE

- A. Keep copies of ASTM C754 on site.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store materials bearing manufacturers' labels indicating manufacturer and brand names.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Non-load bearing wall framing system:
 1. One of the following or equal:
 - a. National Gypsum Co.
 - b. United States Gypsum Co.
 - c. Western Metal Lath Co.

2.02 MATERIALS

- A. Studs: ASTM C645, hot-dip galvanized steel, minimum 20 gauge, 3-5/8 inches wide, channel shaped, punched for utility access.
- B. Runners, typical: ASTM C645, hot-dip galvanized steel, minimum 20 gauge, channel shaped unpunched web, minimum 1-1/4-inch legs, same widths as studs.
- C. Furring channels: ASTM C645, minimum 25 gauge hot-dip galvanized steel, roll formed into 7/8-inch deep by 2-3/4-inch wide hat shaped section.
- D. Bracing members: ASTM C645, hot-dip galvanized steel shapes.
- E. Resilient furring channels: Minimum 26 gauge galvanized steel, 1/2-inch deep.
- F. Anchor plates: ASTM A446, hot-dip galvanized steel, minimum 11 gauge by 4-inch wide by stud spacing with flanges adequate for fastening to stud webs.
- G. Fasteners:
 - 1. General: ASTM C1002, corrosion resistant, for attachment to metal framing 25 gauge and lighter; ASTM C954 for attachment to metal framing 20 gauge and heavier.
 - 2. Thread and head designs and lengths as recommended by manufacturer for uses and materials involved.
- H. Powder actuated fasteners: Type and size suitable for application and as specified in Section 05_12_00 - Structural Steel Framing.
- I. Sealant: Polyurethane, as specified in Section 07_92_00 - Joint Sealants.

PART 3 EXECUTION

3.01 PREPARATION

- A. Coordinate installation of bucks, anchors, blocking, and electrical and mechanical construction to be placed in or behind framing.
- B. Coordinate erection of system with requirements of door and window frame supports or attachments.

3.02 WALL FRAMING

- A. Install metal framing in accordance with ASTM C754.
- B. Cut framing members to fit squarely against abutting members. Align stud web openings for installation of utilities. Allow for minimum 1/4-inch clearance between top of stud and top runner web.
- C. Do not splice studs.
- D. Align runners to configurations indicated on the Drawings.

- E. Provide clearance under structural members to prevent stud deflection.
- F. Provide extended leg top runners when not possible to provide clearance under structural members:
 - 1. Drill 3/4-inch long vertical slots, slightly larger than fasteners, at stud locations.
- G. Place bead of sealant between runners and construction where water may penetrate.
- H. Anchor runners to structure at maximum 2 inches from ends and at maximum 24 inches on center.
- I. Anchor runners to:
 - 1. Concrete with powder actuated fasteners or concrete stub nails.
 - 2. Steel with bolts or by welding.
 - 3. Wood with screws penetrating into wood at least 1 inch or nails penetrating into wood at least 1-1/2 inches.
 - 4. Suspended ceiling grid with toggle or molly bolts.
- J. Anchor top runners not anchored directly to structure with brace runners at minimum 36 inches on center:
 - 1. Fasten brace runner to top runners at right angles to each other.
 - 2. Bend brace runner ends upward at 45-degree angles.
 - 3. Anchor brace runner ends to structural members.
- K. Place bed of sealant between studs and construction where water may penetrate.
- L. Seat studs squarely in track with stud webs and flanges abutting bottom runner webs.
- M. Install 2 studs at abutting construction and on each side of openings.
- N. Fit runners under and above openings:
 - 1. Secure cripples between sill and header, and bottom and top runners at minimum 16 inches on center, unless otherwise indicated on the Drawings.
- O. Install minimum 3 studs at metal framing corners.
- P. Space studs at 16 inches on center, unless otherwise indicated on the Drawings.
- Q. Fasten studs to runners tightly:
 - 1. Loosely fasten studs to extended leg runners through slotted holes.
- R. Fasten studs next to openings at framing intersections and at corners to typical runners with 2 screws on each side.
- S. Do not tie framing components together with wire.
- T. Make framing system with bracing members.

- U. Fasten anchor plates to stud webs where required to support wall-mounted accessories, fixtures, or hardware:
 - 1. Align surfaces of anchor plates flush with stud flanges.
- V. Special techniques:
 - 1. Framing components may be fabricated into panels prior to erection.
 - 2. Brace panels with additional bracing members to prevent racking.
 - 3. Prevent local member distortion when handling panels.

3.03 FURRING CHANNEL INSTALLATION

- A. Space furring channels at maximum 24 inches on center.
- B. Nest end splices with minimum 8-inch overlaps:
 - 1. Secure with 2 fasteners.
- C. Attach channels at maximum 24 inches on center through alternate flanges.

3.04 TOLERANCES

- A. Vertical alignment of studs: Within 1/8 inch in 10 feet.
- B. Horizontal alignment of walls: Within 1/8 inch in 10 feet.
- C. Stud spacing: Within 1/8 inch, provided that cumulative error does not exceed requirements of finish materials.
- D. Squareness of prefabricated panels: Within 1/8 inch within length of panel.

END OF SECTION

SECTION 09_29_00

GYPSUM BOARD

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Gypsum board and associated accessories.

1.02 REFERENCES

- A. ASTM International (ASTM):
 - 1. C475 - Standard Specification for Joint compounds and Joint Tape for Finishing Gypsum Board.
 - 2. C514 - Standard Specification for Nails for the Application of Gypsum Wallboard.
 - 3. C557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard in Wood Framing.
 - 4. C840 - Standard Specification for Application and Finishing of Gypsum Board.
 - 5. C919 - Standard Practice for Use of Sealants in Acoustical Applications.
 - 6. C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Based to Wood Studs or Steel Studs.
 - 7. C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
 - 8. C1396 - Standard Specification for Gypsum Board.
 - 9. E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- B. Gypsum Association:
 - 1. GA 216 - Application and Finishing of Gypsum Board.
- C. Underwriters Laboratories, Inc. (UL).

1.03 SUBMITTALS

- A. Product Data: Include manufacturer's instructions for sealing openings, penetrations, and cut edges of water-resistant gypsum board.
- B. Samples: Include texture samples on minimum 6 inch square specified materials.

1.04 QUALITY ASSURANCE

- A. Manufacturer qualifications: Provide gypsum board products from single manufacturer or from manufacturers recommended by manufacturer of gypsum board.
- B. Regulatory requirements: When indicated, provide UL listed and labeled fire-rated components or by other recognized rating service.

- C. Pre-installation conference: Convene with affected entities to review coordination and sequencing of construction to ensure that everything that will be concealed by gypsum board has been installed, and that chases, openings, supplementary framing and blocking have been completed.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Store gypsum board under cover, stacked flat, off floor.
- B. Store adhesives in dry place, protected against freezing.

1.06 ENVIRONMENTAL REQUIREMENTS

- A. Maintain uniform room temperature between 55 and 70 degrees Fahrenheit in cold weather during application of wallboard and joint treatment until joint treatment is completely dry or building is occupied.
- B. Provide adequate ventilation.

PART 2 PRODUCTS

2.01 GYPSUM BOARD

- A. Regular board:
 - 1. ASTM C1396; 5/8 inches thick; tapered edge; Type X where required for fire rating.
- B. Moisture resistant board:
 - 1. ASTM C1396; 5/8 inches thick; tapered edge; Type X where required for fire rating.
- C. Insulating gypsum board: Gypsum board as specified with aluminum foil on back surface; ends square cut; tapered edges.

2.02 ACCESSORIES

- A. Square corner bead reinforcement:
 - 1. Manufacturers: One of the following or equal:
 - a. USG, Dur-A-Bead.
 - b. Gold Bond National Gypsum Co., Wallboard corner bead with 1-1/4 inch flanges.
- B. Metal casing bead:
 - 1. Manufacturers: One of the following or equal:
 - a. USG, No. 200A Metal Trim.
 - b. Gold Bond National Gypsum Co., No. 100 wall board casing.
- C. Control joints:
 - 1. Manufacturers: One of the following or equal:
 - a. USF, No. 093.
 - b. Gold Bond National Gypsum Co., 0.093 zinc control joint.

2.03 FASTENERS

- A. Screws for metal studs: ASTM C1002, Type S; self-drilling, self-tapping, bugle head, for use with power driven tool, minimum 1-1/4 inches long or length to suit application.
- B. Screws for wood framing: ASTM C1002, Type W, minimum 1-1/4 inches.
- C. Nails: ASTM C514; minimum 1-1/4 inch long, 12-1/2 gauge, 1/4 inch diameter head.
- D. Staples:
 - 1. Manufacturers: The following or equal:
 - a. Bostitch, Type G; 1/2 inch.

2.04 LAMINATING ADHESIVES

- A. Gypsum board to metal framing:
 - 1. Manufacturers: One of the following or equal:
 - a. USG, Durabond® 200 or 300.
 - b. Gold Bond National Gypsum Co., Sta-Smooth setting type compound.
- B. Gypsum board to gypsum board:
 - 1. Manufacturers: One of the following or equal:
 - a. USG, Durabond® 600.
 - b. Gold Bond National Gypsum Co., Gypsum board laminating adhesive.

2.05 ACOUSTICAL SEALANT

- A. Type: ASTM C919; Architecture Sealant:
 - 1. Manufacturers: The following or equal:
 - a. USG.

2.06 FINISHING MATERIALS

- A. Moisture or water resistant sealant:
 - 1. Manufacturers: One of the following or equal:
 - a. USG, Sheetrock W/R Sealant.
 - b. Gold Bond National Gypsum Co.
- B. Joint compound and tape: ASTM C475:
 - 1. Manufacturers: One of the following or equal:
 - a. USG, Sheetrock joint system consisting of Sheetrock Reinforcement Tape and Sheetrock All Purpose Ready Mixed Compound for embedding, fill, and finishing.
 - b. Gold Bond National Gypsum Co., Sta-Smooth HS tape and Sta-Smooth joint compound.
- C. Texturing compound for walls:
 - 1. Manufacturers: One of the following or equal:
 - a. USG, Spray Texture Finish.
 - b. Gold Bond National Gypsum Co., Perfect Spray EM, orange peel finish.

- D. Texturing compound for exterior ceilings:
 - 1. Manufacturers: The following or equal.
 - a. USG, Duracal® Exterior Spray Texture Finish.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install gypsum board systems in accordance with ASTM C840 and GA 216.

3.02 GYPSUM BOARD INSTALLATION ON WALLS

- A. Cut gypsum wallboard by scoring and breaking or by sawing, working from face side.
- B. Use boards of maximum practical length to minimize end joints.
- C. Apply board with long dimension at right angles to framing or furring members with ends on studs. Attach upper boards first.
- D. Bring boards into contact with each other but do not force into place.
- E. Do not place butt ends against tapered edges.
- F. Stagger end joints. Locate joint on opposite sides of partition on different studs.
- G. Do not align joints with edges of openings, except for control joints. Cut board neatly to fit around openings. Locate joints at least 8 inches from openings. Center vertical end joints above openings.
- H. Extend board to within 1/4 inch of floor.
- I. Install fasteners proceeding from center portion of gypsum board toward edges and ends.
- J. On non-fire rated walls, screw board to framing at maximum 12 inches on center in field of board at bearings and along abutting edges. Nail board to framing at maximum 8 inches on center in field at bearings and along edges.
- K. On fire rated walls, nail or screw board to framing at maximum 8 inches on center in field of board at bearings and along edges, unless indicated otherwise by UL assembly requirements.
- L. Drive fasteners home with maximum 1/32 inch dimple in wall surface. Avoid breaking face paper of wallboard. Remove improperly driven nails.
- M. Thoroughly seal openings, penetrations and cut edges of water-resistant wallboard in accordance with manufacturer's recommendations.

- N. Double stud partitions:
 - 1. Install strips of gypsum board 12 inches wide and of length to span partition depth by screwing to webs of opposing studs.
 - 2. Space strips approximately 42 inches on center.
- O. Double layer partitions:
 - 1. Install first layer vertically then second layer horizontally.
 - 2. Stagger joints between layers and on opposite sides as far as is practical.
- P. Sound control partitions:
 - 1. Apply full running beads of acoustical sealant at perimeter of sound control partitions.
 - 2. Apply acoustical sealant with air operated equipment.
 - 3. Inspect joints to receive sealant to be sure they are clean, dry and free of dust, dirt and other foreign matter.
 - 4. Seal around light boxes, outlets, and switches, with continuous bead of sealant.
 - 5. Remove excess of sealant or smears as construction progresses.
- Q. Perimeter relief where non-load bearing gypsum board partitions abut structural decks or ceilings or vertical structural elements:
 - 1. Allow not less than 1/4 inch, nor more than 1/2 inch gap between gypsum board and structure.
 - 2. Finish edges of board face layer with metal casing bead and caulk space between casing bead and structure with continuous sealant bead.
 - 3. Attach board to studs not less than 1/2 inch below bottom edge of ceiling track flanges and to first stud adjacent to vertical tracks. Do not attach boards directly to tracks.

3.03 ADHERING GYPSUM BOARD TO MASONRY

- A. Apply 1-1/2 inch diameter by 1 inch high daubs of adhesive at 6 inch on center along edges and at 12 inch on center each way on field of gypsum board.
- B. Position boards vertically and 1/4 inch above floor.
- C. Press boards on masonry walls within 10 minutes after applying adhesive. Apply firm hand pressure over entire board to flatten daubs of adhesive to level board.
- D. Drive masonry nails through wood blocks at top and bottom of each panel to temporarily secure gypsum board. Remove nails and wood blocks when adhesive has set.

3.04 GYPSUM BOARD INSTALLATION ON SUSPENDED CEILINGS

- A. Attach board to suspension system in accordance with manufacturer's instructions with:
 - 1. Screws at 8 inches on center to furring runners, furring ties, cross ties and wall track.
 - 2. Long dimension paralleling furring runners.
 - 3. Joints staggered.

- B. Loading of suspension component may not cause deflection of more than 1/360 of span.

3.05 GYPSUM BOARD INSTALLATION ON FRAMED OR FURRED CEILINGS

- A. Apply board with long dimension at right angles to framing or furring members with abutting ends and edges occurring over flanges.
- B. Use board to maximum practical length to minimize end joints.
- C. Cut gypsum board neatly to fit around openings.
- D. Neatly fit a stagger end joints.
- E. Nail field of boards at bearing, and along abutting edges at maximum 7 inches on center. Drive nails up to form slight dimple in board.
- F. Screw field of boards, at bearings, and along abutting edges at maximum of 8-inches on center.

3.06 EXTERIOR SOFFIT

- A. Install exterior board at right angles to supports, with end joint staggered over supports.
- B. Install exterior board with 1/4 inch open space where boards abut other construction.
- C. Install exterior board with 1/16 to 1/8 inch space between butt ends of boards.
- D. Fasten to supports screws at 12 inches on center or nails at 8 inches on center.

3.07 INSTALLATION OF CASING AND CORNER BEADS

- A. Install casing beads wherever board terminates against dissimilar materials or where edges of board are exposed. Provide:
 - 1. Type with face flange to receive joint compound except where semi-finishing is indicated.
 - 2. L-type trim where gypsum board is tightly abutted to other construction.
 - 3. Special kerf-type where other construction is kerfed to receive long leg of L-type trim.
 - 4. U-type trim where edge is exposed, revealed, gasketed, or sealant filled, including expansion joints.
- B. Install metal corner bead reinforcement at outside corners.
- C. Where board partitions intersect masonry walls:
 - 1. Provide control joints no less than 1/4 inch nor more than 3/8 inch wide between board and masonry.
 - 2. Finish exposed edges of board with square-nose metal casing bead and caulk space between casing bead and masonry with continuous sealant.

- D. Secure corner beads with same fasteners used for applying wallboard, spaced 8 inches maximum apart on each flange of bead with nails opposite.

3.08 INSTALLATION OF CONTROL JOINTS

- A. Discontinue gypsum board at control joints.
- B. In ceiling construction, discontinue gypsum board and framing at control joints.
- C. In partitions, discontinue gypsum board and install framing studs on each side of control joints.
- D. Position control joints to intersect light fixtures, air diffusers, door openings and other areas of stress concentration.
- E. Isolate gypsum board construction at following locations:
 - 1. Where partitions or ceilings of dissimilar construction meet and remain in same plane.
 - 2. Where wings of "L," "U," and "T" shaped ceiling areas are joined.
 - 3. When expansion or control joints occur in base building construction.
- F. Space control joints at following maximum distances:
 - 1. Partitions: 30 feet in either direction.
 - 2. Interior ceilings with perimeter relief: 50 feet in either direction.
 - 3. Interior ceilings without perimeter relief: 30 feet in either direction.
 - 4. Exterior ceilings: 30 feet in either direction.
- G. Extend control joints to ceiling from both corners of door frames where control joints are required.
- H. Cut end joints square, align to provide neat fit.
- I. Staple control joint to board at maximum 6 inches on center in each flange.

3.09 JOINT COMPOUND

- A. Mix joint and topping compound in accordance with instructions on package.
- B. Apply thin layer of joint compound uniformly approximately 4 inches wide over each joint.
- C. Center tape over joint and embed into compound, leaving sufficient joint compound under tape to provide proper bond.
- D. Reinforce wall angles and inside corner angles with tape folded to conform to angle and embedded into compound.
- E. Apply skim coat of compound immediately after embedding tape.
- F. After compound is thoroughly dry, cover tape with coat of joint compound or topping compound. Spread over tape and approximately 3 inches beyond edges of tape. Feathered out edge.

- G. After compound is thoroughly dry, cover tape with coat of joint compound or topping compound. Spread over tape and approximately 3 inches beyond edges of previous coat. Feathered out edge.
- H. Coat inside corners with minimum of one coat of joint compound or topping compound with edges feathered out.
- I. Apply 3 coats of compound to nail and screw head dimples.
- J. Conceal flanges of wallboard corner beads with minimum of 2 coats of compound:
 - 1. Apply joint compound for first coat.
 - 2. Apply joint compound or topping compound for second coat:
 - a. Feathered out second coat approximately 9 inches on both sides of exposed metal nose of corner bead.
- K. Clean excess compound from board surface.
- L. Sand coats as necessary after each application of compound has dried:
 - 1. Leave board uniformly smooth ready to receive texturing, to extent that after painting, board shows no distinguishable difference in appearance between taped and untapped surfaces.

3.10 TEXTURING

- A. Verify that gypsum board surfaces have been primed in accordance with Section 09_91_00 - Painting.
- B. Clean surfaces of dust, dirt, and oil before application.
- C. Mix and apply specified materials in accordance with manufacturer's recommendation to produce texture similar to accepted sample.
- D. Apply sprayed knockdown texture to interior walls.
- E. Remove texture droppings or overspray from adjacent completed construction.

3.11 TOLERANCES

- A. Offsets between planes of board faces: Maximum 1/16 inch.
- B. Flatness: Maximum 1/8 inch in 96 inches.
- C. Variation from plumb: Maximum 1/8 inch in 96 inches.

END OF SECTION

SECTION 09_91_00

PAINTING

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Field applied paints and coatings for normal exposures.
 - 2. Painting Accessories.

1.02 DEFINITIONS

- A. Paints: Manufacturer's best ready-mixed coatings, except when field catalyzed, with fully ground pigments having soft paste consistency and capable of being readily and uniformly dispersed to complete homogeneous mixture, having good flowing and brushing properties, and capable of drying or curing free of streaks or sags.
- B. Volatile Organic Compound (VOC): Content of air polluting hydrocarbons in uncured coating product measured in units of grams per liter or pounds per gallon.

1.03 SUBMITTALS

- A. General: Submit as specified in Section 01_33_00 - Submittal Procedures.
- B. Shop drawings: Include schedule of where and for what use coating materials are proposed in accordance with requirements for Product Data.
- C. Product data: Include description of physical properties of coatings including solids content and ingredient analysis, VOC content, temperature resistance, typical exposures and limitations, and manufacturer's standard color chips.
- D. Samples: Include 8-inch square draw-downs or brush-outs of topcoat finish when requested. Identify each sample as to finish, formula, color name and number and sheen name and gloss units.
- E. Manufacturer's instructions: Submit in accordance with requirements for Product Data. Include:
 - 1. Special requirements for transportation and storage.
 - 2. Mixing instructions.
 - 3. Shelf life.
 - 4. Pot life of material.
 - 5. Precautions for applications free of defects.
 - 6. Surface preparation.
 - 7. Method of application.
 - 8. Recommended number of coats.
 - 9. Recommended thickness of each coat.
 - 10. Recommended total thickness.

11. Drying time of each coat, including prime coat.
12. Required prime coat.
13. Compatible and non-compatible prime coats.
14. Recommended thinners, when recommended.
15. Limits of ambient conditions during and after application.
16. Time allowed between coats.
17. Required protection from sun, wind and other conditions.
18. Touch-up requirements and limitations.

1.04 QUALITY ASSURANCE

- A. Products: First line or best grade.
- B. Materials for each paint system: By single manufacturer.
- C. Applicator qualifications: Applicator of products similar to specified products with minimum 3 years of experience.
- D. Regulatory requirements: Comply with by using paints that do not exceed governing agency's VOC limits or do not contain lead.
- E. Field samples:
 1. Paint 1 complete surface of each color scheme to show colors, finish texture, materials, and workmanship.
 2. Obtain approval before painting other surfaces.

1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products as specified in Section 01_60_00 - Product Requirements.
- B. Remove unspecified and unapproved paints from Project site immediately.
- C. Deliver containers with labels identifying:
 1. Manufacturer's name.
 2. Brand name.
 3. Product type.
 4. Batch number.
 5. Date of manufacturer.
 6. Expiration date or shelf life.
 7. Color.
 8. Mixing and reducing instructions.
- D. Store coatings in well-ventilated facility that provides protection from the sun weather, and fire hazards:
 1. Maintain ambient storage temperature between 45 and 90 degrees Fahrenheit, unless otherwise recommended by the manufacturer.
- E. Take precautions to prevent fire and spontaneous combustion.

1.06 ENVIRONMENTAL CONDITIONS

- A. Surface moisture contents: Do not paint surfaces that exceed manufacturer specified moisture contents, or when not specified by the manufacturer, the following moisture contents:
 - 1. Plaster and gypsum wallboard: 12 percent.
 - 2. Masonry, concrete and concrete block: 12 percent.
 - 3. Interior located wood: 15 percent.
 - 4. Concrete floors: 7 percent.
- B. Do not paint or coat:
 - 1. Under dusty conditions.
 - 2. When light on surfaces measures less than 15 foot-candles.
 - 3. When ambient or surface temperature is less than 50 degrees Fahrenheit or unless manufacturer allow a lower temperature.
 - 4. When relative humidity is higher than 85 percent, unless manufacturer allows a higher relative humidity.
 - 5. When surface temperature is less than 5 degrees Fahrenheit above dew point.
 - 6. When surface temperature exceeds the manufacturer's recommendation.
 - 7. When ambient temperature exceeds 90 degrees Fahrenheit, unless manufacturer allows a higher temperature.
 - 8. Apply clear finishes at minimum 65 degrees Fahrenheit.
- C. Provide fans, heating devices, or other means recommended by coating manufacturer to prevent formation of condensate or dew on surface of substrate, coating between coats and within curing time following application of last coat.
- D. Provide adequate continuous ventilation and sufficient heating facilities to maintain minimum 50 degrees Fahrenheit for 24 hours before, during and 48 hours after application of finishes.

1.07 PROTECTION

- A. Protect adjacent surfaces from paint and damage. Repair damage resulting from inadequate or unsuitable protection.
- B. Furnish sufficient drop cloths, shields, and protective equipment to prevent spray or droppings from fouling surfaces not being painted and in particular, surfaces within storage and preparation area.
- C. Place cotton waste, cloths, and material that may constitute fire hazard in closed metal containers and remove daily from site.
- D. Remove electrical plates, surface hardware, fittings and fastenings, prior to painting operations:
 - 1. Carefully store, clean and replace on completion of painting in each area.
 - 2. Do not use solvent or degreasers to clean hardware that may remove permanent lacquer finish.

1.08 EXTRA MATERIALS

- A. Extra materials: Deliver as specified in Section 01_77_00 - Closeout Procedures. Include minimum 1 gallon of each type and color of coating applied:
 - 1. When manufacturer packages material in gallon cans, deliver unopened labeled cans as comes from factory.
 - 2. When manufacturer does not package material in gallon cans, deliver material in new gallon containers, properly sealed and identified with typed labels indicating brand, type, and color.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Paints: One of the following or equal:
 - 1. Carboline: Carboline.
 - 2. PPG Paints/PMC.
 - 3. S/W: Sherwin-Williams Co.
 - 4. Tnemec: Tnemec Co.
- B. Submit requests for substitutions as specified in Section 01_60_00 - Product Requirements:
 - 1. Include certified ingredient analyses.
 - 2. Provide colors that match specified colors.

2.02 PRETREATMENT, PRIMERS, PRIMER-SEALERS, AND WOOD STAIN

- A. Aluminum primer:
 - 1. Manufacturers: One of following or equal:
 - a. Carboline Co.: Carbocrylic 120.
 - b. PPG: Pitt-Tech® Plus 4020 PF Interior/Exterior Primer/Finish, 4020PF.
 - c. Sherwin-Williams Co.: DTM Wash Primer.
- B. Concrete masonry filler/primer:
 - 1. Manufacturers: One of following or equal:
 - a. Carboline Co.: Sanitile 100.
 - b. PPG: Perma-Crete® Interior/Exterior Block & Masonry Surfacer/Filler, 4-100XI.
 - c. Sherwin-Williams Co.: HD Block Filler, B42W46.
 - d. Tnemec:
 - 1) Series 130, Envirofill.
 - 2) Series 180, Tneme-crete.
- C. Concrete, porous, filler/primer:
 - 1. Manufacturers: One of following or equal:
 - a. Carboline Co.: Sanitile 100.
 - b. PPG: Perma-Crete® Interior/Exterior Block & Masonry Surfacer/Filler, 4-100XI.
 - c. Sherwin-Williams Co.: HD Block Filler, B42W46.

- d. Tnemec:
 - 1) Series 130, Envirofill.
 - 2) Series 180, Tneme-crete.
- D. Concrete, smooth, filler/primer:
 - 1. Manufacturers: One of following or equal:
 - a. Carboline Co.: Sanitile 100.
 - b. Carboline Co.: Carbocrylic 120.
 - c. PPG:
 - 1) Perma-Crete® Interior/Exterior Block & Masonry Surfacers/Filler, 4-100XI.
 - 2) Seal Grip® Hydrosealer Exterior Bonding Primer/Sealer, 17-6001.
 - d. Sherwin-Williams Co.:
 - 1) HD Block Filler, B42W46.
 - 2) Epoxy Masonry Tilt Primer White B42WW49.
 - e. Tnemec: Series 180, Tneme-Crete.
- E. Ferrous metal primer:
 - 1. Manufacturers: One of following or equal:
 - a. Carboline Co.: Carboguard 890.
 - b. PPG: PITT-GUARD® Rapid-Coat Direct-to-Rust Epoxy Mastic Coating, 95-245 Series.
 - c. Sherwin-Williams Co.: Macropoxy 646.
 - d. Tnemec: Series 104.
- F. Galvanized metal surface pretreatment materials:
 - 1. Manufacturers: One of following or equal:
 - a. Carboline Co.: Surface Cleaner 3.
 - b. PPG: Duraprep® Concentrated Degreaser, Prep125.
- G. Galvanized metal surface primer:
 - 1. Manufacturers: One of following or equal:
 - a. Carboline Co.: Carboguard 890.
 - b. PPG: PITT-GUARD® Rapid-Coat Direct-to-Rust Epoxy Mastic Coating, 95-245 Series Sherwin-Williams Co.: Macropoxy 646.
 - c. Tnemec: Series 104.

2.03 PAINTS, INTERIOR EXPOSURE

- A. Latex, flat:
 - 1. Manufacturers: One of following or equal:
 - a. Carboline Co.: Carbocrylic 3359flat.
 - b. PPG:
 - 1) Speedhide® Zero Interior Flat, 6-5110 Series.
 - 2) Ultralast Interior Matte, 13-210 Series.
 - c. Sherwin-Williams Co.: Promar 200, B30W200.
- B. Latex, semi-gloss:
 - 1. Manufacturers: One of following or equal:
 - a. Carboline Co.: Carbocrylic 3359.

- b. PPG:
 - 1) Speedhide® Zero Interior Semi-Gloss, 6-5510 Series.
 - 2) Copper Armor Interior Latex Paint + Primer Semi-Gloss, 29-1510.
- c. Sherwin-Williams Co.: Promar 200, B77W3402D.

PART 3 EXECUTION

3.01 INSPECTION

- A. Thoroughly examine surfaces scheduled to be painted before starting work.
- B. Start painting when unsatisfactory conditions have been corrected.

3.02 SURFACE PREPARATION

- A. Prepare surfaces in accordance with paint manufacturer's instructions or when none, the following:
 - 1. Aluminum:
 - a. Remove surface contamination by steam, high-pressure water, or degreasers.
 - b. Abrade surface by abrasive blasting, power tool cleaning or hand tool cleaning.
 - c. Apply etching primer.
 - 2. Reinforced concrete panels:
 - a. Remove dirt, powdery residue, and foreign matter.
 - b. Paint immediately; both sides when applicable.
 - 3. Canvas and cotton insulation coverings: Remove dirt, grease, and oil.
 - 4. Concrete floors:
 - a. Remove contamination, abrasive blast or acid etch and rinse with clear water.
 - b. Ensure required acid-alkali balance is achieved. Allow to dry thoroughly.
 - 5. Copper for paint finish:
 - a. Remove contamination by steam, high-pressure water, or degreasers.
 - b. Abrade surface by abrasive blasting, power tool cleaning or hand tool cleaning.
 - c. Apply vinyl etch primer.
 - 6. Copper for oxidized finish:
 - a. Remove contamination.
 - b. Apply oxidizing solution of copper acetate and ammonium chloride in acetic acid.
 - c. Rub on repeatedly for correct effect.
 - d. Once attained rinse surfaces well with clear water and allow to dry.
 - 7. Gypsum wallboard:
 - a. Remove contamination and prime to show defects.
 - b. Repair and prime defects.
 - 8. Galvanized surfaces:
 - a. Remove surface contamination and oils and wash with degreasers.
 - b. Apply coat of etching type primer.
 - 9. Zinc coated surfaces: Remove surface contamination and oils and prepare for priming in accordance with metal manufacturer's recommendations.

10. Concrete and concrete masonry:
 - a. Remove dirt, loose mortar, scale, powder and other foreign matter.
 - b. Remove oil and grease with solution of tri-sodium phosphate.
 - c. Remove stains caused by weathering of corroding metals with solution of sodium metasilicate.
 - d. Rinse well and allow to thoroughly dry.
 - e. Spot prime exposed metal with alkyd primer.
11. Plaster:
 - a. Fill hairline cracks, small holes and imperfections with patching plaster.
 - b. Smooth off to match adjacent surfaces.
 - c. Wash and neutralize high alkali surfaces where they occur.
12. Unprimed steel and iron: Remove grease, rust, scale, dirt and dust by wire brushing, sandblasting or other necessary method.
13. Shop primed steel:
 - a. Sand and scrape to remove loose primer and rust.
 - b. Feather out edges to make touch-up patches inconspicuous.
 - c. Clean surfaces.
 - d. Prime bare steel surfaces.

3.03 APPLICATION

- A. Apply each coat at proper consistency.
- B. Tint each coat of paint slightly darker than preceding coat.
- C. Sand lightly between coats to achieve required finish.
- D. Do not apply finishes on surfaces that are not sufficiently dry.
- E. Allow each coat of finish to dry before following coat is applied, unless directed otherwise by manufacturer.
- F. Where clear finishes are required ensure tint fillers match wood:
 1. Work fillers well into grain before set.
 2. Wipe excess from surface.
- G. Backprime exterior woodwork, which is to receive paint finish, with exterior primer paint.
- H. Backprime interior woodwork, which is to receive paint or enamel finish, with enamel undercoat paint.
- I. Backprime interior and exterior woodwork, which is to receive stain or varnish finish, with gloss varnish reduced 25 percent with mineral spirits.
- J. Prime top and bottom edges of wood and metal doors with enamel undercoat when they are to be painted.
- K. Prime top and bottom edges of wood doors with gloss varnish when they are to receive stain or clear finish.

3.04 MECHANICAL AND ELECTRICAL EQUIPMENT

- A. Identify equipment, ducting, piping, and conduit in accordance with Related Sections.
- B. Remove grilles, covers, and access panels for mechanical and electrical system from location and paint separately.
- C. Finish paint primed equipment with color selected by the Engineer.
- D. Prime and paint insulated and bare pipes, conduits, boxes, insulated and bare ducts, hangers, brackets, collars, and supports, except where items are plated or covered with prefinished coating.
- E. Replace identification markings on mechanical or electrical equipment when painted over or spattered.
- F. Paint interior surfaces of air ducts, convector, and baseboard heating cabinets that are visible through grilles and louvers with 1 coat of flat black paint, to limit of sight line.
- G. Paint dampers exposed immediately behind louvers, grilles, convector, and baseboard cabinets to match face panels.
- H. Paint exposed conduit and electrical equipment occurring in finished areas with color and texture to match adjacent surfaces.
- I. Paint both sides and edges of plywood backboards for electrical equipment before installing backboards and mounting equipment on them.
- J. Color code equipment, piping, conduit, exposed ductwork, and apply color banding and identification, such as flow arrows, naming and numbering, in accordance with the Contract Documents.

3.05 SURFACES NOT REQUIRING FINISHING

- A. Stainless steel, brass, bronze, copper, Monel®, chromium, anodized aluminum: Specially finished articles such as porcelain enamel, plastic coated fabrics, and baked enamel.
- B. Finished products such as ceramic tile, windows, glass, brick, resilient flooring, acoustical tiles, board and metal tees; other architectural features, such as finish hardware, furnished in aluminum, bronze or plated ferrous metal, prefinished panels, or other items that are installed prefinished.
- C. Items completely finished at factory, such as preformed metal roof and wall panels, aluminum frames, toilet compartments, sound control panels, acoustical tiles, shower compartments, folding partition, and flagpole.

3.06 CLEANING

- A. As work proceeds and upon completion, promptly remove paint where spilled, splashed, or spattered.
- B. During progress of work, keep premises free from unnecessary accumulation of tools, equipment, surplus materials, and debris.
- C. Upon completion of work, leave premises neat and clean.

3.07 INTERIOR PAINT SCHEDULE

Gypsum board: 2 coats of following finish paints:

- 1. Latex, flat:
 - a. Ceilings.
- 2. Latex, semi-gloss:
 - a. Walls and partitions.

END OF SECTION

SECTION 09_96_01

HIGH-PERFORMANCE COATINGS

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ATTACHMENT A - SCHEDULE OF SURFACES TO BE COATED

ATTACHMENT B - COATING DETAIL SHEETS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Coatings, including coating systems, surface preparation, application requirements, and quality control requirements.

1.02 REFERENCES

- A. ASTM International (ASTM):
 - 1. D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications.
 - 2. D2200 - Standard Practice for Use of Pictorial Surface Preparation Standards and Guides for Painting Steel Surfaces.
 - 3. D3359 - Standard Test Methods for Rating Adhesion by Tape Test.
 - 4. D3960 - Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings.
 - 5. D4262 - Standard Test Method for pH of Chemically Cleaned or Etched Concrete Surfaces.
 - 6. D4263 - Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.
 - 7. D4285 - Standard Test Method for Indicating Oil or Water in Compressed Air.
 - 8. D4414 - Standard Practice for Measurement of Wet Film Thickness by Notch Gages.
 - 9. D4417 - Standard Test Methods for Field Measurement of Surface Profile of Blast-Cleaned Steel.
 - 10. D4541 - Standard Test Methods for Pull-Off Strength of Coatings Using Portable Adhesion Testers.
 - 11. D4787 - Standard Practice for Continuity Verification of Liquid or Sheet Linings Applied to Concrete Substrates.
 - 12. D5162 - Standard Practice for Discontinuity (Holiday) Testing of Nonconductive Protective Coating on Metallic Substrates.
 - 13. D7234 - Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers.
 - 14. E337 - Standard Test Method for Measuring Humidity with a Psychrometer (the Measurement of Wet- and Dry-Bulb Temperatures).
 - 15. F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
 - 16. F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using In-situ Probes.
- B. International Concrete Repair Institute (ICRI):
 - 1. 310.2 - Guideline for Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair.
- C. NACE International (NACE):
 - 1. SP0178 - Design, Fabrication, and Surface Finish Practices for Tanks and Vessels to Be Lined for Immersion Service.

2. SP0188 - Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates.
- D. National Association of Pipe Fabricators (NAPF):
1. 500-03 - Surface Preparation Standard for Ductile Iron Pipe and Fittings in Exposed Locations Receiving Special External Coatings and/or Special Internal Linings.
- E. NSF International (NSF):
1. 61 - Drinking Water System Components - Health Effects.
- F. Occupational Safety and Health Administration (OSHA).
- G. Society of Protective Coatings (SSPC):
1. Glossary - SSPC Protective Coatings Glossary.
 2. Guide 6 - Guide for Containing Surface Preparation Debris Generated during Paint Removal Operations.
 3. Guide 15 - Field Methods for Retrieval and Analysis of Soluble Salts on Steel and Other Nonporous Substrates.
 4. PA 1 - Shop, Field, and Maintenance Painting of Steel.
 5. PA 2 - Procedure for Determining Conformance to Dry Coating Thickness Requirements.
 6. PA 9 - Measurement of Dry Coating Thickness Using Ultrasonic Gages.
 7. QP 1 - Standard Procedure for Evaluating the Qualifications of Industrial/Marine Painting Contractors.
 8. SP 1 - Solvent Cleaning.
 9. SP 3 - Power Tool Cleaning.
 10. SP 5 - White Metal Blast Cleaning.
 11. SP 10 - Near-White Metal Blast Cleaning.
 12. SP 11 - Power Tools Cleaning to Bare Metal.
 13. SP 13 - Surface Preparation of Concrete.
 14. SP 16 - Brush-Off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals.
 15. SP COM - Surface Preparation Commentary.
 16. SP VIS 1 - Guide and Reference Photographs for Steel Surfaces Prepared by Dry Abrasive Blast Cleaning.
 17. SP WJ-1 - Waterjet Cleaning of Metals -- Clean to Bare Substrate.
 18. SP WJ-2 - Waterjet Cleaning of Metals -- Very Thorough Cleaning.
 19. SP WJ-3 - Waterjet Cleaning of Metals -- Thorough Cleaning.
 20. SP WJ-4 - Waterjet Cleaning of Metals -- Light Cleaning.

1.03 DEFINITIONS

- A. Definitions used in this Section are in accordance with definitions referenced in ASTM D16, ASTM D3960, and SSPC Glossary of Definitions.
- B. Specific definitions:
1. Abrasive: Material used for blast cleaning, such as sand, grit, or shot.
 2. Abrasive Blast Cleaning: Cleaning/surface preparation by abrasive propelled at high speed.
 3. Anchor Pattern: Profile or texture of prepared surface(s).

4. Biogenic Sulfide Corrosion: Corrosion caused by sulfuric acid formed when *Thiobacillus* bacteria metabolizes hydrogen sulfide.
5. Bug Holes: Small cavities resulting when air bubbles are entrapped in the surface of formed concrete during placement and consolidation.
6. System: Protective film with 1 or more coats applied in a predetermined order, including surface preparation and quality control requirements.
7. Coating/Paint/Lining Thickness: Total thickness of primer, intermediate, and/or finish coats after drying or curing.
8. Dew point: Temperature a given air/water vapor mixture starts to condense.
9. Drying Time: Time interval between application and material curing.
10. Dry to Recoat: Time interval between material application and its ability to receive the next coat.
11. Dry to Touch: Time interval between material application and its ability to tolerate a light ouch without coating damage.
12. Exposed Surface: Any indoor or outdoor surface not buried or encased.
13. Feather Edging: Reducing coating thickness at its edge to blend with existing surrounding coating.
14. Feathering: Tapering off a wet edge with a comparatively dry brush.
15. Ferrous: Cast iron, ductile iron, wrought iron, and all steel alloys except stainless steel.
16. Field Coat: Application of a surface coating system at the work site.
17. Finish Coat: Final coat in a paint system, including texture, color, smoothness of surface, and other properties affecting appearance.
18. Hold Point: A defined point, specified in this Section, at which work shall be halted for inspection.
19. Holiday: A discontinuity, skip, void, or pinhole in coating or coating system film that exposes the substrate.
20. Honeycomb: Segregated and porous surface of hardened concrete due to insufficient consolidation.
21. Hydroblast: High or ultra-high-pressure water jet surface preparation.
22. Incompatibility: One coating's inability to overlay another coating or surface as evidenced by bleeding, poor bonding, or lifting of old coating; inability of a coating to bond to a substrate.
23. Immersed/Immersion: A service condition in which substrate is submerged, is immediately above liquids, or is subject to frequent wetting, splashing, or washdown.
24. Laitance: A thin, weak, brittle layer of cement and aggregate fines on a concrete surface.
25. Mil: 0.001 inch.
26. Overspray: Dry spray, particularly paint bonded to an unintended surface.
27. Pinhole: A small diameter discontinuity in a coating or coating system film, created by offgassing from a void in a concrete or masonry substrate causing a void between coats or exposing the substrate. Usually caused by coating application while temperature is rising.
28. Pot Life: Time interval after components are mixed and coating can be satisfactorily applied.
29. Prime Coat: First full paint coat applied to a surface when using a multicoat system. Primers adhere to a new substrate, protect the substrate, and promote adhesion of subsequent coats of paint. The prime coat on metal surfaces is the first full coat and does not include solvent wash, grease emulsifiers, or other pretreatment applications.

30. Resurfacer/Resurfacing Material: A layer of cementitious and/or resin-based material used to fill or otherwise restore surface continuity to worn or damaged concrete surfaces.
31. Shelf Life: Maximum storage time a material may be stored without losing its usefulness.
32. Shop Coat: 1 or more coats applied in an off-site shop or plant before shipment to work site where field or finishing coat(s) are applied.
33. Spreading Rate: Area covered by a unit volume of paint at a specific thickness.
34. Stripe Coat: A separate brush coat of paint applied to all weld seams, pits, nuts/bolts/washers, and edges. This coat shall not be applied until previous coats have cured. Once applied, the coat shall be allowed to cure before subsequent coats are applied.
35. Tie Coat: An intermediate coat that bonds different types of paint material, improving succeeding coat adhesion.
36. Thick Film Coating System: A coating system applied with a minimum dry film thickness of 25 mils.
37. Touch-Up Painting: Application of paint on previously painted surfaces to repair marks, scratches, and deteriorated or damaged areas to restore the appearance and performance of the coating.
38. Water Blast: An alternative to air abrasive blast cleaning that can be used with or without abrasive injection. Water cleaning at pressures up to 5,000 pounds per square inch is called low-pressure water cleaning or power washing. High-pressure water cleaning uses water pressures between 5,000 and 10,000 pounds per square inch. Water jetting is water blasting with added abrasive at pressures between 10,000 and 25,000 pounds per square inch. Ultra-high-pressure water jetting is water blasting at pressures above 25,000 pounds per square inch.
39. Weld Splatter: Beads of non-structural weld metal that adhere to the surrounding surface, removed as part of surface preparation.

1.04 ABBREVIATIONS

- A. CSM - Coating System Manufacturer.
- B. CMU - Concrete Masonry Units.
- C. CSA - Coating System Applicator. Specialty subcontractor retained by the Contractor to install the coating systems specified in this Section.
- D. CTR - Coating System Manufacturer's Technical Representative.
- E. DFT - Dry-Film Thickness. Thickness of cured film, usually expressed in mils (0.001 inch).
- F. SSD - Surface Saturated Dry. Refers to concrete surface condition where the surface is saturated (damp) without the presence of standing water.
- G. TPC - Technical Practice Committee.
- H. VOC - Volatile Organic Compound. Portion of the coating that is a compound of carbon, is photochemically reactive, and evaporates during drying or curing;

expressed in grams per liter (g/l) or pounds per gallon (lb/gal). VOC is determined by EPA Method 24.

- I. WFT - Wet Film Thickness. Coating thickness as measured immediately after application. Usually expressed in mils (0.001 inch).

1.05 SUBMITTALS

- A. As specified in Section 01_33_00 - Submittal Procedures, submit the following:
 - 1. Schedule of proposed coating materials.
 - 2. Schedule of surfaces to be coated with each coating material.
 - 3. Dehumidification and heating plan.
 - 4. Product data:
 - a. Physical properties of coatings, including the following:
 - 1) Solids content.
 - 2) Ingredient analysis.
 - 3) VOC content.
 - 4) Temperature resistance.
 - 5) Typical exposures and limitations.
 - 6) Manufacturer's standard color chips.
 - b. Compliance with regulatory requirements:
 - 1) VOC limitations.
 - 2) Lead compounds and polychlorinated biphenyls.
 - 3) Abrasives and abrasive blast cleaning techniques and disposal.
 - 4) Methods for tenting blasting areas and methods to protect existing equipment from dust and debris.
 - 5) NSF certification of coatings for potable water supply systems.
 - c. CSM's current printed recommendations and product data sheets for coating systems, including:
 - 1) Surface preparation recommendations.
 - 2) Primer type.
 - 3) Maximum dry and wet-mil thickness per coat and number of coats:
 - a) Coating Coverage Worksheets.
 - 4) Minimum and maximum curing time between coats, including atmospheric conditions for each.
 - 5) Curing time before submergence in liquid.
 - 6) Thinner to be used for each coating.
 - 7) Ventilation requirements.
 - 8) Minimum and maximum atmospheric conditions during which the paint shall be applied.
 - 9) Allowable application methods.
 - 10) Maximum allowable substrate moisture content.
 - 11) Maximum shelf life.
 - 12) Requirements for transportation and storage.
 - 13) Mixing instructions.
 - 14) Shelf life.
 - 15) Material Pot life.
 - 16) Precautions for applications free of defects.
 - 17) Method of application.
 - 18) Drying time of each coat, including prime coat.
 - 19) Compatible prime coats.

- 20) Limits of ambient conditions during and after application.
- 21) Required protection from sun, wind, and other conditions.
- 22) Touch-up requirements and limitations.
- 23) Minimum adhesion of each system submitted in accordance with ASTM D4541 and ASTM D7234.
- d. Samples: Include 8-inch square drawdowns or brushouts of topcoat finish when requested. Identify each sample as to finish, formula, color name and number, sheen name, and gloss units.
- e. Affidavits signed by an officer of the CSM's corporation attesting to full compliance of each coating system component with current federal, state, and local air pollution control regulations and requirements.
- f. List of cleaning and thinner solutions allowed by the CSMs.
- g. Storage requirements, including temperature, humidity, and ventilation for Coating System Materials as recommended by the CSMs.
- h. Thick film coating systems (greater than 25 mils):
 - 1) CSM's detailed written instructions for coating system treatment and graphic details for coating system terminations in coated structures, including pipe penetrations, metal embedments, gate frames, and other terminations encountered.
 - 2) Include detail treatment for coating system at concrete joints.
 - 3) Manufacturer's Representative's (CTR) Field Reports.
- 5. Quality assurance submittals:
 - a. Quality assurance plan.
 - b. Qualifications of CSA, including:
 - 1) List of Similar Projects:
 - a) Name and address of project.
 - b) Year of installation.
 - c) Year placed in operation.
 - d) Point of contact: Name and phone number.
 - 2) Provide a minimum of 5 project references, each including contact name, address, and telephone number where similar coating work has been performed by their company in the past 5 years.
 - c. CSA Reports:
 - 1) Written daily quality control inspection reports.
 - d. CTR Reports:
 - 1) Reports on visits to project site to view and approve surface preparation of structures to be coated.
 - 2) Reports on visits to project site to observe and approve coating application procedures.
 - 3) Reports on visits to coating plants to observe and approve surface preparation and coating application on shop-coated items.

1.06 QUALITY ASSURANCE

- A. CSA qualifications:
 - 1. Minimum of 5 years of experience applying specified type or types of coatings under conditions similar to those of the Work:
 - a. Provide qualifications of applicator and references listing 5 similar projects completed in the past 5 years.
 - 2. SSPC-QP 1 certified.

3. Manufacturer-approved applicator when manufacturer has approved applicator program or when required in these specifications.
- B. CTR qualifications:
1. Certification, one of the following:
 - a. NACE Level 2 or 3 Certified Coating Inspector.
 - b. SSPC Level 3 Protective Coatings Inspector.
 2. Minimum of 5 years of experience evaluating application of manufacturer's coatings under conditions similar to those of the Work:
 - a. Provide CTR qualifications and references listing 5 similar projects completed in the past 5 years.
- C. Regulatory requirements: Comply with governing agencies' regulations by using coatings conforming to their VOC limits:
1. Lead-based coatings are not permitted.
 2. Do not use coal-tar epoxy in contact with drinking water or exposed to ultraviolet radiation.
- D. Pre-installation conference: Conduct as specified in Section 01_31_19 - Project Meetings:
1. Coordinate Hold Point schedule.
- E. Obtain approval before coating other surfaces. Use products by same manufacturer for prime coats, intermediate coats, and finish coats on same surface, unless specified otherwise.
- F. CSM services:
1. CSA shall arrange for CTR to attend pre-installation conferences.
 2. Visit the project site periodically to consult on and inspect specified surface preparation and application Hold Points.
 3. Visit coating plants to observe and approve surface preparation procedures and coating application of items to be shop primed and coated.
 4. CTR shall provide written inspection reports.
- G. Quality control requirements:
1. Contractor shall be responsible for the workmanship and quality of the coating system installation:
 - a. Inspections by Owner, Engineer, CSA, or CTR will not relieve or limit Contractor's responsibilities.
 2. Conform to this specification's requirements and the standards referenced in this Section. Changes in the coating system application requirements will be allowed only with the Engineer's written acceptance.
 3. Specially trained crews with experience applying the specified coating system coating are required for:
 - a. Coating application using plural component spray equipment or other specialty equipment.
 - b. Coating with specialty linings for severe service conditions, including floor coatings, and with linings for corrosive headspaces or secondary containment areas.

4. CTR shall specially train personnel for coating systems as specified in Attachment B - Coating Detail Sheets:
 - a. CSM shall approve personnel in writing applying the coating system.
5. Do not use contaminated, outdated, diluted materials, and/or materials from previously opened containers.
6. Identify inspection access points used by Owner's or Engineer's personnel.
7. Provide ventilation, ingress, egress, or other means as necessary for Owner's or Engineer's personnel to safely access the work areas.
8. Conduct and continually inspect work so the coating system is installed as specified. The CSM shall provide written directions to correct coating work not conforming to the specifications or is otherwise unacceptable.
9. Provide written daily reports summarizing test data, work progress, surfaces covered, ambient conditions, quality control inspection test findings, and other information pertinent to the coating system application:
 - a. Determine relative humidity in accordance with ASTM E337. Confirm other conditions, such as proper protective measures for surfaces not to be coated and safety requirements for personnel:
 - 1) Measure daily at shift's beginning and end and at intervals not to exceed 4 hours during the shift.
 - 2) Determine the acceptability of weather and/or environmental conditions within the structure in accordance with the CSM's requirements.
 - b. Monitoring surface preparation: Spot check cleanliness, surface profile, and surface pH testing at least 3 times daily. Check each surface at least once. In accordance with:
 - 1) ASTM D4262.
 - 2) ASTM D4263.
 - 3) ASTM D4417.
 - 4) ICRI 310.2 requirements.
 - 5) SSPC Surface Preparation Standards.
 - c. Confirm that compressed air used for surface preparation or blow-down cleaning is free of oil and moisture.
 - d. Monitor surface preparation daily at shift's beginning and end and at intervals not to exceed 4 hours during the shift.
 - e. Do not apply coatings when environmental conditions are outside of the CSM's published limits.
 - f. Monitoring coatings application: Continuously inspect, measure, and record the wet film thickness and general film quality (visual inspection) for runs, sags, pinholes, holidays, etc. during coating:
 - 1) Perform WFT measurements in accordance with ASTM D4414.
 - g. Post cure evaluation: Measure and inspect the overall dry film thickness on all surfaces. Conduct a DFT survey and perform adhesion testing, holiday detection, or cure testing as required in this Section and/or the CSM's written instructions. Perform all applicable tests in accordance with ASTM D4541, ASTM D4787, ASTM D5162, ASTM D7234, SSPC-PA 1, SSPC-PA 2, SSPC-PA 9, and other pertinent standards and recommended practices.

H. Inspection at Hold Points:

1. Conduct inspections at Hold Points during the coating system application and record the results.

2. Coordinate Hold Points with the Engineer so the Engineer can observe Contractor's inspections on a scheduled basis.
3. Provide the Engineer a minimum of 24 hours of notice before conducting Hold Point Inspections.
4. Hold Points shall be as follows:
 - a. Conditions before surface preparation: Before starting surface preparation, observe, record, and confirm that oil, grease, and/or soluble salts are gone from the surface.
 - b. Post surface preparation: After completing surface preparation, measure and inspect for cleanliness and proper surface profile as specified in this Section and in the CSM's written instructions.
 - c. Coatings application: At the beginning of any coating system application, measure, record, and confirm acceptability of surface and ambient air temperature and humidity. Inspect applicator's equipment for serviceability and suitability for coatings application.
 - d. Coatings application: At the beginning of coating system application, measure, record, and confirm acceptability of surface and ambient air temperature and humidity. Inspect applicator's equipment for serviceability and suitability for coatings application:
 - 1) Observe conditions during the Pre-application Meeting.

1.07 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products as specified in Section 01_60_00 - Product Requirements.
- B. Immediately remove unspecified and unapproved coatings from Project site.
- C. Deliver new labeled, unopened containers:
 1. Do not deliver materials after manufacturer's expiration date or over 12 months from manufacturing date, whichever is more stringent. Store materials in well-ventilated enclosed structures and protect from weather and excessive heat or cold in accordance with the CSM's recommendations:
 - a. Store flammable materials in accordance with federal, state, and local requirements.
 - b. Store rags and cleanup materials appropriately to prevent fire and spontaneous combustion.
 2. Store and dispose of hazardous waste in accordance with federal, state, and local requirements. This requirement specifically applies to waste solvents and coatings.
 3. Container labels shall show the following:
 - a. Brand name or product title.
 - b. CSM's batch number.
 - c. CSM's manufacture date.
 - d. CSM's name.
 - e. Generic material type.
 - f. Application and mixing instructions.
 - g. Hazardous material identification label.
 - h. Shelf life expiration date.
 - i. Color.
 - j. Mixing and reducing instructions.

4. Clearly mark containers to indicate safety hazards associated with the use of or exposure to materials.

1.08 PROJECT CONDITIONS

- A. Apply coatings to dry surfaces:
 1. Surface moisture: Comply with manufacturer's requirements or as specified in this Section.
- B. Do not apply coatings when the following conditions exist and when no damaging environmental conditions are forecasted for the time when the material will be vulnerable to such environmental damage. If such conditions exist, provide containment, covers, environmental controls, and other necessary measures:
 1. During rainy, misty, or damp weather, or to surfaces with frost or condensation.
 2. When the surface temperature is below 10 degrees Fahrenheit above the dew point.
 3. When ambient or surface temperature:
 - a. Is less than 55 degrees Fahrenheit unless manufacturer allows a lower temperature.
 - b. Is less than 65 degrees Fahrenheit for clear finishes, unless manufacturer allows a lower temperature.
 - c. Exceeds 90 degrees Fahrenheit, unless manufacturer allows a higher temperature.
 - d. Exceeds manufacturer's recommendation.
 4. When relative humidity is higher than 85 percent.
 5. Under dusty or adverse environmental conditions.
 6. When light on surfaces measures less than 15 foot-candles.
 7. When wind speed exceeds 15 miles per hour.
- C. Apply coating only under evaporation conditions rather than condensation:
 1. Use dehumidification equipment, fans, and/or heaters inside enclosed areas to maintain required atmospheric and surface temperature requirements for proper coating application and cure.
 2. Measure and record relative humidity and air and surface temperatures at the start and end of each shift to confirm proper humidity and temperature levels inside the work area:
 - a. Submit test results.
- D. Continuously ventilate, dehumidify, and heat enclosed spaces with high humidity during surface preparation, coating application, and curing:
 1. Maintain minimum air temperature of 55 degrees Fahrenheit and 10 degrees Fahrenheit above the dew point.
 2. Maintain dew point of at least 10 degrees Fahrenheit less than the temperature of the coldest part of the structure where work is performed.
 3. Reduce dew point temperature in conditioned space by at least 10 degrees Fahrenheit within 20 minutes.
 4. Seal work areas and maintain positive pressure per dehumidification equipment supplier's recommendations.

5. Maintain these conditions before, during, and after application to ensure proper adhesion and cure of coatings for no less than:
 - a. Entire curing period.
 - b. 8 hours after coating.
- E. Systems:
 1. Site electrical power availability as specified in Section 01_50_00 - Temporary Facilities and Controls.
 2. Internal combustion engine generators may be used:
 - a. Obtain required permits and provide air pollution and noise control devices on equipment as required by permitting agencies require.
 - b. Comply with state, federal, and local fire and explosion protection measures when locating and operating generator.
 - c. Locate engine generator outside hazardous classified areas per NFPA 820.
 - d. Provide daily fuel service for generator for duration of use.
 3. Dehumidification:
 - a. Provide desiccant or refrigeration drying.
 - b. Use only desiccant types with a rotary desiccant wheel capable of continuous operation.
 - c. Liquid, granular, or loose lithium chloride drying systems are not acceptable.
 4. Heating:
 - a. Use electric, indirect combustion, or steam coil.
 - b. Direct-fired combustion heaters are not acceptable heat sources during abrasive blasting, coating application, or coating cure.
 5. Filters:
 - a. Use a filtration system for dust removal designed to not interfere with dehumidification equipment's ability to control dew point and relative humidity inside the reservoir.
 - b. Do not allow air from the working area or dust filtration equipment to recirculate through their dehumidifier during coating application or when solvent vapors are present.
 6. Design and submittals:
 - a. Prepare and submit dehumidification and heating plan, including all equipment and operating procedures.
 - b. Suppliers of services and equipment shall have at least 3 years of experience in similar applications.

1.09 MAINTENANCE

- A. Provide table of products applied organized by surface type. List coating manufacturer, color, color formulation, distributor name, telephone number, and address.

1.10 CTR RESPONSIBILITIES

- A. General:
 1. Attend pre-installation conference.
 2. Perform onsite application training.
 3. Periodically inspect coating system application.

- B. Coating system installation training:
1. Provide a minimum of 8 hours of classroom and off-site training for application personnel and supervisory personnel in one of the following ways:
 - a. Train a minimum of 2 supervisory personnel and 2 application personnel.
 - b. Submit a letter from the CSM stating that CSM approves the supervisory and application personnel, listed by name and responsibility, and no additional training is required.
 2. CTR can train up to 14 application personnel and 3 supervisory personnel at a time.
 3. Minimum training requirements:
 - a. Explain in detail the mixing, application, curing, and termination requirements.
 - b. Provide hands-on demonstration of coating system mixing.
 - c. Explain in detail the ambient condition requirements for temperature and humidity.
 - d. Explain in detail the surface preparation requirements.
 - e. Explain in detail the re-coat times, cure times, and related ambient condition requirements.
 - f. Write a letter stating that training was satisfactorily completed by the personnel, listed by name and responsibility.
 4. Provide special training as specified in the Coating Detail Sheets.
- C. Coating system inspection:
1. CTR inspection is in addition to the CSA's inspection as specified in this Section.
 2. Be on-site to oversee:
 - a. Coating application at least once a week.
 - b. End of surface preparation.
 - c. During coating application.
 - d. Post-cure inspection.
 3. Routinely inspect and verify in writing that application personnel have successfully performed surface preparation, filler/surfacer application, coating system application, and Quality Control Inspection in accordance with this Section and to warrantable quality.
 4. Perform the following activities to confirm conformance with the specifications:
 - a. Inspect ambient conditions during coating system installation at Hold Points for conformance with the specified requirements.
 - b. Inspect each coated surface type and coating system applied to verify the following:
 - 1) Cleanliness.
 - 2) Surface pH for concrete substrates.
 - 3) Confirm surface preparation of substrates where coating system will terminate or will be applied for conformance to the specified application criteria.
 - c. Verify surface profile of substrates by completing the following:
 - 1) Inspect preparation and application of coating detail treatment at terminations, transitions, metal embedments in concrete, and joints and cracks in substrates.
 - 2) Inspect application of filler/surfacer materials for concrete and masonry substrates.
 - 3) Verify proper mixing of coating materials.

- 4) Inspect application of primers and finish coats, including wet and dry film thickness.
- 5) Inspect coating systems for proper cure times and conditions.
- d. Review adhesion testing of cured coating systems.
- e. Review coating system continuity testing.
- f. Inspect and record representative-localized repairs.
- g. Conduct final review of completed coating system installation.
- h. Prepare and submit site visit reports after each site visit to document that the coating work is in accordance with the CSM's Recommendations.

PART 2 PRODUCTS

2.01 DESIGN AND PERFORMANCE CRITERIA

- A. Coating materials shall be formulated for environments encountered in water and wastewater treatment processes.
- B. Coating materials that come in contact with water distributed as potable water shall be certified in accordance with NSF 61.

2.02 MATERIALS

- A. General:
 1. Product requirements as specified in Section 01_60_00 - Product Requirements.

2.03 COATING SYSTEMS IDENTIFICATION

- A. Naming Conventions: Coating Systems Identifications contain the elements defined in Table 1.

Table 1 Coating System Identification Elements						
First Element	-	Second Element	-	Third Element	-	Fourth Element (optional)
3 or 4 alpha characters		1-3 alpha characters		1 number		3 or 4 alpha characters
Coating Type		Substrate		System Number		Additional Substrate or Special Condition
Example: EPX	-	C	-	6	-	BSC

- 1) First element identifies the coating type using the following abbreviations:
 - a) ACR: Acrylic.
 - b) CTE: Coal tar epoxy.
 - c) ELA: Elastomeric acrylic.
 - d) EPU: Epoxy-polyurethane.
 - e) EPX: Epoxy.
 - f) POL: Polyurethane.
 - g) SIL: Silicone.
 - h) SILX: Siloxane or silane.
 - i) VE: Vinyl ester.

- 2) Second element identifies the substrate using the following abbreviations:
 - a) C: Concrete or masonry.
 - b) F: Concrete flooring.
 - c) FRP: Fiber-reinforced plastic.
 - d) GM: Galvanized metal.
 - e) M: Metal.
 - f) PVC: Polyvinyl chloride, chlorinated polyvinyl chloride.
- 3) Third element identifies the sequential system number:
 - a) For example, EPX-C-2 is the second standard epoxy coating system for concrete substrates.
- 4) Fourth element is optional and identifies the additional substrate or special condition with the following abbreviations:
 - a) PWS: Potable water service applications (NSF-61 approved).
 - b) BSC: Biogenic sulfide corrosion-resistant applications in wastewater.
 - c) BG: Below grade or buried.
 - d) OZ: Organic zinc primer, epoxy polyurethane system.
 - e) SC: Secondary containment.

2.04 PRODUCTS FOR COATING SYSTEMS

- A. Products: As specified in Attachment B - Coating Detail Sheets.
- B. Cleaning solvents:
 1. Requirements for solvent wash, solvent wipe, or cleaner used, including, but not limited to, those used for surface preparation in accordance with SSPC-SP 1:
 - a. Emulsifying type.
 - b. Containing no phosphates.
 - c. Biodegradable.
 - d. Does not damage zinc.
 - e. Compatible with the specified primer.
 - f. Complying with applicable air-quality control board requirements.
 2. Use clean white cloths and clean fluids in solvent cleaning.

PART 3 EXECUTION

3.01 GENERAL PROTECTION REQUIREMENTS

- A. Protect adjacent coated surfaces from coatings and damage associated with coating work. Repair damage resulting from inadequate or unsuitable protection.
- B. Use drop cloths and other coverings to protect adjacent surfaces not to be coated against spatter and droppings.
- C. Mask off surfaces of items not to be coated or remove items from area.
- D. Furnish and deploy sufficient drop cloths, shields, and protective equipment to prevent spray or droppings from fouling surfaces not being coated and, in particular, surfaces within storage and preparation areas.

- E. Place coating waste, cloths, and material that may pose a fire hazard in closed metal containers and remove daily from site.
- F. Remove electrical plates, surface hardware, fittings, and fasteners before coating application. Carefully store, clean, and replace items after completing coating in each area. Do not use solvent or degreasers to clean hardware that may remove permanent lacquer finishes.
- G. Erect and maintain protective enclosures in accordance with SSPC-Guide 6.
- H. Protect the following surfaces from abrasive blasting by masking or by other means:
 - 1. Threaded portions of valve and gate stems, grease fittings, and identification plates.
 - 2. Machined surfaces for sliding contact.
 - 3. Surfaces to be assembled against gaskets.
 - 4. Surfaces of shafting where sprockets will be fit.
 - 5. Surfaces of shafting where bearings will be fit.
 - 6. Machined bronze surfaces, including slide gates.
 - 7. Cadmium-plated items, except cadmium-plated, zinc-plated, or sherardized fasteners used to assemble equipment requiring abrasive blasting.
 - 8. Galvanized items, unless scheduled to be coated.
- I. Protect installed equipment, mechanical drives, and adjacent coated equipment from abrasive blasting to prevent damage caused by spent abrasive blast media, dust, or dirt entering such equipment.
- J. Schedule cleaning and coating to keep dust and spray from the cleaning process from falling on wet, newly coated surfaces:
 - 1. Whenever possible, coordinate with other trades and complete surface preparation and coating work before installing hardware, hardware accessories, nameplates, data tags, electrical fixtures, and similar uncoated items that will be in contact with coated surfaces. Mask machined surfaces, sprinkler heads, and other small items that will not be coated.
 - 2. After completing coating, reinstall removed items.
 - 3. Disconnect and move equipment adjacent to walls to clean and coat equipment and walls. Replace and reconnect equipment after coating.

3.02 GENERAL SURFACE PREPARATION REQUIREMENTS

- A. Prepare surfaces in accordance with CSM's instructions unless more stringent requirements are specified in this Section.
- B. Coating detail sheets in Attachment B - Coating Detail Sheets include additional surface preparation requirements.
- C. Follow more stringent requirement if information conflicts.

3.03 MECHANICAL AND ELECTRICAL EQUIPMENT PREPARATION

- A. Identify equipment, ducting, piping, and conduit as specified in Section 46_05_10 - Common Work Results for Mechanical Equipment,

Section 40_05_00.03 - Pipe Identification, and Section 26_05_53 - Identification for Electrical Systems.

- B. Remove grilles, covers, and access panels for mechanical and electrical system and coat separately.
- C. Prepare and finish coat equipment primed by the manufacturer using specified intermediate and top coats, as applicable, and color selected by the Owner.
- D. Prepare, prime, and coat both insulated and bare pipes, conduits, boxes, insulated and bare ducts, hangers, brackets, collars, and supports, except where items are covered with material not requiring coating, or with a prefinished coating.
- E. Replace identification markings on mechanical or electrical equipment when coated over or spattered.
- F. Prepare and coat interior surfaces of air ducts and convactor and baseboard heating cabinets visible through grilles and louvers with 1 coat of flat black paint to limit of sight line.
- G. Prepare and coat dampers exposed immediately behind louvers, grilles, and convactor and baseboard heating cabinets to match face panels.
- H. Prepare and coat exposed conduit and appurtenances occurring in finished areas with color and texture to match adjacent surfaces.
- I. Prepare and coat sides' front, back, and edges of plywood backboards for electrical equipment before installing backboards and mounting equipment on them.
- J. Color code equipment, piping, conduit, and exposed ductwork and apply color banding and identification, such as flow arrows, naming, and numbering, in accordance with the Contract Documents.

3.04 CLEANING OF NEW AND PREVIOUSLY COATED OR NEW SURFACES

- A. Utilize cleaning agent to remove soluble salts, such as chlorides, from concrete and metal surfaces:
 - 1. Cleaning agent: Biodegradable non-flammable and containing no VOC.
 - 2. Manufacturers: The following or equal:
 - a. CHLOR*RID International, Inc.:
 - 1) Complete soluble salt removal with steam or warm water cleaning.
 - 3. Steam clean and degrease surfaces to be coated to remove oils and grease.
 - 4. Clean surfaces with decontamination agent in conjunction with abrasive blast cleaning, steam cleaning, high-pressure washing, or hand washing, as approved by the CTR and the Engineer.
 - 5. Test cleaned surfaces to ensure removal of soluble salts. Carry out additional cleaning as needed.
 - 6. Complete final surface preparation before applying new coating system in strict accordance with CSM's printed instructions.

3.05 BLAST CLEANING

- A. Surface preparation requirements:
 - 1. Do not reuse spent blast abrasive.
 - 2. Ensure that filter compressed air used for blast cleaning is free of condensed water and oil. Clean moisture traps at least once every 4 hours or more frequently, as required, to prevent moisture from entering the abrasive blasting equipment air supply. Check blast air for moisture and oil after each cleaning in accordance with ASTM D4285.
 - 3. Install oil separators just downstream of compressor discharge valves and at the discharge point of blast pot discharges. Check separators on the same frequency as the moisture traps.
 - 4. Keep regulators, gauges, filters, and separators on compressor air lines to blasting nozzles operational at all times.
 - 5. Install an air dryer or desiccant filter drying unit to dry the compressed air before blast pot connections. Use and maintain the dryer throughout surface preparation work.
 - 6. Use a venturi-type, or other high velocity-type, abrasive blast nozzles supplied with at least 100 pounds per square inch gauge air pressure at the nozzle and enough volume to obtain appropriate blast cleaning production rates and surface cleanliness.
 - 7. Provide airborne particulate evacuation and filtering that meets OSHA safety standards. Maintain optimal visibility both to clean and provide the specified surface profile and to allow inspection of the substrate during surface preparation work.
 - 8. If prepared and cleaned metallic substrates become contaminated between final surface preparation work and coating system application, or if the prepared substrate darkens or changes color, re-clean by water blasting, or abrasive blast cleaning as appropriate until the specified degree of cleanliness is restored.
- B. Water jetting or water blasting:
 - 1. Use water jetting or water blasting for recoating or relining where an adequate surface profile exists.
 - 2. Perform water jetting or water blasting in accordance with SSPC-SP 13 and SSPC-WJ-1, WJ-2, WJ-3, WJ-4.

3.06 GENERAL PREPARATION REQUIREMENTS FOR METALLIC SURFACES

- A. Remove rust, scale, and welding slag and spatter:
 - 1. Remove and grind smooth all excessive weld material and weld spatter on metal surfaces before blast cleaning in accordance with NACE SP0178, Appendix C, Level C.
 - 2. Grind sharp edges on metal substrate to approximately 1/16-inch radius before abrasive blast cleaning.
- B. Prepare metallic surfaces in accordance with applicable portions of surface preparation specifications of the SSPC specified for each coating system:
 - 1. Remove grease and oil in accordance with SSPC-SP 1.
 - 2. Use solvent as recommended by the CSM.

3. Measure profile depth of the surface to be coated in accordance with Method C of ASTM D4417. Contractor shall select blast particle size and gradation to produce the specified surface profile.
 4. Constantly monitor and maintain ambient environmental conditions to ensure cleanliness and that no "rust back" occurs before coating material application.
- C. Prepare metallic surfaces by blast cleaning in accordance with SSPC-VIS 1 (ASTM D2200). Prepare abrasive blast representative areas for the Owner's representative to inspect on the first day of cleaning.
- D. Unless otherwise specified, the requirements for blast cleaning steel, ductile iron, and stainless steel substrates are as follows:
1. Ferrous metal surfaces not to be submerged: Abrasive blast in accordance with SSPC-SP 10 unless blasting may damage adjacent surfaces, is prohibited, or is specified otherwise. Where abrasive blasting is not possible, clean surfaces to bare metal with power tools in accordance with SSPC-SP 11.
 2. Ferrous metal surfaces to be submerged: Abrasive blast in accordance with SSPC-SP 5, unless specified otherwise, to clean and provide roughened surface profile with a depth between 2 and 4 mils.
 3. Remove traces of grit, dust, dirt, rust scale, friable material, loose corrosion products, or embedded abrasive from substrate before coating application.
 4. When abrasive blasted surfaces rust or discolor before coating, abrasive blast clean surfaces again.
- E. Field preparation of shop-primed surfaces:
1. Smooth welds and prominences with power tools before applying field-applied coatings.
 2. Clean and dry shop-primed ferrous metal surfaces and fabricated assemblies before applying field coats.
 3. Prepare shop epoxy primed surfaces with light abrasive blasting or abrading and then vacuum before applying finish coats:
 - a. Follow CSM instructions for surface preparation when the primer recoat limit has been exceeded.
 4. Non-immersion service: Clean in accordance with SSPC-SP 2 (Hand Tool Cleaning) or SSPC-SP 3 (Power Tool Cleaning) and uniformly roughen.
 5. Immersion, BSC, and SC service: Remove shop primer in accordance with SSPC-SP 5 (Near-White Blast Cleaning).
- F. Damaged shop primer or rust bleeding:
1. Ferrous metals: Clean in accordance with SSPC-SP 1 (Solvent Cleaning) and spot blast in accordance with SSPC-SP 10 (Near-White Metal Blast Cleaning) to achieve a uniform surface profile between 2.0 and 2.5 mils before recoating.
 2. Reject galvanized steel with rust bleeding.
- G. Damaged coating: Repair by abrasive blast cleaning surfaces as specified for the coating system; feather to a smooth transition before touching up.

3.07 PREPARATION REQUIREMENTS BY SURFACE TYPE

- A. Galvanized steel and non-ferrous metal surfaces:
 - 1. Degrease or solvent clean (SSPC-SP 1) to remove oily residue.
 - 2. Abrasive blast clean in accordance with SSPC-SP 16:
 - a. If abrasive blast cannot be performed, abrade in accordance with SSPC-SP 3 (Power Tool Cleaning).
 - 3. Apply metal pretreatment within 24 hours before coating galvanized surfaces that cannot be thoroughly abraded, such as bolts, nuts, or preformed channels.
 - 4. Test surface for contaminants using copper sulfate solution.
- B. Stainless-steel surfaces:
 - 1. Abrasive blast clean in accordance with SSPC-SP 16 to leave a clean, uniform appearance with surface profile between 1.5 and 2.5 mils.
- C. Ductile iron pipe and fittings to be lined or coated: Abrasive blast clean in accordance with NAPF 500-03.
- D. Sherardized, aluminum, copper, and bronze surfaces:
 - 1. Abrasive blast clean in accordance with SSPC-SP 16.
 - 2. Prepare in accordance with CSM's instructions.
- E. Cadmium-plated, zinc-plated, or sherardized fasteners:
 - 1. Abrasive blast in the same manner as uncoated metal when assembling equipment designated for abrasive blasting.
- F. PVC and FRP surfaces:
 - 1. Lightly sand surfaces to be coated:
 - a. Sand to remove gloss and establish uniform surface profile.
 - 2. Vacuum to remove loose dust, dirt, and other materials.
 - 3. Solvent clean with clean white rags and allow solvent to evaporate completely before applying coating materials.

3.08 APPLICATION REQUIREMENTS

- A. Apply coatings in accordance with manufacturer's instructions.
- B. Empty aboveground piping to be coated of contents when applying coatings.
- C. Mechanical equipment shop primed by the manufacturer:
 - 1. Pumps and valves: Shop coat with manufacturer's highest quality coating system meeting the project specifications:
 - a. Contractor shall provide CTR shop coating reports.
 - 2. Non-immersed equipment: Touch up shop primer, and coat in the field with specified coating system after installation:
 - a. If project requires equipment removal and reinstallation, complete touch-up coating after final installation.
 - 3. Immersed equipment not shop coated: Remove shop primer before surface preparation and field apply coating.

- D. Verify surface preparation immediately before applying coating in accordance with SSPC-SP COM and the SSPC visual standard for the specified surface preparation method.
- E. Allow surfaces to dry, except where coating manufacturer requires surface wetting before coating.
- F. Wash coat and prime sherardized, aluminum, copper, and bronze surfaces, or prime with manufacturer's recommended special primer.
- G. Do not apply coatings to a surface until it has been prepared as specified.
- H. Use equipment designed to apply materials specified:
 - 1. Use compressors with moisture traps and filters that remove water and oils from the air:
 - a. Perform a paper blotter test at the Engineer's request to verify air is sufficiently free of oil and moisture. Do not allow the amount of oil and moisture to exceed CSM-recommended amount.
 - 2. Equip spray equipment with properly sized mechanical agitators, pressure gauges, pressure regulators, and spray nozzles.
- I. Where 2 or more coats are required, tint prime coat intermediate coats as necessary to distinguish each coating and to help indicate coverage:
 - 1. Do not use color additives with chromium, lead or lead compounds that hydrogen sulfide, other corrosive gases, might destroy or alter. Apply the specified number of coats.
- J. Apply coating by brush, roller, trowel, or spray unless a specific application method is required by coating manufacturer's instructions or these Specifications:
 - 1. Apply primer or first coat by brush to power tool cleaned ferrous surfaces.
 - 2. Brush or spray-apply coats for blast-cleaned ferrous surfaces and subsequent coats for non-blast cleaned ferrous surfaces.
 - 3. After prime coat dries, mark, repair, and retest pinholes and holidays before intermediate or top coats are applied.
- K. Spray application:
 - 1. With a brush, stripe coat edges, welds, corners, nuts, bolts, and difficult-to-reach areas, as necessary, before spray application to ensure specified coating thickness along edges.
 - 2. When using spray application, apply each coat to thickness no greater than recommended in coating manufacturer's instructions.
 - 3. Use airless spray method unless air spray method is required by CSM's instruction or these Specifications.
 - 4. Conduct spray coating under controlled conditions. Protect adjacent construction and property from coating mist, fumes, or overspray.
- L. Lightly sand and thoroughly clean surfaces to receive high-gloss finishes unless CSM instructs otherwise.
- M. Remove all dust on coatings between coats.

- N. Shop and field coats:
1. Prime coat: Shop-apply or field-apply prime coats as specified. Use shop-applied primer compatible with the specified field coating system and apply at the minimum dry film thickness recommended by the finish coat CSM:
 - a. Provide data sheets identifying the shop primer to on-site coating application personnel.
 - b. Perform adhesion tests on the shop primer.
 - c. Remove and recoat damaged, deteriorated, and poorly applied shop coatings.
 - d. If shop primer coat meets this Section's requirements, spot prime exposed metal of shop-primed surfaces before spray applying primer over the entire surface.
 2. Field coats: Apply field coats with 1 or more prime coats and finish coats to build up coating to dry film thickness specified for the coating system:
 - a. Do not apply finish coats until other work in the area is complete and previous coats are inspected.
 3. Adhesion confirmation: Perform adhesion tests after proper coating cure in accordance with ASTM D3359. Demonstrate that:
 - a. Prime coat adheres to the substrate.
 - b. Coatings adhere to the prime and intermediate coats:
 - 1) Coating 5 mils or more DFT: Achieve adhesion test result of 5A on immersed surfaces and 4A or better on other surfaces.
 - 2) Coating less than 5 mils DFT: Achieve adhesion test results of 5B on immersed surfaces and 4B or better on other surfaces.
- O. Brush, roll, trowel, or spray and back roll coats for concrete and masonry.
- P. Plural component coating application:
1. Premix contents of component drums if required by the CSM each day.
 2. Before starting application:
 - a. Verify gauges are working properly.
 - b. Complete ratio checks.
 - c. Sample the mix on plastic sheeting to ensure set time is appropriate and complete.
 - d. Label and retain all spray samples. Submit to Engineer when requested.
- Q. Drying and recoating:
1. Provide fans, heating devices, or other means to prevent condensate or dew on substrate surface or between coats and during curing after applying the last coat.
 2. Allow each coat to cure or dry thoroughly, in accordance with if required in CSM's printed instructions, before recoating.
 3. Use CSM's printed instructions and the requirements specified in this Section to determine minimum required drying time:
 - a. Do not allow excessive drying time or exposure, which may impair bond between coats.
 - b. Recoat all coatings within time limits recommended by CSM.
 - c. If time limits are exceeded, abrasive blast clean and de-gloss clean before applying another coat.

4. If limitations on time between abrasive blasting and coating are not met before attaching components to surfaces that cannot be abrasive blasted, coat components before attachment.
5. Ensure primer and intermediate coats of coating are unscarred and completely integral when applying each succeeding coat.
6. Touch up suction spots between coats and apply additional coats where required to produce finished surface of solid, even color, free of defects.
7. Leave no holidays. Repair all holidays in accordance with the requirements on pertinent Coating Detail Sheets or as recommended by the CSM.
8. Sand and feather in to a smooth transition and recoat scratched, contaminated, or otherwise damaged coating surfaces so repairs are invisible to the naked eye.

R. Workmanship:

1. Ensure that coated surfaces are free from runs, drips, ridges, waves, laps, and brush marks. Coats shall be applied to produce a smooth, even film of uniform thickness completely coating corners and crevices.
2. Coat surfaces without drops, overspray, dry spray, excessive runs, ridges, waves, holidays, laps, or brush marks.
3. Remove splatter and droppings after coating work is completed.
4. Evenly apply each coat of material and sharply cut to a line created with masking tape or other suitable materials.
5. Avoid over spraying or spattering paint on surfaces not to be coated. Protect glass, hardware, floors, roofs, vehicles, and other adjacent areas and installations by taping, drop cloths, or other suitable measures.
6. When coating complex steel shapes, stripe coat welds, edges of structural steel shapes, metal cut-outs, pits in steel surfaces, or rough surfaces with the primer before overall coating system application:
 - a. Brush apply stripe coat to ensure proper coverage.
 - b. Do not stripe coat with spray or roller.
7. Ensure that finish coat, including repairs, has a uniform color and gloss.

S. Coating properties, mixing, and thinning:

1. Thin prime coat and apply as recommended by the CSM. Thinned coating must comply with prevailing air pollution control regulations.
2. If maximum recoat time is exceeded, prepare surface with solvent washing, light abrasive blasting, or other procedures per CSM's instructions.
3. Allow adequate drying time between coats as instructed by the CSM, adjusted as necessary for the site conditions.
4. Ensure that coatings, when applied, provide a satisfactory film and a smooth even surface. Lightly sand glossy undercoats to provide a surface suitable for proper application and adhesion of subsequent coats. Thoroughly stir and strain coating materials during application and maintain uniform consistency.
5. Mix coatings with 2 or more components in accordance with CSM's instructions.
6. Where necessary to suit conditions of the surface, temperature, weather, and method of application, thin the coating per CSM's recommendations:
 - a. Ensure that volatile organic content (VOC) of the thinned coating complies with prevailing air pollution control regulations.

- b. Thin coatings to only what is necessary to obtain proper application characteristics.
 - c. Use a thinner recommended by the CSM.
- T. Film thickness and continuity:
 - 1. Apply coating to the specified thicknesses:
 - a. Apply additional coats when necessary to achieve specified thicknesses, especially at edges and corners.
 - 2. Verify WFT of the coating system first coat and after applying each subsequent coat.
 - 3. Do not allow the minimum thickness at any point to deviate more than 25 percent from the required average.
 - 4. Do not allow the surface area covered per gallon of coating for various types of surfaces to exceed those recommended by the CSM:
 - a. Provide coating coverage worksheets listing the maximum and minimum coverage for each unit volume of coating for concrete surfaces.
 - 5. Apply additional coats to achieve the specified dry film thickness if brush or roller application methods cannot achieve the specified film thicknesses per coat.
- U. Protecting coated surfaces:
 - 1. Do not handle, work on, or otherwise disturb coated items until the coating is completely dry and hard.
 - 2. After installation, recoat shop-coated surfaces with specified coating system as necessary to match surrounding surfaces, and to coordinate with the specified color identification requirements.
- V. Special requirements:
 - 1. Before erection, apply all but the final finish coat to interior surfaces of roof plates, roof rafters and supports, pipe hangers, piping in contact with hangers, and contact surfaces inaccessible after assembly. Apply final coat after erection.
 - 2. Coat structural slip-critical connections and high strength bolts and nuts after erection.
 - 3. Areas damaged during erection:
 - a. Prepare surface for spot repairs as specified for the coating system.
 - b. Recoat with prime coat before applying subsequent coats.
 - c. Touch up surfaces after installation.
 - d. Clean and dry surfaces to be coated at time of application.
 - 4. Coat underside of equipment bases and supports not galvanized with at least 2 coats of primer specified before setting the equipment in place.
 - 5. Coat aluminum in contact with concrete.

3.09 APPLICATION REQUIREMENTS FOR CONCRETE COATING SYSTEMS

- A. Apply filler/surfacer as recommended by CSM to fill bug holes and air voids in concrete or block texture in CMU, leaving a uniformly filled surface that does not produce blowholes or outgassing causing the coating system to pinhole:
 - 1. Allow filler/surfacers to cure sufficiently before applying prime coat as required by the CSM. Use the CSM-recommended drying time between coats.

- B. Apply surfacer or filler and let dry before coating application:
 - 1. Use the drying time between filler/surfacer and coating system specified by the CSM for the site conditions:
 - a. Let concrete substrate dry before applying filler/surfacers or coating system materials.
 - 2. If the maximum recoat time is exceeded, prepare surfaces by solvent washing, light abrasive blasting, and other procedures per CSM's instructions.
 - 3. Apply a complete parge coat of the specified filler/surfacer material over the entire substrate before applying the coating system:
 - a. Scrub filler/surfacer into the substrate to completely fill open air voids and bug holes.
 - b. Completely cover the substrate, unless otherwise specified, above such filled voids by 1/8 inch of thickness.
 - c. Provide relatively flat, uniformly even surface before coating application.
 - 4. Secondary containment: Place surfacer or filler 1/16 inch thick above concrete plane to create a monolithic surface free of pinholes:
 - a. Floor surfaces: Broadcast with aggregate to create a non-slip surface texture.
 - b. Remove excess aggregates and apply base coat to encapsulate embedded non-slip aggregate.
- C. Concrete substrate temperatures:
 - 1. Apply filler/surfacers and the coating system when temperatures are falling, typically late afternoon or evening:
 - a. Do not coat concrete with rising concrete substrate surface temperatures or substrates in direct sunlight, to minimize outgassing from the substrate and formation of pinholes, and/or blistering.
 - 2. Should bubbles, pinholes, or other discontinuities form in the applied coating system material, they shall be repaired:
 - a. Should discontinuities develop in the filler/surfacer material or in the first coat of the coating material, repair them before the next coat.
 - b. When discontinuities occur, open the air void behind or beneath the discontinuities and completely fill with specified coating material. Then, abrade the coated area around the discontinuities repair reapply coating over that area.
- D. Perform application detail work in accordance with these Specifications, the CSM's current written recommendations, and drawings, whichever is stricter.

3.10 COATING SYSTEM SCHEDULE

- A. Attachment A - Schedule of Surfaces to be Field Coated specifies surfaces to be coated in the field with the coating systems required.

3.11 SURFACES NOT REQUIRING COATING

- A. Stainless steel piping, valves, pipe supports, instrument sunshades.
- B. Sliding surfaces on expansion joints, motor and pump shafts, machined surfaces at bearings and seals, grease fittings, etc.

- C. Galvanized structural steel framing, galvanized roof decking, galvanized pipe supports.
- D. Copper and brass pipe, fittings, valves, etc.
- E. Bronze valves, bearings, bushings, and fasteners.
- F. Corrosion resistant special alloys: Inconel, Alloy 20, Hastelloy, etc.
- G. Exterior Concrete.
- H. Plastic surfaces except coat PVC, CPVC, and other plastic piping system exposed to sunlight.
- I. Buried Piping that is encased in concrete or cement mortar.

3.12 QUALITY CONTROL

- A. Owner-provided inspection or inspection by others does not limit the Contractor's or CSA's responsibilities for quality workmanship or quality control as specified or as required by the CSM's instructions. Owner inspection is in addition to any inspection required of the Contractor.
- B. Owner may perform, or contract with an inspection agency to perform, quality control inspection and testing of the coating work covered by this Section. These inspections may include the following:
 - 1. Inspect materials upon receipt to ensure that the CSM supplied them.
 - 2. Verify that specified storage conditions for the coating system materials, solvents, and abrasives are provided.
 - 3. Inspect and record findings for substrate cleanliness.
 - 4. Inspect and record pH of concrete and metal substrates.
 - 5. Inspect and record substrate profile (anchor pattern).
 - 6. Measure and record ambient air and substrate temperature.
 - 7. Measure and record relative humidity.
 - 8. Check for substrate moisture in concrete.
 - 9. Verify that mixing of coating system materials is in accordance with CSM's instructions.
 - 10. Inspect, confirm, and record that coating system materials' "pot life" is not exceeded during installation. Inspect to verify that recoat limitations for coating materials are not exceeded.
 - 11. Perform adhesion testing.
 - 12. Measure and record the coating system's thickness.
 - 13. Verify proper curing of the coating system in accordance with the CSM's instructions.
 - 14. Holiday or continuity testing in accordance with NACE SP0188 for coatings that will be immersed or exposed to aggressively corrosive conditions.
- C. Contractor shall perform holiday testing in accordance with NACE SP0188 to identify holidays or pinholes needing repair for coating over 100 percent of surfaces:
 - 1. Coated steel that will be immersed or exposed to aggressively corrosive conditions.

2. Coated concrete.
3. Perform holiday tests after proper application and coating system cure.

3.13 CORRECTIVE MEASURES

- A. Repair pinholes or holidays identified by Holiday Testing as follows:
 1. Remove the coating system with a grinder or other suitable power tool.
 2. Remove coating system at all pinholes and holidays at least 2 inches diameter around the defect back to expose substrate.
 3. Concrete voids: chip back to expose entire cavity in all directions:
 - a. Completely fill void with approved filler/surfacer material using a putty knife or other suitable tool and strike off. Cure per CSM's recommendations.
 4. Aggressively abrade or sand the intact coating system surface at least 3 inches beyond the removal area in all directions to produce a uniform 6- to 8-mil profile in the intact coating system.
 5. Vacuum the prepared area to remove all dust, dirt, etc., leaving clean, sound surfaces.
 6. Tape to mask the periphery of the prepared intact coating area to prevent coating repair application onto the prepared area.
 7. Apply the coating system with enough coats to achieve the specified finish coat thickness over the defect and coating removal area. Feather the coating onto the abraded coated surfaces around the removal area to avoid a lip and to achieve a neat repair outline.
 8. Follow curing time between coats as specified by CSM for the site conditions. Solvent wash and abrasive blast per CSM's instructions, if the maximum recoat time is exceeded.
 9. Apply coating at specified dry film thickness.

3.14 CLEANUP

- A. Remove surplus materials, protective coverings, and accumulated rubbish after completing coating. Thoroughly clean surfaces and repair overspray or other coating-related damage.

3.15 FINAL INSPECTION

- A. Conduct final inspection of coating system work to determine whether it meets specifications requirements.
- B. Conduct subsequent final inspection with Engineer to ensure work conforms to contract documents requirements.
- C. Mark any rework required:
 1. Re-clean and repair, as specified, at no additional cost to the Owner.

END OF SECTION

ATTACHMENT A - SCHEDULE OF SURFACES TO BE COATED

APPENDIX A
Schedule of Surfaces to be Coated

- A. The following schedule is incomplete. Coat unlisted surfaces with same coating system as similar listed surfaces. Contact Engineer for clarification.

EPU-M-1	Metals, exterior, non-immersed	
EPU-GM-1		0
EPX-M-2	Metals, interior, non-immersed	
EPX-M-2-PWS	Metals: immersed and in contact with water being treated for domestic use (potable water).	
EPX-M-5	Aluminum surfaces in contact with concrete or masonry. Locations where Alkali-resistant bitumastic is specified.	
EPX-M-6-BG		0

Notes:

1: Non-immersed ferrous metal surfaces include:

- a. Doors, doorframes, ventilators, louvers, grilles, exposed sheet metal, and flashing.
- b. Pipe, valves, pipe hangers, supports and saddles, conduit, cable tray hangers, and supports.
- c. Motors and motor accessory equipment.
- d. Drive gear, drive housing, coupling housings, and miscellaneous gear drive equipment.
- e. Valve and gate operators and stands.
- f. Structural steel.
- g. Crane and hoist rails.
- h. Exterior of tanks and other containment vessels.
- i. Mechanical equipment supports, drive units, and accessories.
- j. Bare electrical equipment: boxes, exposed conduit, and accessories.
- k. Pumps not submerged.
- l. Other miscellaneous metals.

2: Immersed ferrous metal surfaces include:

- a. Interior surfaces of ferrous metal tanks.
- b. Field priming of ferrous metal surfaces with defective shop-prime coat; including non-submerged service.
- c. Bell rings, underside of manhole covers and frames.
- d. Sump pumps, including underside of base plates and submerged suction and discharge piping.
- e. Exterior of submerged piping and valves other than stainless steel or PVC piping.
- f. Submerged pipe supports and hangers.
- g. Stem guides.
- h. Other submerged iron and steel metal unless specified otherwise.

ATTACHMENT B - COATING DETAIL SHEETS

Appendix B			
Coating Detail Sheet			
Coating System	EPU-M-1		
Coating Material	Two coats epoxy with polyurethane finish coat		
Substrate	Metal		
Products: One of the following or equal:	Primer	Intermediate Coat	Finish Coat
Carboline	Carboguard 890	Carboguard 890	Carbothane 134 VOC
International Paint	Devran 224V	Devran 224V	Devthane 379
PPG	Amercoat 385	Amercoat 385	Amercoat 450H
Sherwin Williams	Macropoxy 646	Macropoxy 646	Hi Solids Polyurethane
Tnemec	Series 69	Series 69	Series 1095
Service Condition	Interior or Exterior, subject to direct sunlight. Non-immersion.		
Surface Preparation			
General	Prepare surfaces as specified in this Section and as follows.		
Ferrous Metal	Bare surfaces: SSPC-SP10, Near-White Blast Cleaning. Shop primed surfaces: SSPC-SP2, Hand Tool Cleaning or SSPC-SP3, Power Tool Cleaning. Damaged primer or rust: SSPC-SP10, Near White Blast Cleaning and spot prime.		
Nonferrous Metal	SSPC-SP16, Brush Blast Cleaning.		
Galvanized Metal	SSPC-SP16, Brush Blast Cleaning. Test for surface contaminants.		
Surface profile			
Ferrous Metal	2.5 to 3.0 mils		
Nonferrous Metal	1.5 to 2.0 mils		
Galvanized Metal	1.5 to 2.0 mils		
System Thickness (Dry Film)			
Total	10 to 13 mils		
Primer	4 to 5 mils		
Intermediate Coat	4 to 5 mils		
Finish Coat	2 to 3 mils		
Application			
Special CTR Training	Not required.		

Appendix B			
Coating Detail Sheet			
Coating System	EPU-GM-1		
Coating Material	Epoxy with polyurethane finish coat		
Substrate	Galvanized Metal		
Products: One of the following or equal:	Primer	Intermediate Coat	Finish Coat
Carboline	Carboguard 890	None Applied	Carbothane 134 VOC
International Paint	Devran 224V	None Applied	Devthane 379
PPG	Amercoat 385	None Applied	Amercoat 450H
Sherwin Williams	Macropoxy 646	None Applied	Hi Solids Polyurethane
Tnemec	Series 69	None Applied	Series 1095
Service Condition	Interior or Exterior, subject to direct sunlight. Non-immersion.		
Surface Preparation			
General	Prepare surfaces as specified in this Section and as follows.		
Galvanized Metal	SSPC-SP16, Brush Blast Cleaning. Test for surface contaminants.		
Surface profile			
Galvanized Metal	1.5 to 2.0 mils		
System Thickness (Dry Film)			
Total	6 to 8 mils		
Primer	4 to 5 mils		
Finish Coat	2 to 3 mils		
Application			
Special CTR Training	Not required.		

Appendix B			
Coating Detail Sheet			
Coating System	EPX-M-2		
Coating Material	Epoxy		
Substrate	Metal		
Products: One of the following or equal:	Primer	Intermediate Coat	Finish Coat
Carboline	Carboguard 890	Carboguard 890	Carboguard 890
International Paint	Bar-Rust 236	Bar-Rust 236	Bar-Rust 236
PPG	Amerlock 2/400 Series	Amerlock 2/400 Series	Amerlock 2/400 Series
Sherwin Williams	Tank Clad HS	Tank Clad HS	Tank Clad HS
Tnemec	Series 69	Series 69	Series 69
Service Condition	Immersed, non-immersed, moderately corrosive environment.		
Surface Preparation			
General	Prepare surfaces as specified in this Section and as follows.		
Ferrous Metal	Bare surfaces: SSPC-SP5, White Metal Blast Cleaning. Shop primed surfaces: SSPC-SP7, Brush-Off Blast Cleaning. Damaged primer or rust: SSPC-SP5, White Metal Blast Cleaning and spot prime.		
Nonferrous Metal	SSPC-SP16, Brush-Off Blast Cleaning.		
Galvanized Metal	SSPC-SP16, Brush-Off Blast Cleaning.		
Surface profile			
Ferrous Metal	2 to 4 mils		
Nonferrous Metal	1.0 to 1.5 mils		
Galvanized Metal	1.0 to 1.5 mils		
System Thickness (Dry Film)			
Total	12 to 16 mils		
Primer	4 to 6 mils		
Intermediate Coat	4 to 6 mils		
Finish Coat	4 to 6 mils		
Application			
Special CTR Training	Not required.		

Appendix B			
Coating Detail Sheet			
Coating System	EPX-M-2-PWS		
Coating Material	Ultra-high Solids Epoxy		
Substrate	Metal		
Products: One of the following or equal:	Primer	Intermediate Coat	Finish Coat
Carboline	Plasite 4500	None Applied	Plasite 4500
International Paint	No product specified	No product specified	No product specified
PPG	No product specified	No product specified	No product specified
Sherwin Williams	Sher-Plate	None Applied	Sher-Plate
Tnemec	Series 22	None Applied	Series 22
Service Condition	Immersed, moderately corrosive environment in contact with Potable Water.		
Surface Preparation			
General	Prepare surfaces as specified in this Section and as follows.		
Ferrous Metal	Bare surfaces: SSPC-SP5, White Metal Blast Cleaning. Shop primed surfaces: SSPC-SP7, Brush-Off Blast Cleaning. Damaged primer or rust: SSPC-SP5, White Metal Blast Cleaning and spot prime.		
Surface profile			
Ferrous Metal	2.0 to 2.5 mils		
Primed surfaces	1.0 to 1.5 mils on the intact primer.		
System Thickness (Dry Film)			
Total	16 to 25 mils		
Application			
Special CTR Training	Required.		

Appendix B			
Coating Detail Sheet			
Coating System	EPX-M-5		
Coating Material	Epoxy mastic		
Substrate	Metal		
Products: One of the following or equal:	Primer	Intermediate Coat	Finish Coat
Carboline	CSM recommended	None applied	Carbomastic 15
International Paint	CSM recommended	Bar-Rust 231	Bar-Rust 231
PPG	CSM recommended	None applied	Amerlock 2 AL
Sherwin Williams	CSM recommended	None applied	Epoxy Mastic Aluminum II
Tnemec	CSM recommended	Series 135	Series 135
Service Condition	Interior, corrosive environment, confined enclosures, where minimal surface preparation is possible.		
Surface Preparation			
General	Prepare surfaces as specified in this Section and as follows.		
Ferrous Metal	Bare surfaces: SSPC-SP11, Power to Cleaning to Bare Metal. Shop primed surfaces: SSPC-SP3, Power Tool Cleaning. Damaged primer or rust: SSPC-SP11, Power to Cleaning to Bare Metal.		
Nonferrous Metal	SSPC-SP16, Brush-Off Blast Cleaning.		
Surface profile			
Ferrous Metal	2.0 to 2.5 mils		
Nonferrous Metal	1.0 to 1.5 mils		
System Thickness (Dry Film)			
Total	15 to 19 mils		
Primer	2 to 4 mils		
Finish Coat	15 mils		
Application			
Special CTR Training	Not Required.		

Appendix B			
Coating Detail Sheet			
Coating System	EPX-M-6-BG		
Coating Material	Epoxy		
Substrate	Metal		
Products: One of the following or equal:	Primer	Intermediate Coat	Finish Coat
Carboline	Carboguard 890	Carboguard 890	Carboguard 890
International Paint	Bar-Rust 236	Bar-Rust 236	Bar-Rust 236
PPG	Amerlock 2/400 Series	Amerlock 2/400 Series	Amerlock 2/400 Series
Sherwin Williams	Tank Clad HS	Tank Clad HS	Tank Clad HS
Tnemec	Series 69	Series 69	Series 69
Service Condition	Below grade in contact with soil.		
Surface Preparation			
General	Prepare surfaces as specified in this Section and as follows.		
Ferrous Metal	SSPC-SP10, Near White Metal Blast Cleaning.		
Nonferrous Metal	SSPC-SP16, Brush-Off Blast Cleaning.		
Galvanized Metal	SSPC-SP16, Brush-Off Blast Cleaning.		
Surface profile			
Ferrous Metal	2.5 to 3.0 mils		
Nonferrous Metal	1.5 to 2.0 mils		
Galvanized Metal	1.5 to 2.0 mils		
System Thickness (Dry Film)			
Total	16 mils		
Primer	4 to 6 mils		
Intermediate Coat	4 to 6 mils		
Finish Coat	4 to 6 mils		
Application			
General	Fill all bugholes with a filler/surfacer compatible with the coating.		
Special CTR Training	Not Required.		

SECTION 10_14_00

SIGNAGE

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Plastic and metal signs for building and site use.

1.02 REFERENCES

- A. National Fire Protection Association (NFPA):
 - 1. 704 - Standard System for the Identification of the Hazards of Materials for Emergency Response.
- B. Occupational Safety and Health Administration (OSHA).

1.03 SUBMITTALS

- A. Product data.
- B. Shop drawings: Include lists of sign types, sizes, text, and colors; mounting details; locations; and cast metal plaque rubbings and templates.
- C. Samples: Include actual materials.
- D. Manufacturer's installation instructions.

1.04 QUALITY ASSURANCE

- A. Manufacturer qualifications: Manufacturer of proposed products for minimum 5 years with satisfactory performance record of minimum 5 years.
- B. Installer qualifications: Manufacturer approved installer of products similar to specified products on minimum 10 projects of similar scope as Project with satisfactory performance record.
- C. Regulatory requirements: Provide signage in accordance with Americans with Disabilities Act as published in the Federal Register, Volume 56, No. 144, Friday, July 26, 1991.

PART 2 PRODUCTS

2.01 PLASTIC SIGNAGE SYSTEM

- A. Manufacturers:
 - 1. One of the following or equal:
 - a. Best Manufacturing Sign Systems, System 900013.

- b. Andco Industries Corp., equivalent product.
 - c. Vomar Products, Inc., equivalent product.
- B. Attachment:
 - 1. Vinyl tape, self-adhering.
- C. Lettering:
 - 1. Helvetica medium, 3/4 inches high.
- D. Material for interior use:
 - 1. Plastic 1/8-inch thick raised letters.
- E. Material for exterior use:
 - 1. Fiberglass 1/4-inch thick with high gloss finish, raised letters, blasted from single piece of fiberglass for integral letter and background.
 - 2. No adhesive as mechanical fastening of letters shall be allowed.
- F. Colors:
 - 1. As selected by Engineer from manufacturer's standard colors.
- G. See Attachment A - Plastic Signage System Schedule for specific sign size, location, text, pictogram, and quantity.

2.02 METAL SAFETY SIGNS

- A. Manufacturer: Meeting OSHA Requirements; 40-mil thick aluminum with baked enamel finish. One of the following or equal:
 - 1. Seton Name Plate Co., Special Wording.
 - 2. Emedco.
- B. Danger sign colors:
 - 1. Background: White.
 - 2. Heading: White lettering on red oval with white border in black rectangular panel.
 - 3. Message: Black lettering on white.
 - 4. Size: As scheduled.
- C. Caution sign colors:
 - 1. Background: Yellow.
 - 2. Heading: Yellow lettering on black rectangular panel.
 - 3. Message: Black lettering on yellow.
 - 4. Size: As scheduled.
- D. Safety instruction signs:
 - 1. Background: White.
 - 2. Heading: White lettering on green rectangular panel.
 - 3. Message: Black lettering.
 - 4. Size: As scheduled.
- E. Warning sign colors:
 - 1. Background: Orange.

2. Heading: Black lettering on orange diamond in black rectangular panel.
 3. Message: Black lettering on orange.
 4. Size: As scheduled.
- F. Notice information signs:
1. Background: White.
 2. Heading: White lettering on blue rectangular panel.
 3. Message: Black lettering.
 4. Size: As scheduled.
- G. Fasteners: Round head stainless steel bolts or screws.
- H. See Attachment B - Metal Safety Sign Schedule for specific sign size, location, text, and quantity.

PART 3 EXECUTION

3.01 PREPARATION

- A. Protect adjacent surfaces which may be damaged by installation of signs.
- B. Prepare substrates in accordance with sign manufacturer's instructions.
- C. Remove scale, dirt, grease, and other contaminants from substrates.

3.02 INSTALLATION

- A. Install signs in accordance with sign manufacturer's instructions.
- B. Fasten signs securely in level, plumb, and true to plane positions.
- C. Install signs where indicated on the Drawings or as indicated in the following Attachments.

END OF SECTION

ATTACHMENT A - PLASTIC SIGNAGE SYSTEM SCHEDULE

PLASTIC SIGNAGE SYSTEM SCHEDULE

A. Room Names:

1. Location: On wall outside room adjacent to latch side of doors or when not enough space on latch side, on nearest adjacent wall.
2. Height: 60 inches above floor to center of sign.
3. Size: 6 inches square.
4. Colors: As selected by Owner.
5. Text: Sign per door of following rooms:

PUMP ROOM (at Finished Water Pump Station, quantity: 3)

ELECTRICAL ROOM (at Finished Water Pump Station, quantity: 3)

CONTROL ROOM (at Finished Water Pump Station, quantity: 3)

ELECTRICAL / CONTROL ROOM (at Recovered Water Pump Station, quantity: 1)

VALVE / METERING ROOM (at Recovered Water Pump Station, quantity: 1)

B. Fire Extinguishers:

1. Location: Adjacent to fire extinguishers.
2. Height: 60 inches above floor to center of sign.
3. Size: 6 inches square.
4. Colors: White letters on OSHA Red background.
5. Text: FIRE EXTINGUISHER.

ATTACHMENT B - METAL SAFETY SIGN SCHEDULE

METAL SAFETY SIGN SCHEDULE

A. NONPOTABLE WATER:

1. Location: At impure water and nonpotable water hose valves in accordance with Typical Detail M276.
2. Height: In accordance with Typical Detail.
3. Size: 10 inches wide by 7 inches high.
4. Heading: DANGER
5. Wording: DO NOT DRINK THIS WATER

B. REMOTELY CONTROLLED AUTOMATIC EQUIPMENT:

1. Location: On wall near equipment that starts automatically by remote control.
2. Height: 60 inches above floor to center of sign.
3. Size: 14 inches wide by 10 inches high.
4. Heading: DANGER
5. Wording: THIS EQUIPMENT STARTS AUTOMATICALLY
BY REMOTE CONTROL

SECTION 10_40_10

SAFETY EQUIPMENT

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Safety equipment.

1.02 REFERENCES

- A. American Society of Mechanical Engineers (ASME).
- B. National Fire Protection Association.
- C. National Institute for Occupational Safety and Health (NIOSH):
- D. Occupational Safety and Health Administration (OSHA).
- E. Underwriters Laboratories, Inc. (UL).

1.03 SUBMITTALS

- A. Shop drawings.
- B. Product data:
 - 1. Submit manufacturer's product literature information for products specified.
 - 2. Manufacturer's installation instructions.
- C. Samples.
- D. Operation and maintenance data.
- E. Warranty.

1.04 QUALITY ASSURANCE

- A. Manufacturer qualifications: Show evidence that the firm has been engaged in producing such materials and products for at least 5 years and that the product submitted has a satisfactory performance record of at least 5 years.
- B. Installer qualifications: Installer shall have 3 years experience in installing these materials for similar projects and shall be approved by the manufacturer prior to bidding of the project.
- C. Regulatory requirements: As applicable, equipment of this Section shall comply with requirements of public agencies of the State of Oklahoma, including OSHA, UL, NFPA, and ASME.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Packing and shipping: Deliver to the job site in manufacturer's original containers.
- B. Delivery: After wet operations in building are completed.
- C. Storage and protection: Store materials in original, unopened containers in compliance with manufacturer's printed instructions.
- D. Keep materials dry until ready for use.
- E. Keep packages of material off the ground, under cover, and away from sweating walls and other damp surfaces.
- F. Protect finished surfaces from soiling and damage during handling and installation. Keep covered with a protective covering.

PART 2 PRODUCTS

2.01 FIRE BLANKET KIT

- A. Manufacturers: One of the following or equal:
 - 1. VWR Scientific, No. 56611-202.
 - 2. Fire Safety Source, M2FBCBR.
- B. Features/characteristics:
 - 1. Blanket: Roller-type, fireproofed, nominal 62 by 84 inches.
 - 2. Case: Wall mounted, metal or ABS, if, no latch.
 - 3. Locate one at each building at Control Room.

2.02 FIRST AID KIT

- A. Manufacturers: One of the following or equal:
 - 1. VWR Scientific, 56613-216.
 - 2. Fire Safety Source, 223UFAO.
- B. Features/characteristics:
 - 1. Prefinished, wall-mounted metal cabinet.
 - 2. Standard medical supplies capable of serving up to 25 people.
 - 3. Meets OSHA requirements.
 - 4. Locate one in each building at Control Room.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install products and fixed equipment in accordance with manufacturers' recommendations.
- B. Replace any equipment found defective with new.

END OF SECTION

SECTION 10_44_00
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Fire extinguishers.

1.02 REFERENCES

- A. ASTM International (ASTM):
1. E814-11a - Standard Test Method for Fire Tests of Penetration Firestop Systems.
- B. National Fire Protection Association (NFPA):
1. 10 - Standard for Portable Fire Extinguishers.
- C. Underwriters Laboratories, Inc. (UL):
1. 711 - Rating and Fire Testing of Fire Extinguishers.

1.03 SUBMITTALS

- A. Product data:
1. Cabinets: Materials description for fire extinguisher cabinets include roughing-in dimensions, details showing mounting methods, relationships to surrounding construction, door hardware cabinet type and materials, trim style and door construction, door style and materials.
 2. Extinguishers: Materials description for fire extinguishers; include ratings and classifications.
 3. Installation instructions for each product specified.
- B. Shop drawings:
1. Small-scale plans showing locations of individual fire extinguishers.
 2. Schedule showing each type of extinguisher to ensure proper fit and function.
 3. Indicate installation procedures and accessories required for a complete installation.

1.04 QUALITY ASSURANCE

- A. Manufacturer qualifications: Minimum 5 years with satisfactory performance record.

1.05 WARRANTY

- A. As specified in Section 01_78_36 - Warranties and Bonds.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. The following or equal:
 - 1. Activar Construction Products Group – JL Industries.

2.02 FIRE EXTINGUISHERS

- A. Multi-purpose chemical type:
 - 1. Extinguisher unit containing a fluidized and siliconized mono ammonium phosphate powder; nonconductive and nontoxic.
 - 2. Construction: Heavy duty steel cylinder with metal valve and siphon tube, o-ring seal, replaceable valve stem seal, visual pressure gage, pull pin and upright squeeze grip.
 - 3. Finish: Factory powder-coated: Red.
 - 4. UL Effectiveness Rating in accordance with UL 711: Class A, B, and C fires.
 - 5. UL Rating in accordance with UL 711: 4A-80BC.
 - 6. Drawing will use the symbol FX for "Fire Extinguisher".
- B. Regular dry chemical type:
 - 1. Extinguisher unit containing Halotron™.
 - 2. Size minimum: 11 pounds.
 - 3. Construction: Heavy duty steel cylinder with metal valve and siphon tube, o-ring seal, replaceable valve stem seal, visual pressure gage, pull pin, and upright squeeze grip.
 - 4. Finish: Factory powder-coated; Red.
 - 5. UL Effectiveness Rating in accordance with UL 711: Class B and C fires.
 - 6. UL Rating in accordance with UL 711: 2A-10BC.
 - 7. Drawing will use the symbol FXE for "Fire Extinguisher - Electrical".

2.03 WALL BRACKETS

- A. Type: Standard as manufactured by fire extinguisher manufacturer.

2.04 FIRE EXTINGUISHER CABINETS (NOT USED)

2.05 FABRICATION (NOT USED)

2.06 EXTRA MATERIALS

- A. Furnish a minimum 10 percent, but not less than 1, of fire extinguishers with brackets installed in addition to the number indicated on the Drawings

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance NFPA 10, Standard for Portable Fire Extinguishers.

3.02 LOCATIONS

- A. Install fire extinguisher type, FX and FXE, as indicated on the Drawings.

END OF SECTION

SECTION 13_34_19
METAL BUILDING SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
1. Prefabricated metal building systems.

1.02 REFERENCES

- A. American Concrete Institute (ACI):
1. 318 - Building Code Requirements for Structural Concrete and Commentary.
- B. American Institute of Steel Construction (AISC):
1. 303 - Code of Standard Practice for Steel Buildings and Bridges.
 2. 360 - Specification for Structural Steel Buildings.
- C. American Iron and Steel Institute (AISI):
1. SG02 - North American Specification for the Design of Cold-Formed Steel Structural Members.
- D. ASTM International (ASTM):
1. A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 2. A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 3. A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
 4. A780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
 5. A792 - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
 6. B187 - Standard Specification for Copper, Bus Bar, Rod, and Shapes and General Purpose Rod, Bar, and Shapes.
 7. B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
 8. D1494 - Standard Test Method for Diffuse Light Transmission Factor of Reinforced Plastics Panels.
 9. F959 - Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners.
 10. F436 - Standard Specification for Hardened Steel Washers.
 11. F3125 - Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi and 150 ksi Minimum Tensile Strength.

- E. American Welding Society (AWS):
 - 1. D1.1 - Structural Welding Code - Steel.
 - 2. D1.3 - Structural Welding Code - Sheet Steel.
- F. FM Global (FM).
- G. International Accreditation Service (IAS):
 - 1. AC472 - Accreditation Criteria for Inspection Programs for Manufacturers of Metal Building Systems.
- H. Metal Building Manufacturing Association (MBMA):
 - 1. Metal Building Systems Manual.
- I. Occupational Safety and Health Administration (OSHA):
 - 1. Occupational Safety and Health Standards:
 - a. 1910.23 - Guarding floor and wall openings and holes.
- J. Research Council on Structural Connections (RCSC):
 - 1. Specification for Structural Joints Using High Strength Bolts.
- K. Society for Protective Coatings (SSPC):
 - 1. SSPC-SP2 - Hand Tool Cleaning.
- L. Steel Door Institute (SDI):
 - 1. A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
- M. Underwriters' Laboratories, Inc. (UL).
 - 1. 580 - Tests for Uplift Resistance of Roof Assemblies.

1.03 DEFINITIONS

- A. Primary framing: An assemblage of beams and columns that support the secondary framing members, and that collects loads to transfer to the building foundation.
- B. Secondary framing: Members which directly support roof, wall, or floor surfaces and convey loads to the primary framing.

1.04 SUBMITTALS

- A. Product Data:
 - 1. Manufacturer's installation instructions.
 - 2. Manufacturer's standard color charts and profiles:
 - a. Exterior wall and roof panels.
 - b. Interior wall and roof liner panels.
 - c. Gutters and downspout trim.
 - 3. Manufacturer's list of approved clamps that may be used to hang suspended items from roof purlins and details of acceptable methods of attachment to purlins.

- B. Shop drawings:
1. Shop drawings: Catalog cuts; design and erection drawings; and other data needed to clearly describe design, materials, construction details, fasteners, and erection:
 - a. Erection drawings shall include building dimensions, required foundation footprint, anchor bolt and base plate settings, bracing, main and secondary framing, and sections and details required to fully describe construction of building.
 - b. Indicate quantity, size, grade, embedment, and projection, and location of anchor bolts.
 2. Calculations: Submit engineering design calculations for the complete structural system, including coverings and foundations, sealed and signed by a Professional Engineer licensed in the state where the project is located:
 - a. Clearly indicate foundation reactions at all columns. Identify all applied loads, load factors, and load combinations used to develop the reactions.
 - b. Calculations will be submitted for record information only:
 - 1) Engineer's review of calculations will be for general conformance to the loading requirements of this Section.
 - 2) The building manufacturer shall remain fully responsible for the structural design and adequacy of the metal building system.
 3. Descriptive data: Submit data for the following items either on the shop drawings or separately: Accessories, each type of flashing, trim closures, caps and similar items, fasteners, doors, roof openings, gutters, and downspouts.
- C. Quality control submittals:
1. Building manufacturer:
 - a. If requested by the Engineer, submit a record of manufacturer's metal building systems of similar design manufactured and erected in the 5-year period preceding the bid date for this project:
 - 1) Include date of installation, location of metal building, and name and address of Owner.
 - b. Submit evidence of manufacturer's certification under IAS AC472 Accreditation:
 - 1) Certification must be valid for the facility at which the metal building will be fabricated.
 - c. Confirmation of UL 580 wind uplift rating.
 2. Erector:
 - a. Submit welder qualification certificates.
- D. Record documents:
1. One set of reproducible "Record Drawings" for the erected structure:
 - a. Drawings shall bear the seal and signature of a Professional Engineer, registered in the state where the work is constructed and who provided responsible charge for the design.
- E. Closeout submittals: Submit Contract Closeout Submittals as specified in Section 01_77_00 - Closeout Procedures:
1. Operating and Maintenance Information.
 2. Warranty.

3. Certificate of Compliance: At the completion of the metal building manufacture, the manufacturer will furnish a letter to the Engineer stating that the work was performed in accordance with the approved construction documents.

1.05 QUALITY ASSURANCE

- A. Manufacturer qualifications: Manufacturer shall have been engaged in the design, manufacture, and erection of metal building systems of the type specified for at least 5 years preceding the Bid Date of this Contract:
 1. Building manufacturer shall be certified by IAS AC472 Accreditation.
 2. The manufacturer's Engineer of Record shall hold current license as a Professional Engineer in the state where the work will be constructed.
- B. Erector qualifications: Erectors shall be trained, approved, and certified by the manufacturer prior to Bidding of the Project. Erectors shall demonstrate at least 3 years of experience in successfully erecting metal building systems of the type specified in this Section.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Packing and shipping: Deliver materials and fabrications to the job site in manufacturer's original containers with seals unbroken and labeled with manufacturer's identification and number.
- B. Delivery:
 1. Deliver materials dry and undamaged, and store out of contact with ground.
 2. Cover materials with weathertight coverings and keep dry.
 3. Provide good air circulation and protection from surface staining for roof and wall covering sheets.
- C. Storage and protection: Store materials in original, unopened containers in compliance with manufacturer's printed instructions.

1.07 WARRANTY

- A. Provide warranty as specified in Section 01_78_36 - Warranties and Bonds.
- B. Special warranty:
 1. Provide Owner with warranty that exterior finish system for metal panels shall be guaranteed against blister, peeling, cracking, chipping, or material rust-through for a period of 1 year from the date of Substantial Completion.
 2. Provide Owner with warranty stating that the metal building system shall be guaranteed against water leaks arising out of or caused by ordinary wear and tear by the elements for a period of 1 year from the date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Buildings: One of the following or equal:
 - 1. Nucor.
 - 2. Behlen Building Systems.
 - 3. Butler Manufacturing Co.
 - 4. Varco Pruden.

2.02 DESIGN AND PERFORMANCE CRITERIA

- A. System:
 - 1. Design: Furnish metal building with vertical walls, gable roof, and with column layout as indicated on the Drawings.
 - 2. Size:
 - a. Furnish metal building of the size and configuration indicated on the Drawings.
 - b. Coordinate manufacturer's design dimensions for metal building system components, including columns, with equipment foundations, and details indicated on the Drawings.
 - 3. Roof slope: Use a roof slope of 3 inch vertical in 12 inches horizontal or steeper.
 - 4. Provide building with horizontal and vertical bracing where indicated on the Drawings.
 - 5. Column reactions shall be vertical and horizontal only:
 - a. No bending moments shall be transferred at column bases.
 - 6. The building roofing system will be listed for a UL 580, Class 60 designation.
 - 7. Openings: Frame openings for doors, windows, louvers, equipment with structural framing to replace panels and secondary framing cut for opening:
 - a. Provide curbs to suit roof-mounted equipment compatible with roof sheathing.
- B. Performance requirements:
 - 1. General:
 - a. Design of the metal building structure and its appurtenances shall conform to the requirements of the IBC, the Metal Building Systems Manual, and the requirements of this Section:
 - 1) Where the Metal Building Systems Manual conflicts with the requirements of this Section, the more restrictive requirements will govern.
 - b. Do not include collateral or auxiliary loads in load combinations where dead loads offset other load effects (for example, uplift due to wind loads).
 - c. Hot-rolled structural steel sections or welded-up plate sections: Design in accordance with AISC 360.
 - d. Cold-formed steel structural members: Design in accordance with the AISI North American Specification for the Design of Cold-Formed Steel Structural Members.
 - e. Anchor bolts:
 - 1) Design anchor bolts to resist column reactions reported from analysis.

- 2) Design anchor bolts in accordance with ACI 318 Chapter 17 for cracked concrete to fail in a ductile manner, yielding the steel section before fracturing the surrounding concrete.
 - 3) Assume concrete foundation strength, $f'_c = 4,500$ pounds per square inch at 28-days.
2. Loading:
- a. General:
 - 1) Design building for dead load, live loads, and combinations of loads including unbalanced loads in accordance with the IBC and the MBMA Metal Building Systems Manual, except as modified in this Section.
 - 2) Reduction in wind, live, or snow loads based on tributary loaded area will not be permitted.
 - b. Roof loading requirements:
 - 1) Live load: Minimum 20 pounds per square foot assumed to act vertically on horizontal projected area of roof.
 - 2) Ground snow load: Minimum 10 pounds per square foot assumed to act vertically on horizontally projected area of roof.
 - 3) Rain on snow surcharge load: Minimum 5 pounds per square foot assumed to act vertically on horizontally projected area of roof.
 - a. Collateral loading: Uniform roof load of 10 pounds per square foot assumed to act vertically on horizontal projected area of roof to account for miscellaneous accessories supported from the structure:
 - 1) Collateral loading shall be considered a live load.
 - 2) Design primary and secondary framing to support the additional weight of mechanical equipment such as fans, air conditioners, etc. shown on plans:
 - a) Mechanical equipment weights are in addition to collateral loading.
 - b. Wind design criteria: As specified in Section 01_81_50 - Design Criteria.
 - 1) Design roof purlins and structural frames for loads specified, but not less than 40 pounds per square foot uplift on horizontally projected roof area.
 - c. Seismic design criteria: As specified in Section 01_81_50 - Design Criteria:
 - 1) Bolted joints subject to seismic loading shall be designated pretensioned joints.
5. Deflection limitations:
- a. Primary frames:
 - 1) Gravity deflection:
 - a) Live load deflection: $L/240$.
 - b) Snow load deflection: $L/240$.
 - c) Total load deflection: $L/180$.
 - 2) Horizontal drift of rigid frames measured at ridge:
 - a) Seismic drift limitation: in accordance with ASCE 7-16.
 - b) Wind drift limitation: $H/60$.
 - b. Secondary framing:
 - 1) Gravity deflection:
 - a) Live load deflection: $L/180$.
 - b) Snow load deflection: $L/180$.
 - c) Total load deflection: $L/150$.

- 2) Horizontal deflection: $L/120$.
- c. Deflection of roof and wall panels: $\text{Span}/180$.
- d. Deflection calculations should be based on the wind loads presented in AISC Design Guide 3:
 - 1) Deflection calculations should be based on the unreduced wind loads required in the IBC (50-year reoccurrence intervals).
- 6. Climatic conditions:
 - a. Gutters and downspouts: Design for a rainfall rate of 3.71 inches per hour.
 - b. Temperature: Provide for movement (expansion or contraction) caused by a range of ambient temperature of 120 degrees Fahrenheit without detrimental effects.

2.03 MATERIALS

- A. Primary framing (rigid frames):
 - 1. Welded plates or hot-rolled steel columns and roof beams, complete with necessary splice or connector plates for bolted field assembly:
 - a. Minimum nominal thickness of structural shapes or their elements shall be $1/4$ -inch.
 - 2. Welding procedures, welder qualifications, and welding quality standards shall be in accordance with AWS D1.1 and AWS D1.3.
 - 3. Base, cap, compression plates, and stiffener plates shall be factory-welded in place and shall have shop-fabricated connection holes:
 - a. Provide minimum 4 anchor bolts per column base.
 - 4. Columns and roof beams shall be fabricated complete with holes in webs and flanges for attaching bracing and roof and sidewall framing.
 - 5. Shop finishing:
 - a. Shop galvanized - hot-dipped:
 - 1) Hot-dip galvanize members in accordance with ASTM A123.
 - 2) Provide a minimum zinc coating of not less than 1.4 ounces per square foot.
- B. Secondary framing (purlins, girts, framing at endwalls and openings, eave struts, bracing):
 - 1. Hot rolled structural steel or cold-formed members.
 - 2. Minimum thickness: 16-gauge.
 - 3. Bracing elements constructed of wire rope, stranded tendons, or other similar material is not permitted:
 - a. Rolled angle sections or solid steel bar is permitted.
 - 4. Provide factory-punched holes for panel connections.
 - 5. Shop finishing - hot rolled sections:
 - a. Galvanized - hot-dipped:
 - 1) Hot-dip galvanize members in accordance with ASTM A123.
 - 2) Provide a minimum zinc coating of not less than 1.4 ounces per square foot.
 - 6. Shop finishing (cold-formed sections):
 - a. Shop primed for field painting:
 - 1) Clean ferrous surfaces of oil, grease, loose rust, loose mill scale, and other foreign substances, in accordance with the SSPC-SP2.

- 2) Apply 1 coat of shop primer in accordance with SSPC Paint Specification No. 15 for temporary corrosion protection
 - a) Remove shop primer as specified in Section 09_96_01 - High-Performance Coatings prior to field coating.
 - b. Galvanized - hot-dipped:
 - 1) Hot-dip galvanize members in accordance with ASTM A653 to G90 designation.
- C. Roof and wall panels:
1. Roll-formed minimum 24-gauge steel, factory-finished each side.
 2. Panels shall have interlocking side seams and shall be the manufacturer's maximum standard width Factory cut to maximum possible length to minimize end laps.
 3. Factory pre-punched for fastening.
 4. Panel finish:
 - a. Factory pre-painted, pre-finished coating consisting of a UV light-resistant polyvinylidene difluoride (PVDF) resin based paint and primer system having a total thickness not less than 1.0 mil on an approximately 55 percent aluminum-43 percent zinc-1 percent silicone galvanized coating complying with ASTM A792.
 - b. The galvanized coating shall be deposited at a minimum rate of 0.50 ounces/square foot.
 - c. Furnish manufacturer's standard color chart for Owner's selection.
 5. Ridge panel: 1-piece, factory-formed to match roof slope at each side, of same material as roof panels, and capable of completely sealing roof ridge.
- D. Bolted joint components: High-strength steel bolts used for steel-to-steel structural connections:
1. Bolts: ASTM F3125, Grade A325, Type 1, or ASTM F3125, Grade A490, Type 1.
 2. Nuts: ASTM A563, heavy hex. Grade and finish to match bolts as specified in RCSC Specification for Structural Joints Using High Strength Bolts.
 3. Washers: ASTM F436; flat unless otherwise noted.
 4. Load indicator devices:
 - a. Twist-off type tension-control bolt assemblies: ASTM F3125, Grade A1852, or ASTM F3125, Grade F2280.
 - b. Compressible washer direct tension indicators: ASTM F959, Type 325-1 for ASTM F3125, Grade A325 bolts, or ASTM F959, Type 490-1 for ASTM F3125, Grade A490 bolts.
 5. Bolts furnished for the project shall be a single size and grade.
- E. Anchor bolts or anchor rods: As specified in Section 05_05_24 - Mechanical Anchoring and Fastening to Concrete and Masonry except that material shall be Type 316 stainless steel unless otherwise indicated on the Drawings.
- F. Fasteners and washers:
1. Fasteners and washers used for attachment of wall and roof panels.
 2. Fasteners: Vinyl-coated steel or stainless steel.
 3. Washers: Neoprene or other accepted type washer capable of being used to ensure watertightness at fastening locations.

- G. Gutters and downspouts:
 - 1. 24-gauge steel.
 - 2. Galvanized in accordance with ASTM A653 to G60 designation.
 - 3. Field painted. Color to be selected by Owner to complement wall panels.
- H. Doors, frames, and door hardware:
 - 1. Provide in accordance with Division 8 specifications.
- I. Touch-up painting materials:
 - 1. For structural elements:
 - a. Shop primer: Manufacturer's standard primer.
 - b. Touch-up paint: Same as shop primer.
 - 2. For sheet metal skin:
 - a. Exterior finish paint: Match specified coating:
 - 1) Color: Color as selected by the Engineer.
- J. Insulation:
 - 1. Thermal value:
 - a. Roof insulation: R-19.
 - b. Wall insulation: R-13.
- K. Translucent panels:
 - 1. Exterior ribbed profile sheet plastic manufactured with light stabilized polyester resins and reinforced with glass fibers:
 - a. Glass fibers shall be approximately 30 percent by weight.
 - 2. Panels shall be resistant to chemicals expected in or around the structure.
 - 3. Exterior panels shall match the configuration of the metal roofing:
 - 4. Color shall be as selected by the Engineer.
 - 5. Panels shall be classified by UL and FM with a flame spread of 25 or less and be self-extinguishing for fire.
 - 6. Minimum light transmittance in accordance with ASTM D1494 shall be 24 percent.
- L. Caulking material: Elastomer type, manufacturer's standard.
- M. Roof vents:
 - 1. 10-foot ridge vents with 9-inch or 12-inch throat opening at ridge. Vents shall be pre-fabricated by a recognized manufacturer and shall include necessary flashing to make them weathertight.
 - 2. Factory painted with color acceptable to Engineer and factory assembled units complete with bird screen and cord operated damper.
 - 3. Each vent shall allow a minimum of 620 cubic feet per minute air movement at a temperature differential of 10 degrees.
 - 4. Vents shall be fabricated by a recognized manufacturer shall include necessary flashing to make them weathertight.
- N. Vent materials:
 - 1. Steel: Minimum 20 gauge galvanized.
 - 2. Screens: 1/8-inch mesh aluminum screen.

- O. Ventilator accessories:
 - 1. Bird Screen.
 - 2. Flashing.

2.04 FABRICATION

- A. Shop fabrication:
 - 1. Structural elements:
 - a. Fabricate rigid frame of hot-rolled sections or continuously welded plate sections.
 - b. Field connections shall be bolted unless otherwise accepted by the Engineer.
 - 2. Wall panels:
 - a. Provide panels that are 1 piece from base to eave and have fasteners located on inside of panels.
 - b. Provide top and bottom closures and bottom supports.
 - 3. Roof panels:
 - a. Panel splicing: Panels may be spliced with minimum end overlap of 9 inches at purlins.
 - b. Ridge panel: Provide 1 piece ridge panel, factory formed to match roof slope, of same material as roof panel, and capable of completely sealing roof ridge.
 - c. Expansion of roof panels: Provide means to allow expansion of roof panels.
 - 4. Fasteners for roof and wall panels:
 - a. Fasteners: Secure with fasteners that ensure maximum weathertightness, proper bearing surface, and permanent seal at point of fastening.
 - b. Washers: Use washers capable of assuring watertightness at fastening locations.
 - 5. Accessories:
 - a. Gutters, downspouts, and hangers:
 - 1) Provide 4-inch gutters, downspouts, and hangers as indicated on the Drawings.
 - b. Vents:
 - 1) Provide vents of size and location indicated on the Drawings.
 - 2) Provide louvers that are operable and that have screens.
 - c. Ventilators:
 - 1) Provide buildings with gravity vertical turbine ventilators with 12-inch throats where indicated on the Drawings.
 - 2) Provide ventilators that are gravity operated with damper.
 - 3) Accessories: Provide hardware and accessories including bird screen and flashing, as required to properly install ventilators in roof openings.
- B. Tolerances:
 - 1. Hot-rolled sections: In accordance with AISC 303.
 - 2. Cold-formed and Built-up sections: In accordance with MBMA Metal Building Systems Manual.

2.05 SOURCE QUALITY CONTROL

- A. General.
 - 1. Components of the metal building system fabricated in the manufacturer's shop will not be subject to special inspection, as specified in this Section.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of conditions:
 - 1. Verify site conditions prior to start of work. Unacceptable conditions shall be reported to Engineer.
 - 2. Starting of erection of metal building system work shall indicate acceptance of existing conditions:
 - a. Manufacturer or manufacturer's trained erector shall review and examine existing site conditions, foundation, and surface preparation, and adequacy of site-prepared components prior to commencing erection of the building.

3.02 ERECTION

- A. General:
 - 1. Erect in accordance with the MBMA, Metal Building Systems Manual and manufacturer's instruction, except as modified in this Section.
 - 2. Separate dissimilar materials with gaskets or suitable insulating coatings.
 - 3. Keep exposed surfaces clean and free from sealant, metal cuttings, and other foreign materials.
- B. Framing and structural members:
 - 1. Set anchor rods by template and securely tie into formwork before concrete placement.
 - 2. Provide uniform bearing under baseplates and sills by filling using a non-shrinking grout as specified in Section 03_60_00 - Grouting.
- C. Walls and roof:
 - 1. Erect a structure that will be free from water leaks and meet design requirements.
 - 2. Direct side lap edges away from the prevailing winds at the site.
 - 3. Do not exceed the maximum fastener spacings specified:
 - a. Space fasteners uniformly not to exceed: 8 inches on center at ends of covering, 12 inches on center at intermediate supports and at roof covering side laps, and 18 inches on center at wall covering side laps.
 - 4. Install fasteners in straight lines within a tolerance of 1/2-inch per bay.
 - 5. Seal side laps, ends of roof, wall coverings, and joints at accessories:
 - a. Drive fasteners to the surface and seat gasketed heads and washers.
 - 6. Fasten accessories to framing members, except as otherwise accepted by the Engineer.
 - 7. Wall panels shall be isolated from concrete floor slab and/or foundation.

8. Flashing shall be provided at the base of wall panels to prevent wind-driven rain from entering the building envelope.
- D. Gutters and downspouts:
 1. Attach securely to the building.
 2. Install gutters sloped to drain with adequate provisions for expansion and contraction.
- E. Doors and roof openings:
 1. Anchor securely to the supporting construction.
 2. Install doors plumb and true and adjust to provide operation.

3.03 FIELD QUALITY CONTROL

- A. General:
 1. Installation of metal building system will be subject to special inspection and evaluation during construction, as specified in this Section.
- B. Site inspection:
 1. Special inspection of the metal building system components will be performed at the time and frequency outlined in Attachment A - Metal Building System Construction Special Inspection.
 2. The elements of the metal building system construction that will be subject to special inspection are as indicated in Attachment A - Metal Building System Construction Special Inspection.

3.04 ADJUSTING

- A. Touch-up factory finished surfaces of roof and wall panels with the manufacturers recommended paint where damaged or abraded.
- B. Where shop processes such as shearing or punching leave edges of galvanized steel unprotected by galvanization, touch up unprotected edges as specified in this Section.
- C. Galvanized surfaces: Repair damaged galvanized surfaces in accordance with recommendations of the American Hot-Dip Galvanized Association.

3.05 CLEANING

- A. Remove excess materials, equipment, and debris incidental to this work upon completion.

3.06 PROTECTION

- A. During erection, the erector shall be responsible for the protection of this and all adjacent work from damage.

END OF SECTION

ATTACHMENT A - METAL BUILDING SYSTEM CONSTRUCTION SPECIAL INSPECTION

METAL BUILDING SYSTEM CONSTRUCTION SPECIAL INSPECTION

IBC Table 1704.3	Inspection Task	Frequency/Timing of Inspection	Criteria Reference
Prior to beginning installation of metal building, verify high-strength bolts, nuts, and washers:			
1.a.	Identification markings conform to ASTM standards required by approved design.	Periodic: Confirm from stockpile of materials delivered to site whether material furnished complies with the materials in the approved design.	
1.b.	Confirmation of manufacturer's certificate of compliance	Periodic: Confirm that manufacturer has furnished the required Certificate of Compliance.	
Inspection of high-strength bolted joints:			
2.a.	Joints designated bearing-type connections by the approved design.	Periodic: Provide continuous inspection of the initial installation of each type and size of joint. Subsequent installations of the same type and size of joint may be inspected on a periodic basis with inspections of a minimum of 20 percent of installations, or once per calendar week, whichever is more frequent.	
2.b.	Joints designated slip-critical connections by the approved design.	Continuous: Provide continuous inspection as specified in Section 01_45_24 - Regulatory Quality Assurance.	
Verification of structural steel material:			
3.a.	Identification markings conform to ASTM standards required by approved design.	Periodic:	
3.b.	Confirmation of manufacturer's certified mill test reports.	Periodic:	

IBC Table 1704.3	Inspection Task	Frequency/Timing of Inspection	Criteria Reference
Prior to beginning installation of metal building, verify weld filler materials:			
4.a.	Identification markings conform to the AWS specification required by approved design.	<u>Periodic:</u>	
4.b.	Confirmation of manufacturer's certificate of compliance	<u>Periodic:</u>	
Inspection of structural steel welding:			
5.a.1.	Complete and partial penetration groove welds.	<u>Continuous:</u> Provide <u>continuous</u> inspection as specified in Section 01_45_24 - Regulatory Quality Assurance.	
5.a.2.	Multipass fillet welds.	<u>Continuous:</u> Provide <u>continuous</u> inspection as specified in Section 01_45_24 - Regulatory Quality Assurance.	
5.a.3.	Single-pass fillet welds greater than 5/16 inch.	<u>Continuous:</u> Provide <u>continuous</u> inspection as specified in Section 01_45_24 - Regulatory Quality Assurance.	
5.a.4.	Single-pass fillet welds less than or equal to 5/16 inch.	<u>Periodic:</u> Provide <u>continuous</u> inspection of the initial production of each type and size of welded joint. Subsequent production of the same type and size of joint may be inspected on a <u>periodic</u> basis with inspections of a minimum of 20 percent of installations, or once per calendar week, whichever is more frequent.	
5.a.5.	Floor and roof deck welds.	<u>Periodic:</u> Provide <u>continuous</u> inspection of the initial production of each type and size of welded joint. Subsequent production of the same type and size of joint may be inspected on a <u>periodic</u> basis with inspections of a minimum of 20 percent of installations, or once per calendar week, whichever is more frequent.	

IBC Table 1704.3	Inspection Task	Frequency/Timing of Inspection	Criteria Reference
Inspection of steel frame joint construction for compliance with approved design.			
6.a.	Bracing and stiffening details.	Periodic: Provide periodic inspection of any bracing and stiffening details of construction. Inspection should include, as a minimum, verification of member sizes and proper orientation. A minimum of 15 percent of locations should be verified.	
6.b.	Member locations.	Periodic: Provide periodic inspection of member locations. Inspection should include, as a minimum, verification of member sizes and proper spacing/location. A minimum of 15 percent of locations should be verified.	
6.c.	Connection joint details.	Periodic: Provide periodic inspection of joint details of construction. Inspection should include, as a minimum, verification of miscellaneous steel detailing, including stiffener plates, concrete pourstops, gusset plates and similar miscellaneous steel framing. A minimum of 15 percent of locations should be verified.	

SECTION 22_42_01

PLUMBING SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Requirements for materials and installation of plumbing systems.

1.02 REFERENCES

A. Abbreviations:

1. gpf - gallons per flush.
2. gph - gallons per hour.
3. gpm - gallons per minute.
4. psig - pounds per square inch, gauge.

B. Definitions:

1. Buried: Piping that is installed below buildings, foundations, or finish grade, either in soil or encased in concrete in soil.
2. Exterior: Piping that is installed outside a building or within a pipe trench or tunnel.
3. Flame Spread and Smoke Density: Burning characteristics determined in accordance with ASTM E84.
4. Interior: Piping that is installed inside a building.
5. K Factor: Thermal conductivity determined in accordance with ASTM C177 or C518.
6. Mineral Fiber: Fibers manufactured of glass, rock, or slag processed from a molten state, with or without a binder.
7. Water Vapor Permeance: Water vapor transmission determined in accordance with ASTM E96 and expressed in units of perm-inch.

C. Standards:

1. American Concrete Institute (ACI).
2. American Gas Association (AGA).
3. American Society of Mechanical Engineers (ASME).
 - a. B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300.
 - b. B16.12 - Cast Iron Threaded Drainage Fittings.
4. American Society of Sanitary Engineering (ASSE):
 - a. 1070 - Performance Requirements for Water Temperature Limiting Devices.
5. American Water Works Association (AWWA):
 - a. C511 – Reduced-Pressure Principle Backflow Prevention.
 - b. C700 - Standard for Cold-Water Meters -- Displacement Type, Bronze Main Case.
 - c. C702 - Standard for Cold-Water Meters -- Compound Type.
6. Americans with Disabilities Act (ADA).

7. ASTM International (ASTM):
- a. A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 - b. A74 - Standard Specification for Cast Iron Soil Pipe and Fittings.
 - c. A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - d. A888 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.
 - e. B32 - Standard Specification for Solder Metal.
 - f. B88 - Standard Specification for Seamless Copper Water Tube.
 - g. B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube.
 - h. B828 - Standard Specification for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings.
 - i. C117 - Standard Test Method for Materials Finer than 75- μ m (No. 200) Sieve in Mineral Aggregates by Washing.
 - j. C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
 - k. C547 - Standard Specification for Mineral Fiber Pipe Insulation.
 - l. C552 - Standard Specification for Cellular Glass Thermal Insulation.
 - m. C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
 - n. C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.
 - o. D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics.
 - p. D297 - Standard Test Methods for Rubber Products—Chemical Analysis.
 - q. D395 - Standard Test Methods for Rubber Property—Compression Set.
 - r. D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension.
 - s. D638 - Standard Test Method for Tensile Properties of Plastics
 - t. D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
 - u. D792 - Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement.
 - v. D1784 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.
 - w. D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
 - x. D2240 - Standard Test Method for Rubber Property—Durometer Hardness.
 - y. D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
 - z. D2467 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
 - aa. D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems.
 - bb. D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings.
 - cc. E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

- dd. E96 - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials.
- ee. F438 - Standard Specification for Socket-Type Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40.
- ff. F439 - Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80.
- gg. F441 - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80.
- hh. F493 - Standard Specification for Solvent Cements for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe and Fittings.
- ii. F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
- jj. F594 - Standard Specification for Stainless Steel Nuts.
- kk. F645 - Standard Guide for Selection, Design, and Installation of Thermoplastic Water- Pressure Piping Systems.
- 8. International Association of Plumbing and Mechanical Officials (IAPMO):
 - a. IS 03 - Copper plumbing Tube Pipe and Fittings.
- 9. National Electrical Manufacturers Association (NEMA):
 - a. 250 - Enclosures for Electrical Equipment (1000 V Maximum).
- 10. Plumbing and Drainage Institute (PDI):
 - a. WH 201 - Water Hammer Arresters Standard.
- 11. Underwriters Laboratories, Inc. (UL):
 - a. 94 - Standard for Tests for Flammability of Plastic Materials for Parts in Devices and Appliances.
- 12. United States Environment Protection Agency (EPA): Water Sense.

1.03 SUBMITTALS

- A. Submit as specified in Section 01_33_00 - Submittal Procedures.
- B. Manufacturer's instructions.
- C. Shop drawings: and as applicable:
 - 1. System layout, mechanical, electrical power, and control diagrams.
 - 2. Nameplate information.
 - 3. Materials.
 - 4. Coatings and linings.
 - 5. Rough-in drawings.
 - 6. Supports, vibration isolators, and details.
 - 7. Primary and ancillary equipment.
 - 8. Proposed cutting and patching.
 - 9. Maximum recommended equipment vibration levels and field-testing method.
 - 10. Copy of factory test results.
- D. Certificates: As specified in Section 01_60_00 - Product Requirements:
 - 1. American Backflow Prevention Association for backflow prevention assembly.
 - 2. National Science Foundation for products when specified.
- E. Field testing documentation.
- F. Warranties.

1.04 WARRANTY

- A. Provide warranty as specified in Section 01_78_36 - Warranties and Bonds.

PART 2 PRODUCTS

2.01 GENERAL

- A. All devices and fixtures shall be in accordance with CCR Title 24.

2.02 PLUMBING AND DRAINAGE PRODUCTS

- A. Type HB-1, Hose bib stations:
 - 1. Manufacturers: The follow or equal:
 - a. Flexon Pro Series.
 - b. Gilmore Group.
 - 2. Hose bib: Size and mounting requirements as indicated on the Drawings.
 - 3. Hose rack: Type and installation as indicated on the Drawings.
 - 4. Hose:
 - a. Length: 75 feet.
 - b. Size: 3/4-inch.
 - c. Commercial/industrial grade rubber hose.
 - 5. Hose nozzle:
 - a. Spray: 7-pattern select-a-spray with vinyl grip.
 - b. Hold-open clip for continuous spraying.
 - c. Material: Rust resistant stainless steel spring.
 - d. Lifetime leak proof seal.
- B. Cleanouts:
 - 1. Cleanouts:
 - a. Cast-iron ferrule, countersunk plug, gastight and watertight seal.
 - b. Adjustable cleanout head extension.
 - c. Nickel-bronze top and securing screw.
 - d. Type FCO1: Floor cleanouts, finished floors:
 - 1) Manufacturers: One of the following or equal:
 - a) Josam Co.
 - b) Zurn Ind., Inc., ZN1400.
 - 2) For finished floors.
 - 3) Traffic: Light.
 - e. Type FCO2: Floor cleanouts, unfinished floors:
 - 1) Manufacturers: One of the following or equal:
 - a) Josam Co., Model 55000.
 - b) Zurn Ind., Inc.
 - 2) For unfinished floors.
 - f. Type FCO3, Floor cleanout, exterior, in asphalt or ground areas:
 - 1) Manufacturers: One of the following or equal:
 - a) Josam Co., Model 55000.
 - b) Zurn Ind., Inc.
 - 2) Rated for outdoor use.

- C. Drains:
 - 1. Drains shall be the type, shape, and size as indicated on the Drawings with connections suitable for the piping system.
 - a. Provide all drains of one type from the same manufacturer.
 - 2. Type FD1: Floor drain, finished floors, pedestrian traffic:
 - a. Manufacturers: One of the following or equal:
 - 1) Josam, 30000-A.
 - 2) Zurn.
 - b. Round, adjustable strainer head, floor level grate.
 - c. Body material: Coated cast iron.
 - d. Strainer:
 - 1) Material: Nickel bronze.
 - 2) Size:
 - a) 6-inch diameter for 3-inch drain.
 - b) 8-inch diameter for 4-inch drain.
 - 3. Type TD1: Trench drain:
 - a. Manufacturers: One of the following or equal:
 - 1) Zurn, Z664.
 - 2) Josam.
 - b. Modular linear trench drain.
 - c. Size: 6-inches wide by 12-inches long modules.
 - d. Bottom outlet, with secondary dome strainer.
 - e. Overall length as indicated on the Drawings.

2.03 PLUMBING PIPING SYSTEMS

- A. As indicated on the Drawings in the Piping Schedule.
- B. PVC piping system:
 - 1. Pipe: Designation PVC 1120 in accordance with ASTM D1785:
 - a. Pipe and fittings: Extruded from Type I, Grade 1, Class 12454 B material in accordance with ASTM D1784.
 - b. PVC Pipe: Schedule 40 unless otherwise specified.
 - 2. Fittings:
 - a. Supplied by pipe manufacturer.
 - b. Pressure fittings: In accordance with ASTM D2466 or ASTM D2467.
 - c. DWV fittings: In accordance with ASTM D2665.
 - 3. Solvent cement: In accordance with ASTM D2564:
 - a. Chemical service: For PVC pipe in chemical service, provide the following primer and cement, or equal:
 - 1) Primer: IPS Corp Type P-70™.
 - 2) Cement: IPS Corp Type 724™ cement or cement certified by the manufacturer for chemical service.

2.04 WALL AND FLOOR SEALS

- A. Single seal.
- B. Seal element: Nitrile with the following physical characteristics:
 - 1. ASTM D297 Specific Gravity: 1.15.

2. ASTM D395 Compression Set (22 hours at 158 degrees Fahrenheit): 45 percent.
 3. ASTM D412 Elongation at Break: 300 percent.
 4. ASTM D412 Tensile Strength: 1,300 psi.
 5. ASTM D2240 Durometer Hardness (shore A): 50±5.
- C. Pressure plate: Reinforced nylon polymer:
1. ASTM D256 IZOD Impact/Notch: 11.1 ft-lb/in.
 2. ASTM D638 Elongation (Break): 11 percent.
 3. ASTM D638 Tensile Strength (Yield): 20,000 psi.
 4. ASTM D790 Flexural Modulus: 1,124,000 psi.
 5. ASTM D790 Flexural Strength (Yield): 30,750 psi.
 6. ASTM D792 Specific Gravity: 1.38.
- D. Bolts: Type 316 stainless steel in accordance with ASTM F593, min tensile strength of 85,000 psi.
- E. Nuts: Type 316 stainless steel in accordance with ASTM F594, min tensile strength of 85,000 psi.

2.05 ANTI-SEIZE LUBRICANT

- A. Manufacturers: One of the following or equal:
1. Bostik, Never Seez.
 2. Oil Research Center.
- B. Use with assembly of stainless steel nuts and bolts.

2.06 BACKFLOW PREVENTERS

- A. Manufacturers: One of the following or equal:
1. Febco backflow prevention:
 - a. Model LF860 all sizes.
 2. Zurn/Wilkins:
 - a. Model 975XL for 1/2-inch through 2-inch.
 - b. Model 375AST for sizes 2 1/2 inch, 3 inch, 8 inch, and 10 inch.
 - c. Model 375 and 375DA for sizes 4 inch and 6 inch.
 3. Watts regulator: Series LF909.
- B. Design: Reduced pressure chamber type in accordance with AWWA C511.
- C. Shutoff valves:
1. Backflow preventers 2-inch and smaller: Provide with full-port, quarter turn, resilient seated ball valves.
 2. Backflow preventers larger than 2-inch: Provide with resilient seated, outside stem and yoke gate valves.

PART 3 EXECUTION

3.01 GENERAL

- A. Furnish and install vents required in drainage piping as part of the plumbing system, in accordance with Laws and Regulations.
- B. Use anti-seize lubricant for stainless steel threads on fittings and fasteners.

3.02 INSTALLATION

- A. Plumbing and drainage products:
 - 1. Traps:
 - a. Install traps as near the fixtures as possible.
 - 2. Sizes of equipment drains and of floor drains shall be as indicated on the Drawings.
- B. Plumbing piping systems:
 - 1. PVC piping systems:
 - a. Where not specified otherwise, install horizontal piping with a grade of 1/4 inch per foot.
 - b. Provide vents, roof drains, and pipes flashed and made watertight at the roof with lead sheet flashings.
 - 1) Minimum 4-pound lead sheet.
 - c. Extend flashing not less than 6 inches up the pipes, and counter flash with standard cast iron or malleable iron recessed roof couplings.
 - d. Extend flashing for vents up to the top of the vent and turn down into the pipe.
 - e. Extend flashing shields not less than 8 inches from vent and pipe in all directions.
- C. Wall and floor seals:
 - 1. Provide seals at rated walls.
 - 2. Provide seals between floors.
 - 3. Use specified barrier seals for concrete/masonry wall and floor penetrations.
- D. Anti-seize lubricant:
 - 1. Use with assembly of stainless steel nuts and bolts.
- E. Pipe insulation:
 - 1. Install insulation and jacket materials in accordance with manufacturer's written instructions.
 - 2. Fittings:
 - a. Insulate fittings by covering with mitered sections of insulation or utilize factory-made prefabricated fitting shapes.
 - b. Terminate preformed pipe jackets or covering at sufficient distance from flanges to permit removal of bolts.
 - c. Overlap flange and flanged fitting insulation on adjacent pipe covering by at least 2 inches.

3. Valves:
 - a. Insulate valves 3 inches in nominal size and larger with removable insulating blankets.
 - b. Size blanket to extend up to packing gland only so that replacement of packing does not require removal of insulating blanket.
 4. Provide continuous insulation through and over pipe supports and provide protection saddles at supports.
 5. Provide continuous pipe insulation and covering through sleeves or openings in walls and floors.
 - a. When buried pipe enters a building through a below grade wall or slab penetration, begin insulation system on interior side of penetration.
 6. Apply pre-molded pipe insulation with extended legs when used on pipe traced with either tubing or electric cable type.
 7. Thermally isolate insulation closure locations (end caps, transitions, etc.).
 - a. Type 1 or 2 jacket installation on piping with potential reach temperatures greater than 150 degrees Fahrenheit.
 8. Apply piping identification on jackets as specified in Section 40_05_00.03 - Pipe Identification.
- F. Backflow preventers:
1. Include shutoff valves at each end of backflow preventer with properly located test cocks.

3.03 FIELD QUALITY CONTROL

- A. Test water piping in accordance with the plumbing code as specified in Section 01_41_00 - Regulatory Requirements.
- B. Test drain lines as specified and in accordance with the plumbing code as specified in Section 01_41_00 - Regulatory Requirements.
- C. Backflow preventer:
 1. Test witnessing: Witnessed.
 2. Conduct pressure and leak test as specified in Section 40_05_51.01 - Common Work Results for Valves.
 3. Certificate of backflow prevention from a tester listed by the American Backflow Prevention Association.

3.04 CLEANING

- A. Upon completion of installation, clean piping interior of foreign matter and debris.
- B. Flush and disinfect potable water piping as specified in Section 01_75_18 - Disinfection.

3.05 SCHEDULES

- A. As indicated on the Drawings.

END OF SECTION

SECTION 23_05_00

COMMON WORK RESULTS FOR HVAC

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. General prescriptive, design, and performance requirements for products and mechanical equipment used to heat, ventilate, cool, or otherwise condition or distribute indoor air.
 - 2. Specific requirements for ductwork accessories:
 - a. Dampers and damper operators.
 - b. Diffusers, grills, and registers.
 - 3. Specific requirements for refrigerant piping.

1.02 REFERENCES

- A. Air-Conditioning, Heating, and Refrigeration Institute (AHRI):
 - 1. 210/240 - Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment.
 - 2. 270 - Sound Rating of Outdoor Unitary Equipment.
 - 3. 340/360 - Performance Rating of Commercial and Industrial Unitary Air Conditioning and Heat Pump Equipment.
 - 4. 430 - Performance Rating of Central Station Air-handling Unit Supply Fans.
- B. Air Movement and Control Association International, Inc. (AMCA):
 - 1. 11 - Certified Ratings Program Operating Manual.
 - 2. 210 - Laboratory Methods for Testing Fans for Certified Aerodynamic Performance Rating.
 - 3. 211 - Certified Rating Program- Product Rating Manual for Fan Air Performance.
 - 4. 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data.
 - 5. 311 - Certified Ratings Program — Product Rating Manual for Fan Sound Performance.
 - 6. 500 – Laboratory Methods of Testing Dampers for Rating.
 - 7. 511 - Certified Ratings Program Product Rating Manual for Air Control Devices.
- C. American Bearing Manufacturer's Association (ABMA):
 - 1. 9 - Load Ratings and Fatigue Life for Ball Bearings.
 - 2. 11 - Load Ratings and Fatigue Life for Roller Bearings.
- D. American National Standards Institute (ANSI):
 - 1. Z21.47 - Gas Fired Central Furnaces (except Direct Vent Central Furnaces).

- E. American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE):
 - 1. Standard 15 - Safety Standard for Refrigeration System.
 - 2. Standard 52.2 - Methods of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size.
- F. American Society of Mechanical Engineers (ASME):
 - 1. RTP-1 – Reinforced Thermoset Plastic Corrosion-Resistant Equipment.
- G. ASTM International (ASTM):
 - 1. B32 - Standard Specification for Solder Metal.
 - 2. B75 - Standard Specification for Seamless Copper Tube.
 - 3. B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.
 - 4. B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube.
 - 5. B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fitting.
 - 6. C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.
 - 7. D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
 - 8. D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
 - 9. D2467 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
 - 10. D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems.
 - 11. D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings.
- H. National Bureau of Standards: NBS PS15-69 - Custom Contact-Molded Reinforced-Polyester Chemical-Resistant Process Equipment.
- I. National Electrical Manufacturers Association (NEMA):
 - 1. 250 - Enclosures for Electrical Equipment (1000 V Maximum).
- J. National Fire Protection Association (NFPA):
 - 1. 70 - National Electrical Code (NEC).
 - 2. 90A - Standard for the Installation of Air Conditioning and Ventilating Systems.
- K. National Roofing Contractors Association (NRCA).
- L. International Association of Plumbing and Mechanical Officials (IAPMO):
 - 1. IS 3 - Installation Standard for Copper Plumbing Tube, Pipe, and Fittings.
- M. Sheet Metal and Air Conditioning Contractors National Association (SMACNA).
- N. Underwriters Laboratories, Inc. (UL):
 - 1. 555 - Standard for Fire Dampers.
 - 2. 555S - Standard for Smoke Dampers.

3. 900 - Standard for Air Filter Units.

1.03 SUBMITTALS

- A. Where items in this Section are components of equipment or systems specified in other sections, include data for this Section's components with the equipment or system submittal.
- B. When products are specified in this Section but are not referenced in other Technical Sections, submit:
 1. As specified in Section 01_33_00 - Submittal Procedures.
 2. Product data:
 - a. Sufficient to substantiate specified requirements.
 3. Description of coating system and instructions for field touch up and re-coating.

PART 2 PRODUCTS

2.01 GENERAL

- A. Technical Sections product requirements supersede conflicting requirements in this Section.
- B. As specified in Section 01_60_00 - Product Requirements.
- C. Electrical:
 1. Components and assemblies.
 2. Carry UL Listing Marking.
 3. In accordance with NEC requirements.
- D. Fans:
 1. Rated and labeled in accordance with AMCA 210 and AMCA 211.
 2. Belt drive systems:
 - a. Adjustable for minimum within 5 percent speed change.
 - b. Rated for 150 percent of maximum motor horsepower.
- E. Unitary air conditioners and heat pumps:
 1. Rated in accordance with AHRI Standards 210/240 or 340/360, AHRI 270, and AHRI 430.
 2. In accordance with ASHRAE Standard 15.
 3. Heating: Certified in accordance with ANSI Z21-47.
 4. Refrigerant: HFC R-410A.
- F. Filters:
 1. Media: UL 900 listed.
- G. Insulation and adhesives: In accordance with NFPA 90A requirements for flame spread and smoke generation.

- H. Factory coating: For equipment with factory coatings, manufacturer to supply 2 containers (each about a pint) of the paint for Contractor/Owner touch up.

2.02 DESIGN AND PERFORMANCE CRITERIA

A. General:

1. Environmental conditions as specified in Section 01_81_50 - Design Criteria.

B. Fans

1. Sharply rising pressure characteristics throughout the operating range and beyond the efficiency peak.
2. Peak operating points to be as close as possible to the maximum efficiency and whose operating range is within the normal fan selection range.
3. Bearings rated per ABMA 9 or 11 for a L10 life rating of not less than 50,000 hours.
4. Total sound power levels in the 8 octave band range in accordance with, AMCA 301, not to exceed the lesser of the following or the sones level indicated on the Drawings.

Sound Power Level, decibels levels referenced to 10-12 watts								
Frequency, Hz	63	125	250	500	1,000	2,000	4,000	8,000
General	100	98	94	88	84	84	78	75

5. Shall comply with AMCA Publication 11 and bear the AMCA Certified Ratings Program seal for air performance and sound performance according to AMCA Publication 211 and AMCA Publication 311.

C. Unitary air conditioners and heat pumps:

1. Outdoor noise levels: Outdoor noise levels in the 8 octave band ranges, as measured in accordance with AHRI 270 shall not exceed the following:

OCTAVE BANDS								
Unit Nominal Capacity (Tons)	63	125	250	500	1,000	2,000	4,000	8,000
0 to 5	64	70	71	74	74	71	67	67
6	79	85	78	74	71	73	66	59
7-1/2 to 10	64	70	73	79	82	78	74	67
12 and larger	84	88	84	83	84	78	72	68

2. Capable of starting and cooling from 45 to 125 degrees Fahrenheit ambient outdoor air temperature and exceeding the maximum load criteria of AHRI Standard 210/240 or 340/360.
3. Minimum cooling, Energy Efficiency Ratio (EER) and Integrated Energy Efficiency Ratio (IEER), as rated in accordance with AHRI 210/240 or 340/360 as follows:

Equipment Type	Net Cooling Cap (British Thermal Units per hour)	EER⁽¹⁾	IEER⁽²⁾
Air Cooled	>65,000 and <135,000	11.2	12.9
Air Cooled	>135,000 and < 240,000	11.0	12.4
Air Cooled	>240,000 and < 760,000	10.0	11.6
Air Cooled	> 760,000	9.7	11.2
(1) Deduct 0.2° from the required EER for units with a heating section other than electric resistance heat.			
(2) IEER is only applicable to equipment with capacity control in accordance with AHRI 340/360			

4. Unit air flows for cooling:
 - a. Minimum of 300 cubic feet per minute (cfm) per ton.
5. Maximum 500 cfm per ton.

D. Filters:

1. Efficiency: 45 to 50 percent dust spot efficiency when rated in accordance with ASHRAE Test Standard 52.2.

E. Smoke detector requirements:

1. Provide all supply, exhaust, and odor control fans greater than or equal to 2,000 cubic feet per minute with smoke detectors:
 - a. Duct or fan mounted smoke detector as specified in Section 23_09_13 - Instrumentation and Control Devices for HVAC.

2.03 DAMPERS

A. General:

1. Damper type, style, and size as indicated on the Drawings.
2. Components: Include with each damper:
 - a. Type, Frame, actuators, clips, connectors, and other accessories necessary for mounting.
 - 1) Manual actuators: Factory supplied locking quadrant on factory mounted stand-off bracket.
 - a) Bracket finish to match frame.
 - 2) Electric actuators when indicated on the Drawings.
3. Leakage Class, when specified, to be in accordance with AMCA Standard 511 and product to bear AMCA Rating Seal for Air Leakage.
 - a. Blade seals to be mechanically attached.
4. All fire dampers and combination smoke/fire dampers to have duct access door near damper as specified in technical sections.

- B. Backdraft dampers (BDD):
 - 1. BDD-1; Style 1; counterbalanced backdraft damper:
 - a. Manufacturers: One of the following or equal:
 - 1) Ruskin: Model CBD6.
 - 2) Greenheck.
 - b. Frame:
 - 1) Minimum depth: 2.25 inches.
 - 2) Minimum thickness: 0.125-inch.
 - 3) Material: 6063T5 aluminum.
 - 4) With insect screen and water stop.
 - c. Blades:
 - 1) Minimum thickness: 0.070-inch.
 - 2) Material: 6063T5 aluminum.
 - 3) High strength nylon bearings.
 - 4) Elastomer edge seals.
 - 5) Aluminum tie-bar.
 - 6) Blades require no more than 4.25 inches clearance beyond frame when fully open.
 - d. Counterbalance:
 - 1) Zinc plated bar on blades.
 - 2) Adjustable down to 0.01-inch wg opening.
 - e. Finish:
 - 1) Polyester Powder.

2.04 DAMPER OPERATORS

- A. General: Provide manual damper operator for each damper furnished as indicated on the Drawings.
- B. Manual operators by damper manufacturer:
 - 1. Operate damper manually with a force not exceeding 20 pounds.
 - 2. Provide with locking quadrant.
 - 3. Provide 3/8 inch, or larger, square double-ended drive shaft adequate for required damper torque, with machined keyways allowing for mounting in 2 positions, 90 degrees apart.
 - 4. Provide sufficient number of operators for torque required to operate damper.

2.05 DIFFUSERS, GRILLES, AND REGISTERS

- A. Provide diffusers, grilles, and registers manufactured by the same manufacturer.
- B. Provide style and size as indicated on the Drawings.
- C. Components: Include specified style with frame, clips, connectors, and other accessories necessary for mounting.
- D. Supply diffuser, grille, and register styles:
 - a.
 - 2. SR-3, Supply Register Style 3:
 - a. Manufacturers: One of the following or equal:
 - 1) Titus Manufacturing Corp, 272FL.

- 2) Tuttle and Bailey.
 - 3) Kees, Inc.
 - 4) Metal Industries, Inc., (MetalAire).
 - 5) Krueger.
 - b. Type: Aero-blade series (3/4-inch) with aluminum border.
 - c. Installation: when duct mounted is indicated on the Drawings, provide 4 inch drop frame.
 - d. Faceplate:
 - 1) Removable grille with double deflection blades spaced at 3/4 inch.
 - 2) Front blades parallel to long dimension.
 - 3) Gasket at frame.
 - e. Core:
 - 1) Adjustable vanes.
 - 2) Rectangular or round neck to match ducting.
 - f. Damper:
 - 1) Opposed blade volume control damper suitable for use with ducting type.
 - 2) Damper adjustable through the face.
 - g. Materials: Aluminum frame, core, damper, and faceplate.
- E. Return/exhaust diffuser, grille, and register styles:
- a.
 - 2. RR-3/ER-3, Return/Exhaust Register Style 3:
 - a. Manufacturers: One of the following or equal:
 - 1) Titus Manufacturing Corp, 350FL.
 - 2) Tuttle and Bailey.
 - 3) Kees, Inc.
 - 4) Metal Industries, Inc., (MetalAire).
 - 5) Krueger.
 - b. Size: Rectangular grille with size as indicated on the Drawings.
 - c. Installation: when duct mounted is indicated on the Drawings, provide 4 inch drop frame.
 - d. Faceplate: Removable grille with fixed blades spaced at 3/4 inch; front blades parallel to long dimension with 35 degree deflection; provide gasket at frame for sealing.
 - e. Core: When connected to ducting, provide suitable rectangular or round neck to match ducting.
 - f. Damper: When connected to ducting, provide opposed blade volume control damper suitable for use with ducting type; damper to be adjustable through the face of the unit.
 - g. Materials: Aluminum frame, core, damper, and faceplate.

2.06 SCREENS

- A. Required on all fans and louvers unless otherwise indicated on the Drawings.
- B. Characteristics and features:
 - 1. Bird screen: 1/2-inch mesh by 14 gauges.
 - a. For exhaust applications.
 - 2. Insect screens: 18 by 14 mesh.
 - a. For intake applications.

3. Screens and frames, same material as ductwork, hood, louver, fan, or equipment connected to screen.
4. Screens secured in frames.

2.07 FLEXIBLE CONNECTORS

- A. Provide flexible duct connectors at connections to fans and other air movement equipment as indicated on the Drawings.
- B. FL-1, Duct to Duct Flexible Connection:
 1. Fabric shall be fire resistant, waterproof, mildew-resistant, and airtight.
 - a. At least 4 inches of fabric shall be exposed.
 - b. Flexible connections shall be in accordance with the requirements of UL and NFPA.
 2. Interior locations:
 - a. Manufacturers: The following or equal:
 - 1) Ventfabrics, "Ventglas".
 - 2) Flextech Engineering.
 - b. Fabric for flexible connections installed inside office areas shall be Neoprene coated glass fabric suitable for a temperature range of 20 to 180 degrees Fahrenheit and shall have a weight of at least 27 ounces per square yard and a thickness of 0.024 inches.
 3. Exterior locations:
 - a. Manufacturers: The following or equal:
 - 1) Ventfabrics, "Ventlon".
 - 2) Flextech Engineering.
 - b. Fabric for flexible connections exposed to sunlight or the weather shall be glass fabric coated with CSPE suitable for a temperature range of -10 to 250 degree Fahrenheit and shall have a weight of at least 24 ounces per square yard and a thickness of 0.019-inch.
- C. FL-2, Duct to Duct Flexible Connection, Corrosive Environment:
 1. Manufacturers: The following or equal:
 - a. Ventfabrics, "Ventel".
 2. Fabric for flexible connections exposed to chemicals shall be glass fabric coated with Teflon™ and suitable for a temperature range of -10 to 500 degrees Fahrenheit and shall have a weight of at least 14 ounces per square yard and a thickness of 0.014-inch.

2.08 CONDENSATE DRAIN PIPING

- A. PVC:
 1. PVC Pipe: Designation PVC 1120 in accordance with ASTM D1785 and appendices:
 - a. Pipe and fittings: Extruded from Type I, Grade 1, Class 12454 B material in accordance with ASTM D1784.
 - b. PVC Pipe: Schedule 80 unless otherwise indicated on the Drawings.
 2. Fittings:
 - a. Supplied by pipe manufacturer.
 - b. Pressure fittings: In accordance with ASTM D2466 or ASTM D2467.
 - c. DWV fittings: In accordance with ASTM D2665.

3. Solvent cement: In accordance with ASTM D2564:
 - a. Manufacturers: The following or equal:
 - 1) Primer: IPS Corp Type P-70™.
 - 2) Cement: IPS Corp Type 724™ cement or cement certified by the manufacturer for chemical service.

2.09 PIPE INSULATION

A. General:

1. As specified in Section 01_60_00 - Product Requirements.
2. Insulation thicknesses: Provide insulation thickness in inches in accordance with the following table. Insulation thickness shown is nominal. Manufacturing tolerance of 15 percent variation is permissible.

Table 1 - Required Insulation Thicknesses (inches)		
Service Temperature Range as Designated in Insulation Schedule at End of this Section	Nominal Pipe Diameters	
	1 inch and Less	1.25 to 2 inches
100 to 200 degrees Fahrenheit	1.5	1.5
40 to 100 degrees Fahrenheit	0.5	1.0

B. Insulation, Type 1:

1. Manufacturers: One of the following or equal:
 - a. Aeroflex USA Inc., Aerocel® AC.
 - b. Armacell®, AP Armaflex.
2. Insulation material: Closed cell elastomeric insulation.
3. Minimum temperature range: Minus 40 degrees Fahrenheit to plus 220 degrees Fahrenheit.
4. K factor at 75 degrees Fahrenheit: Not more than 0.27 BTU-inch/hour-square feet-degrees Fahrenheit.
5. Fire ratings:
 - a. Flame spread: 25 or less.
 - b. Smoke density: 50 or less for insulation thicknesses up to 1.5 inches.
6. Joints: Seal with manufacturer's recommended contact adhesive to form continuous water barrier.

C. Insulation jackets:

1. Type 1:
 - a. Manufacturers: One of the following or equal:
 - 1) Johns Manville, Zeston® 2000 PVC.
 - 2) Proto Corp., LoSMOKE PVC.
 - 3) Speedline® Corp., Smoke-Safe™ PVC.
 - b. Material: Ultraviolet-resistant polyvinyl chloride jacketing, 20 mil minimum thickness.
 - c. Fire rating: 25 maximum flame spread, smoke developed 50 or less.
 - d. Color: White.
 - e. Overlap: 1-inch minimum at joints and fittings.
 - f. Joint seal: PVC solvent welded or adhesive as recommended by the manufacturer.
 - g. Fittings: Factory made with full thickness insulation.

- D. Vapor barriers:
1. Vapor barrier, Type 1:
 - a. Material: White Kraft paper bound to aluminum foil in accordance with ASTM C1136, Type 1.
 - b. Permeability: 0.02 perms or lower.
 - c. Maximum flame spread rating: 25.
 - d. Edge seal: Pressure-sensitive tape lap seal.
 - e. Circumferential joints: 4-inch wide tape or 4-inch overlap with adhesive seal.
 2. Vapor barrier, Type 2:
 - a. Manufacturers: One of the following or equal:
 - 1) Benjamin Foster, No. 30-76.
 - 2) Childers Products CP10/11 Vi-Acryl.
 - 3) Foster Products, 36-10/46-10 Weatherite.
 - 4) Insul-Coustic, No. I.C.-580.
 - b. Material: Mastic.

E. Insulation schedule:

Table 2 - Insulation Schedule					
Service Designation ⁽¹⁾	Location ⁽²⁾	Insulation Type	Jacket Type	Service Temp. °F ⁽³⁾	Vapor Barrier
HVAC Condensate	Interior or Exterior	1	1	Below 60	Required
Notes: 1. Refer to Piping Schedule in Section - Common Work Results for General Piping for service designations. 2. Insulation jackets are not required for interior installations that are concealed. See definitions for description of concealed locations. 3. Unless noted otherwise, use service temperature range provided in this table to establish insulation thickness as required by Table 1.					

2.10 EQUIPMENT NAMEPLATES

- A. Provide a nameplate with the following markings that is plainly visible after installation:
1. Manufacturer's name, trademark, or other descriptive marking to identify specific equipment.
 2. Where equipment is electrically powered:
 - a. Supply voltage, phase, frequency, and full-load current.
 - b. Power source or circuit ID.
 - c. Short-circuit current rating based on one of the following:
 - 1) Short-circuit current rating of a listed and labeled assembly.
 - 2) Short-circuit current rating established utilizing an approved method.

2.11 SHIPPING, SPARE PARTS, MAINTENANCE PRODUCTS, AND SPECIAL TOOLS

- A. As specified in Section 01_60_00 - Product Requirements.
- B. Inspect fasteners for proper tightness.

- C. Ship units in 1 piece (or modular, if required), factory assembled, piped, internally wired, and factory tested.
- D. Provide:
 - 1. Filters: 2 extra (3 total) sets per each unit with filters.
 - 2. Sheaves and belts: 1 set for change-out for final balance per unit installed.
 - 3. Belts: 1 extra set for each unit installed as determined by final balance.
- E. Provide a 2-year supply of maintenance products as indicated in manufacturer's maintenance literature.

PART 3 EXECUTION

3.01 GENERAL

- A. Technical Sections execution requirements supersede conflicting requirements in this Section.
- B. As specified in Section 01_60_00 - Product Requirements.
- C. Inspect fasteners for proper tightness.
- D. Provide temporary closures for openings designed for airflow.

3.02 INSTALLATION

- A. Examine and verify details and sections as indicated on the Drawings, ascertain adequacy, and determine conflicts in dimensions and clearances.
 - 1. Take measurements and verify dimensions to ascertain fit of installation.
 - 2. Ascertain structural sufficiency to support installation.
 - 3. Ascertain that supports and openings are correctly located; otherwise cut new openings where required.
 - 4. Confirm specified thermostat or other controls are compatible with specified equipment.
- B. Install in accordance with manufacturer instructions.
 - 1. Electrical products installation in accordance with NFPA 70 NEC.
 - 2. If there are conflicts, NEC supersedes manufacturer's instruction.
 - a. Notify Engineer of conflicts.
- C. Equipment and ducts:
 - 1. Remove dust and debris before installation.
 - 2. Protect from dust and debris by covering openings with tape or plastic during installation and until equipment is operated.
 - 3. Adjust alignment of ducts to resolve conflicts with the work of other trades.
 - 4. Install and wire unitary air conditioners, controls, and thermostats in accordance with manufacturer's recommendations.

5. Provide flexible duct and flexible piping connections at connections to unitary air conditioners.
 - a. FL-1 and FL-2, Flexible Connections:
 - 1) Install at building expansion joints and as indicated on the Drawings.
 - 2) Install with collar and metal band to form airtight joints.
 - 3) Install with minimum 4 inches of slack in fabric.
 - 4) Install with minimum 3 inches of specified material on each side of fabric.
 - 5) Exterior locations: Install sheet metal weather cover over fabric.
 - 6) Duct alignment shall be a maximum of 1/2-inch offset.
 - 7) The minimum/maximum gap shall be 2-inches and 6-inches.
 - 8) Lap longitudinal joints and glue per manufacturer's recommendations.
 6. Lubrication lines and fittings:
 - a. Support and protect lines from source to point of use.
 - b. Fittings:
 - 1) Bring to outside of equipment in manner such that fittings are readily accessible from outside without necessity of removing covers, plates, housings, or guards.
 - 2) Mount together wherever possible using factory-mounted multiple fitting assemblies securely mounted, parallel with equipment lines, and protected from damage.
 7. Concrete surfaces designated to receive non-shrink grout under equipment:
 - a. Heavy sandblast concrete surface in contact with non-shrink grout.
 - b. Clean concrete surfaces of sandblasting sand, grease, oil, dirt, and other foreign material that may reduce bond to non-shrink grout.
 - c. Saturate concrete with water. Concrete shall be saturated surface damp at time non-shrink grout is placed.
 8. Remove dust and debris from ductwork and equipment at completion of installation.
 9. Set grilles, dampers, and diffusers to achieve flows and flow patterns indicated on the Drawings.
- D. Gas, water piping, drains, and venting in accordance with the authority having jurisdiction and applicable codes.
- E. Completed equipment installations must have confirmation that:
1. The equipment is properly assembled.
 2. The equipment moves or rotates in the proper direction.
 3. Shafting, drive elements, and bearings are installed and lubricated in accordance with proper tolerances.
 4. No unusual power consumption, lubrication temperatures, bearing temperatures, or other conditions are observed.
 5. The installation meets the requirements for intended use as well as the specified vibration and noise tolerances.

END OF SECTION

SECTION 23_05_93

TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Requirements for testing air systems installed as part of this contract and existing air systems affected by the installation of new equipment.

1.02 REFERENCES

- A. Associated Air Balance Council (AABC):
 - 1. National Standards Total System Balance.
- B. National Environmental Balancing Bureau (NEBB):
 - 1. Procedural Standards for Testing, Adjusting, and Balancing Environmental Systems.
- C. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA):
 - 1. HVAC Systems - Testing, Adjusting, & Balancing.
- D. Testing, Adjusting, and Balancing Bureau (TABB):
 - 1. TAB Procedural Guide.

1.03 SUBMITTALS

- A. Resumes of proposed supervisor and personnel showing training and qualifications:
 - 1. Include courses, exams, or tests relating to HVAC testing - taken and passed.
- B. Testing plan:
 - 1. At least 30 days prior to starting field work.
 - 2. Set of report forms completed with design flow values, installed equipment pressure drops, and required cubic feet per minute for air terminals.
 - 3. Heating, ventilating, and air conditioning system schematic similar to Figure 6-1 in SMACNA HVAC Testing, Adjusting, & Balancing.
 - 4. Complete list of instruments proposed to be used, organized in appropriate categories, with data sheets for each showing:
 - a. Manufacturer and model number.
 - b. Description and use when needed to further identify instrument.
 - c. Size or capacity range.
 - d. Latest calibration date.
 - 5. Proposed schedule for testing and balancing.
- C. Report:
 - 1. Not more than 45 days prior to Contractor's request for final inspection, submit draft report on applicable reporting forms.

2. At least 15 days prior to Contractor's request for final inspection, submit 3 copies of final reports incorporating Engineer's comments on draft report.
3. List of instruments used and last date of calibration of each.
4. Procedures followed for testing, adjusting, and balancing.
5. Identification and succinct description of systems included in report.
6. Initial balance test results made with all dampers and air control devices in fully open positions.
7. Description of final locations and sizes, including opening area and dimensioned configuration of orifices and other restrictions used to achieve final balanced flows.
8. Description of final location and opening positions of dampers, registers, louvers, and valves.
9. Schematics of systems included in report; use schematics as part of testing, adjusting, and balancing report to summarize design and final balanced flows.
10. Testing, adjusting, and balancing report forms.
11. Final field results established for system balancing including airflow, fan speeds, and fan static pressures at the fan inlet and outlet.
12. Appendices:
 - a. Raw field data taken during testing.
 - b. Sample calculation sheet for each type of calculation made to convert raw field data to final results.
 - c. Initial air balance results with dampers and registers in fully open position; include airflow at all inlets and outlet, initial fan speed and fan suction and discharge pressures.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

- A. Work of testing, adjusting, and balancing of heating, ventilation, and air conditioning systems to be by an independent testing agency and a certified member in good standing with AABC, NEBB, or TABB.
- B. Field testing to be performed or directly supervised by personal who have passed a Test and Balance course or exam and is an AABC, NEBB, or TABB certified supervisor.
- C. Prior to start of testing, adjusting, and balancing, verify that:
 1. System installation is complete in accordance with the requirements for completed equipment installations in Section 23_05_00 - Common Work Results for HVAC and capable of full operation.
 2. Outside conditions are within reasonable range relative to design conditions.
 3. Lighting fixtures are energized.
 4. Special equipment such as computers, laboratory equipment, and electronic equipment are in full operation.
 5. Requirements for preparation for testing and balancing have been met for elements of each system which require testing.

3.02 TESTING, ADJUSTING, AND BALANCING

- A. Test, adjust, and balance each separate complete heating, ventilating, and air conditioning systems:
 - 1. Include existing heating, ventilating, and air conditioning components when effected by the Work.
- B. Perform testing, adjusting, and balancing cycles until airflows meet acceptance criteria:
 - 1. Ascertain airflow balance between overall requirements and flow in individual supply and exhaust grilles.
- C. Initial testing, adjusting, and balancing:
 - 1. Test each system with dampers, grilles, orifices, and other variable airflow devices in their full open position; measure and report initial airflows, fan speed, and fan static pressures at fan inlet and outlet.
 - 2. Adjust total system flow downward or upward by adjusting fan speed until one inlet or outlet is at indicated flow and all other flows exceed indicated flows.
 - 3. Adjust fan speed by changing fan drives or sheaves as necessary.
- D. Subsequent testing, adjusting, and balancing:
 - 1. Perform adjustments by adjusting dampers, louvers, or size of orifices or plates.
 - 2. Measure and record air volume discharged at each inlet and outlet and adjust air inlets and outlets to design air volumes within 0 to 5 percent over design rates.
 - 3. Adjust fan speeds and motor drives within drive limitations, for required air volume.
 - 4. Measure air flow and static pressures and adjust air supply and exhaust fan units to deliver at least 100 to 105 percent of the design air volume.
 - 5. Measure and record static air pressure conditions on fans, including filter and coil pressure drops, and total pressure across the fan.
 - 6. Evaluate building and room pressure conditions to determine adequate supply and return air conditions.
 - 7. Evaluate space and zone temperature of conditions to determine adequate performance of the systems to maintain temperatures without draft.
 - 8. Permanently mark final balance positions of balancing dampers.
- E. Develop heating, ventilating, and air conditioning system schematics similar to Figure 6-1 in SMACNA Testing, Adjusting, and Balancing.
- F. Accurately record the required data on AABC, NEBB, or TABB test and balance report forms.
- G. Measure amperage draw of fan and pump motors at final balance.
- H. Test primary source equipment in accordance with AABC, NEBB, or TABB procedures:
 - 1. Primary source equipment includes items listed in this Section not previously tested as part of this testing, adjusting, and balancing work.

2. Complete appropriate AABC, NEBB, or TABB equipment test forms for each piece of equipment.
 3. Calculate cooling and heating capacities to show conformance with specified capacities.
 4. Adjust equipment as needed to deliver specified cooling and heating loads.
 5. Record final equipment performing characteristics and adjustment settings in the final design report.
- I. Testing, adjusting, and balancing acceptance criteria:
1. Procedures successful and complete when heating, ventilating, and air conditioning systems and components are functioning properly and system air flows are within specified tolerances of design flows.

END OF SECTION

SECTION 23_07_13

DUCTWORK INSULATION

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Internal acoustical insulation and external thermal insulation for metal air ductwork systems.

1.02 REFERENCES

- A. ASTM International (ASTM):
 - 1. E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 2. G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
- B. Sheet Metal and Air Conditioning Contractor's National Association (SMACNA).

1.03 SUBMITTALS

- A. Submit as specified in Section 01_33_00 - Submittal Procedures.
- B. Product data: As specified in Section 40_05_00.01 - Common Work Results for General Piping.

1.04 QUALITY ASSURANCE

- A. Comply with SMACNA ducting construction standards and the specified requirement, whichever is more stringent.

PART 2 PRODUCTS

2.01 INTERNAL DUCTWORK INSULATION

- A. Manufacturers: One of the following or equal:
 - 1. Owens Corning, QuietR flexible duct liner or Fiberglass rigid duct liner.
 - 2. Johns Manville, Linacoustic RC flexible duct liner or Permacoat Linacoustic R-300 rigid duct liner.
- B. Type: Flexible or board type duct liner with 1 coated surface meeting the following:
 - 1. Thickness: As required to achieve the following R-values:
 - a. For ducting exterior to weather protected spaces provide 2 inches minimum thickness to meet an installed value of R8; provide additional weatherproof exterior barrier covering.

- b. For interior ducting in ceiling plenums, attics or other unconditioned spaces provide 1-1/2 inches minimum thickness to meet an installed value of R6.
 - 2. Temperature range: 40 to 250 degrees Fahrenheit.
 - 3. Density: 1.5 pounds per cubic foot.
 - 4. Thermal conductivity: 0.25 Btu-inch per hour per square foot per degree Fahrenheit at 75 degrees Fahrenheit.
 - 5. Fire hazard classification in accordance with ASTM E84:
 - a. Flame spread: 25.
 - b. Smoke developed: 50.
 - 6. Service conditions: Velocities to 2,500 feet per minute.
 - 7. Acoustical performance: NRC of 0.55 minimum.
 - 8. Bacterial growth: None in accordance with ASTM G21.
- C. Edge treatment: Provide leading edges with galvanized metal nosing; seal other edges with manufacturer's recommended edge treatment.

PART 3 EXECUTION

3.01 INTERNAL DUCTWORK INSULATION

- A. Provide rigid insulation on rectangular ducts carrying conditioned air that pass through outdoor or unconditioned spaces, or as indicated on the Drawings.
- B. Install with coated surface facing inside of duct; attach with adhesive to duct and provide fasteners spaced at not to exceed 12 inches transverse (perpendicular) to flow and 18 inches parallel (longitudinal) to flow; provide fasteners within 3 inches of transverse edges and 4 inches of longitudinal edges.
- C. Follow manufacturer's published installation instructions.
- D. Install metal nosing on leading edges and seal other exposed edges with manufacturer's edge treatment.

END OF SECTION

SECTION 23_09_13

INSTRUMENTATION AND CONTROL DEVICES FOR HVAC

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Controls for Heating, Ventilating, and Air Conditioning (HVAC) Systems.

1.02 REFERENCES

- A. CSA International (CSA).
- B. National Electrical Code (NEC).
- C. Restriction of Certain Hazardous Substances (RoHS).
- D. National Electrical Manufacturers Association (NEMA):
 - 1. 250 - Enclosures for Electrical Equipment (1,000 Volts Maximum).
- E. National Fire Protection Association (NFPA):
 - 1. 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems.
- F. Underwriters' Laboratories, Inc. (UL):
 - 1. 13 – Standard for Safety Power-Limited Circuit Cables.
 - 2. 268A - Standard for Smoke Detectors for Duct Application.
 - 3. 508 - Standard for Industrial Control Equipment.
 - 4. 1479 - Fire Tests of Through-Penetration Firestops.
 - 5. 1685 – Standard for Safety Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables.

1.03 SUBMITTALS

- A. Submit as specified in Section 01_33_00 - Submittal Procedures.
- B. Product data: As specified in Section 46_05_10 - Common Work Results for Mechanical Equipment.
- C. Shop drawings:
 - 1. Manufacturer's information including:
 - a. Catalog information clearly marked to show specific products, models, and sizes being furnished.
 - b. Component cut sheets.

1.04 QUALITY ASSURANCE

- A. The control system shall be designed in accordance with UL and CSA standards.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. The system control products shall be stored and handled per manufacturer's recommendations.

1.06 SITE CONDITIONS

- A. Elevation and ambient conditions as specified in Section 01_81_50 - Design Criteria.

1.07 WARRANTY

- A. Special warranties: Warranty period begins at date of Project Acceptance or first date of Beneficial Use by the Owner:
 - 1. 1 year: Parts and on-site labor for components, systems, and programming.

PART 2 PRODUCTS

2.01 DESIGN AND PERFORMANCE CRITERIA

- A. General requirements:
 - 1. All electrical components shall be UL-listed and meet the design and installation requirements of the NEC.
 - 2. Complete, functional system: Provide all necessary electrical power and control systems, components, and wiring to make a complete functioning system.
 - 3. Comply with electrical Sections for electrical power and control systems.
 - 4. System control functions to perform as described in Products.
 - 5. Materials: New, free from defects, and of the quality specified.
 - 6. Common manufacturer: Provide components, component accessories, and devices, as much as possible, by the same manufacturer throughout the work.
 - 7. Mounting: Mount control components and devices in accessible locations for maintenance and as recommended by the manufacturer; provide necessary manufacturer-approved mounting and configuration hardware for mounting and operation of control components and devices.

2.02 THERMOSTATS

- A. General:
 - 1. Thermostat types: Thermostat types are called out on the drawings by the letter T.
 - 2. Manufacturers: One of the following or equal:
 - a. Johnson Controls, model as specified with each type.
 - b. Honeywell, Tradeline, equivalent models.
 - 3. Thermostat cable:
 - a. Conductor: Number of conductors required to be determined by HVAC system, solid bare copper, 18/20 American Wire Gauge (up to 250 feet); provide sufficient length to accommodate the thermostat locations as indicated on the Drawings.

- b. Insulation: Heat and moisture resistant colored Polyvinylchloride (PVC) or Polypropylene insulation.
- c. Jacket: White or Brown Polyvinylchloride.
- d. Meets UL 13 NEC Article 725. UL Listed Type CL2, Sunlight Resistant. UL 1685 Vertical Tray. RoHS compliant.
- e. Temperature Rating: 140 degrees Fahrenheit.
- f. Voltage Rating: Up to 150V.

Thermostat Terminal	Wire Color (Typical)	Function Description
R	Red	24V AC/Heat Single Transformer
Rc	Red	24V for Dual Transformer - AC
Rh	Red	24V for Dual Transformer - Heat
C	Black/Blue	Common 24VAC Power Source
Y	Yellow	Primary Cooling
Y2	Light Blue/Yellow	Secondary Cooling
W	White	Primary Heating
W2	Brown	Secondary Heating
G	Green	Fan Relay
O	Orange	Reversing Valve

- B. T-2, Type 2 Thermostat, Cooling Only, Line Voltage:
 - 1. Manufacturers: The following or equal: Johnson Controls Model:
 - a. Dry locations (no hose bibs or open water processes in room): Model A19BBC-2C in NEMA 1 enclosure.
 - b. Wet locations (hose bibs or open water processes in room): Model A19QSC-1C in rain and dust tight enclosure.
 - 2. Switch action: Single-pole double-throw, close on rising temperature.
 - 3. Sensing element: Coiled bulb and capillary.
 - 4. Setpoint: 30 to 110 degrees Fahrenheit with knob adjuster and visible scale.
 - 5. Electrical ratings: 16 amps alternating current at 120 volts, 9.2 amps alternating current at 208 volts.
 - 6. Differential range: For dry locations, 3 to 12 degrees Fahrenheit adjustable; for wet locations, 5 degrees Fahrenheit fixed.

2.03 DIFFERENTIAL PRESSURE SWITCHES

- A. Differential pressure switches suitable for monitoring pressure drop in non-hazardous spaces:
 - 1. Manufacturers: One of the following or equal:
 - a. Dwyer, Model EDPS series.
 - b. Omega.
 - 2. Characteristics and features:
 - a. Service:
 - 1) Air and other non-combustible, non-aggressive gases.
 - b. Materials:
 - 1) Diaphragm: Silicone.
 - 2) Housing: Acetal plastic.
 - 3) Switch body: PA 6.6.
 - 4) Cover: Polystyrene.
 - c. Temperature limits: -4 degrees Fahrenheit to 185 degrees Fahrenheit.
 - d. Pressure limits: Maximum 40 inches w.c.
 - e. Switch type: Single-pole double-throw.
 - f. Electrical rating: 1.5 A, 120 V.
 - g. Enclosure: NEMA 3.
 - h. Approvals: ETL approved to UL 508.

2.04 DUCT MOUNTED SMOKE DETECTORS

- A. General:
 - 1. Provide duct mounted smoke detectors in air ducting with flows greater than 2,000 cubic feet per minute as indicated on the Drawings.
 - 2. Capable of mounting to rectangular or round ducts.
 - 3. Integral filter to reduce dust.
 - 4. Comply in accordance with UL 268A for air handling systems.
 - 5. Airflow velocity: 100 to 4,000 feet per minute.
 - 6. Connect the smoke detector to:
 - a. The PLC and hardwired relay(s). Fan control circuit to shut down respective fan upon detection of smoke.
- B. Non-Classified Areas (SD-1):
 - 1. Manufacturers: The following or equal:
 - a. System Sensor InnovairFlex Series D4120.
 - 2. Characteristics:
 - a. Photoelectric type.
 - b. UL 268A listed.
 - c. Enclosure: NEMA Type 4.
 - d. Operating temperature range of -4 to 158 degrees Fahrenheit.
 - e. Power supply voltage: 24 VDC.
 - f. Contacts:
 - 1) Alarm contact: SPST rated for 2 A at 30 VDC.
 - g. Auxiliary contacts: DPDT, rated for 10 A at 30 VDC/10 A at 250 VAC.

- C. Accessories:
1. Provide metal sampling tube and end cap to match duct width. Sampling tube shall be able to be installed without use of tools.
 2. Provide mounting base and hardware.
 3. Provide remote annunciator with alarm and power LEDs and all required wiring and conduit per installation instructions for complete working operation.
 4. Provide remote test station and all required wiring and conduit per installation instructions for complete working operation.

2.05 HVAC CONTROL DESCRIPTIONS

- A. General: Provide control systems that will maintain room or area comfort under changing ambient conditions and varying use; descriptions in this Section are general in nature and do not cover every mode of operation.
- B. Area 60 – Finished Water Pump Station:
1. Electrical and Control Room:
 - a. Packaged air conditioning units ACU-60-9510 and 20 will be controlled by manufacturer provided thermostats with adjustable set-points in a lead/lag configuration. The cooling set-point for the lead unit will be 80 degrees Fahrenheit. The cooling set-point for the second unit will be 85 degrees Fahrenheit. When the temperature rises 3 degrees above the cooling set point, the units will energize. When the temperature falls 3 degrees below the cooling set-point, the units will de-energize. The designations of the units should be rotated periodically to allow equal wear:
 - 1) The unit will have a duct mounted smoke detector (SD-1). When smoke is detected a "Smoke" alarm will be sent to the PLC, PCS, and OIT. A hardwired relay signal shall shut down all HVAC equipment in the associated area.
 - 2) The unit will send a "Dirty Filter" alarm to the PLC and PCS system upon high pressure indication from the differential pressure switch.
 - b. Electric Unit Heaters EUH-60-9581 through 84 will be controlled by manufacturer provided thermostats with adjustable set points. The heating set-point will be 55 degrees Fahrenheit. When the temperature falls 3 degrees below the set-point, the units will energize. When the temperature rises 3 degrees above the set point, the units will de-energize.
 2. Pump Room:
 - a. Exhaust fans EF-60-9530 and 40 will be controlled by a cooling only, type 2 thermostat. The thermostat setpoint shall be 85 deg F. When the temperature rises 3 degrees above the cooling set point, the units will energize. When the temperature falls 3 degrees below the cooling set-point, the units will de-energize.
 - b. Electric Unit Heaters EUH-70-9586 through 91 will be controlled by manufacturer provided thermostats with adjustable set points. The heating set-point will be 55 degrees Fahrenheit. When the temperature falls 3 degrees below the set-point, the units will energize. When the temperature rises 3 degrees above the set point, the units will de-energize.

- C. Area 70 – Recovered Water Pump Station:
1. Electrical Room:
 - a. Packaged air conditioning unit ACU-70-9510 will be controlled by manufacturer provided thermostat with adjustable set-points. The cooling set-point will be 85 degrees Fahrenheit. When the temperature rises 3 degrees above the cooling set point, the unit will energize. When the temperature falls 3 degrees below the cooling set-point, the unit will de-energize:
 - 1) The unit will have a duct mounted smoke detector (SD-1). When smoke is detected a "Smoke" alarm will be sent to the PLC, PCS, and OIT. A hardwired relay signal shall shut down all HVAC equipment in the associated area.
 - 2) The unit will send a "Dirty Filter" alarm to the PLC and PCS system upon high pressure indication from the differential pressure switch.
 - b. Electric Unit Heaters EUH-70-9583 and 84 will be controlled by manufacturer provided thermostats with adjustable set points. The heating set-point will be 55 degrees Fahrenheit. When the temperature falls 3 degrees below the set-point, the units will energize. When the temperature rises 3 degrees above the set point, the units will de-energize.
 2. Valve/Meter Room:
 - a. Exhaust fan EF-70-9530 will be controlled by a cooling only, type 2 thermostat. The thermostat setpoint shall be 85 deg F. When the temperature rises 3 degrees above the cooling set point, the unit will energize. When the temperature falls 3 degrees below the cooling set-point, the unit will de-energize.
 - b. Electric Unit Heaters EUH-70-9581 and 82 will be controlled by manufacturer provided thermostats with adjustable set points. The heating set-point will be 55 degrees Fahrenheit. When the temperature falls 3 degrees below the set-point, the units will energize. When the temperature rises 3 degrees above the set point, the units will de-energize.

PART 3 EXECUTION

3.01 PREPARATION

- A. Before installation remove dust and debris from equipment and accessories.
- B. During installation and until equipment is operated, protect equipment and accessories from dust and debris.

3.02 INSTALLATION

- A. Install as indicated on the Drawings, in accordance with NFPA 90A, and per the manufacturer's written instructions.
- B. Coordinate installation of HVAC control systems with other trades:
 1. Prior to installation, coordinate wiring and conduit requirements with electrical subcontractor.

- C. Mount remote annunciator and test station on wall near smoke detector:
 - 1. Devices shall be easily accessible from floor level.
 - 2. Label annunciator and test station.
- D. Provide all electrical work to support smoke detector:
 - 1. Coordinate with electrical subcontractor.
- E. Thermostat cable conduit installation:
 - 1. As specified in Electrical Sections - 26_05_00 - Common Work Results for Electrical, 26_05_18 - 600-Volt or Less Wires and Cables, 26_05_33 - Conduits.
- F. Sensor and control station mounting:
 - 1. Where not otherwise indicated, mount 5 feet above floor or walking level.
 - 2. Provide insulating back plates when mounting is on an exterior wall or a wall adjoining an unconditioned space.
 - 3. Shield outside thermostats or sensors from the sun; provide thermostats with remote bulb and compensated capillary.
 - 4. Install locking covers where indicated on the Drawings.

3.03 COMMISSIONING

- A. As specified in Section 01_75_17 - Commissioning and this Section.
- B. Functional testing:
 - 1. HVAC Instrumentation and Controls:
 - a. Test witnessing: Witnessed.
 - b. Test each control component and system as part of HVAC system testing, adjusting, and balancing as specified in Section 23_05_93 - Testing, Adjusting, and Balancing for HVAC.

END OF SECTION

SECTION 23_31_13

METAL DUCTS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Aluminum ductwork.

1.02 REFERENCES

- A. ASTM International (ASTM):
 - 1. A167 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
 - 2. A480 - Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip.
 - 3. A527 - Standards Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Lock-Forming Quality.
 - 4. A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 5. B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- B. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA):
 - 1. HVAC Systems-Duct Design.
 - 2. HVAC Duct Construction Standards, Metal and Flexible.
- C. Underwriters Laboratories, Inc. (UL):
 - 1. 181A - Closure Systems for Use with Rigid Air Ducts.

1.03 DEFINITIONS

- A. AWG - American Wire Gauge.

1.04 SUBMITTALS

- A. Submit as specified in Section 01_33_00 - Submittal Procedures.
- B. Product data:
 - 1. Duct and component material and details of construction.
 - 2. System layout including floor and wall penetrations.
 - 3. Supports and anchoring details.
 - 4. Components used in the duct system including turning vanes, dampers, flexible connections, and access doors.

1.05 WARRANTY

- A. Provide as specified in Section 01_78_36 - Warranties and Bonds.

PART 2 PRODUCTS

2.01 GENERAL

- A. Materials:
 - 1. As specified in Section 01_60_00 - Product Requirements.
 - 2. Ducts:
 - a. Aluminum Ducts: Aluminum alloy 3003 H14 in accordance with ASTM B209.
 - 3. Reinforcing: Formed or extruded angles matching ductwork material.
- B. Changes in duct size:
 - 1. Use uniformly tapering sections.
 - 2. Taper not more than 1 inch in 5 inches of run unless otherwise indicated on the Drawings.
- C. Bends: With the exception of miter bends, inside radii of bends to be equal to or greater than the largest duct dimension.

2.02 DESIGN AND PERFORMANCE CRITERIA

- A. Design and fabricate the aluminum ductwork:
 - 1. Pressure allowance:
 - a. Within 2 inches water gauge minimum for supply, return, general exhaust and other applications unless otherwise indicated on the Drawings or specified.
 - b. Within 6 inches water gauge minimum for lab exhaust applications.
 - 2. In accordance with SMACNA HVAC Systems-Duct Design manual:
 - a. Sheet metal thicknesses: The greater of the SMACNA design or:

Diameter or Largest Dimension of Rectangular Duct (Inches)	Minimum Sheet Thickness, Inches (B&S Gage)	
	Galvanized Steel	Aluminum (Conversion of galvanized steel to aluminum)
Up to 12	0.01875 (26)	0.032
13, 14	0.025 (24)	0.04
15 to 18	0.03125 (22)	0.05
19, 20	0.0375 (20)	0.063
21 to 26	0.05 (18)	0.071
Larger than 27	0.0625 (16)	0.09

- b. Spacing of hangers and supports:
 - 1) In accordance with SMACNA but no greater than that indicated on the Drawings.
 - 2) 8 feet on center for ducts 18 inches and smaller in the largest dimension.
 - 3) 4 feet on center to ducts over 18 inches in the largest dimension.

- c. Support connections:
 - 1) In accordance with SMACNA unless indicated on the Drawings.
 - 2) As a minimum, all support connections to metal or wood roofs at roof framing members only.
 - 3) No penetrations through roof deck, roof membrane, or connections to roof membrane.
- 3. Ducts specified with insulation on interior to be sized as indicated on the Drawings.

2.03 COMPONENTS

- A. Duct sleeves:
 - 1. Install where ducts pass through concrete or masonry walls and slabs.
 - 2. Size: 2 inches larger than the duct or duct with external insulation.
 - 3. Flanges: 4 inches wide.
- B. Access openings:
 - 1. Install in locations for access to dampers, fusible links, controllers, and similar devices.
 - 2. Size: 2 inches less than duct size.
 - 3. Doors:
 - a. Gauge not less than duct sheet.
 - b. Provide continuous hinge and latch on outside.
 - 4. Gasket: Along door periphery.
 - 5. Visual panel: 1/8-inch thick, clear Plexiglas.
- C. Turning vanes:
 - 1. Install at 90 degree bends:
 - a. Square-turn elbows, smooth radius elbows, and splitters.
 - 2. Material: Same as ductwork.
 - 3. Type:
 - a. Single-blade vanes for duct widths less than 36 inches.
 - b. Airfoil type vanes for duct widths of 36 inches and greater:
 - 1) No trailing edge.
 - 4. Mounted inside rails.
 - 5. Size: 2-inch blades for ducts up to 18 inches, 4-1/2 inch blades for larger ducts.
- D. Flexible connectors:
 - 1. Install at connections to air handling equipment and at other locations indicated on the Drawings.
 - 2. As specified in Section 23_05_00 - Common Work Results for HVAC.
- E. Splitter dampers: Provide at branch take-offs where necessary for balancing system.

2.04 FABRICATION

- A. Fabricate ductwork to the configuration and dimensions indicated on the Drawings.
- B. Do not utilize S clips, duct tape, or externally applied mastic on medium pressure duct systems.
- C. Do not use snap lock seams.

2.05 SHIPPING

- A. As specified in Section 01_60_00 - Product Requirements with additional requirements in Section 23_05_00 - Common Work Results for HVAC.

PART 3 EXECUTION

3.01 GENERAL

- A. As specified in Section 01_60_00 - Product Requirements with additional requirements in Section 23_05_00 - Common Work Results for HVAC.

3.02 INSTALLATION

- A. Hangers:
 - 1. Install hangers as indicated on the Drawings.
 - 2. When hangers are not detailed, conform to SMACNA HVAC Systems-Duct Design Manual standards and the following requirements:
 - a. Rectangular ducts concealed in ceiling spaces:
 - 1) Use metal strap hangers.
 - 2) Fasten to sides of duct with 2 screws.
 - 3) Fasten to bottom of duct with 1 screw.
 - b. Rectangular ducts in exposed areas:
 - 1) Install shelf angle trapeze hangers or Unistrut type hangers.
 - c. Round ducts in exposed areas:
 - 1) Install 2 half-round bands with rods bolted to panels.
- B. Provide closed-cell neoprene gaskets at flanged joints.
- C. Tapes and mastics used to seal ductwork shall be listed and labeled in accordance with UL 181A and shall be marked.

3.03 FIELD QUALITY CONTROL

- A. Inspect ductwork under operating conditions:
 - 1. Correct audible leaks and leaks that can be felt with the hand.

END OF SECTION

SECTION 23_34_01

FANS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Fans, motors, and accessories.

1.02 REFERENCES

- A. American Bearing Manufacturers Association (ABMA):
1. 9, Load Ratings and Fatigue Life for Ball Bearings.
 2. 11, Load Ratings and Fatigue Life for Roller Bearings.
- B. Air Movement and Control Association International, Inc. (AMCA):
1. 210, Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating.
 2. 211, Certified Rating Program- Product Rating Manual for Fan Air Performance.
 3. 300, Reverberant Room Method for Sound Testing of Fan.
 4. 301, Methods for Calculating Fan Sound Ratings from Laboratory Test Data.
- C. American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE):
1. 52.2 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size.
 2. 68 - Laboratory Methods of Testing to Determine Sound Power in a Duct.
- D. ASTM International (ASTM):
1. A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
 2. D4167 - Standard Specification for Fiber Reinforced Plastic Fans and Blowers.
 3. E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- E. National Electrical Code (NEC).
- F. National Electrical Manufacturers Association (NEMA):
1. 250 - Enclosures for Electrical Equipment (1000 V Maximum).
- G. National Fire Protection Association (NFPA):
1. 90A - Standard for Installation of Air Conditioning and Ventilating Systems.
 2. 820 - Standard for Fire Protection in Wastewater Treatment and Collection Facilities.
- H. National Roofing Contractors Association (NRCA).
- I. Occupational Safety and Health Administration (OSHA).

J. Underwriters' Laboratories, Inc. (UL).

1.03 DEFINITIONS

A. As used in this Section and on the drawings, abbreviations and Fan Schedule headings have the following meaning:

1. SF or SPF: Supply Fan.
2. EF or EXF: Exhaust Fan.
3. Type: Fan type as specified in this Section.
4. SP or ESP: Fan External Static Pressure in inches water column.
5. Size: Nominal fan blade or wheel diameter in inches.
6. Hp: Fan motor horsepower.
7. V/Ph: Fan motor voltage and power phases.

1.04 SUBMITTALS

A. Submit as specified in Section 01_33_00 - Submittal Procedures.

B. Product data:

1. Materials.
2. Primary and ancillary equipment.
3. Sound Power Level in each of 8 octave bands and overall Sones.
4. Fan system layout, mechanical, electrical power, and control diagrams.
5. Supports, vibration isolators, and seismic bracing calculations and details.
6. Calculated fan vibration levels and field-testing method.
7. Bearing life.
8. Fan performance curves showing specified operating condition.

C. Drawings:

1. Component layout and identification.
2. Views:
 - a. Front, side, rear elevations, and top and bottom views, with dimensions.
 - b. Connection locations including electrical, mechanical, and other.
3. Cut away drawings:
 - a. Parts list.
 - b. Material specification lists.
4. Wiring, control schematics, control logic diagrams and ladder logic or similar for computer-based controls.
5. Details for supports, isolators, and bracing.

D. Manufacturer's recommendations for handling, storage, and installation.

E. Nameplate data.

F. Vendor operation and maintenance manuals: Manufacturer's standard instruction manual for operation and maintenance.

G. Provide manufacturers reports on factory testing.

PART 2 PRODUCTS

2.01 GENERAL

- A. As specified in Section 23_05_00 - Common Work Results for HVAC.

2.02 DESIGN AND PERFORMANCE CRITERIA

2.03 TYPE 2, CENTRIFUGAL SIDEWALL EXHAUST FANS

- A. Manufacturers: One of the following or equal:
 - 1. Greenheck, CUBE - WALL.
 - 2. Loren Cook, similar series.
 - 3. Penn, similar series.
- B. Characteristics:
 - 1. Wall-mounted, upblast circular exhaust fan unit.
 - 2. Backward inclined centrifugal fan wheel with Venturi inlet; performance as scheduled.
 - 3. Materials: Aluminum fan, housing, and accessories.
 - 4. Fan bearings: Permanently lubricated ball bearing type.
 - 5. Motor characteristics: As scheduled.
 - 6. Finishes: Provide two coat finish with a 2.0-3.0 mils thick epoxy primer base coat and 2.0-3.0 mils thick polyester powder coated topcoat or approved equal finish on fan and all accessories.
- C. Accessories:
 - 1. Mounting brackets: Necessary for installation.
 - 2. Provide other accessories as scheduled.

2.04 SOURCE QUALITY CONTROL

- A. Factory test fans listed on the Fan Schedule for proper operation, performance, and electrical controls.

2.05 SHIPPING, SPARE PARTS, MAINTENANCE PRODUCTS, AND SPECIAL TOOLS

- A. As specified in Section 01_60_00 - Product Requirements with additional requirements in Section 23_05_00 - Common Work Results for HVAC.
- B. Deliver units in 1 piece, factory assembled, internally wired, and lubricated.

PART 3 EXECUTION

3.01 GENERAL

- A. As specified in Section 01_60_00 - Product Requirements with additional requirements in Section 23_05_00 - Common Work Results for HVAC.

3.02 FIELD QUALITY CONTROL

- A. Test equipment and installation to verify tightness, operation, and unit vibration is within manufacturer's submitted maximum.
- B. Test equipment performance and balance equipment as specified in Section 23_05_93 - Testing, Adjusting, and Balancing for HVAC.

3.03 SCHEDULES

- A. Fan Schedule:
 - 1. As indicated on the Drawings.

END OF SECTION

SECTION 23_81_14
AIR CONDITIONING UNITS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Requirements for factory assembled unitary air systems.
 - 1. Packaged units.
 - 2. Accessories.

1.02 GENERAL

- A. As specified in Section 23_05_00 - Common Work Results for HVAC.

1.02 REFERENCES

- A. American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE):
 - 1. Standard 62.1 - Ventilation for Acceptable Indoor Air Quality.
- B. Federal Specification (FS):
 - 1. Standard 141 - Paint, Varnish, Lacquer and Related Materials: Methods of Inspection, Sampling and Testing.
- C. National Electrical Manufacturers Association (NEMA):
 - 1. 250 - Enclosures for Electrical Equipment (1000 V Maximum).
- D. National Roofing Contractors Association (NRCA).

1.03 SUBMITTALS

- A. Submit as specified in Section 01_33_00 - Submittal Procedures.
- B. Catalog cuts, bulletins, and brochures:
 - 1. Design features.
 - 2. Load capacities.
 - 3. Efficiency ratings.
 - 4. Dimensions.
 - 5. Weight: Shipping and operating.
- C. Drawings:
 - 1. Component layout and identification.
 - 2. Views:
 - a. Front, side, rear elevations, and top and bottom views, with dimensions.
 - b. Connection locations including electrical, mechanical, and other.
 - 3. Cut away drawings.
 - a. Parts list.
 - b. Material specification lists.

4. Wiring, control schematics, control logic diagrams and ladder logic or similar for computer-based controls.
 5. Details for supports, isolators, and bracing.
- D. Calculations:
1. Structural: Supports and vibration isolators if applicable.
- E. Engineering data:
1. Manufacturer's published data for compressor, evaporator coil, condenser, evaporator fan, refrigerant, filter, etc.
 2. Maximum equipment vibration levels and field-testing method.
 3. Sound power level in each of 8 octave bands and overall Sones.
 4. Fan performance curves showing specified operating condition.
 5. Bearing life.
- F. Manufacturer's recommendations for handling, storage, and installation.
- G. Nameplate data.
- H. Vendor operation and maintenance manuals: Manufacturer's standard instruction manual for operation and maintenance.

1.04 WARRANTY

- A. Provide warranty as specified in Section 01_78_36 - Warranties and Bonds.
- B. Special warranty:
1. Refrigerant compressors and closed or sealed refrigerant systems warranty duration: Provide 5-year warranty.
 2. Evaporator and condensing coils warranty duration: Provide 10-year warranty.

PART 2 PRODUCTS

2.01 GENERAL

- A. As specified in Section 23_05_00 - Common Work Results for HVAC.
- B. All supplied components of the unit shall be furnished and fully integrated by the unit system supplier:
1. Provide piping, valves, dampers, sensors, and wiring within the unit package.
 2. Provide a unit mounted control panel prewired on the unit to all dampers and sensors within the unit.
- C. Motors:
1. Totally enclosed.
 2. Voltage and phases as scheduled.
 3. Compressor motors:
 - a. Cooled by refrigerant gas passing through windings.
 - b. Provided with line break thermal and current overload protection.

- 4. Fan and blower motors:
 - a. Permanently lubricated ball bearings.
 - b. Integral automatic reset thermal overload protection.
 - 5. Other requirements as specified.
- D. Electrical:
- 1. Provide a single conduit connection in the unit for both power and control wiring.

2.02 DESIGN AND PERFORMANCE CRITERIA

- A. As specified in Section 23_05_00 - Common Work Results for HVAC.

2.03 PACKAGED AIR CONDITIONING UNITS

- A. Manufacturers: One of the following or equal:
- 1. Trane, Precedent TSJ Series.
 - 2. Daikin.
 - 3. Carrier.
 - 4. Johnson Controls.
- B. Compressors:
- 1. Reciprocating or scroll type:
 - a. Fully hermetically sealed.
 - b. Internal and external vibration isolation.
 - c. Mechanical high-pressure relief.
- C. Fans:
- 1. Evaporator fan:
 - a. Direct or belt drive.
 - b. Forward curved, double inlet, centrifugal type.
 - c. Steel with corrosion resistant finish.
 - d. Statically and dynamically balanced:
 - 1) Provide documentation.
 - e. Permanently sealed and lubricated ball bearings.
 - f. Adjustable pitch motor pulley for belt drives.
 - g. Where the condenser fan exceeds 7.49 horsepower, provide variable speed or 2-speed fan with low speed at 2/3 of the high speed.
 - 2. Condenser fan:
 - a. Direct drive.
 - b. Propeller type, aluminum blades, and vertical discharge.
 - c. Dynamically balanced:
 - 1) Provide documentation.
 - 2) Permanently sealed and lubricated ball bearings.
 - 3. Induced draft blower:
 - a. Direct or belt drive.
 - b. Single inlet, forward curved centrifugal type.
 - c. Statically and dynamically balanced:
 - 1) Provide documentation.
 - d. Steel with corrosion resistant finish.

- D. Coils:
 - 1. Evaporator and condenser coils, seamless copper tubes with mechanically bonded aluminum plate fins.
 - 2. Evaporator and condenser coils, internal piping, and appurtenances: Factory applied phenol-formaldehyde thermosetting resinous coating.
- E. Refrigerant components: Refrigerant circuit including:
 - 1. Accumulator.
 - 2. Filter drier.
 - 3. Expansion device.
 - 4. Gauge ports.
 - 5. Flow control valves.
 - 6. Circuit feed system.
 - 7. Service gauge connections on suction, discharge, and liquid lines to charge, evacuate and contain refrigerant.
- F. Controls and equipment safety features:
 - 1. Provide, as a minimum, the following:
 - a. Condenser fan controls.
 - b. Evaporator fan controls.
 - c. All motor contactors.
 - d. 120-volt control circuit and transformer.
 - e. Manual reset circuit breakers.
 - f. Power disconnect switch.
 - g. Electronic thermostat.
 - h. 5-minute compressor cycle delay.
 - i. Differential enthalpy economizer control.
 - j. Check filter switch suitable for field connection remote alarm.
 - k. 2 stage cooling.
 - l. Provide with a low ambient cooling option.
 - 2. Equipment safety features, include:
 - a. High-pressure switches.
 - b. Compressor over-temperature and overcurrent.
 - c. Loss of charge/low pressure switch.
 - d. Freeze stat on evaporator.
 - e. Lock out protection.
 - 3. Provide dry-contacts for the following status and alarms:
 - a. Failed.
 - b. Running.
 - c. Dirty Filter.
 - 4. Provide input connections for:
 - a. Smoke alarm shutdown.
 - b. HVAC supervisory control/enable.
 - 5. Interface to building HVAC controls:
 - a. Provide contacts and signals to operate unit with the HVAC control system as specified in Section 23_09_13 - Instrumentation and Control Devices for HVAC.

- G. Electrical:
 - 1. Provide 15-amp, 120-volt, single-phase, ground fault interrupter convenience outlet at condenser unit; provide factory installed transformer, and independent fuse or breaker protection for outlet.
 - 2. Provide power disconnect switch at each piece of unit; mount disconnect in NEMA Type 3R enclosure if exterior to unit.
- H. Unit casing:
 - 1. Manufactured of minimum 22-gauge galvanized steel, bonderized, corrosion protected, and exterior coated with a baked enamel finish interior primer coated. Coating shall withstand FS Test Method Standard 141 (Method 6061) 500-hour salt spray test.
 - 2. Weatherproof design, reinforced, and braced for maximum rigidity.
 - 3. Indoor air section compartment: Insulated with minimum 1/2 inch thick, permanent, fireproof, odorless glass fiber material, and coated on the air side. Aluminum foil face fiberglass insulation shall be used in the furnace compartment.
 - 4. Provide gasketed, removable panels or access doors to service equipment components and connections.
 - 5. Provide with:
 - a. Filter rack for 2-inch filters accessible through hinged access door.
 - b. Non-corrosive drain pan in accordance with ASHRAE Standard 62.1.
 - c. Minimum 3/4-inch horizontal drain connection.
 - d. Knockouts for utility and control connections.
 - e. Minimum 16-gauge steel roll formed base rail with lifting holes.
- I. Filter section:
 - 1. Low velocity 2-inch thick pleated filters of commercially available sizes.
 - 2. Filters for any 1 unit shall be the same size.

2.04 ACCESSORIES

- A. Economizer, when scheduled provide:
 - 1. Integrated type capable of compressor operation while modulating to utilize up to 100 percent outdoor air for cooling when outdoor air and humidity are at set acceptable levels.
 - 2. Including:
 - a. Differential bulb enthalpy control.
 - b. Damper drive motor.
 - c. Gravity relief damper.
 - d. Low leakage dampers, not to exceed 3 percent leakage at 1-inch static pressure.
 - 3. Differential enthalpy sensor for economizer control.
- B. Required accessories:
 - 1. Sensors: As specified in 23_09_13 - Instrumentation and Control Devices for HVAC.
 - 2. Dirty filter switch with contacts.
 - 3. Hail guard.
 - 4. Coil guard.

5. Flexible duct connectors: As specified in Section 23_05_00 - Common Work Results for HVAC.

PART 3 EXECUTION

3.01 GENERAL

- A. As specified in Section 23_05_00 - Common Work Results for HVAC.
- B. Insulate refrigerant piping as specified in Section 23_05_00 - Common Work Results for HVAC.
- C. Provide condensate drain per mechanical code as specified in Section 01_41_00 - Regulatory Requirements.

3.02 SCHEDULES

- A. As indicated on the Drawings.

END OF SECTION

SECTION 23_83_01

HEATING UNITS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes: Requirements for electric unit heaters and thermostats for heaters.

1.02 REFERENCES

- A. American Gas Association (AGA).
- B. National Electrical Code (NEC):
 - 1. 70 - National Electrical Code.
- C. National Electrical Manufacturers Association (NEMA):
 - 1. 250 - Enclosures for Electrical Equipment (100 V Maximum).
- D. Underwriters' Laboratories, Inc. (UL).

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Roof coordination as specified in Section 23_05_00 - Common Work Results for HVAC.

1.04 SUBMITTALS

- A. Submit as specified in Section 01_33_00 - Submittal.
- B. Catalog cuts, bulletins, and brochures:
 - 1. Design features.
 - 2. Load capacities.
 - 3. Efficiency ratings.
 - 4. Dimensions.
 - 5. Weight: Shipping and operating.
- C. Drawings:
 - 1. Component layout and identification.
 - 2. Views:
 - a. Front, side, rear elevations, and top and bottom views, with dimensions.
 - b. Connection locations including electrical, mechanical, and other.
 - 3. Cut away drawings:
 - a. Parts list.
 - b. Material specification lists.
 - 4. Wiring, control schematics, control logic diagrams and ladder logic or similar for computer-based controls.
 - 5. Details for supports, isolators, and bracing.

- D. Calculations:
 - 1. Structural: Supports and vibration isolators if applicable.
- E. Engineering data:
 - 1. Manufacturer's published data for fan, burner, and filter.
 - 2. Maximum equipment vibration levels and field-testing method.
 - 3. Sound power level in each of 8 octave bands and overall Sones.
 - 4. Fan performance curves showing specified operating condition.
 - 5. Bearing life.
- F. Manufacturer's recommendations for handling, storage, and installation.
- G. Nameplate data.
- H. Vendor operation and maintenance manuals: Manufacturer's standard instruction manual for operation and maintenance.

1.05 WARRANTY

- A. As specified in Section 01_78_36 - Warranties and Bonds.

PART 2 PRODUCTS

2.01 GENERAL

- A. As specified in Section 01_60_00 - Product Requirements with additional requirements in Section 23_05_00 - Common Work Results for HVAC.

2.02 DESIGN AND PERFORMANCE CRITERIA

- A. As specified in Section 23_05_00 - Common Work Results for HVAC.

2.03 ELECTRIC UNIT HEATER (EUH)

- A. Manufacturers: One of the following or equal:
 - 1. Indeeco, Type TRIAD (Process Areas).
 - 2. Chromalox, Type LUH (Electrical Rooms).
 - 3. Trane.
 - 4. Markel.
- B. Fan type: Aluminum axial flow:
 - 1. Provide fan guards.
 - 2. Dynamically balance.
 - 3. Fan designed for quiet operation.
 - 4. Permanently lubricated ball bearings.
 - 5. Automatic reset thermal overload protection.
- C. Heating element characteristics:
 - 1. Rated capacity at entering air temperature of 65 degrees Fahrenheit.

2. Fin type, Type 316 stainless steel plated heater elements, with elements brazed to common fins, designed for maximum strength and maximum heat transfer.
 3. Over temperature cutout with automatic reset.
- D. Features:
1. Built-in magnetic contactors.
 2. Control transformer for 120-volt control.
 3. Required mounting brackets.
 4. Individually adjustable outlet louvers.
 5. Heavy 16-gauge stainless steel louvered outlet grille and plated rear grille.
 6. Cabinet formed of minimum thickness 18-gauge steel with steel stiffeners. Listed for corrosive areas and NEMA 4X hose down requirements.
 7. Controls:
 - a. Provide thermostat as specified in this Section.
 - b. Provide control transformer suitable for 120-volt control.
- E. Finishes:
1. Casing finish backed enamel in manufacturer's standard color.

2.04 THERMOSTATS FOR UNIT HEATERS

- A. Type: Wall mounted, heat only with fan AUTO-ON selector switch when fan part of unit and separate system ON-OFF selector switch.
- B. Dial or lever temperature setpoint adjustment with 45 to 90 degrees Fahrenheit setpoint range.
- C. Setpoint and temperature indication.
- D. 120-volt control voltage.
- E. Bi-metallic contacts suitable for 1- or 2-stage unit heater control as specified for the heater size.

2.05 SHIPPING, SPARE PARTS, MAINTENANCE PRODUCTS, AND SPECIAL TOOLS

- A. As specified in Section 01_60_00 - Product Requirements with additional requirements in Section 23_05_00 - Common Work Results for HVAC.

PART 3 EXECUTION

3.01 GENERAL

- A. As specified in Section 01_60_00 - Product Requirements with additional requirements in Section 23_05_00 - Common Work Results for HVAC.

3.02 FIELD QUALITY CONTROL

- A. Test equipment and installation to verify operation is within manufacturer's standards and that noise levels do not exceed levels specified.

- B. Test equipment performance and balance equipment as specified in Section 23_05_93 - Testing, Adjusting, and Balancing for HVAC.

3.03 HEATING UNIT SCHEDULES

- A. As indicated on Drawings.

END OF SECTION



Budget Amendment Request

For Budget Year 2024

Department of Finance
723 S. Lewis Street/P.O. Box 1449
Stillwater, OK 74076-1449

Office: 405.372.0025
Web: stillwater.org



Date: 12/11/2023

Department: Finance

Requested by: Christy Cluck

SUA-23-65

Explanation:

Expenditures:
Appropriate funds for Finished Water Pump Station project.

Account Name	Account Number (xxxxxxx-xxxxx)	Project Number	Current Budget Amount	Amount of Change	New Budget Amount
Increase:					
Finished Water Pump Station	9129216 - 54009	24WT02912	\$ 0	\$ 17,789,068	\$ 17,789,068
Contingency	9129216 - 54009	24WT02912	\$ 0	\$ 2,562,700	\$ 2,562,700
	-				\$ 0
	-				\$ 0
	-				\$ 0
Decrease:					
	-				\$ 0
	-				\$ 0
	-				\$ 0
	-				\$ 0
	-				\$ 0

Net Change: (will usually result in a total increase or decrease)

\$ 20,351,768

Reviewed by Department Manager: _____

Date: _____

Reviewed by Finance: Christy Cluck

Date: 12-13-2023

Approved by CMO: _____

Date: _____

Approved by City Council: ☐ Yes ☐ No

Date: _____

Processed by Finance: _____

Date: _____

Set ID: _____

Date Sent to SA&I: _____

--Print on Yellow Paper--

RESOLUTION NO. SUA-2023-9

A RESOLUTION AUTHORIZING A LOAN FROM THE OKLAHOMA WATER RESOURCES BOARD IN THE PRINCIPAL AMOUNT OF \$37,000,000; AUTHORIZING THE ISSUANCE OF A SERIES 2023 DRINKING WATER SRF PROMISSORY NOTE IN THE PRINCIPAL AMOUNT OF SAID LOAN; APPROVING AND AUTHORIZING THE EXECUTION OF A LOAN AGREEMENT FOR DRINKING WATER SRF LOAN AND A SECURITY AGREEMENT PERTAINING TO SAID PROMISSORY NOTE; RATIFYING AND CONFIRMING A LEASE AGREEMENT AND OPERATION AND MAINTENANCE CONTRACT AND A SALES TAX AGREEMENT WITH THE CITY OF STILLWATER; APPROVING AND AUTHORIZING PAYMENT OF FEES AND EXPENSES; APPROVING VARIOUS COVENANTS AND AUTHORIZING EXECUTION OF OTHER DOCUMENTS PERTAINING TO SAID LOAN AND CONTAINING OTHER PROVISIONS RELATING THERETO.

WHEREAS, the Stillwater Utilities Authority, Payne County, Oklahoma (the “Authority”) was organized as a public trust under Title 60, Oklahoma Statutes 2021, Sections 176-180.4, as amended, for the purpose of furthering the public functions of the City of Stillwater, Oklahoma (the “City”); and

WHEREAS, the Authority is authorized under the Trust Indenture dated as of July 1, 1979, pursuant to which the Authority was created, to construct improvements to the City’s water and wastewater systems; and

WHEREAS, the Authority has determined the need to acquire funds to pay costs or reimburse the payment of costs associated with the construction of a finished water and recovered water pump station and chemical and lime feed systems (the “Project”) and did heretofore apply to the Oklahoma Water Resources Board (“OWRB”) for a loan in the amount of \$37,000,000 for such purpose; and

WHEREAS, OWRB approved a loan to the Authority in principal amount not in excess of \$37,000,000 for the purpose of financing the Project at its meeting on November 29, 2023; and

WHEREAS, the Authority has determined to borrow said sum of \$37,000,000 and to evidence such loan by the issuance of its Drinking Water SRF Promissory Note to OWRB (the “Series 2023 DWSRF Note”), to be secured by a pledge of revenue derived by the Authority from its operation of the City’s water, sewer and electric systems (hereinafter collectively, the “System”) and certain sales tax revenue of the City paid over to the Authority (the “Sales Tax Revenue”).

NOW, THEREFORE, BE IT RESOLVED:

Section 1. Issuance of Note. The Authority is hereby authorized to accept a loan from OWRB in the principal amount of \$37,000,000 for the purpose of financing the Project and to issue its Series 2023 Drinking Water SRF Promissory Note in said principal amount payable to the order of OWRB and secure payment of said Note with a pledge of revenue derived from the operation of the System and Sales Tax Revenue, provided, however, the lien on such revenues securing said Note shall be subject and subordinate in all respects to the lien thereon securing the Authority's \$61,830,000 Utility System and Sales Tax Revenue Bonds, Series 2014A and all obligations issued on a parity therewith, but *pari-passu* with other outstanding State Revolving Fund loans of the Authority to OWRB.

Section 2. Execution of Documents. The Authority hereby approves the following financing documents and authorizes the Chairman, or in the event of his absence or incapacity, the Vice Chairman, in said officer's sole discretion to approve such modifications, additions, deletions or other changes thereto as may be requested or required to obtain the loan described herein and further authorizes said officer(s) to execute and deliver such documents for and on behalf of the Authority, together with any additional documents, instruments or certificates necessary or attendant to the closing of said loan:

- (i) Series 2023 DWSRF Note to OWRB in the principal amount of \$37,000,000.
- (ii) Loan Agreement for Drinking Water SRF Loan by and between the Authority and the OWRB pertaining to the Series 2023 DWSRF Note (the "Series 2023 DWSRF Loan Agreement").
- (iii) Security Agreement between the Authority and OWRB pertaining to the Series 2023 DWSRF Note (the "Series 2023 DWSRF Security Agreement"); and
- (iv) Trust Agreement pertaining to the Series 2023 DWSRF Note and Series 2023 DWSRF Loan Agreement between the Authority and BOKF, NA, as Trustee.

Section 3. Designation of Local Trustee. The Borrower hereby designates BOKF, NA, to serve as Local Trustee of certain funds in relation to the Series 2023 DWSRF Note.

Section 4. Covenants of Borrower. Until the Series 2023 DWSRF Note has been paid in full and all obligations owing to OWRB under the Series 2023 DWSRF Loan Agreement and the instruments executed pursuant hereto have been fully performed and satisfied, unless OWRB shall otherwise consent in writing, the Authority hereby represents its intent to abide by and carry out the covenants contained in the Series 2023 DWSRF Loan Agreement and Series 2023 DWSRF Security Agreement, including particularly but not limited to, the covenants in Section 2.4(G) of the Series 2023 DWSRF Loan Agreement, which covenants are incorporated herein in their entirety.

Section 5. Ratification of Lease Agreement and Sales Tax Agreement. The Lease Agreement and Operation and Maintenance Contract dated as of April 1, 1979, between the City and the Authority, as amended, (the "Lease Agreement"), whereby the

City leases the System to the Authority and whereby the Authority agrees to operate and maintain said System, and the Sales Tax Agreement dated as of September 1, 2017, between the City and the Authority whereby the City, in consideration for the Authority's agreement to issue certain obligations for the benefit of the City and to operate and maintain the System for the benefit of the City, agrees to annually appropriate and pay all sales tax proceeds derived from City Ordinance 1835 over to the Authority to be used exclusively for the purposes set out in said Ordinance, are hereby ratified and confirmed and the terms of said Lease Agreement and Security Agreement are hereby extended until the Series 2023 DWSRF Note is paid in full.

Section 6. Fees and Expenses. Upon closing of the loan transaction described herein, the Chairman or Vice Chairman of the Authority is hereby authorized to disburse (from loan proceeds or other available funds of the Authority) to the Authority's Bond Counsel, Trustee and OWRB their respective fees and expenses relative to the issuance of the Series 2023 CDSRF Note, all as to be more fully set out in a Closing Order of the Authority to be executed and delivered upon issuance of said Note.

Section 7. Necessary Action. The Chairman, Vice Chairman, Secretary and Assistant Secretary of the Authority are hereby authorized to approve disbursement of the proceeds of the Series 2023 DWSRF Note; to accept, receive, execute, attest, seal and deliver all documentation, certifications and instruments and to take such further actions as may be required in connection with the transaction contemplated hereby for and on behalf of the Authority, the execution and delivery of such documents being conclusive as to the approval of any terms contained therein.

ADOPTED AND APPROVED THIS 18th DAY OF DECEMBER, 2023.

STILLWATER UTILITIES AUTHORITY

(SEAL)

Chairman

Secretary

CERTIFICATE
OF
AUTHORITY ACTION

I, the undersigned, hereby certify that I am the duly qualified and acting Secretary of the Stillwater Utilities Authority.

I certify that the Trustees of the Stillwater Utilities Authority held a regularly scheduled meeting at 5:30 p.m. on December 18, 2023, following notice duly given in full compliance with the Oklahoma Open Meeting Act.

I certify that attached hereto is a full and complete copy of a Resolution that was passed and approved by said Trustees at said meeting as the same appears in the official records of my office and that said Resolution is currently in effect and has not been repealed or amended as of this date.

I further certify that listed below are those Trustees present and absent at said meeting; the individuals making and seconding the motion that said Resolution be passed and approved, and those voting for and against said motion:

TRUSTEES PRESENT:

ABSENT:

MOTION MADE BY:

MOTION SECONDED BY:

AYE:

NAY:

WITNESS MY HAND THIS 18th DAY OF DECEMBER, 2023.

STILLWATER UTILITIES AUTHORITY

Secretary