

**TECHINICAL SPECIFICATIONS  
FOR  
CONSTRUCTION OF**

**WELL #3 ARSENIC TREATMENT FACILITY  
La Mesa Water Cooperative**

**La Mesa Water Cooperative, NM3500123  
PO Box 53  
Placitas, NM 87043**

**CONSTRUCTION DOCUMENTS PREPARED BY:**

*Wilson & Company, Engineers & Architects  
4401 Masthead Street NE, Ste. 150  
Albuquerque, NM 87109  
(505)-348-4000*

*January 2021*

**WILSON  
& COMPANY**



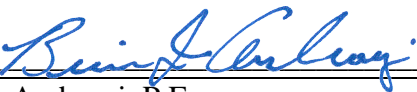
**TECHINCAL SPECIFICATIONS  
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La Mesa Water Cooperative**

Wilson Project # 16-200-204-00

**La Mesa Water Cooperative, NM3500123  
PO Box 53  
Placitas, NM 87043**

I, Brian Ambrogi, certify that I am a licensed Professional Engineer (NMPE #17610), and that these technical specifications were prepared by me or under my direction.

  
\_\_\_\_\_  
Brian Ambrogi, P.E.



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## TECHNICAL SPECIFICATIONS

### TABLE OF CONTENTS

#### **Division 01 – General Requirements**

01 0100– Summary of Work

- Attachment 1 - Construction Debris Policy, Sundance Mesa Homeowners Association, Revised August 2020
- Attachment 2 - Sundance Mesa Homeowners Association Outdoor Commercial Work Policy, Eff. Sept. 1, 2020

01 0150 – Measurement and Payment

01 0190– Contract Considerations

- EJCDC C-620 Application for Payment
- EJCDC C-940 Work Change Directive
- EJCDC C-941 Change Order

01 0390 - Coordination and Meetings

01 0600– Regulatory Requirements

01 3000– Submittals

01 4000– Quality Control

01 5000 - Construction Facilities and Temporary Controls

01 6000 - Delivery, Storage, and Handling

01 6100– Material and Equipment

01 6200 - Construction Mobilization

01 6500– Starting of Systems

01 7000 - Contract Closeout

#### **Division 03 – Concrete**

03 1000 – Concrete Forming and Accessories

03 2000 – Concrete Reinforcing

03 3000 – Cast-in-Place Concrete

#### **Division 04 – Masonry**

04 2300 – Glass Unit Masonry

04 2900 – Reinforced Unit Masonry

#### **Division 05 – Metals**

05 2100 – Steel Joist Framing

05 3100 – Steel Decking

05 5000 – Metal Fabrications

#### **Division 06 – Carpentry**

06 1000 – Rough Carpentry

#### **Division 07 – Thermal and Moisture Protection**

07 2500 – Weather Barriers

07 5400 – Thermoplastic Membrane Roofing

07 6200 – Sheet Metal Flashing and Trim

07 7100 – Roof Specialties

07 7123 – Manufactured Scuppers, Leaderheads, and Downspouts  
07 7200 – Roof Accessories  
07 9200 – Joint Sealants

**Division 08 – Openings**

08 1113 – Hollow Metal Doors and Frames  
08 3323 – Overhead Coiling Doors  
08 7100 – Door Hardware

**Division 09 – Finishes**

09 2236.23 – Metal Lath  
09 2400 – Cement Plastering  
09 9000 – Painting and Coating

**Division 10 – Specialties**

10 4400 – Fire Protection Specialties

**Division 26 – Electrical**

Specs on Drawings

**Division 31 – Earthwork**

31 2200 – Rough Grading  
31 2316 – Excavation  
31 2324 – Backfill and Compaction

- Attachment 1 - Geotechnical Engineering Services, Job No. 1-91210, La Mesa Water Cooperative Arsenic Treatment Building, January 17, 2020
- Attachment 2 – Geotechnical Engineering Services, Job No. 1-00704, La Mesa Water Cooperative Percolation Tests, July 23, 2020

31 2325 – Subgrade Preparation

**Division 32 – Site Improvements**

32 1123 – Aggregate Base Course

**Division 33 – Utilities**

33 1005 – Process Piping and Fittings  
33 1700 – Arsenic Treatment System (AdEdge)  
33 1710 – Backwash Recycle System (AdEdge)  
33 1720 – Carbon Dioxide Feed System (AdEdge)  
33 1730 – High-Density Polyethylene (HDPE) Tanks  
33 2010 – Finished Water Pump Package System

**END OF TABLE OF CONTENTS**

## SECTION 01 0100

### SUMMARY OF WORK

#### PART 1 GENERAL

##### 1.01 SECTION INCLUDES

- A. Contract Description
- B. Sequence Of Work
- C. Work Schedule
- D. Construction Conditions
- E. Progress Cleaning

##### 1.02 CONTRACT DESCRIPTION

- A. The project consists of construction of a new arsenic treatment building, equipment, and associated piping for the La Mesa Water Cooperative Well #3. The project will include, but not be limited to the following:
  - 1. a new 4-inch C-900 PVC well supply line from the existing Well #3 to the treatment building and new 4-inch C-900 PVC treated water line from the treatment building to the existing 6" water line in Camino Manzano.
  - 2. Site grading associated with the building pad and drainage control ponds.
  - 3. Approximately 2,300-SF CMU building designed to meet neighborhood architectural styling and features.
  - 4. Procurement, installation, and start-up of a package arsenic treatment unit capable of treating 150-gpm.
  - 5. Procurement, installation, and start-up of necessary HDPE tanks, including finished water tank, backwash water tank, and waste tank to be housed within the building.
  - 6. Procurement, installation, and start-up of the finished water pump skid to deliver treated water to the distribution system.
  - 7. Procurement, installation, and start-up of all interior system piping, fittings, valves, controls, electrical systems, and appurtenances as indicated in the plan drawings.

8. Produce and deliver Arsenic Treatment Facility Operations & Maintenance Manual.

### 1.03 SEQUENCE OF WORK

- A. All work is to be limited to the location, as shown on the contract drawings. Contractor shall not inhibit operations and maintenance of the well Any required work on the well or existing piping shall be coordinated with and under the control of the OWNER's operating personnel.
- B. Existing Valves shall only be operated by OWNER's operating personnel.
- C. The Schedule of Work shall be coordinated with the Owner's operational activities to ensure that Well #3 remains functional and operational as a backup water source to the system during construction. the CONTRACTOR shall minimize any down-time of Well #3 associated with construction tie-ins and similar construction activities.

### 1.04 WORK SCHEDULE

- A. Conduct all work during normal work hours, typically defined as 8 A.M. to 5 P.M., Monday through Friday, unless otherwise defined by the OWNER or ENGINEER during the Pre-Construction Conference.
- B. Deviation from this work schedule shall be specifically requested at least 24-hours in advance, and approved by the OWNER.

### 1.05 CONSTRUCTION CONDITIONS

- A. Temporary Construction and Utilities Facilities: Provide all temporary facilities required to perform the Work at no additional cost to the Owner, but not intrusive to surrounding lands. Such facilities will include but not be limited to sanitary facilities, access to telephone, electricity, and water. Water for construction purposes, and land for temporary sanitary facilities may be available from the La Mesa Water Cooperative, if arrangements are made prior to construction. Temporary power or other utilities shall not be taken from adjacent private landowners without specific written authorization from the respective property Owners.
- B. Environmental Protection: The Contractor and his subcontractors shall comply with applicable federal, state and local laws and regulations concerning environmental pollution control, sediment runoff control and abatement. The Contractor will be required to maintain all excavations, embankments, stockpiles, haul roads, plant sites, waste areas, borrow areas and all other work areas free from dust which would cause a hazard or nuisance to others. Methods of soil stabilization shall be approved by the Engineer or his representative. Additional requirements may be detailed in the General Construction Notes in the Plan



Drawing set.

1.06 PROGRESS CLEANING

- A. CONTRACTOR and SUBCONTRACTORS shall comply with Sundance Mesa Homeowners Association Construction Debris Policy, Included immediately following this section.

PART 2 PRODUCTS/MATERIALS – (NOT USED)

PART 3 EXECUTION – (NOT USED)

END OF SECTION



**Construction Debris Policy**  
**Sundance Mesa Homeowners Association**  
**REVISED - August 2020**

Effective August 15, 2020, ALL projects must have at least one trash container or other receptacle on the site for the accumulation of trash and project debris. The container or receptacle should be appropriate to the size of the project (i.e., a covered trash can may suffice for a small project; a dumpster or rolloff may be necessary for a larger project). Container(s) and/or other receptacle(s) MUST BE SECURELY COVERED at all times, except when debris is being actively placed in the container or receptacle. The job site and surrounding areas must be inspected and picked up as necessary on a daily basis. The last contractor or sub-contractor to work the site is responsible for making sure this cleanup is done. Open piles of trash or scrap building materials are not acceptable.

**Homeowners are responsible for notifying contractors of this requirement, and are ultimately responsible for compliance.**

Failure to comply with these requirements may result in a \$50/day fine for each day out of compliance. This fine will be assessed against the construction deposit. Any complaint must be in the form of an email to the ACC - [aac@sundancemesa.com](mailto:aac@sundancemesa.com), and must be accompanied by a dated photo showing the non-compliant issue. **It is the sole responsibility of the homeowner, contractor or suitable designee to report back to the ACC that the issue has been brought back into compliance.** The fine will be enforced from the date of the photo until the day an ACC member confirms that cleanup occurred. If an ACC member is unavailable to inspect the clean up immediately, the fine will stop on the day cleanup verification is requested. If a subsequent inspection reveals that the property remains out of compliance with this Policy, the fines will continue from the original date of violation and continue through the date that the eventual cleanup can be verified.

This policy is part of the ACC approval process for property improvement or alteration. Unless signature requirement is waived by Sundance Mesa ACC, homeowner and contractors are required to sign and date the policy before construction begins.

This policy may be signed in counter-parts.

\_\_\_\_\_  
Homeowner Signature

\_\_\_\_\_  
Date

**AND**

\_\_\_\_\_  
Contractor Signature

\_\_\_\_\_  
Date



**Sundance Mesa Homeowners Association  
Outdoor Commercial Work Policy  
Effective September 1, 2020**

Certain lots within Sundance Mesa remain undeveloped and may be subject to construction and improvement in the future.

The Sundance Mesa Homeowners Association Covenants, Conditions and Restrictions (CC&Rs) require existing structures and landscaping to be kept in good condition and repair.

The CC&Rs prohibit, among other things, nuisance and obnoxious activities.

Certain noise levels must be tolerated by all persons for the normal functions of life to continue.

Therefore, outdoor commercial work creating any noise which is audible from a neighboring property is subject to the policy and guidelines as provided herein:

**POLICY**

All outdoor commercial work, including but limited to building maintenance, construction, demolition, drilling, excavation, landscaping, landscape maintenance, lawn or yard work, pest control, pool service, remodeling, repair, structure maintenance, or wood cutting shall be conducted between the hours of 7:00 am and 7:00 pm (Mountain) Monday through Saturday.

**ACTIVITIES EXEMPTED**

The following activities are exempted from the above-described outdoor commercial work:

- 1) Emergency work necessary to restore property to a safe condition following a fire, accident, water leakage, or natural disaster; to restore public utilities, or to protect persons or property from an imminent danger; and
- 2) Activities or operations of governmental units or agencies.

### **TEMPORARY EXEMPTION**

The Sundance Mesa Homeowners Architectural Control Committee (ACC) is authorized to grant a temporary exemption from the requirements established by this Policy provided the person applying for the exemption satisfactorily demonstrates:

- 1) There is no feasible and prudent alternative to the activity, or the method of conducting the activity, for which the temporary exemption is sought; or
- 2) Good cause exists to grant a temporary exemption.

A temporary exemption must be in writing from the Chair of the ACC or his or her designee and must set forth the name of the party granted the exemption, the location of the property for which it is authorized, the date(s) and time(s) for which it is effective.

### **SUNDANCE MESA HOMEOWNERS ASSOCIATION MEMBERS' RESPONSIBILITY**

#### **SIGNATURE REQUIREMENTS**

Homeowners/property owners are responsible for communicating this policy to all contractors and other commercial vendors may be performing work covered by this policy at their property before work begins.

Unless the signature requirement is waived in writing by the ACC, homeowners/property owners and contractors/vendors are required to sign and date a copy of this Policy and submit a signed copy along with any Application for Property improvement or Alteration submitted to the ACC.

This Policy may be signed in counterparts.

The signature requirement discussed above is not required where outdoor commercial work is reasonably expected to be completed within one (1) day between the hours of 7:00 am and 7:00 pm (Mountain) Monday through Saturday.

#### **VIOLATIONS**

Any complaint regarding violation of this Policy must be in the form of an email to the ACC at [acc@sundancemesa.com](mailto:acc@sundancemesa.com), and must include: 1) the time of day the work was observed

being performed; 2) a general description of the work being performed; and, if possible, 3) the name of the individual or company performing the work.

Failure to comply with this Policy may result in up to a \$50 per day fine for each day out of compliance. Any fine assessed in connection with an application for property improvement and alteration will be assessed against the construction deposit.

The imposition and amount of any fine levied under this Policy shall be solely within the discretion of the ACC.

\_\_\_\_\_  
Homeowner Signature

\_\_\_\_\_  
Homeowner Printed Name

\_\_\_\_\_  
Date

**AND**

\_\_\_\_\_  
Contractor Signature

\_\_\_\_\_  
Contractor Printed Name

\_\_\_\_\_  
Date





SECTION 01 1500  
MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.1 DESCRIPTION

- A. Payment for work performed by the CONTRACTOR under these Contract Documents will be made at the approved contract unit price for each of the several items listed in the bid and measured as hereinafter specified. Such payment shall compensate the CONTRACTOR for all costs in connection with furnishing all labor, equipment, and material required and performing the operations to complete the several items in accordance with the Contract Documents. All incidental work essential to completion of the project in a skillful manner, including cleanup and disposal of waste or surplus material, shall be accomplished by the CONTRACTOR at no additional cost to the OWNER.
- B. Quantities listed in the Bid Tabulation are not guaranteed and are indicated only for convenience in comparing bids. Payment will be made for actual quantities constructed or installed, be they more or less than those listed in the Bid Tabulation.

1.2 UNIT PRICE DESCRIPTIONS

- A. Bid Item 1, "Mobilization/Demobilization", Lump Sum (L.S.): Price includes mobilization and demobilization costs. A maximum payment of one-half of one percent of total extended prices shall be made for this item.
- B. Bid Item 2, "Construction Staking", Lump Sum (L.S.): Price includes all costs associated with surveying and staking the site as needed for Contractor to complete construction activities in accordance with the plans and technical specifications.
- C. Bid Item 3, "Site Clearing & Grubbing", Acre (AC): The unit price per acre paid for clearing and grubbing shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in clearing and grubbing as shown on the plans, as provided in these specifications and as directed by the ENGINEER, including the removal and disposal of resulting material.
- D. Bid Item 4, "Fill Construction, incl. excavation, placement & compaction of material, over 2 ft. deep, cip" Cubic Yard (CY): Fill construction shall include excavation, placement, compaction and all related work, and shall be measured in place after compaction. Payment will be made on the unit price per cubic yard for compacted fill unless otherwise noted on the Bid Proposal.
- E. Bid Item 5, "Grading Areas not to be paved, Any combination of cut/fill and/or balance, and/or grading. Less than 2' excavation, no import or export of material, CIP at 95% compaction" Cubic Yard (CY): shall include costs for removal and disposal of unsuitable material up to 2' in depth. Shall include all labor,

equipment, materials, and incidentals to complete site rough and fine grading, and compaction of site as stipulated in the plans and technical specification.

- F. Bid Item 6, "Subgrade preparation of driveway, parking area, and building foundation 12" thickness at 95% compaction, CIP ", Square Yard (SY): Measurement and payment for subgrade preparation will include work on the existing access road and proposed parking area as delineated in the Plans. Payment for subgrade preparation shall include all labor and equipment required to shape, mix, and moisture, compact, bring to grade and maintenance of the prepared subgrade moisture and density until the next course of material is placed.
- G. Bid Item 7, "Aggregate Base Course, crushed, 6" thickness at 95% compaction, Driveway and Parking Area ", Square Yard (SY): Measurement and payment for subgrade preparation will include work on the existing access road and proposed parking area as delineated in the Plans at the thickness required. Unit price shall include all materials, labor, and equipment required in placing, grading and compacting the aggregate base course.
- H. Bid Item 8, "Structural Excavation, backfill, and compaction related to construction of the building, CIP" Cubic Yard (CY): Payment for excavation and backfill for structures shall be made at the contract unit price per cubic yard of excavated quantity, complete in place, which price shall include all equipment, labor and materials required to excavate, stock pile, backfill, compact, and the removal and disposal of excess material. Costs associated with purchase, haul, and placement of engineered fill shall also be considered under this bid item.
- B. Bid Item 9 " Plain Rip-Rap for drainage pond and side slopes, CIP" Cubic Yard (CY): Payment shall be per stipulated unit price and shall include all materials, labor, equipment, and incidentals, necessary to place Rip-Rap as shown in the Plans.
- C. Bid Item 10, "6-inch drainage pipe, incl. trenching, backfill, compaction, fittings, and appurtenances, CIP." Lineal Foot (LF): Shall be measured by the linear foot horizontally from the center of the drain pipe, or top of riser, if applicable, to the end of the service line. Payment shall be made at the unit price per linear foot and shall include pipe, fittings, trenching, compaction and backfill, and all incidental work necessary to complete the installation.
- D. Bid Item 11, "CMU Building incl. foundation, roof system, doors, hardware, Architectural treatments, and all appurtenances, CIP" Lump Sum (LS): Shall include all materials, labor, equipment, and incidentals associated with providing a complete and functional building structure. Unit Cost shall include all architectural, structural, building drain, plumbing, and mechanical elements as defined in the plans and technical specifications.
- E. Bid Item 12, "AdEdge Arsenic Treatment Package, Backwash recycle pump and Tank and System, CO2 pH adjustment System, incl. all equipment, fittings, valves, and appurtenances, CIP, Lump Sum (LS.): Bid item shall include furnishing, installation and assembly, and startup of all equipment, tanks, piping, fittings, valves, instrumentation, controls and appurtenances falling under the scope of

supply from the Arsenic Treatment Supplier (ATS) as defined in the plans and technical specifications.

- G. Bid Item 13, "Finished Water Tank (FWT T-04A) incl. spray nozzle assembly, and all necessary appurtenances, CIP." Lump Sum (LS.): Furnish and install the Finished Water Tank and Treated Water Spray nozzles, including all necessary fittings, valves, and appurtenances. Unit Cost shall include all labor, equipment, and materials necessary to connect, the tank as defined in the plans and technical specifications.
- H. Bid Item 14, " Waste Tank (W T-05A) incl. discharge piping, fittings, and valves to QD-SHQD-001 and all necessary appurtenances, CIP. ", Lump Sum (LS.): Furnish and install the Waste Tank and associated discharge piping, including all necessary fittings, valves, and appurtenances. Unit Cost shall include all labor, equipment, and materials necessary to connect, the tank as defined in the plans and technical specifications.
- I. Bid Item 15, " Finished Water Pump Skid (FWP-01/02) package, incl. furnish, install, and start-up, CIP," Lump Sum (LS.): Shall include all labor, materials, and equipment necessary to furnish, install, and startup a completely functional Finished Water Pump Skid Package, including all necessary fittings, valves, instrumentation, and controls as defined in the plans and technical specifications, and as falling under the scope of supply from the Finished Water Pump Skid supplier.
- J. Bid Item 16, "FWT-04A Air blower system and piping, incl. inlet, filter, blower, piping, meter, fittings, valves, and appurtenances on inlet and FWT-04A outlet, CIP.," Lump Sum (LS.): Shall include all labor, materials, and equipment necessary to furnish, install, and startup associated with the Finished Water Tank Air Blower System as detailed in the Plans. System shall include Inlet, Inlet Filter, Inlet and Outlet Piping, dampeners, fittings, Concrete Pad, Anchors, necessary supports, demister, and vent piping from the FWT, CIP.
- K. Bid Item 17, " Waste Pump (WP-WL-001) system from tank connection at BWT T-03A to tank connection at WT T-05A, incl. pump, fittings, valves, and appurtenances, CIP" Lump Sum (LS.): Shall include all labor, materials, and equipment necessary to furnish, install, and startup Waste Pump System as detailed in the Plans. System shall include waste pump system and associated power and controls from the pump to the local panel, and all piping, fittings, valves, and appurtenances from connection at the backwash tank to connection at the Waste Tank necessary to provide a fully functional system.
- L. Bid Item 18, " Sump pump (SP-SPL-001) and all associated piping, fittings, valves, and appurtenances to WT T-05A, CIP" Lump Sum (LS.): Shall include all labor, materials, and equipment necessary to furnish, install, and startup Sump Pump System as detailed in the Plans. System shall include the sump pump system and associated power and controls for pump, and all piping, fittings, valves, and appurtenances from connection at the sump pump to connection at the Waste Tank necessary to provide a fully functional system.

- M. Bid Item 19, " Finished Water piping, fittings, meters, valves, instrumentation, and appurtenances from FWT T-04A to connection at the distribution system, CIP, Excl. FWP 01/02 Pump Skid package system, Lump Sum (LS): Shall include all labor, materials, and equipment necessary to furnish, install, and startup all piping (above and below ground, and including all material types, connection types, and sizes), associated fittings, valves, instrumentation, supports, and appurtenances, including, trenching, backfill, compaction for underground piping, and all costs associated with connecting to the existing system. This bid item shall also include all restoration of landscaping, removal, disposal, and replacement of paving as necessary to complete the connection to the existing La Mesa Water Cooperative System. This item excludes the Finished Water Pump Skid as described under Bid Item 15.
- N. Bid Item 20, "Backwash supply line piping, meter, bag filter, fittings, valves, and appurtenances from connection at the Finished Water Line to the Arsenic Treatment Skid, CIP," Lump Sum (LS): Bid item shall include all labor, equipment, materials, and incidentals necessary to furnish, install, and startup, all piping, fittings, valves, and appurtenances from the connection point at the backwash tank, to the connection point at the Arsenic Treatment skid. This bid item also includes all labor, equipment, materials, and incidentals associated with furnishing, installing, and starting all equipment, instrumentation, and controls associated with the Backwash supply line.
- O. Bid Item 21, "Treated Water line including piping, fittings, valves, and appurtenances from the Arsenic Treatment Package to FWT T-04A, excl. spray nozzle assembly, CIP," Lump Sum (LS): Bid item shall include all labor, equipment, materials, and incidentals necessary to furnish, install, and startup, all piping, fittings, valves, and appurtenances from the connection point at the Arsenic Treatment Skid, to the connection point at the Finished Water Tank. This bid item also includes all labor, equipment, materials, and incidentals associated with furnishing, installing, and starting all equipment, instrumentation, and controls associated with the Treated Water line. Excluded from this bid item are the spray nozzle assemblies, and appurtenances, that shall be paid for under Bid Item 13.
- P. Bid Item 22, " Overflow piping from FWT T-04A to pond, including all fittings, valves, and appurtenances, CIP," Lump Sum (LS): Bid item shall include all labor, equipment, materials, and incidentals necessary to furnish, install, and startup, all piping, fittings, valves, and appurtenances from the connection point at finished Water Tank, to the discharge at Pond 1.
- Q. Bid Item 23, "Backwash recycle piping from BWT T-03A to connection with Well Supply Line incl. fittings, valves, and appurtenances, CIP. Excl. the backwash recycle pump package system as provided with the Arsenic Treatment Equipment, CIP," Lump Sum (LS): Bid item shall include all labor, equipment, materials, and incidentals necessary to furnish, install, and startup, all piping, fittings, valves, and appurtenances from the connection point at the Backwash tank to the connection point with the Well Supply Line. This bid item also includes all labor, equipment, materials, and incidentals associated with furnishing, installing, and starting all equipment, instrumentation, and controls associated with the backwash recycle supply line. Excluded from this bid item is the Backwash Recycle Pump (RP-

BWRL-501.) This item shall be provided under Bid Item 12 as part of the Arsenic Treatment Package.

- R. Bid Item 24, " Backwash Line Piping incl. all fittings, valves, and appurtenances, CIP. from the Arsenic Treatment System to the BWT T-03A" Lump Sum (LS): Bid item shall include all labor, equipment, materials, and incidentals necessary to furnish, install, and startup, all piping, fittings, valves, and appurtenances from the connection point at the Backwash discharge on the Arsenic Treatment System to the connection point at the Backwash Tank. This bid item also includes all labor, equipment, materials, and incidentals associated with furnishing, installing, and starting all equipment, instrumentation, and controls associated with the backwash line.
- S. Bid Item 25, " NaOCL system - incl. storage tank, chemical feed pump, containment pad, piping, and injection quill, CIP to provide a functional system" Lump Sum (LS): Bid item shall include all labor, equipment, materials, and incidentals necessary to furnish, install, and startup, storage tank, feed pumps, containment pads, piping, tubing, injectors, fittings, valves, instrumentation, and controls specifically associated with the NaOCL system as defined in the Plans and Technical Specifications.
- T. Bid Item 26, "Well Supply Line including piping, trenching, backfill and compaction, fittings, flow meters, bag filter, blow-off piping, pressure relief valve, fittings, valves, and appurtenances from Well #3 to Arsenic Treatment Skid. CIP" Lump Sum (LS): Bid Item shall include all piping (above and below ground, and including all material types, connection types, and sizes), trenching, backfill and compaction associated with subgrade piping, fittings, valves, instrumentation, and controls as defined in the Plans and Technical Specifications from the connection point at the existing Well #3 discharge pipe to the connection point at the Arsenic Treatment System.
- U. Bid Item 27, "Treatment by-pass piping, flow meter, fittings, valves, and appurtenances from the Well Supply Line to Tank FWT T01A, CIP." Lump Sum (LS): Bid item shall include all labor, equipment, materials, and incidentals necessary to furnish, install, and startup, all piping, fittings, valves, and appurtenances from the connection point at the Well Supply Line to the connection point at the Finished Water Tank as detailed in the Plans. This bid item also includes all labor, equipment, materials, and incidentals associated with furnishing, installing, and starting all equipment, instrumentation, and controls associated with the Treatment By-pass piping.
- V. Bid Item 28, "Electrical Supply, Building Electrical, and Lighting, CIP" Lump Sum (LS): Bid item shall include all labor, equipment, materials, and incidentals necessary to provide electrical supply power from the service point of connection to the building, all electrical wiring conduit, boxes, panels, fixtures, and connections to electrically powered equipment as detailed in the Plans, all building lighting (both interior and exterior.) Bid item shall include all electrical elements necessary to providing a fully functional system that is in compliance with governing codes.

- W. Bid Item 29, "Instrumentation and Controls, CIP", Lump Sum (LS): Bid items shall include all labor, equipment, materials, and incidentals associated with the Instrumentation and controls as detailed in the Plans. This bid items shall include all conduit, wiring, panels, consolidators, boxes fixtures and connections between instrumentation and the termination points within the electrical room or other instrumentation. This bid item shall also include all sensors, meters, probes, and controls elements that are not otherwise provided with specific equipment packages under other bid items.

PART 2 MATERIALS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01 0190

CONTRACT CONSIDERATIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Application for Payment.
- B. Change procedures.

1.2 APPLICATIONS FOR PAYMENT

- A. Submit one copies of each application on EJCDC C-620 (Form 00620 – 1 through 4 included herein). Contractor's electronic media driven form similar to EJCDC document may be considered.
- B. Content and Format: Utilize Bid Tab for listing items in Application for Payment.
- C. Payment Period: As specified in the Agreement.
- D. Include an updated construction progress schedule and construction photographs as specified.

1.3 CHANGE PROCEDURES

- A. Engineer will advise of minor changes in the Work not involving an adjustment to Contract Sum/Price or Contract Time as authorized by issuing supplemental instructions.
- B. Engineer may issue a Notice of Change that includes a detailed description of a proposed change with supplementary or revised Drawings and Specifications, a change in Contract Time for executing the change and the period of time during which the requested price will be considered valid. Contractor will prepare and submit an estimate within 10 days.
- C. The Contractor may propose a change by submitting a request for change to the Engineer, describing the proposed change and its full effect on the Work. Include a statement describing the reason for the change, and the effect on the Contract Sum/Price and Contract Time.
- D. Stipulated Sum/Price Change Order: Based on Notice of Change and Contractor's fixed price quotation or Contractor's request for a Change Order as approved by Engineer.

- E. Work Directive Change: Engineer may issue a directive, EJCDC C-940 Work Directive Change signed by the Owner, instructing the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order. Document will describe changes in the Work, and designate method of determining any change in Contract Sum/Price or Contract Time. Promptly execute the change.
- F. Time and Material Change Order: Submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract. Engineer will determine the change allowable in Contract Sum/Price and Contract Time as provided in the Contract Documents.
- G. Maintain detailed records of work done on Time and Material basis. Provide full information required for evaluation of proposed changes, and to substantiate costs for changes in the Work.
- H. Change Order Forms: Form CO-1 (included herein).
- I. Execution of Change Orders: Engineer will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.

1.4 DEFECT ASSESSMENT

- A. Replace the Work, or portions of the Work, not conforming to specified requirements.
- B. If, in the opinion of the Engineer, it is not practical to remove and replace the Work, the Engineer will direct an appropriate remedy or adjust payment.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION



**Contractor's Application for Payment**

<b>Owner:</b> _____	<b>Owner's Project No.:</b> _____
<b>Engineer:</b> _____	<b>Engineer's Project No.:</b> _____
<b>Contractor:</b> _____	<b>Contractor's Project No.:</b> _____
<b>Project:</b> _____	
<b>Contract:</b> _____	
<b>Application No.:</b> _____	<b>Application Date:</b> _____
<b>Application Period:</b> From _____	to _____

1. Original Contract Price	\$	-
2. Net change by Change Orders	\$	-
3. Current Contract Price (Line 1 + Line 2)	\$	-
4. Total Work completed and materials stored to date (Sum of Column G Lump Sum Total and Column J Unit Price Total)	\$	-
5. Retainage		
a. _____ X \$ _____ - Work Completed	\$	-
b. _____ X \$ _____ - Stored Materials	\$	-
c. Total Retainage (Line 5.a + Line 5.b)	\$	-
6. Amount eligible to date (Line 4 - Line 5.c)	\$	-
7. Less previous payments (Line 6 from prior application)		
8. Amount due this application	\$	-
9. Balance to finish, including retainage (Line 3 - Line 4)	\$	-

**Contractor's Certification**

The undersigned Contractor certifies, to the best of its knowledge, the following:

(1) All previous progress payments received from Owner on account of Work done under the Contract have been applied on account to discharge Contractor's legitimate obligations incurred in connection with the Work covered by prior Applications for Payment;

(2) Title to all Work, materials and equipment incorporated in said Work, or otherwise listed in or covered by this Application for Payment, will pass to Owner at time of payment free and clear of all liens, security interests, and encumbrances (except such as are covered by a bond acceptable to Owner indemnifying Owner against any such liens, security interest, or encumbrances); and

(3) All the Work covered by this Application for Payment is in accordance with the Contract Documents and is not defective.

**Contractor:** \_\_\_\_\_

**Signature:** \_\_\_\_\_ **Date:** \_\_\_\_\_

<b>Recommended by Engineer</b>	<b>Approved by Owner</b>
<b>By:</b> _____	<b>By:</b> _____
<b>Title:</b> _____	<b>Title:</b> _____
<b>Date:</b> _____	<b>Date:</b> _____
<b>Approved by Funding Agency</b>	
<b>By:</b> _____	<b>By:</b> _____
<b>Title:</b> _____	<b>Title:</b> _____
<b>Date:</b> _____	<b>Date:</b> _____



**Progress Estimate - Unit Price Work**

**Contractor's Application for Payment**

Owner: \_\_\_\_\_  
 Engineer: \_\_\_\_\_  
 Contractor: \_\_\_\_\_  
 Project: \_\_\_\_\_  
 Contract: \_\_\_\_\_

Owner's Project No.: \_\_\_\_\_  
 Engineer's Project No.: \_\_\_\_\_  
 Contractor's Project No.: \_\_\_\_\_

Application No.: \_\_\_\_\_ Application Period: From \_\_\_\_\_ to \_\_\_\_\_ Application Date: \_\_\_\_\_

A	B	C	D	E	F	G	H	I	J	K	L
Bid Item No.	Description	Contract Information				Work Completed		Materials Currently Stored (not in G) (\$)	Work Completed and Materials Stored to Date (H + I) (\$)	% of Value of Item (J / F) (%)	Balance to Finish (F - J) (\$)
		Item Quantity	Units	Unit Price (\$)	Value of Bid Item (C X E) (\$)	Estimated Quantity Incorporated in the Work	Value of Work Completed to Date (E X G) (\$)				
<b>Original Contract</b>											
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
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					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
<b>Original Contract Totals</b>					\$ -		\$ -	\$ -	\$ -		\$ -

**Progress Estimate - Unit Price Work**

**Contractor's Application for Payment**

Owner: _____ Engineer: _____ Contractor: _____ Project: _____ Contract: _____	Owner's Project No.: _____ Engineer's Project No.: _____ Contractor's Project No.: _____
---	--

Application No.: \_\_\_\_\_ Application Period: From \_\_\_\_\_ to \_\_\_\_\_ Application Date: \_\_\_\_\_

A	B	C	D	E	F	G	H	I	J	K	L
Bid Item No.	Description	Contract Information				Work Completed		Materials Currently Stored (not in G) (\$)	Work Completed and Materials Stored to Date (H + I) (\$)	% of Value of Item (J / F) (%)	Balance to Finish (F - J) (\$)
		Item Quantity	Units	Unit Price (\$)	Value of Bid Item (C X E) (\$)	Estimated Quantity Incorporated in the Work	Value of Work Completed to Date (E X G) (\$)				
<b>Change Orders</b>											
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
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					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
<b>Change Order Totals</b>					\$	-		\$	-	\$	-
<b>Original Contract and Change Orders</b>											
<b>Project Totals</b>					\$	-		\$	-	\$	-

**Stored Materials Summary**

**Contractor's Application for Payment**

Owner: _____	Owner's Project No.: _____
Engineer: _____	Engineer's Project No.: _____
Contractor: _____	Contractor's Project No.: _____
Project: _____	
Contract: _____	

Application No.: \_\_\_\_\_ Application Period: From \_\_\_\_\_ to \_\_\_\_\_ Application Date: \_\_\_\_\_

A	B	C	D	E	F	G	H	I	J	K	L	M	
Item No. (Lump Sum Tab) or Bid Item No. (Unit Price Tab)	Supplier Invoice No.	Submittal No. (with Specification Section No.)	Description of Materials or Equipment Stored	Storage Location	Application No. When Materials Placed in Storage	Materials Stored			Incorporated in Work			Materials Remaining in Storage (I-L) (\$)	
						Previous Amount Stored (\$)	Amount Stored this Period (\$)	Amount Stored to Date (G+H) (\$)	Amount Previously Incorporated in the Work (\$)	Amount Incorporated in the Work this Period (\$)	Total Amount Incorporated in the Work (J+K) (\$)		
<b>Totals</b>						\$	-	\$	-	\$	-	\$	-



This document has important legal consequences; consultation with an attorney is encouraged with respect to its use or modification. This document should be adapted to the particular circumstances of the contemplated Project and the controlling Laws and Regulations.

## WORK CHANGE DIRECTIVE

Prepared By



Endorsed By







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# GUIDELINES FOR USE OF EJCDC® C-940 WORK CHANGE DIRECTIVE

## 1.0 PURPOSE AND INTENDED USE OF THE DOCUMENT

The Work Change Directive is used by Owner to order additions, deletions, or revisions in the Work to proceed without waiting until Owner and Contractor have agreed upon the impact, if any, of these changes on Contract Price, Contract Times, or both. See Paragraph 11.03, EJCDC® C-700, Standard General Conditions of the Construction Contract (2018).

The document is unilateral in nature and does not require Contractor's signature. Owner or Engineer should maintain documentation of the transmittal of a Work Change Directive to Contractor.

Because, by definition, Work Change Directives involve changes to the Work, EJCDC presumes that all Work Change Directives must be supported by Engineer's recommendation. See C-700, Paragraph 11.01.C.

Although the General Conditions do not require any estimates of the impact of the ordered change on the schedule or Contract Price, such estimates are considered good practice and are commonly provided. The estimates may serve as a starting point for determination of schedule and cost impacts.

For additional information regarding C-940, see EJCDC® C-001, Commentary on the 2018 EJCDC Construction Documents (2018).

## 2.0 EDITING THIS DOCUMENT

2.1 It is intended that this document be edited for each Contract. Guidelines for editing include:

- A. Remove the cover pages which consist of the title pages, and these Guidelines for Use.
- B. Type in required information as indicated by brackets ([ ]). Bracketed text will usually provide instructions for what is to be inserted in place of the brackets. Delete brackets and change formatting to match existing text after project specific text has been added, e.g. change "[Project Name]" to "Peach Street Renovation" (without brackets or bold, or quotation marks).
- C. Fill in blanks, if any. It will be more common for information to be inserted by user to be indicated by a prompt in brackets, as described in Paragraph B above, rather than by an underline-style blank.
- D. Most Notes to User are presented before the text to which they apply; some Notes to Users are interspersed in the text, usually within brackets. Delete all "Notes to User" after reviewing each note and taking appropriate action. Delete all associated numbering and brackets.
- E. Modify check-boxes as required by clicking in the box.

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**WORK CHANGE DIRECTIVE NO.: [Number of Work Change Directive]**

Owner: \_\_\_\_\_ Owner's Project No.: \_\_\_\_\_  
Engineer: \_\_\_\_\_ Engineer's Project No.: \_\_\_\_\_  
Contractor: \_\_\_\_\_ Contractor's Project No.: \_\_\_\_\_  
Project: \_\_\_\_\_  
Contract Name: \_\_\_\_\_  
Date Issued: \_\_\_\_\_ Effective Date of Work Change Directive: \_\_\_\_\_

Contractor is directed to proceed promptly with the following change(s):

Description:

**[Description of the change to the Work]**

Attachments:

**[List documents related to the change to the Work]**

Purpose for the Work Change Directive:

**[Describe the purpose for the change to the Work]**

Directive to proceed promptly with the Work described herein, prior to agreeing to change in Contract Price and Contract Time, is issued due to:

**Notes to User—Check one or both of the following**

Non-agreement on pricing of proposed change.  Necessity to proceed for schedule or other reasons.

Estimated Change in Contract Price and Contract Times (non-binding, preliminary):

Contract Price: \$ \_\_\_\_\_ **[increase] [decrease] [not yet estimated].**  
Contract Time: \_\_\_\_\_ days **[increase] [decrease] [not yet estimated].**

Basis of estimated change in Contract Price:

Lump Sum  Unit Price  Cost of the Work  Other

Recommended by Engineer

Authorized by Owner

By:

\_\_\_\_\_

\_\_\_\_\_

Title:

\_\_\_\_\_

\_\_\_\_\_

Date:

\_\_\_\_\_

\_\_\_\_\_

This document has important legal consequences; consultation with an attorney is encouraged with respect to its use or modification. This document should be adapted to the particular circumstances of the contemplated Project and the controlling Laws and Regulations.

## CHANGE ORDER

Prepared By



Endorsed By





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# GUIDELINES FOR USE OF EJCDC® C-941 CHANGE ORDER

## 1.0 PURPOSE AND INTENDED USE OF THE DOCUMENT

The Change Order is used to make modifications to the Contract that change the Contract Price or Contract Times. Changes to the Contract are addressed in Article 11 of EJCDC® C-700, Standard General Conditions of the Construction Contract (2018).

Most Change Orders require the Engineer's recommendation. See C-700, Paragraph 11.01. Many publicly funded projects require that Change Orders be approved by the funding agency (such as the Rural Utilities Service). For projects that do not require such approval, the user may delete the funding agency approval block, or indicate "Not Applicable."

For additional information regarding C-941, see EJCDC® C-001, Commentary on the 2018 EJCDC Construction Documents (2018).

## 2.0 EDITING THIS DOCUMENT

2.1 It is intended that this document be edited for each Contract. Guidelines for editing include:

- A. Remove the cover pages which consist of the title pages, and these Guidelines for Use.
- B. Type in required information as indicated by brackets ([ ]). Bracketed text will usually provide instructions for what is to be inserted in place of the brackets. Delete brackets and change formatting to match existing text after project specific text has been added, e.g. change "[Project Name]" to "Peach Street Renovation" (without brackets or bold, or quotation marks).
- C. Fill in blanks, if any. It will be more common for information to be inserted by user to be indicated by a prompt in brackets, as described in Paragraph B above, rather than by an underline-style blank.
- D. Most Notes to User are presented before the text to which they apply; some Notes to Users are interspersed in the text, usually within brackets. Delete all "Notes to User" after reviewing each note and taking appropriate action. Delete all associated numbering and brackets.
- E. Complete tables.

## 3.0 LICENSE AGREEMENT

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**CHANGE ORDER NO.: [Number of Change Order]**

Owner: \_\_\_\_\_ Owner's Project No.: \_\_\_\_\_  
 Engineer: \_\_\_\_\_ Engineer's Project No.: \_\_\_\_\_  
 Contractor: \_\_\_\_\_ Contractor's Project No.: \_\_\_\_\_  
 Project: \_\_\_\_\_  
 Contract Name: \_\_\_\_\_  
 Date Issued: \_\_\_\_\_ Effective Date of Change Order: \_\_\_\_\_

The Contract is modified as follows upon execution of this Change Order:

Description:

**[Description of the change]**

Attachments:

**[List documents related to the change]**

Change in Contract Price	Change in Contract Times [State Contract Times as either a specific date or a number of days]
Original Contract Price: \$ _____	Original Contract Times: Substantial Completion: _____ Ready for final payment: _____
<b>[Increase] [Decrease]</b> from previously approved Change Orders No. 1 to No. <b>[Number of previous Change Order]</b> : \$ _____	<b>[Increase] [Decrease]</b> from previously approved Change Orders No.1 to No. <b>[Number of previous Change Order]</b> : Substantial Completion: _____ Ready for final payment: _____
Contract Price prior to this Change Order: \$ _____	Contract Times prior to this Change Order: Substantial Completion: _____ Ready for final payment: _____
<b>[Increase] [Decrease]</b> this Change Order: \$ _____	<b>[Increase] [Decrease]</b> this Change Order: Substantial Completion: _____ Ready for final payment: _____
Contract Price incorporating this Change Order: \$ _____	Contract Times with all approved Change Orders: Substantial Completion: _____ Ready for final payment: _____

Recommended by Engineer (if required)

Authorized by Owner

By: \_\_\_\_\_

\_\_\_\_\_

Title: \_\_\_\_\_

\_\_\_\_\_

Date: \_\_\_\_\_

\_\_\_\_\_

Authorized by Owner

Approved by Funding Agency (if applicable)

By: \_\_\_\_\_

\_\_\_\_\_

Title: \_\_\_\_\_

\_\_\_\_\_

Date: \_\_\_\_\_

\_\_\_\_\_



## SECTION 01 0390

### COORDINATION AND MEETINGS

#### PART 1 GENERAL

##### 1.1 SECTION INCLUDES

- A. Coordination and project conditions.
- B. Field engineering.
- C. Preconstruction meeting.
- D. Site mobilization meeting.
- E. Progress meetings.
- F. Pre-installation conferences.

##### 1.2 COORDINATION AND PROJECT CONDITIONS

- A. Coordinate scheduling, submittals, and Work of the various Sections of the Project Manual to assure efficient and orderly sequence of installation of interdependent construction.
- B. Verify that utility requirements and characteristics of operating equipment are compatible with building utilities. Coordinate work of various Sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- C. Coordinate space requirements and installation of mechanical and electrical Work which are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with line of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- D. CONTRACTOR shall coordinate on-site construction activities to allow access and use of the site as necessary for a 3<sup>rd</sup> Party CONTRACTOR to complete well pump installation concurrent with this project.
- E. Coordinate completion and clean-up of Work of separate sections in preparation for Substantial Completion.
- F. After Owner occupancy of premises, coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

##### 1.3 FIELD ENGINEERING

- A. Employ a Land Surveyor registered in the State of New Mexico and acceptable to the Engineer.
- B. Contractor to locate and protect survey control and reference points.
- C. Control datum for survey is that shown on Drawings.

- D. Confirm drawing dimensions and elevations.
- E. Provide field engineering services. Establish elevations, lines, and levels, utilizing recognized engineering survey practices.

#### 1.4 PRECONSTRUCTION MEETING

- A. Engineer will schedule a conference after Notice of Award.
- B. Attendance Required: Owner, Engineer, and Contractor.
- C. Agenda:
  - 1. Submission of executed bonds and insurance certificates.
  - 2. Distribution of Contract Documents.
  - 3. Submission of list of Subcontractors, list of Products, schedule of values, and progress schedule.
  - 4. Designation of personnel representing the parties in Contract, and the Engineer.
  - 5. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders.
  - 6. Scheduling.
- D. Record minutes and distribute copies within two days after meeting to participants.

#### 1.5 SITE MOBILIZATION MEETING

- A. Engineer will schedule a meeting at the Project site prior to Contractor occupancy.
- B. Attendance Required: Engineer, Contractor, Contractor's Superintendent, and major Subcontractors.
- C. Agenda:
  - 1. Use of premises by Owner and Contractor.
  - 2. Owner's requirements.
  - 3. Construction facilities and controls provided by Owner.
  - 4. Temporary utilities provided by Owner.
  - 5. Survey and site layout.
  - 6. Security and housekeeping procedures.
  - 7. Schedules.
  - 8. Application for payment procedures.
  - 9. Procedures for testing.
  - 10. Procedures for maintaining record documents.
  - 11. Requirements for start-up of equipment.
  - 12. Inspection and acceptance of equipment put into service during construction period.
- D. Record minutes and distribute copies within two days after meeting to participants.

#### 1.6 PROGRESS MEETINGS

- A. Schedule and administer meetings throughout progress of the Work at maximum monthly intervals, or as directed by Owner.
- B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
- C. Attendance Required: Job superintendent, major Subcontractors and suppliers, Engineer, as appropriate to agenda topics for each meeting.
- D. Agenda:
  - 1. Review minutes of previous meetings.
  - 2. Review of Work progress.
  - 3. Field observations, problems, and decisions.
  - 4. Identification of problems which impede planned progress.
  - 5. Review of submittals schedule and status of submittals.
  - 6. Review of off-site fabrication and delivery schedules.
  - 7. Maintenance of progress schedule.
  - 8. Corrective measures to regain projected schedules.
  - 9. Planned progress during succeeding work period.
  - 10. Coordination of projected progress.
  - 11. Maintenance of quality and work standards.
  - 12. Effect of proposed changes on progress schedule and coordination.
  - 13. Other business relating to Work.
- E. Record minutes and distribute copies within two days after meeting to participants.

#### 1.7 PREINSTALLATION MEETING

- A. When required in individual specification Sections, convene a pre-installation meeting at the site prior to commencing work of the Section.
- B. Require attendance of parties directly affecting, or affected by, work of the specific Section.
- C. Notify Engineer seven days in advance of meeting date.
- D. Prepare agenda and preside at meeting:
  - 1. Review conditions of installation, preparation and installation procedures.
  - 2. Review coordination with related work.
- E. Record minutes and distribute copies within two days after meeting to participants.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION



SECTION 01 0600

REGULATORY REQUIREMENTS

PART 1 GENERAL

1.1 APPLICABLE CODES AND ORDINANCES

- A. All Work shall conform to the current versions of all applicable building, mechanical, plumbing, and electrical codes.
- B. Contractor is responsible for acquiring all applicable building, mechanical, plumbing, and electrical permits related to this project. Including any necessary permits from the Town of Bernalillo.
- C. Comply with all local laws, ordinances, regulations, and Sundance Mesa HOA CC&Rs, Policies, and ACC Rules which may impact Contractor's Work.

1.2 OSHA REQUIREMENTS

- A. All equipment and facilities provided, including but not limited to, handrails, grating, hoists, equipment guards, ladders, etc., shall meet OSHA requirements whether or not such requirements are specifically indicated or described in Contract Documents.
- B. Any conflicts between OSHA requirements and Contract Documents shall be brought to the attention of the Engineer on a timely basis for resolution.

END OF SECTION





## SECTION 01 3000

### SUBMITTALS

#### PART 1 GENERAL

##### 1.1 SECTION INCLUDES

- A. Submittal procedures.
- B. Construction progress schedules.
- C. Proposed Products list.
- D. Product data.
- E. Shop Drawings.
- F. Samples.
- G. Design data.
- H. Test reports.
- I. Certificates.
- J. Manufacturer's instructions.
- K. Manufacturer's field reports.
- L. Erection drawings.
- M. Construction photographs.

##### 1.2 SUBMITTAL PROCEDURES

- A. Transmit each submittal with Engineer accepted form. Submittals shall be in searchable PDF format and submitted by email, FTP Site, or other means as determined at the preconstruction conference.
- B. Sequentially number the transmittal forms. Resubmittals to have original number with a sequential alphabetic suffix.
- C. Identify Project, Contractor, Subcontractor or supplier; pertinent Drawing and detail number(s), and specification Section number, as appropriate.
- D. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of Products required, field dimensions, adjacent construction Work, and coordination of information, is in accordance with the requirements of the Work and Contract Documents.

- E. Schedule submittals to expedite the Project, and deliver to Engineer at business address. Coordinate submission of related items.
- F. For each submittal for review, allow 15 days excluding delivery time to and from the contractor.
- G. Identify variations from Contract Documents and Product or system limitations, which may be detrimental to successful performance of the completed Work.
- H. Provide space for Contractor and Engineer review stamps.
- I. When revised for resubmission, identify all changes made since previous submission.
- J. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.
- K. Submittals not requested will not be recognized or processed.

### 1.3 CONSTRUCTION PROGRESS SCHEDULES

- A. Submit initial Construction schedule in PDF format within 10 days after date of Notice to Proceed.
- B. Revise and resubmit as required.
- C. Submit revised schedules with each Application for Payment, identifying changes since previous version.
- D. Submit a CPM-based, computer-generated, Tracking Gantt chart with separate line for each major section of Work or operation identifying first work day of each week, or other Engineer accepted chart.
- E. Progress Schedule shall, at a minimum, contain the following:
  - 1. Progress Schedule Heading:
    - a. Name of Contractor
    - b. Name of Engineer
    - c. Name and Address of Project
    - d. Engineer Project Number
    - e. Current Date of submitted schedule
  - 2. Calendar Months of construction
  - 3. Start date of each task/activity
  - 4. "Milestone" dates for each required inspection
  - 5. Start and completion dates for critical tasks or activities
  - 6. Percentage of total costs or work for each task/activity, etc.
  - 7. Duration of time for each task/activity, start to finish
  - 8. Percentage of completion, updated monthly
  - 9. Proposed Construction Curve marked in black an actual construction curve marked in red
  - 10. Payments project to expected per month
  - 11. Accumulation of project payments per month

- 12. Actual payments per month
- 13. Submit updated Progress Schedule each month in conjunction with Certificate of Payment

- F. Show complete sequence of construction by activity, identifying Work of separate stages and other logically grouped activities. Indicate the early and late start, early and late finish, float dates, and duration.
- G. Indicate estimated percentage of completion for each item of Work at each submission.
- H. Indicate submittal dates required for Shop Drawings, product data, samples, and product delivery dates, including those furnished by Owner and under Allowances.

#### 1.4 PROPOSED PRODUCTS LIST

- A. Within 15 days after date of Owner-Contractor Agreement submit complete list of major Products proposed for use as defined in the Technical Specifications. Included in the list shall be the name of manufacturer, trade name, model number of each Product, and corresponding Section of the Contract Documents.
- B. For Products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

#### 1.5 PRODUCT DATA

- A. Product Data for Review:
  - 1. Submitted to Engineer for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
  - 2. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article above and for record documents purposes described in Section 01700 - CONTRACT CLOSEOUT.
- B. Product Data for Information:
  - 1. Submitted for the Engineer's knowledge as contract administrator or for the Owner.
- C. Product Data for Project Close-Out:
  - 1. Submitted for the Owner's benefit during and after project completion.
- D. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information unique to this Project.
- E. Indicate Product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- F. After review, distribute in accordance with Submittal Procedures article above and provide copies for Record Documents described in Section 01700.

#### 1.6 SHOP DRAWINGS

- A. Shop Drawings for Review:
  - 1. Submitted to Engineer for review for the limited purpose of checking for conformance

- with information given and the design concept expressed in the contract documents.
  - 2. After review, produce copies and distribute in accordance with SUBMITTAL PROCEDURES article above and for record documents purposes described in Section 01700.
- B. Shop Drawings for Information:
    - 1. Submitted for the Engineer's knowledge as contract administrator or for the Owner.
  - C. Shop Drawings for Project Close-Out:
    - 1. Submitted for the Owner's benefit during and after project completion.
  - D. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

## 1.7 SAMPLES

- A. Samples for Review:
  - 1. Submitted to Engineer for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
- B. Samples for Information:
  - 1. Submitted for the Engineer's knowledge as contract administrator or for the Owner.
- C. Samples for Selection:
  - 1. Submitted to Engineer for aesthetic, color, or finish selection.
  - 2. Submit samples of finishes, textures, and patterns for Engineer selection.
  - 3. After review, produce duplicates and distribute in accordance with SUBMITTAL PROCEDURES article above and for record documents purposes described in Section 01700.
- D. Submit samples to illustrate functional and aesthetic characteristics of the Product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
- E. Include identification on each sample, with full Project information.
- F. Submit the number or samples specified in individual specification Sections; one of which will be retained by Engineer.
- G. Reviewed samples which may be used in the Work are indicated in individual specification Sections.
- H. Samples will not be used for testing purposes unless specifically stated in the specification section.

## 1.8 DESIGN DATA

- A. Submit for the Engineer's knowledge as contract administrator or for the Owner.
- B. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

## 1.9 TEST REPORTS

- A. Submit for the Engineer's knowledge as contract administrator or for the Owner.
- B. Submit test reports for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

#### 1.10 CERTIFICATES

- A. When specified in individual specification Sections, submit certification by manufacturer, installation/application Subcontractor, or the Contractor to Engineer, in quantities specified for Product Data.
- B. Indicate material or Product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
- C. Certificates may be recent or previous test results on material or Product, but must be acceptable to Engineer.

#### 1.11 MANUFACTURER'S INSTRUCTIONS

- A. When specified in individual specification Sections, submit instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing to Engineer, in quantities specified for Product Data.
- B. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.
- C. Refer to Section 01400 - Quality Control, Manufacturer' Field Services article.

#### 1.12 MANUFACTURER'S FIELD REPORTS

- A. Submit reports for the Engineer's benefit as contract administrator or for the Owner.
- B. Submit PDF report within 30 days of observation to Owner for information.
- C. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

#### 1.13 ERECTION DRAWINGS

- A. Submit drawings for the Engineer's benefit as contract administrator or for the Owner.
- B. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.
- C. Data indicating inappropriate or unacceptable Work may be subject to action by the Engineer or Owner.

#### 1.14 CONSTRUCTION PHOTOGRAPHS

- A. Twice monthly submit photographs in digital format. Photographs shall include project site prior to construction.
- B. Take photographs of site and construction, as directed by the Engineer or Construction Supervisor throughout progress of Work.
- C. Identify photographs with date, time, orientation and project identification.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01 4000  
QUALITY CONTROL

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Quality assurance-control of installation.
- B. Tolerances.
- C. References and standards.
- D. Mock-up.
- E. Testing services.
- F. Inspection services.
- G. Manufacturers' field services.

1.2 QUALITY ASSURANCE-CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, Products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply fully with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Engineer before proceeding.
- D. Comply with specified standards as a minimum quality for the Work except when 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 that field measurements are as indicated on Shop Drawings or as instructed by the manufacturer.
- G. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement.

1.3 TOLERANCES

- A. Monitor fabrication and installation tolerance of Products to produce acceptable Work. Do not permit tolerances to accumulate.

- B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Engineer before proceeding.
- C. Adjust Products to appropriate dimensions; position before securing Products in place.

#### 1.4 REFERENCES AND STANDARDS

- A. For Products or workmanship specified by association, trade, or other consensus standards, comply with requirements of the 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 a specific date is established by code.
- C. Obtain copies of standards when required by product specification sections.
- D. The contractual relationship, duties or responsibilities of the parties in the Contract, or those of the Engineer, shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

#### 1.5 MOCK-UP

- A. Tests will be performed under provisions identified in this Section and identified in the 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 a comparison standard for the 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.

#### 1.6 TESTING SERVICES

- A. Contractor will appoint/employ and pay for specified services of an independent firm to perform testing. Cost for testing services shall be by Contractor and included in the Contract Sum.
- B. Testing firm to be employed shall be named prior to employment and is subject to approval of the Owner.
- C. The independent firm will perform tests and other services specified in individual specification Sections and as required by the Engineer or the Owner.
- D. Testing and source quality control may occur on or off the project site. Perform off-site testing as required by the Engineer or the Owner.



- E. Reports will be submitted by the independent firm to the Engineer in triplicate, indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.
- F. Cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage, safe access, and assistance by incidental labor as requested.
  - 1. Notify Engineer and independent firm 24 hours prior to expected time for operations requiring services.
  - 2. Make arrangements with independent firm and pay for additional samples and tests required for Contractor's use.
- G. Testing does not relieve Contractor to perform Work to contract requirements.
- H. Retesting required because of non-conformance to specified requirements shall be performed by the same independent firm on instructions by the Engineer. Payment for retesting will be charged to the Contractor by deducting testing charges from the Contract Sum/Price.
- I. Owner reserves the right to request additional testing. Additional testing that is found to be of non-conformance to specified requirements shall be paid for by contractor. Additional testing that is found to meet specified requirements shall be paid for by Owner.

#### 1.7 MANUFACTURERS' FIELD SERVICES

- A. When specified in individual specification Sections, require material or Product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, and adjust and balance of equipment as applicable, and to initiate instructions when necessary.
- B. Submit qualifications of observer to Engineer 30 days in advance of required observations.
- C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.
- D. Refer to Section 01 3000 SUBMITTALS and the MANUFACTURERS' FIELD REPORTS article.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION – Not Used

END OF SECTION



## SECTION 01 5000

### CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

#### PART 1 GENERAL

##### 1.1 SECTION INCLUDES

- A. Temporary Utilities: Electricity, telephone service, water, and sanitary facilities.
- B. Temporary Controls: Protection of the Work and water control.
- C. Construction Facilities: Access roads, parking, progress cleaning, and temporary buildings.

##### 1.2 DELIVERY, STORAGE, AND PROTECTION

- A. Protect installed Work and provide special protection where specified in individual Specification Sections.
- B. Provide temporary and removable protection for installed Products. Control activity in immediate work area to minimize damage.
- C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- D. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- E. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- F. Prohibit traffic from landscaped areas

## PART 2 PRODUCTS

### 2.1 FIELD OFFICES

- A. Contractor shall install and maintain a field office on-site throughout the duration of construction. Office shall be of sufficient size and furnishings to hold small meetings, maintain record drawing markups, shop drawing files, payment files, and other materials required to be maintained on-site. On-site field office shall be heated and cooled. Utilities specified herein shall be installed and maintained throughout work.

Provide, install, and remove Contractor's field offices on-site. Electrical requirements are 200 amp, 120-volt, single-phase.

### 2.2 TEMPORARY ELECTRICITY

- A. Cost: Owner will provide and pay for power service required for the field office and construction activities.
- B. Provide temporary electric feeder from electrical service at location as directed.
- C. Provide power outlets for construction operations, with branch wiring and distribution boxes located as required. Provide flexible power cords as required.
- D. Provide meter.

### 2.3 TELEPHONE SERVICE

- A. Provide, maintain, and pay for reliable telephone service to field office and at time of project mobilization.

### 2.4 TEMPORARY WATER SERVICE

- A. Temporary water for construction operations is available on-site and will be provided by Owner and not cost to Contractor.
- B. Contractor shall coordinate with Owner on connection locations for temporary water service connection and metering of temporary service connections.

### 2.5 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures, minimum two toilets. Provide at time of project mobilization.

## PART 3 EXECUTION

### 3.1 PROGRESS CLEANING AND WASTE REMOVAL

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- B. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
- C. Contractor and all Subcontractors shall comply with the Sundance Mesa Home Owner Association Construction Debris Policy, as attached to Section 01 0100 – Summary of Work.

### 3.2 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, materials, prior to Substantial Completion inspection.
- B. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated.
- C. Clean and repair damage caused by installation or use of temporary work.
- D. Restore existing facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

END OF SECTION



## SECTION 01 6000

### DELIVERY, STORAGE AND HANDLING

#### PART 1 GENERAL

##### 1.1 SCOPE OF WORK

- A. This Section specifies the general requirements for the delivery handling, storage and protection of all items required in the construction of the work. Specific requirements, if any, are specified with the related item.

##### 1.2 TRANSPORTATION AND DELIVERY

- A. Transport and handle items in accordance with manufacturer's instructions.
- B. Deliver products to the site in manufacturer's original sealed containers or other packaging systems complete with instructions for handling, storing, unpacking, protecting and installing.
- C. All items delivered to the site shall be unloaded and placed in locations designated for equipment storage, as determined during the Site Mobilization Meeting. Equipment shall not be placed in locations where it will impede construction or daily operations of the facility.
- D. Provide necessary equipment and personnel to handle all items delivered to the site.

##### 1.3 STORAGE AND PROTECTION

- A. Store and protect products in accordance with the manufacturer's instructions, with seals and labels intact and legible. Instruction shall be carefully followed and a written record of this kept by the Contractor.
- B. Store sensitive Products in weather-tight, climate controlled enclosures, in an environment favorable to Product.
- C. For exterior storage of fabricated Products, place on sloped supports, above ground.
- D. Provide off-site storage and protection when site does not permit on-site storage or protection.

- E. Cover Products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation and degradation of Products.
- F. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- G. All mechanical and electrical equipment and instruments subject to corrosive damage by the atmosphere if stored outdoors (even though covered by canvas) shall be stored in a weather-tight enclosure or building to prevent injury. Maintain temperature and humidity within range required by the manufacturer.
  - 1. All equipment shall be stored fully lubricated with oil, grease and other lubricants unless otherwise instructed by the manufacturer.
  - 2. Lubricants shall be changed upon completion of installation.
- H. Provide equipment and personnel to store Products by methods to prevent soiling, disfigurement, or damage.
- I. Arrange storage of Products to permit access for inspection. Periodically inspect to assure Products are undamaged and are maintained in acceptable condition.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION



SECTION 01 6100  
MATERIAL AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Products.
- B. Transportation and handling.
- C. Storage and protection.
- D. Product options.
- E. Substitutions.

1.2 PRODUCTS

- A. Do not use materials and equipment removed from existing premises, except as specifically permitted by the Contract Documents.
- B. Provide interchangeable components of the same manufacturer for components being replaced.

1.3 TRANSPORTATION AND HANDLING

- A. Transport and handle Products in accordance with manufacturer's instructions.
- B. Promptly inspect shipments to assure that Products comply with requirements, quantities are correct, and Products are undamaged.
- C. Provide equipment and personnel to handle Products by methods to prevent soiling, disfigurement, or damage.

1.4 STORAGE AND PROTECTION

- A. Store and protect Products in accordance with manufacturer's instructions, with seals and labels intact and legible.
- B. Store sensitive Products in weathertight, climate controlled enclosures, in an environment favorable to Product.
- C. For exterior storage of fabricated Products, place on sloped supports, above ground.
- D. Provide off-site storage and protection when site does not permit on-site storage or protection.
- E. Cover Products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation and degradation of Products.

- F. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- G. Provide equipment and personnel to store Products by methods to prevent soiling, disfigurement, or damage.
- H. Arrange storage of Products to permit access for inspection. Periodically inspect to assure Products are undamaged and are maintained in acceptable condition.

## 1.5 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Any Product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers followed by words indicating no substitutions: No options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named in accordance with the following article.

## 1.6 SUBSTITUTIONS

- A. Engineer will consider requests for Substitutions only within time limits set forth in General Conditions.
- B. Substitutions may be considered when a Product becomes unavailable through no fault of the Contractor.
- C. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.
- D. A request constitutes a representation that the Contractor:
  - 1. Has investigated proposed Product and determined that it meets or exceeds the quality level of the specified Product.
  - 2. Will provide the same warranty for the Substitution as for the specified Product.
  - 3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.
  - 4. Waives claims for additional costs or time extension which may subsequently become apparent.
  - 5. Will reimburse Owner for review or redesign services associated with re-approval by authorities.
- E. Substitutions will not be considered when they are indicated or implied on Shop Drawing or Product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.

F. Substitution Submittal Procedure:

1. Submit three copies of request for Substitution for consideration. Limit each request to one proposed Substitution.
2. Submit Shop Drawings, Product data, and certified test results attesting to the proposed Product equivalence. Burden of proof is on Contractor.
3. The Engineer will notify Contractor, in writing, of decision to accept or reject request.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

## SECTION 01 6200

### CONSTRUCTION MOBILIZATION/DEMobilIZATION

#### PART 1 DESCRIPTION

Mobilization shall consist of, but not be limited to, all preparatory work, preliminary operations, and incurred costs necessary for the movement of personnel, equipment, supplies, and incidentals to the project site; and for the establishment of all offices, buildings, and other facilities needed for the project – prior to beginning work on project.

Demobilization shall consist of all work required for the removal from the project site of all Contractor personnel, equipment, supplies, facilities, and incidentals, and completion of final cleaning as described in Section 01 7000, Paragraph 1.3.

#### PART 2 MOBILIZATION ADMINISTRATION REQUIREMENTS

##### 2.1 Definitions

- A. Total original contract amount shall mean the total amount bid as compensation for the contract.
- B. Total original contract amount less mobilization shall mean the total amount bid as compensation for the contract, less the amount bid for mobilization.

##### 2.2 General

- A. It is the intent of this specification to provide for the Contractor to receive 100% of the amount bid for mobilization by the time the Contractor has performed 10% of the total original contract amount bid, less the amount bid for mobilization.

If the Contractor's bid for mobilization is over 10% of the total original contract amount bid, less mobilization, payment for the amount over the 10% of the total original contract amount bid, less mobilization, will be made upon completion of all work under the contract.

- B. Payment for demobilization shall be included in final payment upon contract closeout of any retainage held by the Owner during the project.

##### 2.3 Payment Procedures

- A. When Contractors are eligible for payment of less than 5% of the total original contract amount bid, less mobilization, they will be paid 25% of the amount bid for mobilization.

- B. When Contractors are eligible for payment of from 5% to less than 10% of the total original contract amount bid, less mobilization, they will be paid 50% of the amount bid for mobilization.
- C. When Contractors are eligible for payment of 10% or more of the total original contract amount, less mobilization, they will be paid 100% of the amount bid for mobilization, minus any mobilization amount already paid, except for the noted 10% limitation.

2.4 Payment Calculations

- $P_m$  = Mobilization payment.
- $M$  = Total amount bid for mobilization.
- $f$  = Mobilization payment percentage factor – 0.25, or 0.50, or 1.0, as applicable
- $P_m$  =  $M \times f$

Example 1  
MOBILIZATION LESS THAN 10%

Total Original Contract Amount Bid .....	\$110,000
Amount Bid for Mobilization .....	8,000
<u>Total Original Contract Amount Less Mobilization .....</u>	<u>102,000</u>

Percent of Work Completed	$f \times M = P_m$
<5% of \$102,000	$0.25 \times 8,000 = \$2,000$
>5% to <10% of \$102,000	$0.50 \times 8,000 = \$4,000$
≥10% of \$102,000	$1.00 \times 8,000 = \$8,000^*$

\*Minus previously paid amounts

Example 2  
MOBILIZATION MORE THAN 10%

Total Original Contract Amount Bid .....	\$100,000
Amount Bid for Mobilization .....	10,000
Total Original Contract Amount Less Mobilization .....	90,000
10% OF total Original Contract Amount Less Mobilization .....	9,000

Percent of Work Completed	$f \times M = P_m$
<5% of \$90,000	$0.25 \times 10,000 = \$2,500$
≥5% to <10% of \$90,000	$0.50 \times 10,000 = \$5,000$
≥10% of \$90,000	$1.00 \times 9,000 = \$9,000^*$

\*Minus previously paid amounts. Remaining \$1,000 paid upon completion of the work.

PART 3 – EXECUTION (NOT USED)

END OF SECTION





## SECTION 01 6500

### STARTING OF SYSTEMS

#### PART 1 GENERAL

##### 1.1 SECTION INCLUDES

- A. Starting systems.
- B. Demonstration and instructions.

##### 1.2 STARTING SYSTEMS

- A. Coordinate schedule for start up of various equipment and systems.
- B. Notify Engineer seven days prior to start up of each item.
- C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.
- D. Verify that tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- E. Verify wiring and support components for equipment are complete and tested.
- F. Execute startup under supervision of responsible manufacturer's representative in accordance with manufacturers' instructions.
- G. For the following equipment, or when specified in individual specification Sections, equipment manufacturers shall provide authorized representative to be present at site to inspect, check and approve equipment or system installation prior to startup, and to supervise placing equipment or system in operation.
  - 1. Arsenic Treatment System (ATS)
  - 2. Finished Water Pump (FWP) skid and controls.
- H. Submit a written report in accordance with Section 01 3000 that equipment or system has been properly installed and is functioning correctly.
- I. Manufacturer's representative shall remain on site to observe operation of equipment and further advise plant personnel the minimum number of days specified in each Section.

- J. Contractor shall be responsible for complete coordination of manufacturer's representatives while on-site as well as any and all issues that may arise relating to start-up of the plant until substantial completion is granted.
- K. Contractor shall prepare a System Commissioning Plan (SCP) for the entire facility, providing a step-wise plan for startup and testing of all project components. This shall be Submitted at least 60 days before operation of any equipment. The SCP shall address disinfection of equipment prior to connection to LMWC water distribution system in accordance with NMED regulatory requirements.

### 1.3 DEMONSTRATION AND INSTRUCTION

- A. Demonstrate operation and maintenance of Products to Owner's personnel two weeks prior to date of final inspection.
- B. Demonstrate Project equipment by a qualified manufacturers' representative who is knowledgeable about the Project.
- C. Perform start up and demonstration of all equipment within six months of substantial completion.
- D. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owners' personnel in detail to explain all aspects of operation and maintenance.
- E. Demonstrate start up, operation, control, adjustment, trouble shooting, servicing, maintenance, and shutdown of each item of equipment at scheduled time at project site location.
- F. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.
- G. The amount of time required for instruction on each item of equipment and system is that specified in individual sections.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 7000  
CONTRACT CLOSEOUT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Closeout procedures.
- B. Final cleaning.
- C. Adjusting.
- D. Project record documents.
- E. Operations and Maintenance Manuals.
- E. Spare parts and maintenance Products.
- F. Warranties and bonds.
- G. Maintenance service.

1.2 CLOSEOUT PROCEDURES

- A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Engineer and New Mexico Environment Department review.
- B. Provide submittals to Engineer that are required by governing or other authorities, including those specified in the General Conditions and including but not limited to the Certification of Labor standard.
- C. Submit final Application for Payment identifying total adjusted Contract Sum/Price, previous payments, and amount remaining due.

1.3 FINAL CLEANING

- A. Contractor will provide final cleaning after final acceptance.
- B. Clean interior and exterior glass and surfaces exposed to view; remove temporary labels, stains and foreign substances, and polish transparent and glossy surfaces.
- C. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
- D. Clean or replace filters of operating equipment.
- E. Clean debris from roofs, gutters, downspouts, and drainage systems.

- F. Clean site; sweep paved areas, rake clean landscaped surfaces.
- G. Remove waste and surplus materials, rubbish, and construction facilities from the site.

#### 1.4 ADJUSTING

- A. Adjust operating Products and equipment to ensure smooth and unhindered operation.

#### 1.5 PROJECT RECORD DOCUMENTS

- A. Maintain on site, one set of the following record documents; record actual revisions to the Work:
  - 1. Drawings.
  - 2. Specifications.
  - 3. Addenda.
  - 4. Change Orders and other modifications to the Contract.
  - 5. Reviewed Shop Drawings, Product Data, and Samples.
  - 6. Manufacturer's instruction for assembly, installation, and adjusting.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store Record Documents separate from documents used for construction.
- D. Record information concurrent with construction progress.
- E. Specifications: Legibly mark and record at each Product section description of actual Products installed, including the following:
  - 1. Manufacturer's name and product model and number.
  - 2. Product substitutions or alternates utilized.
  - 3. Changes made by Addenda and modifications.
- F. Record Documents and Shop Drawings: Legibly mark each item to record actual construction including:
  - 1. Measured depths of foundations in relation to finish floor datum.
  - 2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
  - 3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
  - 4. Field changes of dimension and detail.
  - 5. Details not on original Contract Drawings.
- G. Delete Engineer title block and seal from all documents.

H. Submit documents to Engineer with claim for final Application for Payment.

1. Submittal shall include the following:
  - a. One complete set of record drawings
  - b. Record Specifications
  - c. Close-out documentation, including:
    1. All previously approved change orders, in sequential order
    2. Listing of approved shop drawings
    3. Consent of Surety form, provided by surety
    4. Certificate and Release of Lien Form
    5. Affidavit of Wages Paid.

## 1.6 OPERATIONS AND MAINTENANCE MANUAL

- A. Submit two copies of preliminary draft of proposed formats and outlines of contents before start of work. Owner/Engineer will review draft and return one copy with comments.
- B. Submit data bound in 8-1/2x11 inch text pages, three D side ring binders with durable plastic covers.
- C. Prepare binder covers with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS", followed by title of the project and date prepared.
- D. Internally subdivide the binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed. Tab shall be plastic or laminated paper and resistant to tearing.
- E. Contents: Prepare a Table of Contents for each volume, with each Product or system description identified, typed on 24 pounds white paper, in three parts as follows:
  - a. Part 1: Directory, listing names, addresses, and telephone numbers of Contractor, Subcontractors, and Major Equipment Suppliers.
  - b. Part 2: Operations and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, telephone numbers, and email address for Subcontractors and suppliers. Identify the following:
    - i. Significant Design Criteria
    - ii. List of Equipment
    - iii. Parts list for each component.
    - iv. Operating Instructions.
      1. Complete installation instructions
      2. Operating procedures (including start-up and shut-down procedures for all modes.)
      3. Preventative Maintenance Procedures and schedules
      4. Lubrication charts and schedules
      5. Spare Parts list
      6. Tool Required
      7. Troubleshooting Instructions
      8. Safety Considerations
    - v. Maintenance instructions for equipment and systems.
    - vi. Maintenance instructions for special finishes, including recommended cleaning methods and material and special precautions identifying detrimental agents.

- c. Part 3: Project documents and certificates, including the following:
  - i. Shop Drawings and product data.
  - ii. Air and water balance reports.
  - iii. Certificates.
  - iv. Photocopies of warranties and bonds.
- F. Submit one draft copy of completed volumes in final form 30 days prior to final inspections. This copy will be reviewed and returned after final inspection, with Owner/Engineer comments. Revise content of documents as required prior to final submission.
- G. Submit two sets of final volumes, bound as described in this section. Submit a digital searchable PDF copy on USB drive within ten days of receipt of final comments.

#### 1.7 SPARE PARTS AND MAINTENANCE PRODUCTS

- A. Provide spare parts, maintenances, and extra Products in quantities specified in individual Specification Sections.
- B. Deliver to Project site and place in location as directed by Owner; obtain receipt prior to final payment.

#### 1.6 WARRANTIES AND BONDS

- A. Provide duplicate notarized copies.
- B. Execute and assemble transferable warranty documents from subcontractors, suppliers, and manufacturers.
- C. Provide Table of Contents and assemble in three D side ring binder with durable plastic cover.
- D. Submit prior to final Application for Payment.
- E. For items of Work delayed beyond date of Substantial Completion, provide updated submittal within ten days after acceptance, listing date of acceptance as start of warranty period.

#### 1.7 MAINTENANCE SERVICE

- A. Furnish service and maintenance of components indicated in specification sections during the warranty period.
- B. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.
- C. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.
- D. Maintenance services shall not be assigned or transferred to any agent or Subcontractor without prior written consent of the Owner.

### PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION





## SECTION 03 2000

### CONCRETE REINFORCEMENT

#### PART 1 - GENERAL

##### 1.1 SECTION INCLUDES

- A. Reinforcing steel bars, welded wire fabric and accessories for cast-in-place concrete.
- B. Supports, rebar chairs and accessories for steel reinforcement.

##### 1.2 RELATED SECTIONS

- A. Section 01 3000 - Submittals
- B. Section 03 1000 - Concrete Forms and Accessories.
- C. Section 03 3000 - Cast-In-Place Concrete.

##### 1.3 REFERENCES

- A. ACI 318 - Building Code Requirements For Structural Concrete and Commentary; American Concrete Institute International; 2016 or latest edition.
- B. ACI SP-66 - ACI Detailing Manual; American Concrete Institute International; latest edition.
- C. ASTM A 615/A 615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement; latest edition.
- D. CRSI (DA4) - Manual of Standard Practice; Concrete Reinforcing Steel Institute; latest edition.
- E. CRSI (P1) - Placing Reinforcing Bars; Concrete Reinforcing Steel Institute; latest edition.

##### 1.4 SUBMITTALS

- A. Shop Drawings: Comply with requirements of ACI SP-66. Include bar schedules, shapes of bent bars, spacing of bars, and location of splices.
- B. Manufacturer's Certificate: Certify that reinforcing steel and accessories supplied for this project meet or exceed specified requirements.

##### 1.5 QUALITY ASSURANCE

- A. Perform work in accordance with referenced ACI Publications, specifically ACI-301, latest edition and ASTM Standards, AWS Code, and CRSI Publications except as modified by this Section.

## PART 2 PRODUCTS

### 2.1 REINFORCEMENT

- A. Reinforcing Steel: ASTM A 615/A 615M Grade 60.
- B. Deformed billet-steel bars.
  - 1. Unfinished.
- C. Reinforcement Accessories:
  - 1. Tie Wire: Annealed, minimum 16 gage.
  - 2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
  - 3. Provide galvanized components for placement within 1-1/2 inches of weathering surfaces.

### 2.2 FABRICATION

- A. Fabricate concrete reinforcing in accordance with CRSI (DA4) - Manual of Standard Practice, and with ACI 318.
- B. Welding of reinforcement is not permitted.
- C. Locate reinforcing splices not indicated on drawings at point of minimum stress.
  - 1. Indicate locations on Shop Drawings.
  - 2. Review locations of splices with Engineer.

## PART 3 EXECUTION

### 3.1 FIELD QUALITY CONTROL

- A. Utilize Owner/Engineer-approved Testing Laboratory Services: Field inspection and testing.
- B. Inspect for acceptability.

### 3.2 PLACEMENT

- A. Place, support and secure reinforcement against displacement. Do not deviate from required position.
- B. Accommodate placement of formed openings.
- C. Maintain concrete cover around reinforcing as specified in ACI 318.
- D. Where lap splices lengths are not shown on the drawings, provide Class B splice lengths as specified in ACI 318. Stagger adjacent splices one lap length minimum. Submit for approval proposed splices not shown on the drawings.
- E. Arrange, space, and securely tie bars and bar supports together with tie wire to hold reinforcement accurately in position during concrete placement operations.

- F. Set wire ties so that twisted ends are directed away from exposed concrete surfaces.
- G. Do not secure reinforcement to forms with wire, nails, or other ferrous metal.

END OF SECTION



## SECTION 03 3000

### CAST-IN-PLACE CONCRETE

#### PART 1 - GENERAL

##### 1.01 SUMMARY

- A. This section specifies cast-in place concrete, including formwork, mix design, placement procedures, and finishes.
- B. Cast-in-place concrete includes the following:
  - I. Foundations, Bases, walls, vaults and footings.
  - II. Interior slabs-on-grade.
  - III. Other Miscellaneous Concrete as Required

##### 1.02 SUBMITTALS

- A. General: Submit the following:
  - 1. Product data for proprietary materials and items, including forming accessories, admixtures, patching compounds, joint systems, curing compounds, and others if requested by the Engineer.
- B. Laboratory test reports for concrete materials and mix design test.

##### 1.03 QUALITY ASSURANCE

- A. Codes and Standards: Comply with provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified:
  - 1. American Concrete Institute (ACI) 301, "Specifications for Structural Concrete for Buildings."
  - 2. American Concrete Institute (ACI) 318, "Building Code and Commentary", latest Edition
- B. Maintain copy of SP-15 on site. SP-15: Specifications for Structural Concrete for Buildings ACI 301 with Selected ACI and ASTM References.

- C. Acquire cement and aggregate from same source for all work.
- D. Conform to ACI 305R when concreting during hot weather.
- E. Conform to ACI 306R when concreting during cold weather.
- F. Concrete Testing Service: Engage a testing agency acceptable to the Engineer to perform material evaluation tests and to design concrete mixes.
- G. Materials and installed work may require testing and re-testing at any time during progress of Work. Tests, including re-testing of rejected materials for installed Work, shall be done at the Contractor's expense.

## PART 2 - PRODUCTS/MATERIALS

### 2.01 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type I.
  - 1. Use one brand of cement throughout Project unless otherwise acceptable to the Engineer.
- B. Normal-Weight Aggregates: ASTM C 33 and as specified. Provide aggregates from a single source for exposed concrete.
  - 1. For exposed exterior or interior surfaces, do not use fine or coarse aggregates that contain substances that cause spalling.
- C. Water: Potable, clean and not detrimental to concrete.

### 2.02 ADMIXTURES

- A. Admixtures, General: Provide concrete admixtures that contain not more than 0.1 percent chloride ions.
- B. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.
- C. Fly Ash: ASTM C618 Class C.
- D. Water-Reducing Admixture: ASTM C 494, Type A.
- E. High-Range Water-Reducing Admixture: ASTM C 494, Type F or Type G.

- F. Water-Reducing, Accelerating Admixture: ASTM C 494, Type E.
- G. Water-Reducing, Retarding Admixture: ASTM C 494, Type D.

### 2.03 ACCESSORIES

- A. Forms for Exposed walls, slabs or columns
- B. Bonding Agent: Polymer resin emulsion.
- C. Non-Shrink Grout: Premixed compound consisting of non-metallic aggregate, cement, water-reducing and plasticizing agents; capable of developing minimum compressive strength of 2,400 psi in 48 hours and 7,000 psi in 28 days.

### 2.04 FORM MATERIALS

- A. Forms for Exposed Finish Concrete: Plywood, metal, metal-framed plywood faced, or other acceptable panel-type materials to provide continuous, straight, smooth, exposed surfaces in accordance with ACI 301. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings.
  - 1. Use plywood complying with U.S. Product Standard PS-1 "B-B (Concrete Form) Plywood," Class I, Exterior Grade or better, mill-oiled and edge-sealed, with each piece bearing legible inspection trademark.
- B. Form Release Agent: Provide commercial formulation form release agent with a maximum of 350 g/L volatile organic compounds (VOCs) that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

### 2.05 RELATED MATERIALS

- A. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 ounces per square yard, complying with AASHTO M 182, Class 2.
- B. Moisture-Retaining Cover: One of the following, complying with ASTM C 171.
  - 1. Waterproof paper.
  - 2. Polyethylene film.
  - 3. Polyethylene-coated burlap.

- C. Liquid Membrane-Forming Curing Compound: Liquid-type membrane-forming curing compound complying with ASTM C 309, Type I, Class A. Moisture loss not more than 0.55 kilograms per square meter when applied at 200 square feet per gallon
- D. Water-Based Acrylic Membrane Curing Compound: ASTM C 309, Type I, Class B.
- E. Evaporation Control: Mono-molecular film-forming compound applied to exposed concrete slab surfaces for temporary protection from rapid moisture loss.
- F. Bonding Agent: Polyvinyl acetate or acrylic base.
- G. Epoxy Adhesive: ASTM C 881, two-component material suitable for use on dry or damp surfaces. Provide material type, grade, and class to suit Project requirements.
- H. Joint Fillers for Cast-in-Place Concrete:
  - 1. Provide pre-formed bituminous fiber joint filler of thickness and widths indicated, complying with ASTM D 1751:
    - a. Asphalt saturated fiberboard ½-inch thick x slab thickness.

## 2.06 PROPORTIONING AND DESIGNING MIXES

- A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. For the trial batch method, use an independent testing agency acceptable to the Engineer for preparing and reporting proposed mix designs.
  - 1. Do not use the same testing agency for field quality control testing.
  - 2. Limit use of fly ash to not exceed 25 percent of cement content by weight.
- B. Submit written reports to the Engineer of each proposed mix for each class of concrete at least 15 days prior to start of Work. Do not begin concrete production until proposed mix designs have been reviewed by the Engineer.
- C. Design mixes to provide normal weight concrete with the following properties as indicated on drawings and schedules:



1. 4000 psi, 28-day compressive strength; water-cement ratio, 0.44 maximum (non-air-entrained), 0.35 maximum (air-entrained).
- D. Water-Cement Ratio: Provide concrete for following conditions with maximum water-cement (W/C) ratios as follows:
1. All concrete: W/C = 0.45. If a pozzolan is used in the concrete, the maximum water-cement plus pozzolan ratio should be 0.45.
- E. Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as follows:
1. Ramps, slabs, and sloping surfaces: Not more than 3 inches.
  2. Reinforced foundation systems: Not less than 1 inch and not more than 3 inches.
  3. Concrete containing high-range water-reducing admixture (superplasticizer): Not more than 8 inches after adding admixture to site-verified 2-to-3-inch slump concrete.
  4. Other concrete: Not more than 4 inches.
- F. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, as accepted by the Engineer. Laboratory test data for revised mix design and strength results must be submitted to and accepted by the Engineer before using in Work.

## 2.07 USE OF ADMIXTURES

- A. Use water-reducing admixture or high-range water-reducing admixture (superplasticizer) in concrete, as required, for placement and workability.
- B. Use accelerating admixture in concrete slabs placed at ambient temperatures below 50 degrees F (10 degrees C).
- C. Use air-entraining admixture in all concrete unless otherwise indicated. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having total air content with a tolerance of plus or minus 1-1/2 percent within the following limits:
  1. Concrete structures and slabs exposed to freezing and thawing, or deicer chemicals:
    - a. 5.5 percent for 1-1/2 inch maximum aggregate.

- b. Other concrete not exposed to freezing, thawing, or to receive a surface hardener: 2 to 4 percent air.
- D. Use admixtures for water reduction and set accelerating or retarding in strict compliance with manufacturer's directions.

## 2.08 CONCRETE MIXING

- A. Ready-Mixed Concrete: Comply with requirements of ASTM C 94, and as specified.
  - 1. When air temperature is between 85 degrees F (30 degrees C) and 90 degrees F (32 degrees C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90 degrees F (32 degrees C), reduce mixing and delivery time to 60 minutes.

## PART 3 - EXECUTION

### 3.01 GENERAL

- A. Coordinate the installation of joint materials, vapor retarder/barrier, and other related materials with placement of forms and reinforcing steel.

### 3.02 FORMS

- A. General: Design, erect, support, brace, and maintain formwork to support vertical, lateral, static, and dynamic loads that might be applied until concrete structure can support such loads. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position. Maintain formwork construction tolerances and surface irregularities complying with the following ACI 347 limits:
  - 1. Provide Class A tolerances for concrete surfaces exposed to view.
  - 2. Provide Class C tolerances for other concrete surfaces.
- B. Construct forms to sizes, shapes, lines, and dimensions shown and to obtain accurate alignment, location, grades, level, and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in the Work. Use selected materials to obtain required finishes. Solidly butt joints and provide backup at joints to prevent cement paste from leaking.

- C. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like for easy removal.
- D. Chamfer exposed corners and edges as indicated, using wood, metal, PVC, or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.
- E. Provisions for Other Trades: Provide openings as required in concrete formwork to accommodate work of treatment building water, chemical and other piping, plumbing and other equipment, and all other trades. Determine size and location of openings, recesses, and chases from trades providing such items, and consult with the Engineer when not clear on sizes and clearances. Accurately place and securely support items built into forms
- F. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before placing concrete. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

### 3.03 PLACING REINFORCEMENT

- A. General: Comply with Technical Section 03200 "Concrete Reinforcement."

### 3.04 JOINTS

- A. Construction Joints: Locate and install construction joints so they do not impair strength or appearance of the structure, as acceptable to the Engineer.
- B. Use bonding agent on existing concrete surfaces that will be joined with fresh concrete.
- C. Contraction (Control) Joints in Slabs-on-Grade: Construct contraction joints in slabs-on-grade to form panels of patterns as shown.
  - 1. Contraction joints in unexposed floor slabs may be formed by saw cuts as soon as possible after slab finishing as may be safely done without dislodging aggregate.

2. If joint pattern is not shown, provide joints not exceeding 15 feet in either direction and located to conform to bay spacing wherever possible (at column centerlines, half bays, third bays).

### 3.05 INSTALLING EMBEDDED ITEMS

- A. General: Set and build into formwork anchorage devices and other embedded items required for other work that is attached to or supported by cast-in-place concrete. Use setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached.
- B. Forms for Slabs: Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and contours in finished surfaces. Provide and secure units to support screed strips using strike-off templates or compacting-type screeds.

### 3.06 PREPARING FORM SURFACES

- A. General: Coat contact surfaces of forms with an approved, non-residual, low-VOC, form-coating compound before placing reinforcement.
- B. Do not allow excess form-coating material to accumulate in forms or come into contact with in-place concrete surfaces against which fresh concrete will be placed. Apply according to manufacturer's instructions.
  1. Coat steel forms with a non-staining, rust-preventative material. Rust-stained steel formwork is not acceptable.

### 3.07 CONCRETE PLACEMENT

- A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.
- B. General: Comply with ACI 304, "Guide for Measuring, Mixing, Transporting, and Placing Concrete," and as specified. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened sufficiently to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation at its final location.
- C. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers no deeper than 24 inches and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.

1. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures for consolidation of concrete complying with ACI 309.
  2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the machine. Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix to segregate.
- D. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until completing placement of a panel or section.
1. Consolidate concrete during placement operations so that concrete is thoroughly worked around reinforcement, other embedded items and into corners.
  2. Bring slab surfaces to correct level with a straightedge and strike off. Use bull floats or darbies to smooth surface free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.
  3. Maintain reinforcing in proper position on chairs during concrete placement.
- E. Cold-Weather Placement: Comply with provisions of ACI 306 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures. When air temperature has fallen to or is expected to fall below 40 degrees F (4 degrees C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 degrees F (10 degrees C) and not more than 80 degrees F (27 degrees C) at point of placement.
1. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen sub-grade or on sub-grade containing frozen materials.

2. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.
- F. Hot-Weather Placement: When hot weather conditions exist that would impair quality and strength of concrete, place concrete complying with ACI 305 and as specified.
1. Cool ingredients before mixing to maintain concrete temperature at time of placement to below 90 degrees F (32 degrees C). Mixing water may be chilled or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is the Contractor's option.
  2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedding in concrete.
  3. Fog spray forms, reinforcing steel, and sub-grade just before placing concrete. Keep sub-grade moisture uniform without puddles or dry areas.
  4. Use water-reducing retarding admixture when required by high temperatures, low humidity, or other adverse placing conditions, as acceptable to the Engineer.

### 3.08 FINISHING FORMED SURFACES

- A. Smooth-Formed Finish: Provide a smooth-formed finish on formed concrete surfaces exposed to view or to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, damp-proofing, veneer plaster, painting, or another similar system. This is an as-cast concrete surface obtained with selected form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch defective areas with fins and other projections completely removed and smoothed.

### 3.09 MONOLITHIC SLAB FINISHES

- A. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as specified; slab surfaces to be covered with membrane or elastic waterproofing, membrane or elastic roofing, or sand-bed terrazzo; and where indicated.

1. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating, using float blades or float shoes only, when surface water has disappeared, or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats or by hand-floating if area is small or inaccessible to power units. Finish surfaces to tolerances of F(F) 18 (floor flatness) and F(L) 15 (floor levelness) measured according to ASTM E 1155. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.
- B. Trowel Finish: Apply a trowel finish to monolithic slab surfaces exposed to view and slab surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile, paint, or another thin film-finish coating system.
1. After floating, begin first trowel-finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and finish surfaces to tolerances of F(F) 20 (floor flatness) and F(L) 17 (floor levelness) measured according to ASTM E 1155. Grind smooth any surface defects that would telegraph through applied floor covering system.

### 3.10 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place, and cure concrete as specified to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete Work.

### 3.11 CONCRETE CURING AND PROTECTION

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. In hot, dry, and windy weather protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control material. Apply according to manufacturer's instructions after screeding and bull floating, but before power floating and troweling.
- B. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 7 days.

- C. Curing Methods: Cure concrete by curing compound, by moist curing, by moisture-retaining cover curing, or by combining these methods, as specified.
- D. Provide moisture curing by the following methods:
  - 1. Keep concrete surface continuously wet by covering with water.
  - 2. Use continuous water-fog spray.
  - 3. Cover concrete surface with specified absorptive cover, thoroughly saturate cover with water, and keep continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with a 4-inch lap over adjacent absorptive covers.
- E. Provide moisture-retaining cover curing as follows:
  - 1. Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3 inches and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
- F. Apply curing compound on exposed interior slabs and on exterior slabs, walks, and curbs as follows:
  - 1. Apply curing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours and after surface water sheen has disappeared). Apply uniformly in continuous operation by power spray or roller according to manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.
  - 2. Use membrane curing compounds that will not affect surfaces to be covered with finish materials applied directly to concrete.
- G. Curing Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces, by moist curing with forms in place for the full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.
- H. Curing Unformed Surfaces: Cure unformed surfaces, including slabs, floor topping, and other flat surfaces, by applying the appropriate curing method.



1. Final cure concrete surfaces to receive finish flooring with a moisture-retaining cover, unless otherwise directed.

### 3.12 REMOVING FORMS

- A. General: Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50 degrees F (10 degrees C) for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form-removal operations, and provided curing and protection operations are maintained.

### 3.13 REUSING FORMS

- A. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-coating compound as specified for new formwork.
- B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use patched forms for exposed concrete surfaces except as acceptable to the Engineer.

### 3.14 CONCRETE SURFACE REPAIRS

- A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removing forms, when acceptable to the Engineer.
- B. Mix dry-pack mortar, consisting of one part portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing.
  1. Cut out honeycombs, rock pockets, voids over 1/4 inch in any dimension, and holes left by tie rods and bolts down to solid concrete but in no case to a depth less than 1 inch. Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water, and brush-coat the area to be patched with bonding agent. Place patching mortar before bonding agent has dried.
  2. For surfaces exposed to view, blend white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Provide test areas at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.

- C. **Repairing Formed Surfaces:** Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of the Engineer. Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes and fill with dry-pack mortar or pre-cast cement cone plugs secured in place with bonding agent.
1. Repair concealed formed surfaces, where possible, containing defects that affect the concrete's durability. If defects cannot be repaired, remove and replace the concrete.
- D. **Repairing Unformed Surfaces:** Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface tolerances specified for each surface and finish. Correct low and high areas as specified. Test unformed surfaces sloped to drain for trueness of slope and smoothness by using a template having the required slope.
1. Repair finished unformed surfaces containing defects that affect the concrete's durability. Surface defects include crazing and cracks in excess of 0.01 inch wide or that penetrate to the reinforcement or completely through non-reinforced sections regardless of width, spalling, popouts, honeycombs, rock pockets, and other objectionable conditions.
  2. Correct high areas in unformed surfaces by grinding after concrete has cured at least 14 days.
  3. Correct low areas in unformed surfaces during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete. Proprietary underlayment compounds may be used when acceptable to the Engineer.
  4. Repair defective areas, except random cracks and single holes not exceeding 1 inch in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose reinforcing steel with at least 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

- E. Perform structural repairs with prior approval of the Engineer for method and procedure, using specified epoxy adhesive and mortar.
- F. Repair methods not specified above may be used, subject to acceptance of the Engineer.

### 3.15 QUALITY CONTROL TESTING DURING CONSTRUCTION

- A. General: The contractor is responsible for employing a testing agency to perform tests and to submit test reports.
- B. Sampling and testing for quality control during concrete placement may include the following, as directed by the Engineer.
  - 1. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.
    - a. Slump: ASTM C 143; one test at point of discharge for each day's pour of each type of concrete; additional tests when concrete consistency seems to have changed.
    - b. Air Content: ASTM C 173, volumetric method for lightweight or normal weight concrete; ASTM C 231, pressure method for normal weight concrete; one for each day's pour of each type of air-entrained concrete.
    - c. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 degrees F (4 degrees C) and below, when 80 degrees F (27 degrees C) and above, and one test for each set of compressive-strength specimens.
    - d. Compression Test Specimen: ASTM C 31; one set of four standard cylinders for each compressive-strength test, unless otherwise directed. Mold and store cylinders for laboratory-cured test specimens except when field-cured test specimens are required.
    - e. Compressive-Strength Tests: ASTM C 39; one set for each day's pour exceeding 5 cubic yard plus additional sets for each 50 cubic yard more than the first 25 cubic yard of each concrete class placed in any one day; one specimen tested at 7 days, two specimens tested at 28 days, and one specimen retained in reserve for later testing if required.
  - 2. When frequency of testing will provide fewer than 5 strength tests for a given class of concrete, conduct testing from at least 5

randomly selected batches or from each batch if fewer than 5 are used.

- a. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.
  - b. Strength level of concrete will be considered satisfactory if averages of sets of 3 consecutive strength test results equal or exceed specified compressive strength and no individual strength test result falls below specified compressive strength by more than 500 psi.
- C. Test results will be reported in writing to the Engineer, ready-mix producer, and the Contractor within 24 hours after tests. Reports of compressive strength tests shall contain the Project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-day tests and 28-day tests.
- D. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.
- E. Additional Tests: The testing agency will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by the Engineer. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.

END OF SECTION

## SECTION 03 1000

### CONCRETE FORMS AND ACCESSORIES

#### PART 1 - GENERAL

##### 1.01 SECTION INCLUDES

- A. Formwork for cast-in place concrete, with shoring, bracing and anchorage.
- B. Openings for other work.
- C. Form accessories.
- D. Form stripping.

##### 1.02 RELATED SECTIONS

- A. Section 03 2000 - Concrete Reinforcement.
- B. Section 03 3000 - Cast-in-Place Concrete.

##### 1.03 REFERENCES

- A. ACI 301 - Specifications for Structural Concrete for Buildings; American Concrete Institute International; Latest Edition.
- B. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; American Concrete Institute International; Latest Edition.
- C. ACI 347 - Guide to Formwork for Concrete; American Concrete Institute International; Latest Edition.

##### 1.04 DESIGN REQUIREMENTS

- A. Design, engineer and construct formwork, shoring and bracing to conform to design and code requirements; resultant concrete to conform to required shape, line and dimension.

##### 1.05 SUBMITTALS

- A. Product Data: Provide data on void form materials and installation requirements.

##### 1.06 QUALITY ASSURANCE

- A. Perform work of this section in accordance with ACI 301 and ACI 318.

##### 1.07 REGULATORY REQUIREMENTS

- A. Conform to applicable code for design, fabrication, erection and removal of formwork.

## PART 2 PRODUCTS

### 2.01 WOOD FORM MATERIALS

- A. Form Materials: per ACI 301.

### 2.02 PREFABRICATED FORMS

- A. Preformed Steel Forms: Minimum 16 matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.
- B. Preformed Plastic Forms: Thermoplastic polystyrene form liner, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces

### 2.03 FORMWORK ACCESSORIES

- A. Form Release Agent:
- A. Form Ties: Snap-off type, plastic, adjustable length, with waterproofing washer, 1-1/2 inch back break dimension, free of defects that could leave holes larger than 1- inch in concrete surface.
- B. Form Release Agent: Colorless mineral oil which will not stain concrete, or absorb moisture non-toxic within thirty days in liquid containing structures.
- C. Corners: Filleted Chamfered, 3/4 x 3/4 inch; maximum possible lengths.
- D. Nails, Spikes, Lag Bolts, Through Bolts, and Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.
- E. Waterstops: Polyvinyl chloride, serrated, 6-inch wide unless otherwise shown, maximum possible lengths, preformed corner sections, heat welded jointing.
  - 1. Six-inch Waterstop: 5/8-inch (15.9 mm) to 3/4-inch (19.1 mm) O.D. and 1/4-inch (6.3 mm) to 3/8-inch (9.5 mm) I.D. center bulb, 3/8-inch (9.5 mm) minimum thickness to 3/16-inch (4.7 mm) minimum thickness at edges.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.

### 3.02 EARTH FORMS

- A. Except where indicated, earth forms are not permitted.
- B. Hand trim sides and bottom of earth forms. Remove loose soil prior to placing concrete.

### 3.03 ERECTION - FORMWORK

- A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 301.
- B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.
- C. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.
- D. Align joints and make watertight. Keep form joints to a minimum.
- E. Obtain approval before framing openings in structural members that are not indicated on drawings.
- F. Provide fillet strips on external corners of beams, joists, and columns.
- G. Install void forms in accordance with manufacturer's recommendations. Protect forms from moisture or crushing.
- H. Coordinate this section with other sections of work that require attachment of components to formwork.
- I. If formwork is placed after reinforcement, resulting in insufficient concrete cover over reinforcement, request instructions from Engineer before proceeding.

### 3.04 APPLICATION - FORM RELEASE AGENT

- A. Apply form release agent on formwork in accordance with manufacturer's recommendations.
- B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.
- C. Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings that are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

### 3.05 INSERTS, EMBEDDED PARTS, AND OPENINGS

- A. Provide formed openings where required for items to be embedded in passing through concrete work.
- B. Locate and set in place items that will be cast directly into concrete.
- C. Coordinate with work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other work.
- D. Install accessories in accordance with manufacturer's instructions, so they are straight, level, and plumb. Ensure items are not disturbed during concrete placement.
- E. Install waterstops in accordance with manufacturer's instructions, so they are continuous without displacing reinforcement. Heat seal joints so they are watertight.
- F. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.
- G. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted

so joints will not be apparent in exposed concrete surfaces.

### 3.06 FORM CLEANING

- A. Clean forms as erection proceeds, to remove foreign matter within forms.
- B. Clean formed cavities of debris prior to placing concrete.
- C. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.
- D. During cold weather, remove ice and snow from within forms. Do not use de-icing salts. Do not use water to clean out forms, unless formwork and concrete construction proceed within heated enclosure. Use compressed air or other means to remove foreign matter..

### 3.07 FORMWORK TOLERANCES

- A. Construct formwork to maintain tolerances required by ACI 301.

### 3.08 FIELD QUALITY CONTROL

- A. Section 01 4000 - Quality Control: Field inspection and testing.
- B. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and that supports, fastenings, wedges, ties, and items are secure.
- C. Do not reuse wood formwork more than 3 times for concrete surfaces to be exposed to view. Do not patch formwork.

### 3.09 FORM REMOVAL

- A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.
- B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.
- C. Store removed forms to prevent damage to form materials or to fresh concrete. Discard damaged forms.

END OF SECTION



SECTION 04 2300  
GLASS UNIT MASONRY

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Glass masonry units.
- B. Setting and pointing materials.
- C. Perimeter treatment.

1.2 REFERENCE STANDARDS

- A. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2011.
- B. ASTM C150/C150M - Standard Specification for Portland Cement; 2017.
- C. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2006 (Reapproved 2011).
- D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

1.3 SUBMITTALS

- A. Product Data: Provide data for glass units and accessories.
- B. Samples: Submit two glass units illustrating color, design, and face pattern.
- C. Manufacturer's Installation Instructions: Indicate special procedures, positioning of reinforcement, perimeter conditions requiring special attention.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum three years of documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Accept glass units on site on pallets; inspect for damage.

1.6 FIELD CONDITIONS

- A. Maintain materials and surrounding air temperature to minimum 40 degrees F prior to, during, and 48 hours after completion of masonry work.
- B. Maintain materials and surrounding air temperature to maximum 90 degrees F prior to, during, and 48 hours after completion of masonry work.

1.7 WARRANTY

- A. Glass Block Units: Limited 5 year warranty on product only.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

#### A. Glass Units:

1. Mulia, Inc: [www.muliainc.com/glassblock/#sle](http://www.muliainc.com/glassblock/#sle).
2. Nippon Electric Glass Co. Ltd: [www.neg.co.jp/en/product/cg/glass\\_block](http://www.neg.co.jp/en/product/cg/glass_block).
3. Novalglass: [www.novalglass.com](http://www.novalglass.com).
4. Seves Glass Block Inc: [www.sevesglassblock.com](http://www.sevesglassblock.com).
5. Weck Glass Blocks: [www.glashaus.com](http://www.glashaus.com).

### 2.2 GLASS UNITS

- A. Hollow Glass Units: Permanently seal hollow unit by heat fusing joint; factory coat unit edges to improve bond with mortar.
- B. Nominal Size: 8 inch by 8 inch by 4 inch.
1. Color: Clear glass.
  2. Pattern and Design:
    - a. Light-diffusive wavy-undulation faces.
  3. Compressive Strength: 400-600 psi.
  4. Visible Light Transmittance: 55 percent.
  5. Shading Coefficient: 0.65.

### 2.3 ACCESSORIES

- A. Panel Reinforcement: Steel, galvanized after fabrication in accordance with requirements of ASTM A123/A123M:
1. Side Rods: Two 1/8 inch diameter rods spaced 1-5/8 inch or 2 inches apart.
  2. Cross Rods: 1/16 inch diameter rods welded 8 inch on center.
  3. Product: PC Panel Reinforcing manufactured by Pittsburgh Corning Corporation.
- B. Expansion Strips: Polyethylene foam with thickness of 3/8 inch.
1. Product: PC Expansion Strips manufactured by Pittsburgh Corning Corporation.
- C. Panel Anchors: Steel strips, at least 20 gage, 0.0359 inch thick by 1 3/4 inch wide; punched with three rows of elongated holes, pattern staggered, hot dip galvanized after fabrication in accordance with requirements of ASTM A123/A123M.
1. Product: PC Panel Anchors manufactured by Pittsburgh Corning Corporation.
- D. Sealant: Refer to Section 07 9200 - Joint Sealants.
- E. Asphalt Emulsion: Water based.

### 2.4 MORTAR AND POINTING MATERIAL

- A. Mortar: ASTM C270; preblended, Type S using the Proportion specification .
1. Portland Cement: Type 1 in accordance with ASTM C150/C150M.
  2. Hydrated Lime: Type S, in accordance with ASTM C207, pressure-hydrated dolomitic lime, provided that not less than 92 percent of all the active ingredients are completely hydrated.
  3. Sand: Clean, white quartzite or white silica type, essentially free of iron compounds, for thin joints, in accordance with ASTM C144, not less than 100 percent passing a No. 8 sieve.
- B. Pointing Mortar: Same as mortar.

## 2.5 MORTAR MIXING

- A. Thoroughly mix mortar ingredients in accordance with ASTM C270 in quantities needed for immediate use.
- B. Do not use anti-freeze compounds to lower the freezing point of mortar.
- C. If water is lost by evaporation, re-temper only within two hours of mixing.
- D. Use mortar within two hours after mixing at temperatures of 90 degrees F, or two-and-one-half hours at temperatures under 40 degrees F.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify that openings are ready to receive work.
- B. Verify that panel anchors or channels for support at head and jambs are properly installed.

### 3.2 PREPARATION

- A. Clean glass units of substances that may impair bond with mortar or sealant.
- B. Establish and protect lines, levels, and coursing.
- C. Protect elements surrounding the work of this section from damage and disfigurement.

### 3.3 INSTALLATION

- A. Erect glass units and accessories in accordance with manufacturer's instructions.
- B. Make provision for expansion and movement at jambs and heads of all panels; do not allow structural loads to bear on glass blocks.
- C. Set panel anchors in mortar bed directly over coating.
  - 1. Set panel anchors at other coursing in accordance with manufacturer's recommendations.
- D. Provide full mortar joints. Furrowing is not permitted. Remove excess mortar.
- E. Maintain uniform joint width of 1/4 inch.
- F. Place panel reinforcement at every second horizontal joint in full mortar bed and at first course above and below openings within the glass unit panel.
- G. Lap reinforcement joints 6 inches. Discontinue reinforcement at expansion joints.
- H. Intermediate Vertical Supports: Concealed; provide of type and spacing in accordance with manufacturer's recommendations.
- I. Strike joints flush while mortar is still plastic and before final set. Remove excess mortar from faces of units and wipe dry. Tool joints smooth and concave, before mortar takes final set.
- J. Remove and clean out all excess mortar from jamb, head and other expansion joint locations.
- K. Isolate panel from adjacent construction on sides and top with expansion strips . Keep expansion joint voids clear of mortar.
- L. Shore assembly until setting bed will maintain panel in position without movement.

M. Pointing With Mortar:

1. Before mortar sets, rake out joints to depth of 5/8 to 3/4 inch.
2. Fill joints with pointing mortar; press into joint to eliminate voids; neatly tool surface to a concave profile.
3. Remove excess pointing mortar.

N. Perimeter Joints: Install sealant at expansion joints; and head, jambs, and sill of openings in accordance with sealant manufacturer's instructions.

1. Apply sealant to joints; press into joint to eliminate voids; neatly tool surface to concave profile.
2. Remove excess sealant.

3.4 TOLERANCES

A. Variation From Joint Width: Plus 1/8 inch and minus 0 inches.

B. Maximum Variation from Plane of Unit to Adjacent Unit: 1/32 inch.

C. Maximum Variation of Panel from Plane: 1/8 inch.

3.5 CLEANING

A. Clean and polish faces of glass unit masonry, using materials and technique that will not scratch or deface units.

END OF SECTION

SECTION 04 2900  
REINFORCED UNIT MASONRY

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Concrete Masonry Units.
- B. Mortar and Grout.
- C. Reinforcement and Anchorage.
- D. Flashings.
- E. Lintels.
- F. Accessories.

1.2 RELATED SECTIONS

- A. Sectopm 01 4000 - Quality Requirements: Mock-ups.
- B. Section 03 2000 - Concrete Reinforcing: Reinforcing steel for grouted masonry.
- D. Section 07 9200 - Joint Sealants: Sealing control and expansion joints.
- E. Section 08 1113 - Hollow Metal Doors and Frames: Grouting hollow metal frames.
- F. Section 09 9000 - Paints and Coatings: Field-applied painted finish.

1.3 REFERENCES

- A. ACI 530/530.1/ERTA - Building Code Requirements and Specification for Masonry Structures and Related Commentaries; American Concrete Institute International; 2011.
- B. ASTM A82/A82M - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement; 2007.
- C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.
- D. ASTM A 951 - Standard Specification for Masonry Joint Reinforcement; 1996.
- E. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units; 2014.
- F. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2015.
- G. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2011.
- H. ASTM C150/C150M - Standard Specification for Portland Cement; 2016.
- I. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2006 (Reapproved 2011).
- J. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2014a.
- K. ASTM C 331 - Standard Specification for Lightweight Aggregate for Concrete Masonry Units; 1989.

- L. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2011.
- M. ASTM C476 - Standard Specification for Grout for Masonry; 2010.
- N. ASTM C 518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2004.
- O. ASTM C1019 - Standard Test Method for Sampling and Testing Grout; 2013.
- P. ASTM C 1142 - Standard Specification for Extended Life Mortar for Unit Masonry.
- Q. ASTM D 2842 Standard Test Method for Water Absorption of Rigid Cellular Plastics; 2006.
- R. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2004.
- S. ASTM E 514 - Standard Test Method for Water Permeance of Masonry; 1990.
- T. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing; 2005.
- U. BIA Technical Notes No. 28B - Brick Veneer/Steel Stud Walls; 2005.
- V. BIA Technical Notes No. 46 - Maintenance of Brick Masonry; 2005.
- W. NCMA TEK 8-2 - National Concrete Masonry Association, Removal of Stains from Concrete Masonry Walls; 1972

#### 1.4 SUBMITTALS

- A. See Section 01 3000 for submittal procedures.
- B. Product Data: Provide data for masonry units, fabricated wire reinforcement, wall ties, mortar and grout, and water-repellant admixture.
- C. Shop Drawings: Indicate bar sizes, spacing, reinforcement quantities, bending and cutting schedules, reinforcement supporting and spacing devices, control joints, and accessories.
  - 1. Include elevations of each wall indicating type and layout of units.

#### 1.5 QUALITY ASSURANCE

- A. Single-Source Responsibility for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from one source and by a single manufacturer for each different product required.
- B. Single-Source Responsibility for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source or producer for each aggregate.
- C. Single-Source Responsibility for Moisture-Resistant Admixture Materials: Obtain moisture-resistant admixture ingredients for masonry and mortar from the same manufacturer.

- D. Comply with provisions of ACI 530/ASCE 5/TMS 402 and ACI 530.1/ASCE 6/TMS 602, except where exceeded by requirements of the contract documents or local building codes.
- E. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum ten years of documented experience.
- F. Installer Qualifications: Company specializing in performing work of the type specified and with at least five years of documented experience.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials. If units become wet, do not install until they are in an air-dried condition.
- B. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

## 1.7 ENVIRONMENTAL REQUIREMENTS

- A. Cold and Hot Weather Requirements: Comply with requirements of ACI 530/530.1/ERTA or applicable building code, whichever is more stringent.

# PART 2 PRODUCTS

## 2.1 CONCRETE MASONRY UNITS

- A. Concrete Masonry Units: Comply with referenced standards and as follows:
  - 1. Types: Provide units with nominal dimensions, color, texture, and pattern as indicated in the Schedule at the end of this Section.
  - 2. Size: Standard units with nominal face dimensions of 16 x 8 inches and nominal depths as indicated.
  - 3. Special Shapes: Provide non-standard blocks configured for corners, lintels, headers, control joint edges, and other detailed conditions.
    - a. Provide corner units where installation would expose cores of units.
    - b. Provide solid units where installation would expose cores of units at sills in wall openings.
  - 4. Load-Bearing Units: ASTM C90, medium weight.
    - a. Both hollow and solid block, as indicated.
    - b. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 1900 psi.
    - c. Aggregates: Volcanic Scoria shall meet ASTM C 331.
  - 5. Moisture-Resistant Admixture: Water repellent compound designed to reduce capillarity.
    - a. Product and Manufacturer: Dry-Block Block Admixture, W.R. Grace & Co.: [www.na.graceconstruction.com](http://www.na.graceconstruction.com).
    - b. Substitutions: See Section 01 6100 Materials & Equipment

## 2.2 MORTAR MATERIALS

- A. Portland Cement: ASTM C150/C150M, Type I.
  - 1. Hydrated Lime: ASTM C207, Type S.
  - 2. Mortar Aggregate: ASTM C144.
  - 3. Grout Aggregate: ASTM C404.
- B. Water: Clean and potable.
- C. Moisture-Resistant Admixture: Water repellent compound designed to reduce capillarity.
  - 1. Product and Manufacturer: Dry-Block II Mortar Admixture, W.R. Grace & Co.: [www.na.graceconstruction.com](http://www.na.graceconstruction.com).
  - 2. Substitutions: See Section 01 6100 – Materials & Equipment.

## 2.3 REINFORCEMENT AND ANCHORAGE

- A. Reinforcing Steel: Types as specified in Section 03 2000; size as indicated on drawings.
- B. Horizontal Joint Reinforcement: Manufacture in accordance with ASTM A 951, with materials that conform to the following requirements:
  - 1. Single Wythe Joint Reinforcement: Ladder type; ASTM A 82/A 82M steel wire, hot dip galvanized after fabrication to ASTM A 153/A 153M, Class B; 0.1483 inch side rods with 0.1483 inch cross rods; with prefabricated corner and tee units; width as required to provide not more than 1 inch and not less than 1/2 inch of mortar coverage on each exposure.

## 2.4 FLASHINGS

- A. Copper/Asphalt-Saturated Glass Fabric Flashings: 7 oz/sq ft sheet copper permanently coated and bonded between two layers of asphalt-saturated glass fabric.
  - 1. Product and Manufacturer: C-Fab Flashing, Hohmann and Barnard, Inc.: [www.h-b.com](http://www.h-b.com).
  - 2. Substitutions: See Section 01 6100 – Materials & Equipment.
- B. Primer: Flashing manufacturer's standard product or product recommended by manufacturer for bonding flashing sheets to masonry and concrete.

## 2.5 FOAM INSULATION

- A. Polymer foamed in-place plastic insulation, non-toxic, biodegradable, odor-free with no off-gassing; containing no formaldehyde and no chlorofluorocarbons (CFCs);
  - 1. Surface burning characteristics: Flamespread 25, smoke developed 40, when tested in accordance with ASTM E 84.
  - 2. R-value per inch thickness at 25 degrees F: 4.50, minimum, when tested in accordance with ASTM C 518.
  - 3. Water Vapor Absorption: 10% by volume at 24 hours, at 25 degrees F (-4 degrees C), at 100% relative humidity, when tested in accordance with ASTM D 2842.4.



5. Product: R-501 Foam Insulation manufactured by Polymaster, Inc.:  
www.polymaster.com.
6. Substitutions: See Section 01 6100 – Materials & Equipment.

## 2.6 ACCESSORIES

- A. Masonry Control Joints:
  1. Preformed Control Joints: Polyvinyl chloride material. Provide with corner and tee accessories, fused joints.
- B. Sealant and Joint Backing: In accordance with Section 07 9200.
- C. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Type 2, Class A, Grade 1; compressible up to 3 percent; of width and thickness indicated; formulated from neoprene or polyvinyl.
- D. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

## 2.7 LINTELS

- A. Provide prefabricated or built-in-place masonry lintels. Use specially formed bond beam lintel units with reinforcement bars placed as indicated and filled with grout.
  1. Provide minimum bearing 8 inches at each jamb, unless otherwise indicated.

## 2.8 MORTAR MIXES

- A. Mortar for Unit Masonry: ASTM C270, using the Proportion Specification.
  1. All masonry: Type S.
  2. Masonry Cement: Use of masonry cement is not allowed.

## 2.9 MORTAR MIXING

- A. Thoroughly mix mortar ingredients using mechanical batch mixer, in accordance with ASTM C270 and in quantities needed for immediate use.
- B. Maintain sand uniformly damp immediately before the mixing process.
- C. Do not use anti-freeze compounds to lower the freezing point of mortar.
- D. If water is lost by evaporation, re-temper only within two hours of mixing.
- E. Strength: 1,800 psi at 28 days.

## 2.10 GROUT MIXES

- A. Bond Beams, Lintels, and Grouted Cells: 2,000 psi strength at 28 days; 8-11 inches slump; mix in accordance with ASTM C 476.
  1. Fine grout for spaces with smallest horizontal dimension of 2 inches or less.
  2. Coarse grout for spaces with smallest horizontal dimension greater than 2 inches.
- B. Grout for Hollow Metal Frames: 2000 psi strength at 28 days; mix in accordance with ASTM C 476; Maximum 4-inch slump for hand-troweling; thinner pumpable grout is prohibited.

## 2.11 GROUT MIXING

- A. Mix grout in accordance with ASTM C94/C94M.
- B. Thoroughly mix grout ingredients in quantities needed for immediate use in accordance with ASTM C476 for fine and coarse grout.
- C. Add admixtures in accordance with manufacturer's instructions; mix uniformly.
- D. Do not use anti-freeze compounds to lower the freezing point of grout.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive masonry.
- B. Verify that related items provided under other sections are properly sized and located.
- C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

### 3.2 PREPARATION

- A. Masonry infill in existing wall openings: Install metal anchors at locations indicated.
- B. Clean reinforcement of loose rust.
- C. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

### 3.3 COURSING

- A. Establish lines, levels, and coursing indicated. Protect from displacement.
- B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

### 3.4 PLACING AND BONDING

- A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
- B. Lay hollow masonry units with face shell bedding on head and bed joints.
- C. Battering corners of joints or excessive furrowing of mortar joints is not permitted.
- D. Remove excess mortar as work progresses.
- E. Interlock intersections and external corners.
- F. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- G. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
- H. Mortar Joints: Refer to Schedule at the end of this Section.

- I. Mortar Joints:
  - 1. Exposed joints: Tool joints slightly concave.
  - 2. Cut mortar joints flush where wall tile is scheduled, resilient base is scheduled, sheet flashing is applied, or cavity insulation is applied.

### 3.5 REINFORCEMENT AND ANCHORAGE

- A. Provide reinforcement and anchorage as indicated.
- B. Cut or interrupt reinforcement bars at control and expansion joints, unless otherwise indicated.
- C. Joint Reinforcement: Install horizontal joint reinforcement 16 inches on center.
  - 1. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
  - 2. Place continuous joint reinforcement in first and second joint below top of walls.
  - 3. Lap joint reinforcement ends minimum 12 inches.
  - 4. Provide continuity at corners and wall intersections by using prefabricated "L" and "T" sections. Cut and bend reinforcement units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.
- D. Anchors: Reinforce joint corners and intersections with strap anchors 16 inches on center.

### 3.6 MASONRY FLASHINGS

- A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
  - 1. Extend flashings full width at such interruptions and at least 6 inches, minimum, into adjacent masonry or turn up at least 8 inches, minimum, to form watertight pan at non-masonry construction.
  - 2. Remove or cover protrusions or sharp edges that could puncture flashings.
  - 3. Seal lapped ends and penetrations of flashing before covering with mortar.
- B. Extend laminated flashings to within 1/4 inch of exterior face of masonry.
- C. Lap end joints of flashings at least 6 inches, minimum, and seal watertight with flashing sealant/adhesive.
- D. Install weep holes in the head joints in exterior wythes of the first course of masonry immediately above embedded flashing and as follows:
  - 1. Space weep holes no more than 32 o.c.
- E. Place cavity drainage material immediately above flashing in cavities, in accordance with manufacturer's recommendations.

### 3.7 GROUTING

- A. Placement
  - 1. Verify that horizontal and vertical reinforcement is in proper position and adequately secured before beginning pours.

2. Hollow Masonry: Limit lifts to maximum 5 feet.
  3. Pour grout only after vertical reinforcing is in place; place horizontal reinforcing as grout is poured. Prevent displacement of bars as grout is poured.
  4. Place grout for each pour continuously and consolidate immediately; do not interrupt pours for more than 1-1/2 hours.
  5. Intersecting walls: Please grout in cells beneath strap anchors.
- B. Fill all cores in hollow concrete masonry units that contain vertical reinforcing or that are located below adjacent grade.
- C. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

### 3.8 CONTROL AND EXPANSION JOINTS

- A. Do not continue horizontal joint reinforcement through control or expansion joints.
- B. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.
1. Joint width: 3/8 inches unless indicated otherwise.
- C. Form expansion joint as detailed on drawings.

### 3.9 BUILT-IN WORK

- A. As work progresses, install built-in anchor bolts, plates, and metal fabrications and other items to be built into the work and furnished under other sections.
- B. Install built-in items plumb, level, and true to line.
- C. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout.
1. Fill adjacent masonry cores with grout minimum 16 inches from framed openings.
- D. Provide steel lintels where indicated
- E. Provide masonry lintels where shown and where openings of more than 12 inches are shown without structural steel or other supporting lintels.
- F. Do not build into masonry construction organic materials that are subject to deterioration.

### 3.10 INSULATION INSTALLATION AT CONCRETE MASONRY

- A. Install Foam Insulation in accordance with manufacturer's recommendations at the following locations:
1. Walls between heated, air-conditioned, or evaporative-cooled spaces and the exterior.
  2. Interior walls between heated and non-heated spaces.
  3. Interior walls between air-conditioned and non-air-conditioned spaces.

4. Interior walls between evaporative-cooled and non-evaporative-cooled spaces.
  5. Interior walls between air-conditioned and evaporative-cooled spaces.
- B. Install insulation into non-grouted cores of masonry units, taking care to fill voids completely. Maintain inspection ports to show presence of insulation at extremities of each fill area. Close after confirming complete coverage.

### 3.11 CUTTING AND FITTING

- A. Cut and fit for chases, pipes, conduit, sleeves, and structural elements. Coordinate with other sections of work to provide correct size, shape, and location.
1. Bond beams and lintels: Do not penetrate with pipes, conduit, and sleeves without Architect's approval; locating piping and conduits within bond beams and lintels is prohibited.
- B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

### 3.12 REPAIRING AND POINTING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or if units do not match adjoining units. Install new units to match adjoining units; install in fresh mortar or grout, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point-up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for application of sealants.
- C. Determination of acceptable workmanship, color appearance, and texture appearance will be at the sole discretion of the Architect.

### 3.13 CLEANING

- A. Remove excess mortar and mortar smears as work progresses.
- B. Replace defective mortar. Match adjacent work.
- C. Clean soiled surfaces with cleaning solution.
1. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
  2. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2 applicable to type of stain present on exposed surfaces.
- D. Use non-metallic tools in cleaning operations.

### 3.14 PROTECTION OF UNFINISHED WORK

- A. Protection of Masonry: During erection, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
  - 1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
  - 2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that comes in contact with such masonry
- D. Protect base of walls from rain-splashed mud and mortar splatter by coverings spread on ground and over wall surface.

### 3.15 SCHEDULE

- A. Concrete Masonry Units Type A:
  - 1. Pattern and Color: Smooth face, integrally colored.
    - a. Color: Color as selected from manufacturer's standards.
    - b. Coursing: Running bond.
  - 2. Nominal Dimensions: 8 inches high x 16 inches long unless indicated otherwise.
    - a. Depth: As indicated.
  - 3. Mortar:
    - a. Color: Match color of Concrete Masonry Units Type "A".

END OF SECTION

SECTION 05 2100  
STEEL JOIST FRAMING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Open web steel joists, with bridging, attached seats and anchors.
- B. Loose bearing members, such as plates or angles, and anchor bolts for site placement.
- C. Supplementary framing for roof openings greater than 18 inches (450 mm).

1.2 RELATED REQUIREMENTS

- A. Section 05-3100 - Steel Decking: Support framing for small openings in deck.

1.3 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.
- B. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2014.
- C. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2014.
- D. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015.
- E. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel; International Accreditation Service, Inc; 2011.
- F. SJI (SPEC) - Catalog of Standard Specifications Load Tables and Weight Tables for Steel Joists and Joist Girders; 2011.
- G. SJI Technical Digest No. 9 - Handling and Erection of Steel Joists and Joist Girders; 2008.
- H. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).
- I. SSPC-SP 2 - Hand Tool Cleaning; 1982 (Ed. 2004).

1.4 SUBMITTALS

- A. See Section 01 3000 - Submittals, for submittal procedures.
- B. Shop Drawings: Indicate standard designations, joist coding, configurations, sizes, spacings, cambers, locations of joists, joist leg extensions, bridging, connections, and attachments.
- C. Welders' Certificates: Submit manufacturer's certificates, certifying welders employed on the Work, verifying AWS qualification within the previous 12 months.

1.5 QUALITY ASSURANCE

- A. Perform Work, including that for headers and other supplementary framing, in accordance with SJI (SPEC) Standard Specifications Load Tables and SJI Technical Digest No. 9.

- B. Manufacturer Qualifications: Company specializing in performing the work of this section with minimum 5 years documented experience.
- C. Fabricator Qualifications: A qualified steel fabricator that is accredited by the International Accreditation Service (IAS) Fabricator Inspection Program for Structural Steel in accordance with IAS AC172.
- D. Erector Qualifications: Company specializing in performing the work of this section with minimum 5 years documented experience.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Transport, handle, store, and protect products to SJI requirements.

## PART 2 PRODUCTS

### 2.1 MATERIALS

- A. Open Web Joists: SJI Type K Joists:
  - 1. Minimum End Bearing on Concrete or Masonry Supports: Comply with referenced SJI standard.
  - 2. Finish: Shop primed.
- B. Anchor Bolts, Nuts and Washers: ASTM A307, plain.
- C. Structural Steel For Supplementary Framing and Joist Leg Extensions: ASTM A36/A36M.
- D. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- E. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

### 2.2 FINISH

- A. Shop prime joists as specified.
- B. Prepare surfaces to be finished in accordance with SSPC-SP 2.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify existing conditions prior to beginning work.

### 3.2 ERECTION

- A. Erect joists with correct bearing on supports.
- B. Allow for erection loads. Provide sufficient temporary bracing to maintain framing safe, plumb, and in true alignment.
- C. Coordinate the placement of anchors for securing loose bearing members furnished as part of the work of this section.



- D. After joist alignment and installation of framing, field weld joist seats to steel bearing surfaces.
- E. Install supplementary framing for roof openings greater than 18 inches (450 mm).
- F. Do not permit erection of decking until joists are braced, bridged, and secured or until completion of erection and installation of permanent bridging and bracing.
- G. Do not field cut or alter structural members without approval of joist manufacturer.
- H. After erection, prime welds, damaged shop primer, and surfaces not shop primed.

### 3.3 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch (6 mm).
- B. Maximum Offset From True Alignment: 1/4 inch (6 mm).

### 3.4 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000 - Quality Control.

END OF SECTION



SECTION 05 3100  
STEEL DECKING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Roof deck.
- B. Supplementary framing for openings up to and including 18 inches (450 mm).
- C. Bearing plates and angles.

1.2 RELATED REQUIREMENTS

- A. Section 05 2100 – Steel Joist Framing

1.3 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.
- B. ASTM A1008/A1008M - 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; 2015.
- C. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society; 2015.
- D. AWS D1.3/D1.3M - Structural Welding Code - Sheet Steel; American Welding Society; 2008.
- E. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel; International Accreditation Service, Inc.; 2011.
- F. SDI (DM) - Publication No.31, Design Manual for Composite Decks, Form Decks, Roof Decks; Steel Deck Institute; 2007.
- G. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; Society for Protective Coatings; 1999 (Ed. 2004).

1.4 SUBMITTALS

- A. See Section 01-3000 - Submittals, for submittals procedures.
- B. Shop Drawings: Indicate deck plan, support locations, projections, openings, reinforcement, pertinent details, and accessories.
- C. Certificates: Certify that products furnished meet or exceed specified requirements.
- D. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.
- E. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC172.

## 1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified steel fabricator that is accredited by the International Accreditation Service (IAS) Fabricator Inspection Program for Structural Steel in accordance with IAS AC172.
- B. Installer Qualifications: Company specializing in performing the work of this Section with minimum 5 years of experience.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Cut plastic wrap to encourage ventilation.
- B. Separate sheets and store deck on dry wood sleepers; slope for positive drainage.

## PART 2 PRODUCTS

### 2.1 STEEL DECK

- A. All Deck Types: Select and design metal deck in accordance with SDI Design Manual.
  - 1. Calculate to structural working stress design and structural properties specified.
  - 2. Maximum Vertical Deflection of Roof Deck: 1/240 of span.
- B. Roof Deck: Non-composite type, fluted steel sheet:
  - 1. Ungalvanized Steel Sheet: ASTM A1008/A1008M, Designation SS, Grade 33, Type 1.
  - 2. Primer: Shop coat of manufacturer's standard primer paint over cleaned and phosphatized substrate.
  - 3. Structural Properties:
    - a. Span Design: Multiple.
  - 4. Minimum Base Metal Thickness: 20 gage, 0.0359 inch (0.91 mm).
  - 5. Nominal Height: 1-1/2 inch (38 mm).
  - 6. Profile: Fluted; SDI WR.
  - 7. Formed Sheet Width: 36 inch (900 mm).
  - 8. Side Joints: Lapped, mechanically fastened.
  - 9. End Joints: Lapped, welded.

### 2.2 ACCESSORY MATERIALS

- A. Bearing Plates and Angles: ASTM A36/A36M steel, unfinished.
- B. Welding Materials: AWS D1.1/D1.1M.
- C. Mechanical Fasteners: Steel; hex washer head, self-drilling, self-tapping.
- D. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

### 2.3 FABRICATED DECK ACCESSORIES

- A. Sheet Metal Deck Accessories: Metal closure strips and cover plates, 22 gage, 0.0299 inch (0.76 mm) thick sheet steel; of profile and size as indicated; primed.

- B. Roof Sump Pans: Formed sheet steel, 14 gage, 0.0747 inch (1.90 mm) minimum thickness, flat bottom, sloped sides, recessed 1-1/2 inches (38 mm) below roof deck surface, bearing flange 3 inches (75 mm) wide, sealed watertight.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify existing conditions prior to beginning work.

### 3.2 INSTALLATION

- A. Erect metal deck in accordance with SDI Design Manual and manufacturer's instructions. Align and level.
- B. On steel supports provide minimum 1-1/2 inch (38 mm) bearing.
- C. Fasten deck to steel support members at ends and intermediate supports at 12 inches (300 mm) on center maximum, parallel with the deck flute and at each transverse flute using methods specified.
  - 1. Welding: Use fusion welds.
- D. At mechanically fastened male/female side laps fasten at 24 inches (600 mm) on center maximum.
- E. Drive mechanical sidelap connectors completely through adjacent lapped sheets; positively engage adjacent sheets with minimum three-thread penetration.
- F. Weld deck in accordance with AWS D1.3/D1.3M.
- G. At deck openings from 6 inches (150 mm) to 18 inches (450 mm) in size, provide 2 by 2 by 1/4 inch (50 by 50 by 6 mm) steel angle reinforcement. Place angles perpendicular to flutes; extend minimum two flutes beyond each side of opening and fusion weld to deck at each flute.
- H. At deck openings greater than 18 inches (450 mm) in size, provide steel angle reinforcement as specified in Section 05 1200.
- I. At openings between deck and walls, columns, and openings, provide sheet steel closures and angle flashings to close openings.
- J. Position roof drain pans with flange bearing on top surface of deck. Fusion weld at each deck flute.
- K. Immediately after welding deck and other metal components in position, coat welds, burned areas, and damaged surface coating, with touch-up primer.

END OF SECTION



SECTION 05 5000  
METAL FABRICATIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. The following shop fabricated steel items, including:
  - 1. Miscellaneous Steel Shapes.
  - 2. Bollards.
  - 3. Stud Anchors, Expansion Anchors, and Miscellaneous Fasteners.

1.2 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete: Placement of metal fabrications in concrete.
- B. Section 04 2731 - Reinforced Unit Masonry: Placement of metal fabrications in masonry.
- C. Section 05 3100 - Steel Decking: Bearing plates for metal deck bearing, including anchorage.
- D. Section 09 9000 - Painting and Coating: Field painting.

1.3 REFERENCE STANDARDS

- A. ANSI/AISC 360-05 - Specification for Structural Steel Buildings; 2005.
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.
- C. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.
- D. ASTM A 108 - Standard Specification for Steel Bars, Carbon, Cold Finished, Standard Quality; 1995.
- E. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2013.
- F. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 2014.
- G. ASTM A325M - Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength (Metric); 2014.
- H. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2014.
- I. ASTM A 786/A 786 M - Standard Specification for Rolled Steel Floor Plates; 1989.
- J. ASTM A1011/A1011M - 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; 2014.
- K. ASTM B26/B26M - Standard Specification for Aluminum-Alloy Sand Castings; 2014.

- L. ASTM C 1107 - Standard Specification for Packaged, Dry, Hydraulic-Cement Grout (Non-shrink); 1991.
- M. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; American Welding Society; 2012.
- N. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society; 2015.
- O. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; Society for Protective Coatings; 1999 (Ed. 2004).
- P. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings; 2002 (Ed. 2004).
- Q. SSPC-SP 2 - Hand Tool Cleaning; 1982 (Ed. 2004).
- R. ASTM E 488 - Standard Test Method for Strength of Anchors in Masonry and Concrete; 1990.

#### 1.4 SUBMITTALS

- A. See Section 01 3000 - Submittals, for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
  - 1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

#### 1.5 QUALITY ASSURANCE

- A. Welding: Conform to all applicable requirements of ANSI/AISC 360-05.

### PART 2 PRODUCTS

#### 2.1 MATERIALS - STEEL

- A. Steel Sections: ASTM A36/A36M.
- B. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.
- C. Bars: ASTM A 36/A 36M.
- D. Rolled Steel Floor Plate: ASTM A 786.
- E. Plates: ASTM A283/A283M.
- F. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.
- G. Stud Anchors: ASTM A 108, Grade 1015.
  - 1. Product: S3L as manufactured by TRW Nelson Stud Welding Division; [www.nelsonstudwelding.com](http://www.nelsonstudwelding.com).
  - 2. Substitutions: See Section 01 6100 – Materials & Equipment.
- H. Bolts, Nuts, and Washers: ASTM A325 (ASTM A325M), Type 1, plain.
  - 1. Refer to Section 05 0553 - Security Metal Fastenings for tamper proof metal fasteners in inmate-accessible areas.



- I. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- J. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
- K. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

## 2.2 SHEET MATERIALS

- A. Galvanized Steel Sheet: ASTM A 653/A 653M, with G90/Z275 zinc coating; gage as indicated.
  - 1. If gage is not indicated provide 20 gage sheets.

## 2.3 GROUT AND ANCHORING CEMENT

- A. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

## 2.4 FABRICATION

- A. Fit and shop assemble items in largest practical sections, for delivery to site.
- B. Fabricate items with joints tightly fitted and secured.
- C. Continuously seal joined members by continuous welds.
- D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- F. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

## 2.5 FABRICATED ITEMS

- A. Bollards: Steel pipe, with stud anchors, concrete filled, flush concrete cap, set in concrete foundation, as detailed; if not detailed provide bollards meeting the following requirements:
  - 1. Diameter: 4-inch.
  - 2. Stud Anchors: Provide at quarter points of steel tubes in contact with concrete foundation, spaced vertically 24 inches on center; locate studs in staggered arrangement with 12 inch vertical spacing from adjacent quarter point.

## 2.6 ANCHORS

- A. Anchors with capability to sustain, without failure, load imposed within factors of safety indicated, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency; designed for use in concrete and masonry.
  - 1. Expansion Anchors: Stud type zinc plated carbon steel expansion anchor, sizes as indicated, with a single piece wedge.

- a. Head Type: Provide the following head types:
  - 1) Exposed locations: Flat head type, set flush in pre-drilled, countersunk hole.
  - 2) Concealed locations: Any head type.
2. Threaded Inserts: Internally threaded, flush mounted, sizes as indicated, expansion type zinc-plated carbon steel.

## 2.7 FINISHES - STEEL

- A. Prime paint steel items.
  1. Exceptions: Galvanized items indicated.
- B. Prepare surfaces to be primed in accordance with SSPC-SP2.
- C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- D. Prime Painting: One coat.
  1. Provide shop primer compatible with specified field-applied topcoats.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.

### 3.2 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.

### 3.3 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Perform field welding in accordance with AWS D1.1/D1.1M.
- C. Obtain approval prior to site cutting or making adjustments not scheduled.
- D. After erection, prime welds, abrasions, and surfaces not shop primed .
- E. Anchors: Provide anchorage devices and fasteners where necessary for securing metal fabrications; including, but not limited to: chemical anchors, expansion anchors, threaded inserts, toggle bolts, through-bolts, dowels, threaded rod, lag-bolts, and anchor bolts, and other connections as required to provide for loads; Install in accordance with manufacturer's instructions.

### 3.4 TOLERANCES

- A. Maximum Variation from Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset from True Alignment: 1/4 inch.
- C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

SECTION 06 1000  
ROUGH CARPENTRY

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Roofing nailers.
- B. Preservative treated wood materials.
- C. Fire retardant treated wood materials.
- D. Communications and electrical room mounting boards.
- E. Wood nailers for roofing and items installed on roof.
- F. Miscellaneous blocking and wood nailers.
- G. Anchorage devices and fasteners.

1.2 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete: Setting anchors in concrete.
- B. Section 07 5400 – Thermoplastic Membrane Roofing

1.3 REFERENCE STANDARDS

- A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.
- B. ASTM A 153/A 153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2000.
- C. ASTM A 307 - Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength; 2004.
- D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.
- E. AWPA C2 - Lumber, Timbers, Bridge Ties and Mine Ties--Preservative Treatment by Pressure Processes; American Wood-Preservers' Association; 2003.
- F. AWPA U1 - Use Category System: User Specification for Treated Wood; 2012.
- G. PS 1 - Structural Plywood; 2009.
- H. PS 20 - American Softwood Lumber Standard; National Institute of Standards and Technology, Department of Commerce; 2010.

1.4 SUBMITTALS

- A. See Section 01 3000 – Submittals for submittal procedures.
- B. Product Data: Provide technical data on fire retardant treatment materials.
- C. Product Data: Provide technical data on wood preservative materials.

## 1.5 QUALITY ASSURANCE

- A. Lumber: Comply with PS 20 and approved grading rules and inspection agencies.
  - 1. Acceptable Lumber Inspection Agencies: Any agency with rules approved by American Lumber Standards Committee or the Canadian Lumber Standards Accreditation Board.
- B. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an American Lumber Standard Committee (ALSC)-accredited testing agency, certifying level and type of treatment in accordance with AWWA standards.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.
- B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, or installation.

## PART 2 PRODUCTS

### 2.1 GENERAL REQUIREMENTS

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
  - 1. Species: Douglas Fir-Larch, unless otherwise indicated.
  - 2. Grading Agency: Any grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee ([www.alsc.org](http://www.alsc.org)) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.
- B. Lumber fabricated from old growth timber is not permitted.

### 2.2 DIMENSION LUMBER

- A. Sizes: Nominal sizes as indicated on drawings, S4S.
- B. Moisture Content: S-dry or MC19.
- C. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
  - 1. Lumber: S4S, No. 2 or Standard Grade.
  - 2. Boards: Standard or No. 3.

### 2.3 TIMBERS FOR CONCEALED APPLICATIONS

- A. Sizes: Nominal sizes as indicated on drawings, S4S.
- B. Moisture Content: S-dry (19 percent maximum).
- C. Beams and Posts 5 inches and over in thickness:
  - 1. Species: Douglas Fir-Larch.
  - 2. Grade: No. 1.

## 2.4 CONSTRUCTION PANELS

- A. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.
- B. Other Applications:
  - 1. Concealed Plywood: PS 1, C-C Plugged or better, fire-retardant treated, exterior grade.
  - 2. Thickness: 19/32-inch unless indicated otherwise.

## 2.5 ACCESSORIES

- A. Fasteners and Anchors:
  - 1. Metal and Finish: Hot-dipped galvanized steel per ASTM A153/A153M for high humidity; exposed, or preservative-treated wood locations; and sheathing; unfinished steel elsewhere.
  - 2. Bolts, Nuts, and Washers: ASTM A 307 galvanized to ASTM A 153/A 153M for galvanized components.
  - 3. Anchor Bolts: ASTM A 307 galvanized to ASTM A 153/A 153M for galvanized components; sizes as indicated with L-shaped embedment leg.
  - 4. Anchors: Toggle bolt type for anchorage to hollow masonry.
- B. Adhesive: Weatherproof, 100% polyurethane, approved by manufacturer for wood, steel, and galvanized products in contact with metal, masonry, and concrete, complying with ASTM D 3498; not for use with plastic and rubber materials.
  - 1. Products:
    - a. Franklin International, Inc.; Titebond Fast Set Polyurethane Construction Adhesive: [www.titebond.com/sle](http://www.titebond.com/sle).
    - b. Henkel Corporation: Loctite PL Premium Construction Adhesive: [www.loctiteproducts.com](http://www.loctiteproducts.com).
    - c. PPG Industries, Inc.: Liquid Nails LN-950 Polyurethane Construction Adhesive: [www.liquidnails.com](http://www.liquidnails.com).

## 2.6 FACTORY WOOD TREATMENT

- A. Treated Lumber and Construction Panels: Comply with requirements of AWWA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
  - 1. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWWA standards.
- B. Preservative Treatment:
  - 1. Preservative Pressure Treatment of Exposed Lumber Above Grade: AWWA U1, Use Category UC3B, Commodity Specification A using waterborne preservative to 0.25 lb/cu ft retention.
  - 2. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
  - 3. Preservative Pressure Treatment of Lumber in Contact with Soil: AWWA U1, Use Category UC4A, Commodity Specification A using waterborne preservative.

- a. Preservative for Field Application to Cut Surfaces: As recommended by manufacturer of factory treatment chemicals for brush-application in the field.

## PART 3 EXECUTION

### 3.1 PREPARATION

- A. Coordinate installation of rough carpentry members specified in other sections.

### 3.2 INSTALLATION - GENERAL

- A. Select material sizes to minimize waste.
- B. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

### 3.3 BLOCKING, NAILERS, AND SUPPORTS

- A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.
- B. In framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to code authorities may be used in lieu of solid wood blocking.
- C. In metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing.

### 3.4 ROOF-RELATED CARPENTRY

- A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.

### 3.5 INSTALLATION OF ACCESSORIES AND MISCELLANEOUS WOOD

- A. Install blocking where shown and where required for attaching other work. Attach to substrates to support applied loading. Form to shapes shown and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Recess fasteners flush with surfaces, unless otherwise indicated.

### 3.6 INSTALLATION OF CONSTRUCTION PANELS

- A. Communications and Electrical Room Mounting Boards: Secure with CMU wall anchors; space fasteners at maximum 24 inches on center on all edges.

### 3.7 TOLERANCES

- A. Gaps Between Construction Panels: 1/16 inch, maximum.
- B. Variation from Plane (Other than Floors): 1/4 inch in 10 feet maximum, and 1/2 inch in 30 feet maximum.

### 3.8 CLEANING

- A. Do not burn scrap on project site.
- B. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill.
- C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION





SECTION 07 2500  
WEATHER BARRIERS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Underlayments: Used under copings; water-resistive barrier applied directly to substrate.

1.2 RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Dimension lumber under weather barrier.
- B. Section 07 5400 – Thermoplastic Membrane Roofing: Underlayment installed as part of roofing system.

1.3 REFERENCE STANDARDS

- A. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2006a (Reapproved 2013).
- B. ASTM D 1117 - ASTM D1117-01 Standard Guide for Evaluating Nonwoven Fabrics; 2001.

1.4 SUBMITTALS

- A. See Section 01 3000 - Submittals for submittal procedures.
- B. Product Data: Provide data on material characteristics, performance criteria, and limitations.
- C. Manufacturer's Installation Instructions: Indicate preparation, installation methods, and storage and handling criteria.

1.5 FIELD CONDITIONS

- A. Maintain temperature and humidity recommended by the materials manufacturers before, during and after installation.

PART 2 PRODUCTS

2.1 UNDERLAYMENT

- A. Manufacturers:
  - 1. Henry Company: <http://us.henry.com>.
  - 2. Innovative Metals Company, Inc. (Imetco); [www.imetco.com](http://www.imetco.com).
  - 3. Tamko Building Products, Inc.: [www.tamko.com](http://www.tamko.com).
  - 4. W. R. Grace & Company: [www.na.graceconstruction.com](http://www.na.graceconstruction.com).

- B. Underlayment: Cold-applied, self-adhering membrane composed of a high density, cross laminated polyethylene film coated on one side with a layer of butyl rubber adhesive, low-temperature and high-temperature resistant.
  - 1. Thickness: 40 mils, minimum.
  - 2. Tensile Strength: 250 psi in accordance with ASTM D412 (Die C modified).
  - 3. Permeance: 0.05 perms max in accordance with ASTM E96.

## 2.2 ACCESSORIES

- A. Primers, Thinners and Cleaners: As recommended by material manufacturer.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify that surfaces and conditions are ready to accept the work of this section.
- B. Verify substrate locations where dowels for precast architectural concrete will penetrate underlayment; sequence installation as required to avoid conflicts and delays.

### 3.2 PREPARATION

- A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.
- B. Remove trash, debris, grease, oil, water, moisture, and contaminants that may affect bond of underlayment to substrate surfaces.
- C. Clean and prime substrate surfaces to receive underlayment in accordance with manufacturer's instructions.

### 3.3 INSTALLATION

- A. Install materials in accordance with manufacturer's instructions.
- B. Self-Adhesive Sheets:
  - 1. Apply primer to substrate in accordance with manufacturer's recommendations.
  - 2. Lap sheets shingle-fashion to shed water and seal laps air tight.
  - 3. Once sheets are in place, press firmly into substrate with resilient hand roller; ensure that all laps are firmly adhered with no gaps or fishmouths.
  - 4. Use same material, or other material approved by sheet manufacturer for the purpose, to seal to adjacent construction and as flashing.
  - 5. At wide joints, provide extra flexible membrane allowing joint movement.
  - 6. Seal penetrations with manufacturer's recommended sealant around penetrating item and seal to weather barrier surface.

### 3.4 PROTECTION

- A. Do not leave materials exposed to weather longer than recommended by manufacturer.

END OF SECTION

SECTION 07 5400  
THERMOPLASTIC MEMBRANE ROOFING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Adhered system with thermoplastic roofing membrane.
- B. Insulation, flat.
- C. Cover boards.
- D. Flashings.
- E. Roofing pipe boots, roofing expansion joints, and walkway pads.

1.2 DEFINITIONS

- A. Substantial completion of roofing work is defined as the contractually required and weathertight installation of roof system including specified roof preparation, insulation, roof membrane, flashings, counterflashings, sheet metal, fasteners and sealants.

1.3 REFERENCE STANDARDS

- A. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2014a.
- B. ASTM C209 - Standard Test Methods for Cellulosic Fiber Insulating Board; 2015.
- C. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2017.
- D. ASTM D1621 - Standard Test Method for Compressive Properties Of Rigid Cellular Plastics; 2016.
- E. ASTM D6878/D6878M - Standard Specification for Thermoplastic Polyolefin Based Sheet Roofing; 2017.
- F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2017.
- G. ASTM E1980 - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces; 2011.
- H. FM (AG) - FM Approval Guide; current edition.
- I. FM DS 1-28 - Wind Design; 2016.
- J. NRCA (RM) - The NRCA Roofing Manual; 2018.
- K. NRCA (WM) - The NRCA Waterproofing Manual; 2005.
- L. SPRI ES-1 - Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems; 2011.

## 1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate with installation of associated counter-flashings installed under other sections.
- B. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all affected installers; review preparation and installation procedures and coordination and scheduling necessary for related work.
  - 1. Mandatory Attendance:
    - a. Contractor.
    - b. Roofing installer's foreman.
    - c. Owner's representative.
  - 2. Meeting Agenda:
    - a. Verify acceptability of substrate before commencement of installation.
    - b. Verify efforts that will be employed by Contractor's workforce to protect the roof from damage during construction. Items of concern include, but are not limited to, the following:
      - 1) Workforce traffic pathways.
      - 2) Stored materials and equipment.
      - 3) Removal of loose fasteners and sharp object.
      - 4) Debris removal.
    - c. Examine roof openings, curbs, pipes, sleeves, ducts, and vents through roof, wood nailing strips and reglets in place; Observe if curbs and penetrations have been laid out and installed with adequate vertical and horizontal clearance as required by the manufacturer to provide the specified warranty.
    - d. Identify and relocate appliances, equipment, fans, roof hatch openings or other components that require service so that none of their elements are within ten feet of parapets and roof edges.
    - e. Identify and relocate any roof vent penetrations within 18 inches of a parapet or roof edge.
    - f. Verify locations of roof penetration housings for multiple pipe penetrations are in place; and solidly set; refer to Section 07 7200.
    - g. Verify surface to receive roof insulation is firm, clean, smooth, and dry.
    - h. Review Contractor's schedule for roofing work so that all parties can coordinate essential tasks within the time restraints and as required by the roofing production rates of the contract
    - i. Review the responsibilities of all parties in regard to communication and coordination during the roofing portion of the Work, especially in that which pertains to the involvement Owner's roofing consultant and observer.
    - j. Review the progress of other construction activities and preparations for roofing construction, including, but not limited to deliveries, possible conflicts, special or unique details, weather limitations, acceptability of substrates, possible conflicts, manufacturer's recommendations, coordination with other trades, and site inspections by manufacturer's technical representative.
    - k. Review status of submittals necessary to be approved prior to the start of the roofing work.
    - l. Review plans for roofing equipment and materials staging and roofing schedule in coordination with school schedule and traffic patterns.

- C. Provide required notifications and secure inspections required by manufacturer of the approved materials to facilitate issuance of the specified roof warranty.
- D. Pay required fees, secure required inspections, and complete items necessary to provide the following items:
  - 1. Manufacturer's technical representative site inspections identified under Quality Assurance article in this Section.
  - 2. Copies of all manufacturer's punch lists and documentation of completion; deliver to the Architect.
  - 3. Warranties identified under Quality Assurance article in this Section.
- E. Submittal Schedule: Allow ample time for processing and approval prior to Pre-Roofing Coordination Meeting and start of roof system installation work.

## 1.5 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data indicating membrane materials, flashing materials, insulation, and fasteners.
  - 1. Also include the following product data:
    - a. Membrane adhesive.
    - b. Cover board.
    - c. Pipe flashing.
    - d. TPO penetration pockets.
    - e. Pourable sealer.
    - f. Termination bars.
    - g. TPO coated metal fabrications.
    - h. Walkway pads.
    - i. Storage and handling requirements and recommendations.
- C. Shop Drawings: Indicate joint or termination detail conditions, conditions of interface with other materials, and mechanical fastener layout.
  - 1. Show detail showing proposed temporary night seal.
  - 2. Show insulation and coverboard fastening patterns for field, perimeter and corner areas and a roof plan clearly showing the perimeter and corner areas to receive increased fastener frequency.
  - 3. Show fastening patterns for nailers and blocking.
  - 4. Show manufacturer's tapered insulation fabrication drawings including plan and cross sections.
  - 5. Show sheet metal and flashing shop drawings as required by Section 07 6200.
  - 6. Show walkway layout plan.
  - 7. Show crickets.
- D. Wind Uplift Information: Provide documentation that rigid insulation, cover board, adhered roofing system, and component materials are suitable for the structural deck, and that have been tested as a complete system for application and slopes indicated. Provide information on fastening for uplift resistance to meet the applicable Building Code.
- E. Manufacturer's Installation Instructions: Indicate membrane seaming precautions, special procedures, and perimeter conditions requiring special attention.

- F. Manufacturer's Field Reports: Indicate procedures followed and supplementary instructions given.
- G. Manufacturer's maintenance data.
- H. Specimen Warranty: For approval.

## 1.6 QUALITY ASSURANCE

- A. Perform work in accordance with manufacturer's instructions.
- B. Installer Qualifications: Company specializing in performing the work of this section, with minimum ten year's experience and listed by the roofing manufacturer as an approved applicator for each roof system included in this section for at least five years from the Bid Date of this project.
- C. Subcontracting the installation of the roof system to an individual or a firm that is not a full-time employee of the installer's company is prohibited.
- D. Provide onsite inspections beginning with cover board installation and thereafter as required by the membrane manufacturer, but no fewer than one inspection per 30 calendar days, not counting the substantial completion inspection.
  - 1. Perform inspections by manufacturer's technical representative who is a full time employee of the roof membrane manufacturer's technical service department.
  - 2. Manufacturer's technical representative site inspections: Mark defects for repair; provide written report during each site visit listing deficient work requiring correction.
  - 3. Provide reports and other correspondence associated with the site visit to the Architect and Contractor within three business days of the visit.
  - 4. Coordinate inspections with the Contractor and Architect a minimum of three business days in-advance.
- E. Provide substantial completion inspection report to the Architect by manufacturer's technical representative that identifies defective/incomplete work to be remedied.
  - 1. Correct areas indicated to the full satisfaction of the Architect, Owner and manufacturer.
- F. Asbestos or asbestos-related products: Not allowed.
- G. Membrane roof system metal edge securement: Provide in accordance with SPRI ES-1.
- H. Perimeter and corner area calculations: Comply with applicable building code requirements.
- I. Factory Mutual Classification: Provide roofing assemblies meeting Class I and windstorm resistance of I-90, in accordance with FM DS 1-28.
- J. Insulation Thermal Value (R): As indicated on the drawings; R value does not include cover board.
  - 1. Tapered areas within 18 inches of roof sumps may be provided in thicknesses required to achieve no less than 50 percent of the Insulation Thermal Value (R).

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's original containers, dry and undamaged, with seals and labels intact.
- B. Store materials in weather protected environment, clear of ground and moisture.

1. Store materials in dry, raised, protected areas in an upright position; Control temperature of storage areas in accordance with manufacturer's instructions; Protect materials from exposed to the elements.
- C. Ensure storage and staging of materials does not exceed static and dynamic load-bearing capacities of roof decking.
- D. Mark wet, damaged, or defective materials intended for incorporation into the roofing system; remove from the site the same day as discovered.
- E. Protect foam insulation from direct exposure to sunlight.
- F. Avoid storage of materials and equipment on completed roof membranes; where unavoidable, take caution not to overload the assembly or underlying structural system and provide proper membrane protection by using structural plywood sheathing over high-density rigid insulation.

#### 1.8 FIELD CONDITIONS

- A. Do not apply roofing membrane during unsuitable weather.
- B. Do not apply roofing membrane when ambient temperature is below 40 degrees F or above 90 degrees F.
- C. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.
- D. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.
- E. Schedule applications so that no partially completed sections of roof are left exposed at end of workday.

#### 1.9 WARRANTY

- A. See Section 01 7000 – Contract Closeout, for additional warranty requirements.
- B. Installer's Warranty: Provide manufacturer's warranty for weathertightness of roofing system, including agreement to repair or replace roofing that fails to keep out water within specified warranty period of 2 years from date of Substantial Completion.
- C. System Warranty: Provide 30 year, no dollar limit, manufacturer's warranty for weather-tightness of membrane, flashings, and related items used to fasten the membrane and flashing to the roof structure, against leaks arising out of or caused by ordinary wear and tear under normal weather and atmospheric conditions.
  1. Warranty includes labor and materials to repair or replace membrane, insulation, fasteners, termination bars, scuppers, flashings, cover boards, and other miscellaneous accessories.
    - a. Include design wind speed identified in this Section.
    - b. Warranty shall not include any buy-out clauses and shall not be prorated.
  2. Exceptions are not Permitted:
    - a. Damage due to roof traffic.
    - b. Damage due to wind of speed greater than 56 mph but less than 90 mph.
- D. Warranties shall include written provision(s) stating they are fully transferable at any time during the specified warranty period.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

- A. Thermoplastic Polyolefin (TPO) Membrane Roofing Materials:
  - 1. Carlisle Roofing Systems, Inc: [www.carlisle-syntec.com/sle](http://www.carlisle-syntec.com/sle).
  - 2. Firestone Building Products Co.: [www.firestonebpco.com](http://www.firestonebpco.com).
  - 3. Johns Manville: [www.jm.com](http://www.jm.com).
  - 4. Substitutions: Not permitted.

### 2.2 ROOFING

- A. Thermoplastic Membrane Roofing: One ply membrane, fully adhered, over insulation.
- B. Roofing Assembly Requirements:
  - 1. Solar Reflectance Index (SRI): Minimum of 64 based on three-year aged value; if three-year aged data is not available, minimum of 82 initial value.
    - a. Calculate SRI in accordance with ASTM E1980.
    - b. Field applied coating may not be used to achieve specified SRI.
  - 2. Factory Mutual Classification: Class 1 and windstorm resistance of 1-90, in accordance with FM DS 1-28.
- C. Acceptable Insulation Types - Constant Thickness Application:
  - 1. Minimum 2 layers of polyisocyanurate board.

### 2.3 MEMBRANE ROOFING AND ASSOCIATED MATERIALS

- A. Membrane Roofing Materials:
  - 1. TPO: Thermoplastic polyolefin (TPO) complying with ASTM D6878/D6878M, sheet contains reinforcing fabrics or scrims.
    - a. Thickness: 80 mil, 0.080 inch, minimum.
  - 2. Sheet Width: Factory fabricated into largest sheets possible.
  - 3. Color: Tan.
  - 4. Product: JM TPO - 80 MIL, Johns Manville.
- B. Seaming Materials: As recommended by membrane manufacturer.
- C. Membrane Fasteners: As recommended and approved by membrane manufacturer.
- D. Flexible Flashing Material: Flexible TPO roofing membrane, heat weldable, recommended by membrane manufacturer.
  - 1. Thickness: 60 mils.
  - 2. Color: Match membrane color.
- E. Cushion Sheet: Same material as membrane.

### 2.4 COVER BOARDS

- A. Cover Boards: ASTM C1289, Type II, Class 4, Grades 1, 2 and 3 high density, closed-cell, polyisocyanurate foam core with coated glass facer.
  - 1. Board Thickness: 1/4 inch minimum, uniform board thickness.
  - 2. Thermal Resistance: R-value of 1.2, minimum.
  - 3. Board Edges: Square.
  - 4. Compressive Strength: In accordance with ASTM D1621, 120 psi, minimum.



5. Water Absorption: In accordance with ASTM C209, less than 4.0 percent of volume maximum.
6. Cover Boards: HCFC-free, with no Ozone Depletion Potential (Zero-ODP).
7. Flame/Smoke Properties: 75 maximum core foam flame spread in accordance with ASTM E84.
8. Location: Provide beneath TPO membrane, above roof insulation.
9. Product: Invinsa Roof Board, Johns Manville.

## 2.5 ROOF INSULATION

- A. Polyisocyanurate (ISO) Board Insulation: Rigid cellular foam, complying with ASTM C1289.
  1. Classifications:
    - a. Type II:
      - 1) Class 1 - Faced with glass fiber or non-organic facers on both major surfaces of core foam.
      - 2) Compressive Strength: Classes 1-2-3, Grade 2 - 20 psi (138 kPa), minimum.
      - 3) Thermal Resistance, R-value: At 1-1/2 inch thick; Class 1, Grades 1-2-3 - 8.4 (1.48) at 75 degrees F.
  2. Insulation Boards: HCFC-free, with no Ozone Depletion Potential (Zero-ODP).
  3. Water Absorption: In accordance with ASTM C209, less than 1.0 percent of volume maximum.
  4. Flame Spread (foam core): 30 maximum in accordance with ASTM E84.
  5. Smoke Developed (foam core): 250 maximum in accordance with ASTM E84.
  6. Board Size: 48 by 48 inch, minimum.
  7. Board Thickness: 1-1/2 inch, minimum.
  8. Provide boards in quantities required to achieve indicated R-value in two layers, minimum.
  9. Board Edges: Square.
  10. Manufacturer: Same as membrane manufacturer.
  11. Product: Enrgy 3, Johns Manville.

## 2.6 ACCESSORIES

- A. Crickets, saddles, and sumps: Insulation manufacturer's pre-manufactured tapered boards, same insulation type specified above.
  1. Slope: 1/2 inch per foot, minimum.
  2. Provide tapered insulation crickets and saddles in accordance with NRCA (RM), Figure 48 Guide for Crickets and Saddles, and Figure 49 Guide for Crickets.
- B. Prefabricated roofing expansion joints and sheet metal copings: See Section 07 7100.
- C. Wood materials for nailers and curbs: Refer to Section 06 1000 - Rough Carpentry.
- D. Pipe Boots: Prefabricated flexible boot and collar for pipe stacks through membrane; same material as membrane, with stainless steel clamping rings.
  1. Round penetrations between 1 and 6 inches in diameter: Use pipe boots.
  2. Round penetrations more than 6 inches in diameter: Use field fabricated flexible flashing.
  3. Multiple roof penetrations within the same pipe boot: Not allowed; use penetration pockets or pitch pans.

- E. TPO Penetration Pockets: Membrane manufacturer's two-part molded TPO pocket with rigid vertical wall and preformed welding flange, designed for use with pourable sealer to seal around uneven or small clusters of penetrations.
  - 1. Color: Match membrane color.
  - 2. Product: JM TPO Penetration Pocket, Johns Manville.
- F. Pourable Sealer: Membrane manufacturer's two-part, pourable, polyurethane sealer, designed for use as a penetration pocket filler.
  - 1. Product: JM TPO Pourable Sealer, Johns Manville.
- G. Grout: Non-shrink, non-metallic aggregate type, complying with ASTM C1107/C1107M and capable of developing a minimum compressive strength of 7,000 psi at 28 days.
- H. Termination Bars: Membrane manufacturer's standard extruded aluminum bar, 1 inch wide by 0.098 inch thick; pre-drilled, with non-corrosive fasteners compatible with substrate.
  - 1. Horizontal Termination Bars: Cover with surfaced-mounted reglet flashings specified in Section 07 6200.
- I. Insulation Fasteners: Appropriate for purpose intended and approved by roofing manufacturer.
- J. Membrane Adhesive: Membrane manufacturer's cold applied, moisture cured, single component roof membrane adhesive.
- K. Surface Conditioner for Adhesives: Compatible with membrane and adhesives.
- L. Thinners and Cleaners: As recommended by adhesive manufacturer, compatible with membrane.
- M. Miscellaneous Accessories: Provide primers, mastic, bonding adhesive, and other accessories recommended by roofing system manufacturer for intended use.
- N. TPO Coated Metal: Manufacturer's 0.030 inch thick non-reinforced TPO membrane laminated to 0.022 inch thick galvanized steel to allow direct welding of TPO membrane to the metal; fabricated to appropriate configurations at locations such as drip edges, flashings, scuppers, and fascia's.
  - 1. Scuppers: Comply with sheet metal requirements identified in Section 07 7123 - Manufactured Gutters and Downspouts.
- O. Sheet metal leaderheads, gutters, and downspouts: Refer to Section 07 7123 - Manufactured Gutters and Downspouts.
- P. Overnight Seal: As recommended by membrane manufacturer.
- Q. Sealants, cleaners, and primers: Membrane manufacturer's standard products, designed for use with TPO membrane and flashings.
- R. Spray Foam Insulation: Two-component polyurethane foam adhesive, approved in writing by membrane manufacturer; for use in cracks and hard-to-reach places not suitable for insulation board.
- S. Reglet Flashings: Refer to Section 07 6200.
- T. Walkway Pads: Membrane manufacturer's UV resistant, urethane rubber rolls, minimum 30 inches wide, suitable for maintenance traffic; of same color as roof membrane.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Examine substrate and conditions under which roofing work is to be performed notify the Architect and Owner immediately of unsatisfactory conditions.
  - 1. Do not proceed with roofing work until unsatisfactory conditions have been corrected in a manner acceptable to Architect, installer and manufacturer.
- B. Verify that surfaces and site conditions are ready to receive work.
- C. Verify deck is supported and secure.
- D. Verify deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for installation of roof system.
- E. Verify deck surfaces are dry and free of snow or ice.
- F. Verify that roof openings, curbs, and penetrations through roof are solidly set, and nailing strips are in place.

### 3.2 PREPARATION

- A. Broom clean roof deck prior to installation of roofing system.
- B. Remove and relocate appliances, equipment, fans, roof hatch openings or other components that require service that are located within 10 feet of a roof edge, parapet, or open side of a walking surface where such edge, parapet, or open side is located more than 27 inches above the floor, roof or grade below.
- C. Remove trash, debris, fasteners, grease, oil, water, moisture, and contaminants that may affect bond of membrane to cover board.
- D. Remove and replace curbs that will not provide 8 inches minimum clearance between top of flashing and roof membrane.
- E. Remove and relocate curbs and penetrations where crickets will block roof drainage.
- F. Remove standing water, frost, snow, or loose debris from surfaces scheduled to receive roofing.
- G. Verify cover board installation is smooth, properly sloped, free of sharp projections, and free of obvious depressions.
- H. Verify roof openings, curbs, pipes, sleeves, ducts, supports, and vents through roof are solidly set, and cant strips, wood nailing strips and reglets are in place before roofing work begins.
- I. Verify roof penetration housings for multiple pipe penetrations are in place; and solidly set before roofing work begins; refer to Section 07 7200.
- J. Verify nailers, curbs and penetrations have been laid out and securely installed with adequate vertical and horizontal clearance as required by the manufacturer to provide the specified warranty.
- K. Do not start roof application until defects have been corrected.
- L. Coordinate roofing work with provisions for roof drainage, flashing, trim, penetrations, and other adjoining work to assure that the completed roof will be free of leaks.
- M. Separate dissimilar metals by applying permanent method approved by roof membrane manufacturer.

### 3.3 PREPARATION - METAL DECK

- A. Remove trash, fasteners, debris, grease, oil, water, and moisture.

### 3.4 INSTALLATION - GENERAL

- A. Perform work in accordance with manufacturer's instructions, NRCA (RM), and NRCA (WM) applicable requirements.
- B. Do not apply roofing membrane during unsuitable weather.
- C. Do not apply roofing membrane when ambient temperature is outside the temperature range recommended by manufacturer.
- D. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.
- E. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.
- F. Coordinate this work with installation of associated counterflashings and copings installed by other sections as the work of this section proceeds.
- G. Temporary flashings are prohibited without written prior approval by the Architect.
- H. Remove and replace areas where water has entered under newly completed roofing due to incomplete flashings, seams and or night seals at no cost to the Owner.
- I. Wood Nailers: Install nailers as indicated on drawings and as required to meet manufacturer's requirements and in accordance with local authorities having jurisdiction.
  - 1. Discard nailers with defects that might impair quality of work or that are too small to use in fabricating work with minimum joints or optimum joint arrangement.
  - 2. Set nailers to required levels and lines with members plumb and true.
  - 3. Install nailers with 1/4 inch gap between ends of adjoining pieces.
  - 4. Fastener Schedule: Comply with requirements of approved shop drawings.
  - 5. Fastener Schedule:
    - a. Nailers 5-1/2 inches or wider: Install fasteners in two rows, staggered one-third of nailer width.
      - 1) Perimeter Nailers: Space nailers in each row 12 inches on center.
      - 2) Corner Nailers: Space nailers in each row 6 inches on center; extend 8 feet minimum from all outside building corners.
      - 3) Install two fasteners within 3 inches of each nailer end.
    - b. Install two fasteners within 3 inches of each nailer end.
    - c. Where two or more nailers are installed, fasten each nailer independently.
- J. Provide two, working, 2A10 BC fire extinguishers located on roof, within 50 feet of all solvent-based adhesive application activities.

### 3.5 INSULATION - UNDER MEMBRANE

- A. Attachment of Insulation:
  - 1. Mechanically fasten insulation to deck in accordance with roofing manufacturer's instructions and FM (AG) Factory Mutual requirements.
- B. Tapered Insulation:

1. Install tapered saddles in valleys, where indicated on the approved shop drawings in the sizes shown; Saddle and cricket slope shall be twice the field slope, unless otherwise noted on the drawings.
    - a. Provide sufficient width at end of saddle such that flat spots do not occur in valley.
  2. Provide tapered insulation panels and tapered edge strips to construct sumps at roof drains, scuppers, and gutters where detailed. Delete thermal insulation within sumps, as required, for installation of tapered panels, so as to provide continuous slope down to drainage device, without creating a sharp/steep sloped transition. At no time shall slope within drain sump exceed 1:12, unless otherwise noted in drawings.
    - a. Size: As indicated in approved shop drawings.
  3. When tapered insulation is installed along a perimeter edge of uniform nailer height, provide tapered edge strip along nailers as tapered insulation thickness decreases for smooth transition and for proper support for the membrane system.
  4. Utilize tapered edge strip at transitions in construction of more than ¼ inch to provide a smooth transition and proper support for the membrane system or subsequent insulation layer. Field cut and shape edge strip as required. Direct slope of edge strip so as to provide for proper drainage.
  5. Verify that tapered insulation is properly installed according to the approved shop drawings and that no irregularities exist that will result in ponding water in the finished roof system.
- C. On metal deck, place boards perpendicular to flutes with insulation board edges bearing on deck flutes.
- D. Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.
- E. Neatly fit insulation to all penetrations, projections, and nailers. Insulation should be loosely fitted, with gaps greater than 1/4 inch being filled with foam insulation.
- F. Install only as much insulation as can be covered with roofing membrane and completed before the end of the day's work or before the onset of inclement weather.
- G. Do not permit installed insulation to be damaged prior to its concealment.
- H. Areas of damage or broken corners: Cut out and replace with pieces 12 by 12 inches minimum.
- I. At roof drains, use factory-tapered boards to slope down to roof drains over a distance of 18 inches or greater, as required to meet maximum slope requirements.
- J. Install tapered crickets on the upslope sides of all rectangular penetrations with a dimension greater than 24 inches perpendicular to slope, whether indicated on the Drawings or not. Cricket slope shall be twice the field's slope, unless otherwise noted on drawings.
- K. Cover Board Installation:
1. Locations:
    - a. TPO roofs: Install cover board over roof insulation, beneath TPO membrane.
    - b. Metal roofs: Install cover board over roof deck, beneath underlayment specified in Section 07 2500 - Weather Barriers.
  2. Mechanically fasten cover board in accordance with roofing manufacturer's instructions and Factory Mutual requirements.
  3. Lay boards with edges in moderate contact without forcing. Cut cover boards to fit neatly to perimeter blocking and around penetrations through roof.

4. Neatly fit cover board to penetrations and projections. Cover board should be loosely fitted, with gaps greater than 1/4 inch being filled with foam insulation.
5. Install only as much cover board as can be covered with roof membrane or metal roof panels and completed before the end of the day's work or before the onset of inclement weather.
6. Do not permit cover board to be damaged prior to its concealment.
7. Areas of damage or broken corners: Cut out and replace with pieces 12 by 12 inches minimum.

### 3.6 MEMBRANE APPLICATION

- A. Roll out membrane, free from wrinkles or tears. Place sheet into place without stretching.
- B. Shingle joints on sloped substrate in direction of drainage.
- C. Fully Adhered Application: Apply adhesive to substrate at rate recommended by manufacturer. Fully embed membrane in adhesive except in areas directly over or within 3 inches of expansion joints. Fully adhere one roll before proceeding to adjacent rolls.
  - 1. Apply adhesive to substrate and membrane in an even coat without holidays, puddles, or other irregularities; Join membrane to substrate in accordance with manufacturer's requirements.
    - a. Allow adhesive to dry completely before installing membrane.
  - 2. Unroll and position roofing membrane, without stretching, over the approved substrate, allowing sheets to overlap a minimum of 3 inches.
    - a. Fold 1/2 of the membrane back and coat underside with adhesive at a rate as recommended by the manufacturer. When the membrane adhesive has dried slightly to produce strings when touched with a dry finger, the coated membrane shall be rolled onto the previously coated substrate being careful to avoid wrinkles or air pockets. Do not allow adhesive on the underside of the membrane to dry completely.
    - b. Fold back the remaining un-bonded half of the sheet shall and repeat the procedure.
  - 3. Install laps in the membrane in a shingled manner in the direction of drainage so as not to restrict the flow of water.
  - 4. Hot-weld laps daily with fully welded seams.
    - a. Robot welding: Fully weld seams a minimum of 1.5 inches from edge of lap.
    - b. Hand welding: Fully weld seams a minimum of 2 inches from edge of lap.
  - 5. Patch T-laps using heat welded membrane.
  - 6. Make repairs daily by hot air welding.
  - 7. Clean seaming area in accordance with manufacturer's requirements.
- D. Overlap edges and ends and seal seams by contact adhesive, minimum 3 inches. Seal permanently waterproof. Apply uniform bead of sealant to joint edge.
- E. At intersections with vertical surfaces:
  - 1. Extend membrane up a minimum of 8 inches onto vertical surfaces.
  - 2. Flashing terminations at metal copings: Fully adhere flexible flashing over membrane, up wall, and beneath coping nailer; Return edge down exterior face of nailer.
    - a. Terminate flexible flashing edge 3/4 inches past bottom of nailer; trim exposed membrane flush with bottom of vertical face of coping.
  - 3. Around rectangular roof penetrations, seal flanges and fully adhere flexible flashing over membrane, up vertical face of penetration a minimum of 12 inches and terminate with termination bar.
    - a. Termination bar fastener spacing: 8 inches on center, maximum.
  - 4. Flashing terminations at reglets: Where indicated, fully adhere flexible flashing over membrane and up to termination bars; cover termination with reglets specified in Section 07 6200.
  - 5. Fully adhere flexible flashing over membrane and up to reglets.
- F. Around rectangular roof penetrations or penetrations larger than 6 inches diameter, seal flanges and flashings with flexible flashing.

- G. At piping and vent stack penetrations 6 inches or less in diameter heat weld pipe boots to membrane; secure pipe boots to penetrations with adjustable stainless steel clamps.
- H. Install roofing expansion joints at locations required by manufacturer and in accordance with manufacturer's requirements. Make joints watertight.
  - 1. Install prefabricated joint components in accordance with manufacturer's instructions.
- I. Coordinate installation of roof drains and sumps and related flashings.

### 3.7 TEMPORARY NIGHT SEAL INSTALLATION

- A. Provide temporary water cutoffs at the end of each working day to protect the insulation, roofing, building, and building interior from damage due to wind, snow, and rain; install in accordance temporary night seal detail in approved shop drawings.

### 3.8 WALKWAY INSTALLATION

- A. Install walkways products at locations indicated, as required to provide a minimum 30 inch wide walking surface.
- B. Heat weld walkways to membrane as required by manufacturer and as required to prevent moisture from accumulating beneath walkways.
  - 1. Provide two gaps in the heat weld, one inch wide at the low side of the pad to allow for drainage of inadvertent moisture between the walkway and the membrane.
  - 2. When walkway orientation interrupts or redirects roof drainage patterns provide 2 inch wide gap 60 inches on center maximum spacing between walkways.
- C. Do not cover field seams with walkways; Provide 2 inch wide gap at seam locations.
- D. In addition to locations indicated, provide walkways at the following minimum locations, as required to provide a minimum 30 inch wide walking surface, whether indicated on the Drawings or not:
  - 1. Perimeters of roof hatches.
  - 2. Perimeters of roof top equipment with motors greater than 1/6 horsepower.
  - 3. Landings of roof access ladders.
  - 4. Work area 48 inches long in front of roof-mounted electrical panels.

### 3.9 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for general requirements for field quality control and inspection.
- B. Require site attendance of roofing material manufacturer's representative as indicated under Quality Assurance article of this Section.

### 3.10 CLEANING

- A. Completed Roof Membrane: Monitor and clean constantly to prevent accumulation of sharp objects and/or debris that could damage the membrane.
- B. Remove bituminous markings from finished surfaces.
- C. In areas where finished surfaces are soiled by work of this section, consult manufacturer of surfaces for cleaning advice and comply with their documented instructions.
- D. Repair or replace defaced or damaged finishes caused by work of this section.



### 3.11 PROTECTION

- A. Protect installed roofing and flashings from construction operations.
- B. Protect building surfaces, rooftop mounted equipment, piping, conduit, etc., against damage from roofing work.
- C. Where traffic must continue over finished roof membrane, protect surfaces using durable materials.
- D. Protection During Installation:
  - 1. When any of the following conditions are observed on the roof the Owner reserves the right to stop work on the roof until the non-compliance condition is corrected by the Contractor:
    - a. Roof is not protected from stored materials or equipment.
    - b. Roof is not protected from construction foot traffic.
    - c. Loads from hoisted, wheeled, or stored materials or equipment create a hazard to the roof assembly or structure.
    - d. Loose fasteners or sharp objects create a puncture hazard.
    - e. Excessive amounts of trash, dirt, or debris create an abrasion hazard to products or materials.
  - 2. Upon notification by the Owner to stop the work for a non-compliance condition follow these procedures:
    - a. Direct workforce to exit the roof immediately except for personnel dedicated to:
      - 1) Correcting the non-compliance condition(s).
      - 2) Installing temporary closures and night seals to prevent damage to products, materials, or the building.
    - b. Perform no other work on the roof until the non-compliance condition is corrected.
  - 3. Notify Architect when non-compliance conditions have been corrected; do not proceed with any other work on the roof until Architect has approved corrections.
  - 4. Cost and time associated with corrections to non-compliance conditions will be considered incidental to the Work; no separate payment or time extension will be allowed.

END OF SECTION



SECTION 07 6200  
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Fabricated sheet metal items, including flashings and counterflashings.
- B. Sheet metal and flashings not specifically described but required to prevent penetration of water through exterior building shell.

1.2 DEFINITIONS

- A. Substantial completion of sheet metal flashing work is defined as the contractually required and weathertight installation of roof system including specified roof preparation, flashings, counterflashings, sheet metal, fasteners, and sealants.

1.3 REFERENCE STANDARDS

- A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.
- B. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process; 2010 (Reapproved 2015).
- C. CDA A4050 - Copper in Architecture - Handbook; current edition.
- D. FM DS 1-28 - Wind Design; 2016.
- E. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.
- F. SPRI ES-1 - Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems; 2011.

1.4 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's technical product data, installation instructions, and general recommendations for each specified material and fabricated product.
- C. Identify each sealant type including sealant products used at concealed seams in flashings and other sheet metal fabrications.
- D. Shop Drawings: Indicate material profile, metal gages, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.
- E. Samples: Submit two samples 3 by 3 inch in size illustrating metal finish color.

## 1.5 QUALITY ASSURANCE

- A. Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.
- B. Edge Metal, Fascias, Flashings, and Securement: Provide in accordance with SPRI ES-1.
- C. Provide products complying with the following design wind pressures:
  - 1. Factory Mutual Classification: Class I and windstorm resistance of I-90, in accordance with FM DS 1-28.
- D. Fabricator and Installer Qualifications: Company specializing in sheet metal work with three years of documented experience.
- E. Provide products complying with roofing manufacturer's warranty requirements for leaks and wind resistance.
- F. Where sheet metal is required and no material or gage is indicated on the drawings, provide the highest quality and gage corresponding with the referenced standards.
- G. Coordinate with work of Section 07 4113 - Metal Roof Panels for installing flashings and fascias.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- B. Prevent contact with materials that could cause discoloration or staining.

## 1.7 WARRANTY

- A. Warrant all materials and workmanship for a period of two years from the date of acceptance of the completed work by the Owner. Correct defects in materials or workmanship that may develop during the two-year period by repairing or replacing defects at Contractor's expense without cost to the Owner.
- B. PVDF (Polyvinylidene Fluoride) Coating finish: 20-year warranty.

## PART 2 PRODUCTS

### 2.1 SHEET MATERIALS

- A. Provide materials that are compatible with the existing conditions and with each other.
- B. Provide products that do not contain asbestos or asbestos-related materials.
- C. Pre-Finished Sheet: ASTM A792/A792M aluminum-zinc alloy, pre-coated with polyvinylidene fluoride (PVDF) coating.
  - 1. PVDF Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system; color as selected from manufacturer's standard colors.
  - 2. Thickness: 24 gage (0.0239 inch).
- D. TPO Coated Metal: Refer to Section 07 5400 - Thermoplastic Membrane Roofing.

## 2.2 FLASHINGS, COUNTERFLASHINGS, FASCIAS, AND DRIP EDGES

- A. Configuration: As indicated.

## 2.3 FABRICATION

- A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- B. Fabricate cleats of same material as sheet, minimum 1 inches wide, interlocking with sheet.
- C. Form pieces in longest possible lengths.
- D. Hem exposed edges on underside 1/2 inch; miter and seal corners.
- E. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.
- F. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.
- G. Fabricate vertical faces with bottom edge formed outward and hemmed to form drip.

## 2.4 GUTTER AND DOWNSPOUT FABRICATION

- A. Gutters and Downspouts: Refer to Section 07 7123 - Manufactured Gutters and Downspouts.

## 2.5 ACCESSORIES

- A. Exposed Fasteners:
  - 1. Screws: Stainless steel with with factory-colored heads and EPDM washers.
  - 2. Pop Rivets: Stainless steel with with factory-colored heads, size to support applied loading.
- B. Concealed Fasteners: Screws, stainless steel or galvanized.
- C. Primer: Zinc chromate type.
- D. Sealant: Types as specified in Section 07 9200 - Joint Sealants.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.
- B. Verify roofing termination and base flashings are in place, sealed, and secure.
- C. Examine the areas and conditions under which work of this section will be installed. Correct conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Install starter and edge strips, and cleats before starting installation.
- B. Install components true to lines and levels.
- C. Back paint concealed metal surfaces in contact with cementitious or other dissimilar material in accordance with Section 09 9000.
- D. Provide protection of roofing surfaces from metal trimmings, foot traffic, and mechanical damage during flashing and sheet metal work.

### 3.3 INSTALLATION

- A. Comply with drawing details.
- B. Install sheet metal assemblies as required to meet warranty requirements and to prevent penetration of water through exterior building shell, whether specifically described or not.
- C. Prime joints and surfaces receiving sealant in accordance with manufacturer's requirements.
- D. Lap seams in the direction of the water flow; provide 3 inch minimum lap at seams that do not have a joint cover.
- E. Miter inside and outside corner joints in edge metal and expansion joints; Locate joints adjacent to inside and outside corners 24 inches in each direction from the corner, unless otherwise approved prior to fabrication and installation.
- F. Secure components in place as recommended by manufacturer. Use exposed fasteners only where permitted.
- G. Fasten clips and cleats 6 inches on center unless otherwise noted or unless other spacing is required by manufacturer.
- H. Fit components tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.
- I. Seal metal joints watertight.

### 3.4 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration of finishes.
- B. Remove unused sheet metal fasteners, scraps, and other debris resulting from sheet metal work that could puncture or damage roofing components.
- C. Provide final protection and maintain conditions that ensure sheet metal work during construction is without damage or deterioration other than natural weathering.
- D. Protect installed metal surfaces from subsequent construction operations.

END OF SECTION

SECTION 07 7100  
ROOF SPECIALTIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Manufactured roof specialties, including copings.

1.2 RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Wood blocking and nailers.
- B. Section 07 5100 - Built-Up Bituminous Membrane Roofing: Roofing system components.
- D. Section 07 7200 - Roof Accessories: Manufactured curbs.
- E. Section 07 7123 - Manufactured Gutters and Downspouts.

1.3 DEFINITIONS

- A. Substantial completion of sheet metal flashing work is defined as the contractually required and weathertight installation of roof system including specified roof preparation, insulation, roof membrane, copings, flashings, counterflashings, sheet metal, fasteners, and sealants.

1.4 REFERENCE STANDARDS

- A. SMACNA (ASMM) - Architectural Sheet Metal Manual; Sheet Metal and Air Conditioning Contractors' National Association; 2012.
- B. SPRI ES-1 - Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems; 2011.

1.5 SUBMITTALS

- A. See Section 01 3000 - Submittals for submittal procedures.
- B. Product Data: Provide data on shape of components, materials and finishes, anchor types and locations.
- C. Shop Drawings: Indicate configuration and dimension of components, adjacent construction, required clearances and tolerances, and other affected work.
  - 1. Copings: Indicate nailer and roof membrane.
- D. Manufacturer's Installation Instructions: Indicate special procedures, fasteners, supporting members, and perimeter conditions requiring special attention.

1.6 QUALITY ASSURANCE

- A. Perform work in accordance with SMACNA (ASMM) details.

## PART 2 PRODUCTS

### 2.1 COMPONENTS

- A. Copings: Factory fabricated to sizes required; mitered; concealed fasteners.
  - 1. Configuration: Factory fabricated to sizes required with concealed continuous hold down cleat at both legs; internal splice piece at joints of same material, thickness and finish as cap, and concealed stainless steel fasteners.
    - a. Form with 4-1/2 inch high front fascia and 3-1/2 inch high rear fascia, with watertight butted seams and hook-shaped drip edges; designed to snap onto anchor plate and lock without the use of exposed fasteners.
    - b. Cleat: Concealed, continuous 20 gage, L-shaped, galvanized cleat; formed to receive and lock coping into place without exposed fasteners.
    - c. Anchor Plate: Formed to lock copings in place without fasteners, fabricated from minimum 20 gage galvanized steel .
      - 1) Width: Full width of wall.
      - 2) Spacing: 5 feet on center, maximum.
    - d. Concealed Splice Plates: Galvanized plates, minimum 6 inches long provided with concealed butyl seal strips to assure leak tightness. Finish to match coping.
    - e. Expansion Joints: Provide 1/4-inch joint at splice plates to allow for thermal expansion.
    - f. Length: 144 inch sections, minimum.
  - 2. Pull-Off Resistance: Tested in accordance with SPRI ES-1 RE-3 to positive and negative design wind pressure as defined by applicable code.
  - 3. Material: Provide one of the following:
    - a. Formed aluminum sheet, 0.050 inch thick, minimum.
    - b. Pre-finished, formed metal sheet, 22 gage ASTM A 792/A 792M aluminum-zinc alloy coated to AZ50/AZM150.
  - 4. Finish: 70 percent polyvinylidene fluoride.
  - 5. Color: As scheduled.
  - 6. Guarantee: 20 years failure of finish and leaks.

### 2.2 ACCESSORIES

- A. Fasteners for Nailers at Copings: Secure nailer to substrate with two rows, staggered, minimum 32 inches on center, increased to 24 inches on center within 10 feet of corners; countersink fasteners flush with top of wood nailer.
  - 1. Concrete and masonry substrates: Provide 1/4 x 3-1/4 inches, self-tapping galvanized masonry screws with hex-heads.
  - 2. Metal stud framing substrates: Provide 1/4-14 x 3 inches, self-tapping galvanized screws with hex-heads and bonded washer.
- B. Coping Anchor Plate Anchorage Devices: Provide fasteners that show no more than 15% red rust corrosion after 30 cycles of Kesternich testing.



## 2.3 FINISHES

- A. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system; color as scheduled.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify that deck, curbs, roof membrane, base flashing, and other items affecting work of this Section are in place and positioned correctly.
- B. Verify that supplemental framing to support roof curb is in place and positioned correctly.
- C. Verify that wall construction, and other items affecting the work of this Section are in place and positioned correctly.

### 3.2 INSTALLATION

- A. Install components in accordance with manufacturer's instructions.
- B. Seal joints within components when required by component manufacturer.
- C. Anchor components securely.
- D. Coordinate installation of components of this section with installation of roofing membrane and base flashings.
- E. Coping: Install components in accordance with manufacturer's requirements.

### 3.3 SCHEDULES

- A. Copings: One color for entire project; Match color of concrete masonry units abutting coping.

END OF SECTION



SECTION 07 7123  
MANUFACTURED SCUPPERS, LEADERHEADS AND DOWNSPOUTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Downspouts.
- B. Leaderheads.
- C. Thru-wall scuppers.
- D. Precast concrete splash pads.

1.2 RELATED REQUIREMENTS

- A. Section 07 5100 - Built-Up Bituminous Membrane Roofing: Roof membrane and insulation.

1.3 REFERENCE STANDARDS

- A. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2015.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

1.4 SUBMITTALS

- A. See Section 01 3000 - Submittals, for submittal procedures.
- B. Shop Drawings: Indicate locations, configurations, jointing methods, fastening methods, locations, and installation details.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Stack material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope to drain.
- B. Prevent contact with materials that could cause discoloration, staining, or damage.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Pre-Finished Galvanized Steel Sheet: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 0.02 inch thick base metal.
  - 1. Finish: Shop pre-coated with modified silicone coating.
  - 2. Color: As selected from manufacturer's standard colors.

## 2.2 COMPONENTS

- A. Form sections square, true, and accurate in size, in maximum possible lengths, free of distortion or defects detrimental to appearance or performance.
- B. Downspouts: SMACNA plain rectangular profile. Pre-fabricated from minimum 10 foot lengths. Terminate bottom of downspout with 45-degree return to direct water away from building.
  - 1. Size: As indicated on Drawings.
  - 2. Downspout Supports: Brackets; Profile to suit downspouts.
    - a. Provide brackets in accordance with SMACNA Figure 1-35A.
    - b. Bracket fasteners at downspouts: Rivets.
    - c. Bracket fasteners at masonry and concrete walls: Expansion anchors.
    - d. Bracket fasteners at framed walls: Toggle bolts with collapsible, spring-loaded wings.
- C. Anchors and Supports: Profiled to suit leaderheads and downspouts.
  - 1. Anchoring Devices: In accordance with SMACNA requirements.
- D. Leaderhead and Thru-wall Scupper Assembly: Provide in accordance with SMACNA Figure 1-27, modified to terminate top of leaderhead at top of thru-wall scupper flange.
  - 1. Leaderhead: Provide in accordance with SMACNA Figure 1-25F, modified to include overflow cut-out.
    - a. Overflow Cut-Out: Provide 2 inches high by 3 inches wide cut-out opening to allow roof drainage to bypass clogged downspout; located on center of leaderhead with bottom of cut-out 2 inches above scupper invert elevation.
    - b. Provide leaderhead with flanged outlet for connection to downspout.
  - 2. Anchorage Devices: In accordance with SMACNA requirements.
- E. Fasteners: Galvanized steel.
- F. Copings: Refer to Section 07 7100 - Roof Specialties.

## 2.3 ACCESSORIES

- A. Splash Pads: Precast concrete type, size and profiles indicated; minimum 3000 psi at 28 days, with minimum 5 percent air entrainment.

## 2.4 FABRICATION

- A. Form downspouts, leaderheads, and thru-wall scuppers of profiles and sizes indicated.
- B. Fabricate with required connection pieces.
- C. Form sections square, true, and accurate in size, in maximum possible lengths, free of distortion or defects detrimental to appearance or performance. Allow for expansion at joints.
- D. Hem exposed edges of metal.
- E. Leaderhead and Thru-wall Scupper Assembly: Tin and solder seams of flanged outlet to downspout, and flanges of scupper at leaderhead connection. After soldering, remove flux, wipe and wash solder joints clean; weather seal joints.

F. Seal downspout connections to leaderheads watertight.

## 2.5 FINISHES

A. Modified silicone polyester coating: Baked enamel system conforming to AAMA 2603.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that surfaces are ready to receive work.

### 3.2 PREPARATION

A. Paint concealed metal surfaces and surfaces in contact with dissimilar metals with protective backing paint to a minimum dry film thickness of 15 mil.

### 3.3 INSTALLATION

- A. Install leaderheads, scuppers, and downspouts.
- B. Connect scuppers to leaderheads with seams flashed and soldered watertight.
- C. Connect leaderheads to downspouts with seams flashed and soldered watertight.
- D. Connect downspout sections together with formed seams flashed and sealed watertight.
- E. Downspouts, Scuppers, and Leaderheads:
  - 1. Rigidly support and secure components. Join lengths with formed seams sealed watertight.
  - 2. Downspouts that discharge onto earth or landscaped areas: Provide cast-in-place concrete splash pads as detailed at each location, centered on downspout and oriented to direct discharge away from building.
- F. Seal wall penetrations with sealant specified in Section 07 9200 - Joint Sealants.

END OF SECTION



SECTION 07 7200  
ROOF ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Manufactured curbs for unit skylights.

1.2 RELATED REQUIREMENTS

- A. Section 05 3100 - Steel Decking.
- B. Section 07 5100 - Built-up Bituminous Membrane Roofing: Roof membrane and insulation.
- D. Section 07 7123 - Manufactured Gutters and Downspouts.
- E. Section 08 4500 - Translucent Roof and Wall Assemblies: Skylights mounted to curbs.

1.3 REFERENCE STANDARDS

- A. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process; 2010 (Reapproved 2015).

1.4 SUBMITTALS

- A. See Section 01 3000 - Submittals for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used.
  - 1. Preparation instructions and recommendations.
  - 2. Storage and handling requirements and recommendations.
  - 3. Installation methods.
  - 4. Maintenance requirements.
- C. Shop Drawings: Submit detailed layout developed for this project. Show dimensioned location and number for each type of roof accessory.
  - 1. Manufactured Curbs: Indicate configuration and dimension of components, adjacent construction, required clearances and tolerances, and other affected work.
    - a. Indicate connections to roof deck.
    - b. Indicate roof insulation thickness abutting each roof curb.
    - c. Indicate curb height dimension of each roof curb as measured from roof material to top of curb (8 inches minimum required).

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store products under cover and elevated above grade.

## PART 2 PRODUCTS

### 2.1 MANUFACTURED CURBS

- A. Manufactured Curbs, Equipment Rails, and Other Roof Mounting Assemblies:
  - 1. Custom Curb, Inc.: [www.customcurb.com](http://www.customcurb.com).
  - 2. The Pate Company: [www.patecurbs.com](http://www.patecurbs.com).
  - 3. Roof Products, Inc.: [www.rpicurbs.com](http://www.rpicurbs.com).
  - 4. Thycurb, Div. of Thybar: [www.thybar.com](http://www.thybar.com).
- B. Manufactured Curbs: Factory-assembled hollow sheet metal construction with fully mitered and welded corners, internal reinforcing, and top side and edges formed to shed water.
  - 1. Sheet Metal: Hot-dip aluminum zinc alloy coated steel sheet (Galvalume) complying with ASTM A792/A792M; AZ55 coating designation; 18 gage, 0.048 inch thick.
  - 2. Manufacture curb bottom and mounting flanges for installation directly on roof deck, not on insulation; match slope and configuration of roof deck.
- C. Curbs at Translucent Roof Assemblies:
  - 1. Curb Width: 1-1/2 inches.
  - 2. Provide preservative treated wood nailers along top of curb.
  - 3. Insulate inside curbs with 1-1/2 inch thick fiberglass insulation.
  - 4. Height Above Finished Roof Surface: 8 inches, minimum, with curb flange mounted as detailed.
  - 5. Top of Curb Slope: 3 inches per foot.
  - 6. Exterior Finish: Mill finish aluminum.
  - 7. Product: TC-3 extra height as manufactured by Thybar Corporation.
- D. Thru-Wall Scuppers, Leaderheads, Gutters, and Downspouts: Refer to Section 07 7123 – Manufactured Gutters and Downspouts.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

### 3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.



### 3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions, in manner that maintains roofing weather integrity.

### 3.4 CLEANING

- A. Clean installed work to like-new condition.

### 3.5 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION



SECTION 07 9200  
JOINT SEALANTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Nonsag gunnable joint sealants.
- B. Self-leveling pourable joint sealants.
- C. Joint backings and accessories.

1.2 RELATED REQUIREMENTS

- A. Section 08 4500 - Translucent Wall and Roof Assemblies: Weatherseal sealants and accessories.
- B. Section 08 7100 - Door Hardware: Setting exterior door thresholds in sealant.

1.3 REFERENCE STANDARDS

- A. ASTM C834 - Standard Specification for Latex Sealants; 2014.
- B. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014.
- C. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.
- D. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants; 2002 (Reapproved 2013).
- E. ASTM C1382 - Standard Test Method for Determining Tensile Adhesion Properties of Sealants When Used in Exterior Insulation and Finish Systems (EIFS) Joints; 2011.

1.4 SUBMITTALS

- A. See Section 01 3000 - Submittals, for submittal procedures.
- B. Product Data for Sealants: Submit manufacturer's technical data sheets for each product to be used, that includes the following.
  - 1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
  - 2. List of backing materials approved for use with the specific product.
  - 3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
  - 4. Substrates the product should not be used on.
  - 5. Substrates for which use of primer is required.
  - 6. Sealant Type Identification: Identify manufacturer's products according to the same Sealant Types (Type ES-1 and Type ES-2, etc.) listed in Part 2 of this Section.
    - a. Failure to identify products according to Sealant Types listed in Part 2 of this Section will result in immediate rejection of the submittal.

C. Product Data for Accessory Products: Submit manufacturer's technical data sheets for each product to be used, including physical characteristics, installation instructions, and recommended tools.

1. Include product data for manufacturer's primers that will be used with sealants specified; identify substrates where primers will be required.

## 1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum 10 years documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section and with at least five years of documented experience.

## 1.6 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

## 1.7 COORDINATION

A. Coordinate the work with all sections referencing this section.

B. Do not apply concrete sealers until full sealant cure period recommended by manufacturers is attained.

## 1.8 WARRANTY

A. See Section 01 7000 – Contract Closeout, for additional warranty requirements.

B. Warranty: Include coverage for installed sealants and accessories which fail to achieve watertight seal, exhibit loss of adhesion or cohesion, or do not cure.

1. Provide the following warranties for specific types of sealants indicated:
  - a. Exterior Building Silicones: 20 years.
  - b. Building Urethane Sealants: 5 years.

# PART 2 PRODUCTS

## 2.1 MANUFACTURERS

A. Non-Sag Sealants: Permits application in joints on vertical surfaces without sagging or slumping.

1. BASF Construction Chemicals-Building Systems:  
[www.buildingsystems.basf.com](http://www.buildingsystems.basf.com).
2. Dow Corning Corporation: [www.dowcorning.com/construction/sle](http://www.dowcorning.com/construction/sle).
3. Momentive Performance Materials, Inc (formerly GE Silicones):  
[www.momentive.com/sle](http://www.momentive.com/sle).
4. Pecora Corporation: [www.pecora.com](http://www.pecora.com).
5. Tremco Global Sealants: [www.tremcosealants.com](http://www.tremcosealants.com).
6. Sika Corporation: [www.usa-sika.com](http://www.usa-sika.com).

- B. Self-Leveling Sealants: Pourable or self-leveling sealant that has sufficient flow to form a smooth, level surface when applied in a horizontal joint.
  - 1. BASF Construction Chemicals-Building Systems: [www.buildingsystems.basf.com](http://www.buildingsystems.basf.com).
  - 2. Dow Corning Corporation: [www.dowcorning.com/construction/sle](http://www.dowcorning.com/construction/sle).
  - 3. Tremco Global Sealants: [www.tremcosealants.com](http://www.tremcosealants.com).
  - 4. Sika Corporation: [www.usa-sika.com](http://www.usa-sika.com).
- C. Sealants for Security-Rated Areas: Elastomeric and epoxy sealants.
  - 1. BASF Construction Chemicals-Building Systems: [www.buildingsystems.basf.com](http://www.buildingsystems.basf.com).
  - 2. Pecora Corporation: [www.pecora.com](http://www.pecora.com).
  - 3. Sika Corporation: [www.usa-sika.com](http://www.usa-sika.com).

## 2.2 JOINT SEALANT APPLICATIONS

- A. Scope:
  - 1. Exterior Joints: Seal open joints, whether or not the joint is indicated on the drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to, the following items.
    - a. Wall expansion and control joints.
    - b. Joints between door, window, and other frames and adjacent construction.
    - c. Joints between different exposed materials.
    - d. Openings below ledge angles in masonry.
    - e. Refer to Schedule at the end of this Section.
  - 2. Do not seal the following types of joints.
    - a. Joints where sealant is specified to be provided by manufacturer of product to be sealed.

## 2.3 NONSAG JOINT SEALANTS

- A. Type SIL-2: Clear silicone; ASTM C 920, Type S, Grade NS, Class 25, Use NT; single component, mildew resistant; compliant with FDA Regulation No. 21 CFR 177.2600 and NSF Standard 51.
  - 1. Volatile organic compound (VOC) content: 33 grams/liter.
  - 2. Product: 786 Mildew Resistant Silicone Sealant as manufactured by Dow Corning Corp.
- B. Type SIL-4: Single component silicone sealant; ASTM C 920, Type S, Grade NS, Class 50, Uses M, NT, G, A, and O.
  - 1. Tensile Strength: 45 psi.
  - 2. Volatile Organic Content: 43 g/liter.
  - 3. Product: Dow 795 Silicone Building Sealant as manufactured by Dow Corning Corp.
- C. Type ES-1 - General Purpose Exterior Sealant: Polyurethane; ASTM C 920, Grade NS, Class 25, Uses NT, M, G, A and O; multi-component.
  - 1. Color: Match adjacent finished surfaces.
  - 2. Volatile organic compound (VOC) content: 80 grams per liter, maximum.

3. Product MasterSeal NP 2 as manufactured by BASF Construction Chemicals, LLC.
- D. Type ES-7: Low-modulus, solvent-free, nonsag, elastomeric, silyl-terminated polyether polymer (STPe); ASTM C 920, Type S, Grade NS, Class 100/50 for vertical joints, Use NT, M, G, A, and O; USDA compliant and for use with EIFS per ASTM C1382.
  1. Product MasterSeal NP 150 as manufactured by BASF Construction Chemicals, LLC.
    - a. Primer: Primer 733 as manufactured by BASF Construction Chemicals, LLC.
- E. Type AE-1 - General Purpose Interior Sealant: Acrylic emulsion latex; ASTM C834, Type OP, Grade NF single component, paintable.
  1. Color: Standard colors matching finished surfaces.
  2. Volatile organic compound (VOC) content: 35 grams per liter, maximum.
  3. Product: AC-20+ Silicone as manufactured by Pecora Corporation: [www.pecora.com](http://www.pecora.com).

#### 2.4 SELF-LEVELING SEALANTS

- A. Type ES-2: Self-leveling polyurethane; ASTM C920, Grade P, Class 25, Uses T and M; multi-component.
  1. Color: Standard colors matching finished surfaces.
  2. Volatile organic compound (VOC) content: 95 grams per liter, maximum.
  3. Product: MasterSeal SL 2 as manufactured by BASF Construction Chemicals, LLC.

#### 2.5 ACCESSORIES

- A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.
  1. Type for Joints Not Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type C - Closed Cell Polyethylene.
  2. Type for Joints Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type C - Closed Cell Polyethylene.
  3. Closed Cell and Bi-Cellular: 25 to 33 percent larger in diameter than joint width.
- B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.
- C. Masking Tape: Self-adhesive, nonabsorbent, non-staining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.
- D. Joint Cleaner: Non-corrosive and non-staining type, type recommended by sealant manufacturer; compatible with joint forming materials.
- E. Primers: Type recommended by sealant manufacturer to suit application; non-staining.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify that joints are ready to receive work.
- B. Verify that backing materials are compatible with sealants.
- C. Verify that backer rods are of the correct size.
- D. Verify that backer seal is of the correct size.

### 3.2 PREPARATION

- A. Remove loose materials and foreign matter that could impair adhesion of sealant.
- B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.
- C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
- D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.
- E. Concrete Floor Joints That Will Be Exposed in Completed Work: Test joint filler in inconspicuous area to verify that it does not stain or discolor slab.

### 3.3 INSTALLATION

- A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Perform installation in accordance with ASTM C1193.
- C. Measure joint dimensions and size joint backers to achieve the following, unless otherwise indicated:
  - 1. Width/depth ratio of 2:1.
  - 2. Neck dimension no greater than 1/3 of the joint width.
  - 3. Surface bond area on each side not less than 75 percent of joint width.
- D. Install bond breaker backing tape where backer rod cannot be used.
- E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.
- F. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.
- G. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.
- H. Concrete Floor Joint Filler: After full cure, shave joint filler flush with top of concrete slab.

### 3.4 SCHEDULE: NON-SECURITY-RATED AREAS

- A. Provide Sealant Type ES-1 at the following locations:
  - 1. Exterior expansion joints between paving and building where paving is sloped more than 1:50.

2. Exterior expansion joints in concrete paving sloped more than 1:50, where joints are indicated to receive sealant.
- B. Provide Sealant Type ES-2 at the following locations:
1. Exterior expansion joints in concrete slabs sloped 1:50 or less, where joints are indicated to receive sealant.
  2. Exterior expansion joints between paving and building where paving is sloped 1:50 or less.
  3. Interior expansion and control joints in concrete slabs and floors.
  4. Interior control and expansion joints in glazed floor tile.
- C. Provide Sealant Type ES-7 at the following exterior locations:
1. Concealed joints between ductwork and walls.
  2. Concealed joints between piping and walls.
  3. Joints between exposed concrete masonry and adjacent work.
  4. Joints in sheet metal flashings and counterflashings.
  5. Joints in sheet metal fascias, copings, drip edges, and gravel stops.
  6. Joints in sheet metal gutters, downspouts, leaderheads, and scuppers.
  7. Joints between metal frames and adjacent work.
  8. Joints between exposed metal and adjacent work.
  9. Joints under exterior door thresholds.
  10. Joints for which no other sealant type is indicated.
- D. Provide Sealant Type AE-1 at the following interior locations where joints will be covered with paint:
1. Joints between metal frames and field-painted surfaces of adjacent work.
  2. Joints between painted plywood and adjacent surfaces.
  3. Joints between painted concrete masonry and adjacent work.
- E. Provide Sealant Type SIL-2 at the following interior locations:
1. Joints between plumbing fixtures and surrounding surfaces.
  2. Joints between wet locations and adjacent work where sealant will be left exposed.
- F. Provide Sealant Type SIL-4 at the following locations:
1. Exterior locations:
    - a. Joints between translucent roof assemblies and adjacent work.
- G. Colors: Except as otherwise indicated provide colors that match adjacent surfaces.
1. Sealant Type SIL-2: Clear.
  2. Sealant Type SIL-4: Clear.

END OF SECTION



SECTION 08 1113  
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Non-fire-rated hollow metal doors and frames.
- B. Thermally insulated hollow metal doors.
- C. Accessories.

1.2 RELATED REQUIREMENTS

- A. Section 08 7100 - Door Hardware.
- B. Section 09 9000 - Painting and Coating: Field painting.

1.3 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- B. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2014.
- C. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2011.
- D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.
- E. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength, Low Alloy, and High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2015.
- F. ASTM A1011/A1011M - 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; 2014.
- G. ICC A117.1 - Accessible and Usable Buildings and Facilities; International Code Council; 2009 (ANSI).
- H. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames; 2007.

1.4 SUBMITTALS

- A. See Section 01 3300 - Submittals for submittal procedures.
- B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced standards/guidelines.

- C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.
- D. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.

## 1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- B. Manufacturer Qualifications: Provide all products from a single manufacturer who is a member of the Hollow Metal Manufacturer's Association or the Steel Door Institute.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
- B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

- A. Hollow Metal Doors and Frames:
  - 1. Ceco Door, an Assa Abloy Group company: [www.assaabloydss.com](http://www.assaabloydss.com).
  - 2. Amweld Building Products, Inc.: [www.amweld.com](http://www.amweld.com).
  - 3. Pioneer Industries, Inc: [www.pioneerindustries.com](http://www.pioneerindustries.com)
  - 4. Republic Doors: [www.republicdoor.com](http://www.republicdoor.com)
  - 5. Steelcraft, an Allegion brand: [www.allegion.com/us](http://www.allegion.com/us).

### 2.2 DESIGN CRITERIA

- A. Requirements for Hollow Metal Doors and Frames:
  - 1. Steel used for fabrication of doors and frames shall comply with one or more of the following requirements; Galvannealed steel conforming to ASTM A653/A653M, cold-rolled steel conforming to ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel conforming to ASTM A1011/A1011M, Commercial Steel (CS) Type B for each.
  - 2. Accessibility: Comply with ICC A117.1 and ADA Standards.
  - 3. Door Top and Bottom Closures: Fully welded, flush with faces and edges.
- B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

### 2.3 HOLLOW METAL DOORS

- A. Exterior Doors: Thermally insulated.
  - 1. Grade: ANSI/SDI A250.8 (SDI-100); Level 3 - Extra Heavy-Duty, Physical Performance Level A, Model 2 - Seamless.
  - 2. Core Material: Manufacturers standard core material/construction and in compliance with requirements.
  - 3. Door Thickness: 1-3/4 inch, nominal.
  - 4. Weatherstripping: Refer to Section 08 7100.
  - 5. Product and Manufacturer: 747T Series with flush top and bottom, Curries Company, a division of Essex Industries, Inc.: [www.curries.com](http://www.curries.com) or equal.

### 2.4 HOLLOW METAL FRAMES

- A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.
- B. Exterior Frames: Fully welded.
  - 1. Weatherstripping: Separate, see Section 08 7100.
- C. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.

### 2.5 ACCESSORIES

- A. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered or butted corners; prepared for countersink style tamper proof screws.
- B. Mechanical Fasteners for Concealed Metal-to-Metal Connections: Self-drilling, self-tapping, steel with electroplated zinc finish.
- C. Grout for Frames: Portland cement grout with maximum 4 inch slump for hand troweling; thinner pumpable grout is prohibited.
- D. Silencers: Resilient rubber, fitted into drilled hole; 3 on strike side of single door, 3 on center mullion of pairs, and 2 on head of pairs without center mullions.
- E. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.
- F. Frame Anchors: Manufacturer's standard anchoring devices for indicated opening types, minimum six per frame, with anchoring device accessories specified in manufacturer's installation instructions.
  - 1. Masonry or concrete construction: Provide masonry wire anchors or masonry T-shaped anchors.
  - 2. Door Frames: Provide 3 anchors minimum for each jamb for frames up to 78 inches in height; 4 anchors up to 96 inch jamb height; one additional anchor each 24 inches or fraction thereof over 96 inch jamb height.
    - a. Door frame anchor locations: Provide anchors on each jamb at hinge and strike levels.

## 2.6 FINISHES

- A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.
- B. Bituminous Coating: Asphalt emulsion or other high-build, water-resistant, resilient coating.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Verify that finished walls are in plane to ensure proper door alignment.

### 3.2 PREPARATION

- A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

### 3.3 INSTALLATION

- A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.
- B. Coordinate frame anchor placement with wall construction.
- C. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.
- D. Grout frames using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.
- E. Coordinate installation of hardware.

### 3.4 TOLERANCES

- A. Clearances Between Door and Frame: Comply with related requirements of specified door and frame standards or custom guidelines indicated.
- B. Maximum Diagonal Distortion: 1/16 in measured with straight edge, corner to corner.

### 3.5 ADJUSTING

- A. Adjust for smooth and balanced door movement.

### 3.6 SCHEDULE

- A. Refer to Door and Frame Schedule on the drawings.

END OF SECTION

SECTION 08 3323  
OVERHEAD COILING DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Overhead coiling doors, operating hardware, exterior, electric operation.
- B. Wiring from electric circuit disconnect to operator to control station.

1.2 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.
- B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2015.
- C. ITS (DIR) - Directory of Listed Products; Intertek Testing Services NA, Inc.; current edition.
- D. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; National Electrical Manufacturers Association; 2000 (R2005), with errata, 2008.
- E. NEMA MG 1 - Motors and Generators; National Electrical Manufacturers Association; 2014.
- F. UL (DIR) - Online Certifications Directory; Underwriters Laboratories Inc.; current listings at [database.ul.com](http://database.ul.com).
- G. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems; Current Edition, Including All Revisions.

1.3 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide general construction, electrical equipment, and component connections and details.
- C. Shop Drawings: Indicate pertinent dimensioning, anchorage methods, hardware locations, and installation details.
- D. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.
- E. Manufacturer's Installation Instructions: Indicate installation sequence and procedures, adjustment and alignment procedures.
- F. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
- G. Maintenance Data: Indicate lubrication requirements and frequency and periodic adjustments required.

#### 1.4 QUALITY ASSURANCE

- A. Provide exterior assemblies that withstand positive wind loads of 20 psf, without undue deflection or damage to components.
- B. Installer Qualifications: Company specializing in performing the work of this section, with minimum ten years' experience and authorized by the overhead door manufacturer as an approved installer for each overhead door system included in this section for at least five years from the Bid Date of this project.
- C. Provide doors capable of withstanding 50 cycles per day and an overall maximum of 50,000 operating cycles for the life of the door.

#### 1.5 REGULATORY REQUIREMENTS

- A. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified and indicated.

#### 1.6 WARRANTY

- A. Provide two year manufacturer's warranty against defects in workmanship and materials.

### PART 2 PRODUCTS

#### 2.1 MANUFACTURERS

- A. Exterior Coiling Doors:
  - 1. Cornell Iron Works Inc.: [www.cornelliron.com](http://www.cornelliron.com).
  - 2. The Cookson Company: [www.cooksondoor.com](http://www.cooksondoor.com).
  - 3. Overhead Door Corporation: [www.overheaddoor.com](http://www.overheaddoor.com).

#### 2.2 COILING DOORS

- A. Exterior Coiling Doors: Steel slat curtain.
  - 1. Capable of withstanding positive wind loads of 25 psf, without undue deflection or damage to components.
- B. Sandwich slat construction with insulated core of foamed-in-place polyurethane insulation; minimum R-value of 8.0.
- C. Finish: Factory painted, color as selected.
- D. Guides: Angles; galvanized steel.
- E. Hood Enclosure: Refer to Schedule at end of this Section.
- F. Electric operation.
  - 1. Watertight components.
  - 2. Mounting: Within framed opening.
  - 3. Locking Devices: Slide bolt on inside.

- G. Product and Manufacturer: Type FMWI - Motor (Gearhead) Operated Service Door,  
The Cookson Company: [www.cooksondoor.com](http://www.cooksondoor.com) or equal.

## 2.3 MATERIALS

- A. Curtain Construction: Interlocking slats.
1. Slat Ends (end locks): Each slat fitted with end locks to act as wearing surface in guides and to prevent lateral movement.
    - a. Endlocks: Nylon.
  2. Windlocks: Manufacturer's standard, corrosion-resistant; provide as required to meet wind load requirements.
  3. Curtain Bottom: Fitted with angles to provide reinforcement and positive contact in closed position.
    - a. Angles: Manufacturer's standard, galvanized.
    - b. Exterior Finish: Powder coat to match slats.
    - c. Interior Finish: Powder coat to match slats.
  4. Weatherstripping: Moisture and rot proof, resilient type, located at jamb edges, bottom of curtain, and where curtain enters hood enclosure of exterior doors.
    - a. Provide weatherstripping on interior and exterior sides of jamb edges to resist movement caused by wind.
- B. Steel Slats: ASTM A 653/A 653M galvanized steel sheets, sandwich slat construction.
1. Slat height: 2-1/4 inch.
  2. Total Slat Thickness: 15/16 inches.
  3. Exterior Slat: 18 gage.
  4. Interior Slat: 22 gage.
  5. Galvanizing: Minimum G90/Z275 coating.
  6. Concealed Insulation: Manufacturer's standard rigid type that will not produce a flame spread greater than 25 and a smoke generation greater than 50.
  7. Factory Finish and Color: Refer to Finishes article in this Section.
- C. Guide Construction: Continuous, of profile to retain door in place, mounting brackets of same metal.
- D. Steel Guides: ASTM A36/A36M steel angles, size as required for wind loading, hot-dip galvanized per ASTM A 123/A 123M.
1. Factory Finish: Baked-on polyester powder coat, 2.5 mils dry film thickness.
  2. Color: Match slat color.
- E. Hood Enclosure: Refer to Schedule at end of this Section.
- F. Lock Hardware:
1. For motor operated units, additional lock or latching mechanisms are not required.
  2. Latching Mechanism: Inside mounted, adjustable keeper, spring activated latch bar feature to keep in locked or retracted position.
  3. Latch Handle: Manufacturer's standard.
  4. Slide Bolt: Provide on both-jamb sides, extending into slot in guides, with padlock-locking capability on both sides.

5. Auxiliary Chain Lift: Provide manufacturer's standard, stored above coil near disconnect switch.
- G. Roller Shaft Counterbalance: Steel pipe and helical steel spring system, capable of producing torque sufficient to ensure smooth operation of curtain from any position and capable of holding position at mid-travel; with adjustable spring tension; requiring 25 lb nominal force to operate.
  1. Provide barrel with corrosion resistant coating.
- H. Brackets: Steel plate with permanently lubricated ball or roller bearings at rotating support points to support counterbalance shaft assembly and form end closures.
  1. Factory Finish: Baked-on polyester powder coat, 2.5 mils dry film thickness.
  2. Color: Match slat color.

## 2.4 FINISHES

- A. Factory Finish: Two-coat polyester based powder coat:
  1. First Coat: Corrosion inhibiting primer, minimum 0.2 mils dry film thickness.
  2. Finish Coat: Polyester-based powder coating, heat cured, minimum 1.5 mils dry film thickness.
    - a. Color: As selected by Architect from manufacturer's standards.
    - b. Product and Manufacturer: ColorCote, The Cookson Company: [www.cooksondoor.com](http://www.cooksondoor.com) or equal.

## 2.5 ELECTRIC OPERATION

- A. Operator, Controls, Actuators, and Safeties: Comply with UL 325; provide products listed by ITS (DIR), UL (DIR), or testing agency acceptable to authorities having jurisdiction.
  1. Provide interlock switches on motor operated units.
- B. Electric Operators:
  1. Mounting: Refer to Schedule at end of this Section.
  2. Motor Enclosure:
    - a. Exterior Doors: NEMA MG 1, Type 4; open drip proof.
  3. Motor Rating: 1/2 hp; continuous duty.
  4. Motor Voltage: 120 volt, single phase, 60 Hz.
  5. Motor Controller: NEMA ICS 2, full voltage, reversing magnetic motor starter.
  6. Controller Enclosure: NEMA 250 Type 4, key operated.
  7. Opening Speed: 8 - 9 inches per second.
  8. Brake: Adjustable friction clutch type, activated by motor controller.
  9. Manual override in case of power failure.
  10. Product and Manufacturer: Model MG (Industrial Duty Gear Head) Operator, The Cookson Company, Inc.: [www.cooksondoor.com](http://www.cooksondoor.com) or equal.
- C. Control Station: Standard three button (OPEN-STOP-CLOSE) momentary control for each operator.
  1. 24 volt circuit.
  2. NEMA 4/12 open, drip proof with keyed lockout; Surface mounted.



- 3. Watertight.
- D. Safety Edge: Located at bottom of curtain, full width, electro-mechanical sensitized type, wired to stop operator upon striking object, hollow rubber covered.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify that opening sizes, tolerances and conditions are acceptable.

### 3.2 INSTALLATION

- A. Install units in accordance with manufacturer's instructions.
- B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.
- C. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.
- D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.
- E. Complete wiring from disconnect to unit components.

### 3.3 TOLERANCES

- A. Maintain dimensional tolerances and alignment with adjacent work.
- B. Maximum Variation From Plumb: 1/16 inch.
- C. Maximum Variation From Level: 1/16 inch.
- D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 ft straight edge.

### 3.4 ADJUSTING

- A. Adjust operating assemblies for smooth and noiseless operation.
- B. Modify door bottom, weatherstripping, and curtain construction to conform to irregular surfaces which project above the plane of the floor, as required to provide a tight seal.

### 3.5 CLEANING

- A. Clean installed components.
- B. Remove labels and visible markings.

### 3.6 SCHEDULE

- A. Exterior Coiling Door Type A; provide with components specified in this Section, and with the following features:
  - 1. Location: Treatment Rooms 101.
  - 2. Size: As indicated on the Drawings.
  - 3. Motor Mounting: Side mounted, with motor in horizontal position.

4. Hood Enclosure: Manufacturer's standard curved profile; galvanized steel; internally reinforced to maintain rigidity and shape; with internal baffle to prevent air infiltration.
  - a. Finish: Minimum 24 gage, galvanized.

END OF SECTION

## SECTION 087100

### DOOR HARDWARE

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

- A. This Section includes commercial door hardware for the following:
  - 1. Swinging doors.
  - 2. Other doors to the extent indicated.
- B. Door hardware includes, but is not necessarily limited to, the following:
  - 1. Mechanical door hardware.
  - 2. Cylinders specified for doors in other sections.
- C. Related Sections:
  - 1. Division 08 Section "Hollow Metal Doors and Frames".
- D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
  - 1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
  - 2. ICC/IBC - International Building Code.
  - 3. NFPA 70 - National Electrical Code.
  - 4. NFPA 80 - Fire Doors and Windows.
  - 5. NFPA 101 - Life Safety Code.
  - 6. NFPA 105 - Installation of Smoke Door Assemblies.
  - 7. State Building Codes, Local Amendments.
- E. Standards: All hardware specified herein shall comply with the following industry standards:
  - 1. ANSI/BHMA Certified Product Standards - A156 Series
  - 2. UL10C – Positive Pressure Fire Tests of Door Assemblies

### 1.3 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
- B. Door Hardware Schedule: 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.
  - 1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
  - 2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
  - 3. Content: Include the following information:
    - a. Type, style, function, size, label, hand, and finish of each door hardware item.
    - b. Manufacturer of each item.
    - c. Fastenings and other pertinent information.
    - d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
    - e. Explanation of abbreviations, symbols, and codes contained in schedule.
    - f. Mounting locations for door hardware.
    - g. Door and frame sizes and materials.
    - h. Warranty information for each product.
  - 4. Submittal Sequence: 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. 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: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.
- D. Informational Submittals:
  - 1. 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.

- E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.

#### 1.4 QUALITY ASSURANCE

- A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.
- 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: 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. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. 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. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:
  - 1. Function of building, purpose of each area and degree of security required.
  - 2. Plans for existing and future key system expansion.
  - 3. Requirements for key control storage and software.
  - 4. Installation of permanent keys, cylinder cores and software.
  - 5. Address and requirements for delivery of keys.
- G. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "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.

1. 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. 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.
  2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
  3. Review sequence of operation narratives for each unique access controlled opening.
  4. Review and finalize construction schedule and verify availability of materials.
  5. Review the required inspecting, testing, commissioning, and demonstration procedures
- H. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
- B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
- C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

#### 1.6 COORDINATION

- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.
- B. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

#### 1.7 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

- B. Warranty Period: 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:
  - 1. Structural failures including excessive deflection, cracking, or breakage.
  - 2. Faulty operation of the hardware.
  - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
  - 4. Electrical component defects and failures within the systems operation.
- C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.
- D. Special Warranty Periods:
  - 1. Ten years for extra heavy duty cylindrical (bored) locks and latches.
  - 2. Five years for exit hardware.
  - 3. Twenty five years for manual overhead door closer bodies.

## 1.8 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: 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.

## PART 2 - PRODUCTS

### 2.1 SCHEDULED DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.
- B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:
  - 1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.
- C. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

## 2.2 HANGING DEVICES

- A. Hinges: ANSI/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. Two Hinges: For doors with heights up to 60 inches.
    - b. Three Hinges: For doors with heights 61 to 90 inches.
    - c. Four 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.
  2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
    - a. Widths up to 3'0": 4-1/2" standard or heavy weight as specified.
    - b. Sizes from 3'1" to 4'0": 5" standard or heavy weight as specified.
  3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
    - a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
    - b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.
  4. Hinge Options: Comply with the following:
    - a. 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.
  5. Manufacturers:
    - a. Bommer Industries (BO) - LB Series.
    - b. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - TA Series.

## 2.3 CYLINDERS AND KEYING

- A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.
- B. Source Limitations: Obtain each type of keyed cylinder and keys from the same source manufacturer as locksets and exit devices, unless otherwise indicated.
1. Manufacturers:
    - a. Corbin Russwin Hardware (RU).



- C. Cylinders: Original manufacturer cylinders complying with the following:
  - 1. Mortise Type: Threaded cylinders with rings and cams to suit hardware application.
  - 2. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
  - 3. Bored-Lock Type: Cylinders with tailpieces to suit locks.
  - 4. 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.
  - 5. Keyway: Manufacturer's Standard.
  
- D. Permanent Cores: Manufacturer's standard; finish face to match lockset; complying with the following:
  - 1. Interchangeable Cores: Core insert, removable by use of a special key; usable with other manufacturers' cylinders.
  
- E. Keying System: Each type of lock and cylinders to be factory keyed.
  - 1. Conduct specified "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.
  
- F. Key Quantity: Provide the following minimum number of keys:
  - 1. Change Keys per Cylinder: Two (2)
  - 2. Master Keys (per Master Key Level/Group): Five (5).
  - 3. Construction Keys (where required): Ten (10).
  - 4. Construction Control Keys (where required): Two (2).
  - 5. Permanent Control Keys (where required): Two (2).
  
- G. Construction Keying: Provide construction master keyed cylinders.
  
- H. Construction Keying: Provide temporary keyed construction cores.
  
- I. Key Registration List (Bitting 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.

## 2.4 MECHANICAL LOCKS AND LATCHING DEVICES

- A. Tubular Locksets, Grade 1 (Extra-Heavy Duty): ANSI/BHMA A156.2 Series 4000, Grade 1 certified.
  - 1. Locksets to withstand 3000 inch pounds of torque applied to the locked lever without gaining access.

2. Locksets to fit a standard 2 1/8" bore without the use of through-bolts.
3. Lever handles to be made of solid material with no plastic fillers.
4. Latchbolt head to be one-piece stainless steel construction encased within the lock body.
5. Extended cycle test: Locks to have been cycle tested in ordinance with ANSI/BHMA A156.2 requirements to 34 million cycles.
6. Furnish with standard 2 3/4" backset and 1/2" throw latchbolt (3/4" at rated paired openings).
7. Manufacturers:
  - a. Corbin Russwin Hardware (RU) – CL3100 Series.
  - b. Sargent Manufacturing (SA) – 11 Line.

## 2.5 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 three-piece antifriction latchbolts, 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: For locks at double acting doors. 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.

## 2.6 CONVENTIONAL EXIT DEVICES

- A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:
  1. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.

2. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer's catalog and template book for specific requirements.
  3. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
  4. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
  5. Flush End Caps: Provide flush end caps made of architectural metal in the same finish as the devices as in the Hardware Sets. Plastic end caps will not be acceptable.
  6. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.
    - a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
    - b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.
  7. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
  8. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2" wide stiles.
  9. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
  10. Extended cycle test: Devices to have been cycle tested in ordinance with ANSI/BHMA 156.3 requirements to 9 million cycles.
  11. Rail Sizing: Provide exit device rails factory sized for proper door width application.
  12. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.
- B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 certified panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Exit device latch to be stainless steel, pullman type, with deadlock feature.
1. Manufacturers:
    - a. Corbin Russwin Hardware (RU) - ED4000 / ED5000 Series.
    - b. Sargent Manufacturing (SA) - 80 Series.

## 2.7 DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers including installation and adjusting information on inside of cover.
2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
3. Cycle Testing: Provide closers which have surpassed 15 million cycles in a test witnessed and verified by UL.
4. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the physically handicapped, provide units complying with ANSI ICC/A117.1.
5. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
6. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
7. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.

B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.

1. Manufacturers:
  - a. Corbin Russwin Hardware (RU) - DC8000 Series.
  - b. Sargent Manufacturing (SA) - 351 Series.
  - c. Norton Door Controls (NO) - 7500 Series.

C. Door Closers, Surface Mounted (Unitrol): Unitrol arms to have door stop mechanism to absorb dead stop shock on arm and top hinge. Hold-open arms to have a spring loaded mechanism in addition to shock absorber assembly. Arms to be provided with rigid steel main arm and secondary arm lengths proportional to the door width.

1. Manufacturers:

- a. Corbin Russwin Hardware (RU) - Unitrol Series.
- b. Norton Door Controls (NO) - Unitrol Series.

## 2.8 ARCHITECTURAL TRIM

### A. Door Protective Trim

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1" LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.
3. Where plates are applied to fire rated doors with the top of the plate more than 16" above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer's catalog and template book for specific requirements for size and applications.
4. Protection Plates: ANSI/BHMA A156.6 certified protection plates (kick, armor, or mop), fabricated from the following:
  - a. Stainless Steel: 300 grade, 050-inch thick.
5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.
6. Manufacturers:
  - a. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).

## 2.9 DOOR STOPS AND HOLDERS

- A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.
- B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 certified door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.
  1. Manufacturers:
    - a. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).

## 2.10 ARCHITECTURAL SEALS

- A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.
- B. Smoke Labeled Gasketing: Assemblies complying 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 according to UL 1784.
  - 1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.
- C. Fire Labeled Gasketing: Assemblies complying 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 according to UL-10C.
  - 1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NPFA 252, Standard Methods of Fire Tests of Door Assemblies.
- D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.
- E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
- F. Manufacturers:
  - 1. National Guard Products (NG).
  - 2. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE).

## 2.11 FABRICATION

- A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

## 2.12 FINISHES

- A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.
- B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware

- C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

### 3.2 PREPARATION

- A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.
- B. Wood Doors: Comply with ANSI/DHI A115-W series.

### 3.3 INSTALLATION

- A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.
  - 1. 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. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
  - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
  - 2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
  - 3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
  - 4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.
- C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. 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 Division 9

Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

- D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."
- E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. 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.

### 3.4 FIELD QUALITY CONTROL

- A. Field Inspection (Punch Report): Reference Division 01 Section "Closeout Procedures" for project punch and reporting requirements including compliance with approved submittals and verification door hardware is properly installed, operating and adjusted.

### 3.5 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

### 3.6 CLEANING AND PROTECTION

- A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.
- B. Clean adjacent surfaces soiled by door hardware installation.
- C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

### 3.7 DEMONSTRATION

- A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

### 3.8 DOOR HARDWARE SETS

- A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with



corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

1. Quantities listed are for each pair of doors, or for each single door.
2. The supplier is responsible for handing and sizing all products.
3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate selection for the material and application.
4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.

B. Manufacturer's Abbreviations:

1. MK - McKinney
2. RU - Corbin Russwin
3. RO - Rockwood
4. PE - Pemko
5. OT - Other

**Hardware Sets**

**Set: 1.0**

Doors: **101B**

3 Hinge, Hvy Wt	T4A3386 NRP	US32D	MK
1 Rim Exit Device, Nightlatch	ED5200 VT957ET M110 CT6B	630	RU
1 Core	CR8000	626	RU
1 Surface Closer/PA/Stop	DC8210 A11	689	RU
1 Surface Closer/PA	DC8210 A3	689	RU
1 Kick Plate	K1050 10" x 2" LDW CSK BEV	US32D	RO
1 Wall Stop	406	US32D	RO
1 Threshold	171A		PE
1 Gasketing	303AS		PE
1 Rain Guard	346C		PE
1 Sweep	315CN		PE

**Set: 2.0**

Doors: **101C**

3 Hinge, Hvy Wt	T4A3386 NRP	US32D	MK
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1 Rim Exit Device, Nightlatch	ED5200 VT957ET M110 CT6B	630	RU
1 Core	CR8000	626	RU
1 Surface Closer/PA/Stop	DC8210 A11	689	RU
1 Kick Plate	K1050 10" x 2" LDW CSK BEV	US32D	RO
1 Threshold	171A		PE
1 Gasketing	303AS		PE
1 Rain Guard	346C		PE
1 Sweep	315CN		PE

**Set: 3.0**

Doors: 102

3 Hinge, Hvy Wt	T4A3386	US32D	MK
1 Storeroom Lock	CL3157 NZD CT6B	626	RU
1 Core	CR8000	626	RU
1 Surface Closer/Reg	DC8200 A10	689	RU
1 Kick Plate	K1050 10" x 2" LDW CSK BEV	US32D	RO
1 Wall Stop	406	US32D	RO
1 Gasketing	S88D		PE

**Set: 4.0**

Doors: 103

1 Storeroom Lock	CL3157 NZD CT6B	626	RU
1 Core	CR8000	626	RU
1 Balance of Hardware	By Gate Supplier		OT

**Set: 5.0**

Doors: 101A

1 Hardware	By Overhead Door Supplier		OT
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END OF SECTION 087100

SECTION 09 2236.23  
METAL LATH

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Metal lath for cement plaster.

1.2 RELATED REQUIREMENTS

- A. Section 09 2400 - Cement Plastering.

1.3 REFERENCE STANDARDS

- A. ASTM C841 - Standard Specification for Installation of Interior Lathing and Furring; 2003 (Reapproved 2013).
- B. ASTM C847 - Standard Specification for Metal Lath; 2014a.
- C. ASTM C1032 - Standard Specification for Woven Wire Plaster Base; 2014.
- D. ASTM C1063 - Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster; 2017a.

1.4 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on furring and lathing components, structural characteristics, material limitations, and finish.
  - 1. Provide data on slip sheets used between metal lath and fluid-applied weather barrier.

1.5 QUALITY ASSURANCE

- A. Install lath and accessories in accordance requirements of local authorities having jurisdiction.
- B. Installer Qualifications: Company specializing in performing the work of this section a minimum five years documented experience.

PART 2 PRODUCTS

2.1 LATH ASSEMBLIES

- A. Provide completed assemblies with the following characteristics:
  - 1. Maximum Deflection of Vertical Assemblies: 1:360 under lateral point load of 100 lbs.
  - 2. Maximum Deflection of Horizontal Assemblies: 1:240 deflection under dead loads and wind uplift.

## 2.2 METAL LATH

- A. Stucco Netting: ASTM C1032, woven wire hexagonal shaped lath, galvanized, self-furring.
  - 1. Hexagonal Size: 1 inch.
  - 2. Thickness: 20 gage, minimum.
- B. Diamond Mesh Metal Lath: ASTM C847, galvanized; self-furring.
  - 1. Weight: To suit application, comply with deflection criteria, and as specified in ASTM C841 or ASTM C1063 for framing spacing.
  - 2. Weight: 3.4 lb/sq yd.
- C. Corner Mesh: Formed sheet steel, minimum 0.018 inch thick, perforated flanges shaped to permit complete embedding in plaster, minimum 2 inch size; same finish as lath.
- D. Strip Mesh: Expanded metal lath, same weight as lath, 2 inch wide by 24 inch long; same finish as lath.
- E. Mesh Reinforcing: Specified in Section 09 2400.
- F. Beads, Screeds, Joint Accessories, and Other Trim: Depth governed by plaster thickness, and maximum possible lengths.
  - 1. Material: Formed galvanized sheet steel, expanded metal flanges.
  - 2. LC Beads (Casing Beads): J-shaped; Square edges.
  - 3. Corner Beads: Radiused corners.
  - 4. Foundation Weep Screed: Formed 26-gage galvanized steel with perforated V-stop, depth governed by plaster thickness, maximum possible lengths; with perforated, 3-1/2 inch nailing flanges.
  - 5. Control Joints: Accordion profile, galvanized, with factory-installed protective tape, 2 inch flanges.
- G. Corner Reinforcement: Welded wire mesh formed into rounded or straight angle shape with 2-1/2 inch outstanding legs, with radiused edges, galvanized.

## 2.3 ACCESSORIES

- A. Weather barriers: Refer to Section 07 2500 - Weather Barriers.
- B. Anchorage: Tie wire, masonry nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place, galvanized.
- C. Fasteners: As recommended by lath product manufacturers or local code officials for substrate, whichever is more stringent.
- D. Tie Wire: Annealed galvanized steel.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that substrates are ready to receive work and conditions are suitable for application.
- C. Do not begin until unacceptable conditions have been corrected.
- D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

### 3.2 INSTALLATION - GENERAL

- A. Install metal lath and furring for Portland cement plaster in accordance with ASTM C1063.

### 3.3 CONTROL JOINT INSTALLATION

- A. Locate joints as indicated on drawings and comply with ASTM C1063.
- B. Install prefabricated joint accessories in accordance with ASTM C1063.
- C. Locate control joints as indicated on on Drawings.

### 3.4 LATH INSTALLATION

- A. Apply lath taut, with long dimension perpendicular to supports.
- B. Lap or nest ends of metal lath in accordance with ASTM C841.
- C. Secure end laps with tie wire where they occur between supports.
- D. Attach metal lath to masonry joints with masonry nails at maximum 12 inches on center, or as recommended by metal lath manufacturer, whichever is closer.
- E. Continuously reinforce internal angles with corner mesh, except where the metal lath returns 3 inches from corner to form the angle reinforcement; fasten at perimeter edges only.
- F. Place corner bead at external corners; fasten at outer edges of lath only.
- G. Place foundation weep screeds at locations required by local governing authorities; embed laps with sealant specified in Section 07 9200.
- H. Place mesh reinforcing specified in Section 09 2400 centered over junctions of dissimilar backing materials.
- I. Place 4 inch wide strips of metal lath centered over junctions of dissimilar backing materials in accordance with Section 09 2400. Secure rigidly in place.
- J. Place lath vertically above each top corner and each side of door and glazed frames to 6 inches above ceiling line.
- K. Place casing beads at terminations of plaster finish. Butt and align ends. Secure rigidly in place.
- L. Place strip mesh diagonally at corners of lathed openings in accordance with Section 09 2400. Secure rigidly in place.

### 3.5 TOLERANCES

- A. Maximum Variation from True Lines and Levels: 1/16 inch in 10 feet.
- B. Maximum Variation from True Position: 1/16" inch.

### 3.6 PROTECTION

- A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 09 2400  
CEMENT PLASTERING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Cement plastering.

1.2 REFERENCE STANDARDS

- A. ASTM C926 - Standard Specification for Application of Portland Cement-Based Plaster; 2017.

1.3 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittals procedures.
- B. Product Data: Provide data on plaster materials and trim accessories.
- C. Evaluation Service Reports: Show compliance with specified requirements.
- D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- E. Samples for Verification: For each finish product specified, two samples, minimum size 12 inches square, illustrating finish color and texture.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience.

1.5 FIELD CONDITIONS

- A. Exterior Plaster Work: Do not apply plaster when substrate or ambient air temperature is 40 degrees F or lower, or when temperature is expected to drop below 40 degrees F within 48 hours of application.

PART 2 PRODUCTS

2.1 CEMENT PLASTER APPLICATIONS

- A. Lath Plaster Base: Metal lath.
  - 1. Plaster Type: Factory prepared plaster mix.
  - 2. Number of Coats: Three.

2.2 FACTORY PREPARED CEMENT PLASTER

- A. Exterior Portland cement plaster system made of scratch and brown base coat and acrylic finish coat; install in accordance with ASTM C926.
  - 1. Basis of Design: Sto Powerwall ci; Sto Corp: [www.stocorp.com/#sle](http://www.stocorp.com/#sle).
    - a. Substitutions: See Section 01 6000 - Product Requirements.

2. Provide continuous exterior insulation as part of the system, as specified in Section 07 2100 - Thermal Insulation.
  3. Provide continuous weather barrier as part of the system, as specified in Section 07 2500 - Weather Barriers.
- B. Premixed Base Coats: Mixture of cement, aggregate, and proprietary admixtures for scratch and brown coats; install in accordance with ASTM C926.
1. Product: Sto Powerwall ci; Sto Corp: [www.stocorp.com/#sle](http://www.stocorp.com/#sle).
- C. Premixed Finish Coating: Water-based, air curing, acrylic-based, vapor permeable, UV-resistant, color consistent coating that includes dirt-resistant technology; trowel applied to substrates prepared in accordance with manufacturer's written installation instructions; with integral color and texture.
1. Product: Stolit 1.5, Sto Corporation.
    - a. Color: As selected by Architect from manufacturer's standards.
      - 1) A maximum of two colors will be selected for the entire project.

### 2.3 ACCESSORIES

- A. Lath: As specified in Section 09 2236.23.
- B. Beads, Screeds, and Joint Accessories: As specified in Section 09 2236.23.
- C. Finish Coat Primer: 100 percent acrylic-based primer, low VOC, vapor permeable, capable of resisting efflorescence resulting from cement base coats; recommended by finish coat manufacturer to improve bonding of finish coat to substrate.
1. Product: Sto Primer/Adhesive, Sto Corp.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify existing conditions are acceptable prior to starting this work.
- B. Verify lath is flat, secured to substrate, and joint and surface perimeter accessories are properly in place.
- C. Verify mechanical and electrical equipment and services located within areas to receive this work have been properly tested and approved.

### 3.2 PREPARATION

- A. Remove surface contaminants such as dust and dirt without damaging substrate.

### 3.3 MIXING

- A. Mix only as much plaster as can be used prior to initial set.
- B. Mix materials dry, to uniform color and consistency, before adding water.
- C. Add acrylic admixture to each base coat in accordance with manufacturer's recommendations.
- D. Do not retemper mixes after initial set has occurred.
- E. Protect mixtures from frost or freezing temperatures, contamination, and excessive evaporation.



### 3.4 APPLICATION

- A. Apply plaster in accordance with manufacturer's written instructions and comply with ASTM C926.
- B. Exterior Walls - Three Coat Application Over Wall Sheathing, Rigid Board Insulation, and Weather Barrier:
  - 1. Wall Sheathing: As specified in Section 06 1000 - Rough Carpentry.
  - 2. Rigid Insulation: As specified in Section 07 2100 - Thermal Insulation.
  - 3. Weather Barrier: As specified in Section 07 2500.
  - 4. Scratch coat: Fully embed metal lath with base coat material mixed with acrylic admixture to a nominal thickness of 3/8 inches; scratch horizontally to provide a key for the brown coat.
  - 5. Brown coat: Once scratch coat is cured, apply base coat material mixed with acrylic admixture to a nominal thickness of 3/8 inches with fully embedded while the brown coat is still wet; lap joints of reinforcing mesh in accordance with manufacturer's requirements; rod or darby brown coat to a flat and uniform consistency.
  - 6. Finish Coat Primer: Once brown coat has cured, apply finish coat primer in accordance with manufacturer's instructions.
  - 7. Finish Coat: Apply over finish coat primer in accordance with manufacturer's instructions.
    - a. Finish Texture: Trowel to a consistent finish.

### 3.5 TOLERANCES

- A. Maximum Variation from True Flatness: 1/4 inch in 10 feet.

### 3.6 PROTECTION

- A. Protection of Plaster: During installation, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work.
  - 1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
- B. Stain Prevention: Prevent plaster from staining the face of existing, non-plaster surfaces. Immediately remove plaster that comes in contact with such surfaces.
  - 1. Protect windows, doors, frames, equipment, pavement, landscaping, roofing, flashings, and other existing items from splatter by coverings spread on ground and over existing surfaces.

### 3.7 REPAIR

- A. Patching: Remove loose, damaged or defective plaster and replace with plaster of same composition; finish to match surrounding area.

### 3.8 CLEANING

- A. Remove excess plaster and droppings as work progresses.
- B. Clean soiled surfaces as recommended by manufacturer.
- C. Efflorescence and Stains: Repair plaster surfaces with exposed efflorescence and stains in accordance with manufacturer's recommendations. Acceptance of repairs is at the sole discretion of the Architect.
- D. Use non-metallic tools in cleaning operations.

END OF SECTION



SECTION 09 9000  
PAINTING AND COATING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Surface preparation.
- B. Field application of paints.
- C. Do Not Paint or Finish the Following Items:
  - 1. Items fully factory-finished unless specifically so indicated; materials and products having factory-applied primers are not considered factory finished.
  - 2. Items indicated to receive other finishes.
  - 3. Items indicated to remain unfinished.
  - 4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
  - 5. Stainless steel, anodized aluminum, bronze, terne, and lead items.
  - 6. Glass.
  - 7. Acoustical materials, unless specifically so indicated.
  - 8. Concealed pipes, ducts, and conduits.
- D. See Schedule - Surfaces to be Finished, at end of Section.

1.2 DEFINITIONS

- A. Conform to ASTM D16 for interpretation of terms used in this section.

1.3 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.
- B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2012.

1.4 SUBMITTALS

- A. See Section 01 3000 – Submittals for submittal procedures.
- B. Product Data: Provide complete list of all products to be used, with the following information for each:
  - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
  - 2. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
- C. Product Data: Provide data on all finishing products.

1. Paint System Identification: Identify each product as a component of the appropriate paint numbering system in Part 2 of this Section (i.e., ME-OP-3A-1). Unidentified products will result in rejection of the entire submittal.
- D. Paint Samples: Submit two paper chip samples, 3 x 3 inches in size illustrating range of colors and textures available for each surface finishing product scheduled.
- E. Manufacturer's Instructions: Indicate special surface preparation procedures.
- F. Maintenance Data: Submit data on cleaning, touch-up, and repair of painted and coated surfaces.

#### 1.5 QUALITY ASSURANCE

- A. Applicator Qualifications: Company specializing in performing the type of work specified with minimum five years documented experience.

#### 1.6 REGULATORY REQUIREMENTS

- A. Conform to applicable code for flame and smoke rating and VOC requirements for products and finishes.
- B. Lead, Heavy Metals, Cadmium, and Chromates: Lead, Heavy Metals, Cadmium, and Chromate content of painting materials shall not exceed amount permitted by federal, state, and local authorities.
- C. Comply with governing code requirements for air quality and material disposal regulations.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.
- D. Provide fire extinguishers and post caution signs warning against smoking and open flame when working with flammable materials.
- E. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Engineer. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.

#### 1.8 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
- D. Minimum Application Temperatures for Latex Paints: 45 degrees F for interiors; 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.
- E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

- A. Provide all paint and coating products from the same manufacturer to the greatest extent possible.
- B. Manufacturers - Provide paint and coating products by one of the following:
  1. Corotech, a Benjamin Moore & Co. Company: [www.corotechcoatings.com](http://www.corotechcoatings.com).
  2. Benjamin Moore & Co. (Moore): [www.benjaminmoore.com](http://www.benjaminmoore.com).
  3. Sherwin-Williams Company: [www.sherwin-williams.com](http://www.sherwin-williams.com).
  4. Tnemec Company Inc (Tnemec): [www.tnemec.com](http://www.tnemec.com)

### 2.2 PAINTS AND COATINGS - GENERAL

- A. Paint exposed surfaces, except where the Paint Schedule indicates that a surface or material is not to be painted or is to remain natural. If the Paint Schedules does not specifically mention an item or a surface, paint the item or surface the same as similar adjacent materials or surfaces whether or not the Schedules indicates color(s). If the Schedule does not indicate color(s) or finishes, the Engineer will select from standard colors and finishes available.
- B. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.
- C. Paints and Coatings: Ready mixed, unless intended to be a field-catalyzed coating.
  1. Provide paints and coatings of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
  2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
  3. Supply each coating material in quantity required to complete entire project's work from a single production run.
  4. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.
- D. Primers: As follows unless other primer is required or recommended by manufacturer of top coats; where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.

- E. Volatile Organic Compound (VOC) Content:
  - 1. Provide coatings that comply with the most stringent requirements specified in the following:
    - a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
    - b. Architectural coatings VOC limits of the State in which the Project is located.
  - 2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.
- F. Colors: As indicated in Color Schedule.
- G. Material Compatibility: Provide block fillers, primers, undercoats, and finish-coat materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience
  - 1. Review other Sections of these Specifications in which prime paints are to be provided to ensure compatibility of the total coatings system for the various substrates. Contractor shall be responsible for the compatibility of all shop primed and field painted items.
  - 2. Furnish information on the characteristics of the finish materials proposed to use, to ensure that compatible prime coats are used. Provide Tie coats over incompatible primers or remove and reprime as required. Notify Engineer, in writing, of anticipated problems using the coating systems as specified with substrates primed by others.
- H. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

## 2.3 PAINT SYSTEMS - EXTERIOR

- A. Paint WE-OP-3A-1 - Wood, Opaque, Alkyd, 3 Coat:
  - 1. Primer: Moore; Moorwhite Primer 100; 1 coat, 2.1-2.3 dry mils.
  - 2. Gloss Finish: Moore; Impervo Alkyd High Gloss Metal and Wood Enamel 133; 2 coats, 1-2 dry mils per coat.
- B. Paint ME-OP-3A-1 - Ferrous Metals, Primed and Unprimed, Alkyd, 3 Coats:
  - 1. Surface Preparation of Existing Painted Metals: SSPC -SP7 Brush/Sweep Blast.
  - 2. Primer: Moore; Alkyd Metal Primer M06; One coat, 1.3-1.5 dry mils.
  - 3. Gloss Finish: Moore; Impervo Alkyd High Gloss Metal and Wood Enamel 133; 2 coats, 1-2 dry mils per coat
- C. Paint MgE-OP-3A-1 - Primed and Unprimed Galvanized Metals, Alkyd, 3 Coats:
  - 1. Primer: Moore; Alkyd Metal Primer M04; One coat, 1.3-1.5 dry mils.
  - 2. Gloss Finish: Moore; Impervo Alkyd High Gloss Metal and Wood Enamel 133; 2 coats, 1-2 dry mils per coat

## 2.4 PAINT SYSTEMS - INTERIOR

- A. Paint CI-OP-3L - Concrete/Masonry, Opaque, Latex, 3 Coat:

1. One coat of block filler.
  - a. Product and Manufacturer: Moore: Regal FirstCoat #216; 1.0 dry mil.
2. Semi-gloss: Two coats of latex enamel; Moore; Regal Aquaglo #333; 1.3 dry mils per coat.

## 2.5 ACCESSORY MATERIALS

- A. Accessory Materials: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required to achieve the finishes specified whether specifically indicated or not; commercial quality.
- B. Patching Material: Polyurethane or acrylic filler.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Do not begin application of coatings until substrates have been properly prepared.
- B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- D. If substrate preparation is the responsibility of another installer, notify Engineer of unsatisfactory preparation before proceeding.
- E. Test shop-applied primer for compatibility with subsequent cover materials.
- F. Test previously painted surfaces for compatibility with subsequent cover materials.

### 3.2 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to coating application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Perform all preparation and cleaning procedures as specified herein and in strict accordance with the paint manufacturer's instructions for each particular substrate and atmospheric condition.
- D. Clean surfaces to be painted before applying paint or surface treatments. Remove oil and grease with clean cloths and cleaning solvents prior to mechanical cleaning. Program the cleaning and painting so that dust and other contaminants from the cleaning process will not fall in wet, newly painted surfaces.
- E. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
- F. Surfaces: Correct defects and clean surfaces which affect work of this section.
- G. Marks: Seal marks which may bleed through surface finishes with tie coat compatible with paint.

- H. Impervious Surfaces: Remove mildew in accordance with paint manufacturer's recommendations.
- I. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- J. Concrete and Unit Masonry Surfaces to be Painted: Allow new concrete and masonry to cure 28 days. Remove stains, oil, grease, dirt, loose mortar, scale, salt or alkali powder, and other foreign matter in accordance with paint manufacturer's recommendations. Do not use wire brushes for preparation or cleaning.
  - 1. Do not paint over surfaces where the moisture content exceeds 8 percent, unless otherwise permitted in the manufacturer's printed instructions.
- K. Concrete Floors and Traffic Surfaces to be Painted: Remove contamination, acid etch, and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.
- L. Galvanized Surfaces to be Painted: Remove surface contamination and oils and wash with solvent.
- M. Corroded Steel and Iron Surfaces to be Painted: Prepare using at least SSPC-SP 2 (hand tool cleaning) or SSPC-SP 3 (power tool cleaning) followed by SSPC-SP 1 (solvent cleaning).
- N. Uncorroded Uncoated Steel and Iron Surfaces to be Painted: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by hand wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Prime paint entire surface; spot prime after repairs.
- O. Shop-Primed and Non-Shop-Primed Ferrous Surfaces to be Finish Painted: Clean and prepare in accordance with manufacturer's recommendations. Feather edges to make touch-up patches inconspicuous. Prime bare steel surfaces.

### 3.3 APPLICATION

- A. Apply products in accordance with manufacturer's instructions.
  - 1. Any spot measurement found below the required minimum dry film thickness shall be repainted by the Contractor in accordance with the manufacturer's instructions, at no additional cost to the Owner.
- B. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.
- C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- D. Apply each coat to uniform appearance.
- E. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.
- F. Sand metal surfaces lightly between coats to achieve required finish.
- G. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.



- H. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

### 3.4 FIELD QUALITY CONTROL

- A. The Engineer reserves the right to test surfaces, film thickness, and paint products at any time and as often as the Engineer deems necessary during the period when paint is being applied.
  - 1. Any spot measurement found below the required minimum dry film thickness shall be repainted by the Contractor in accordance with the manufacturer's instructions, at no additional cost to the Owner.
  - 2. Do not paint unsatisfactory surfaces until they have been corrected and are in accordance with paint manufacturer's recommendations.

### 3.5 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

### 3.6 PROTECTION

- A. Protect finished coatings until completion of project.
- B. Touch-up damaged coatings after Substantial Completion.

### 3.7 SCHEDULE - SURFACES TO BE FINISHED

- A. Paint the surfaces described below under Schedule - Paint Systems.
- B. Roof joists to be painted with finish coat before they are erected.
- C. Backwash tank stand to be finish painted by Tank Supplier in factory. Any finish scratches from shipment and installation shall be touched up by Contractor.
- D. Waste tank stand to be finished painted by Tank Supplier in factory. Any finish scratches from shipment and installation shall be touched up by Contractor.

### 3.8 SCHEDULE - PAINT SYSTEMS

- A. Galvanized Metals for Which No Other Paint System is Indicated: MgE-OP-3A-1.
- B. Ferrous Metals for Which No Other Paint System is Indicated: ME-OP-3A-1.
- C. Concrete Masonry: Finish all surfaces exposed to view.
  - 1. Exterior: No painting required.
  - 2. Interior: CI-OP-3L.
- D. Steel Doors and Frames: Finish all surfaces, MgE-OP-3A-1.
- E. Bollards: Finish all surfaces exposed to view, ME-OP-3A-1.
- F. Plywood backboards for electrical and telephone equipment: WE-OP-3A-1.

### 3.9 SCHEDULE - COLORS

- A. Colors: Except as noted below provide colors as selected by Engineer from full range of manufacturer's standards.

1. Interior plywood backboards for electrical and telephone equipment: 2143-07 Simply White, Benjamin Moore.
2. Exterior Metal Doors and Frames: Dark bronze to match overhead coiling door.
3. Bollards: Color to be selected by Owner.
4. Concrete Masonry Units:
  - a. Interior: Match 2143-07, Simply White, Benjamin Moore
  - b. Exterior: No painting required.

END OF SECTION

SECTION 10 4400  
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Fire extinguishers.
- B. Accessories.

1.2 REFERENCE STANDARDS

- A. NFPA 10 - Standard for Portable Fire Extinguishers; 2013.
- B. UL (FPED) - Fire Protection Equipment Directory; Underwriters Laboratories Inc.; current edition.

1.3 PERFORMANCE REQUIREMENTS

- A. Conform to NFPA 10.
- B. Provide extinguishers classified and labeled by Underwriters Laboratories Inc. for the purpose specified and indicated.
- C. Provide extinguishers which are fully charged and ready for operation upon installation.
- D. Provide extinguishers complete with Manufacturer's Warranty with Inspection Tag attached.

1.4 SUBMITTALS

- A. See Section 01 3000 – Submittals for submittal procedures.
- B. Product Data: Provide extinguisher operational features, color and finish, anchorage details, and physical dimensions.
- C. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

1.5 FIELD CONDITIONS

- A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Fire Extinguishers and Accessories:
  - 1. J.L. Industries, Inc.: [www.jlindustries.com](http://www.jlindustries.com).
  - 2. Larsen's Manufacturing Co: [www.larsensmfg.com](http://www.larsensmfg.com)

3. Nystrom, Inc: [www.nystrom.com](http://www.nystrom.com).
4. Potter-Roemer: [www.potterroemer.com](http://www.potterroemer.com).

## 2.2 FIRE EXTINGUISHERS

- A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
  1. Provide extinguishers labeled by UL for the purpose specified and indicated.
- B. Dry Chemical Type: Carbon steel tank, hose discharge, with pressure gage.
  1. Class: A:B:C.
  2. U.L. Rating: 4A-80B:C.
  3. Capacity: 10 lbs.
  4. Overall Width: 9 inches (nominal).
  5. Overall Height: 20 inches (nominal).
  6. Finish: Baked enamel, red color.
  7. Product and Manufacturer: Cosmic 10E, J.L. Industries, Inc.: [www.jlindustries.com](http://www.jlindustries.com) or equal.
  8. Quantity: 3

## 2.3 ACCESSORIES

- A. Extinguisher Brackets: Formed steel, galvanized and enamel finished.
  1. Provide brackets for each fire extinguisher.
  2. Product and Manufacturer: 846 Optional Bracket, Larson's Manufacturing Co.: [www.larsensmfg.com](http://www.larsensmfg.com) or equal.
- B. Expansion Anchors: Threaded stud bolt type with a single piece wedge, designed for concrete and masonry substrate.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify plumbing line for fire hose and valve cabinets are correctly sized and located.

### 3.2 INSTALLATION

- A. Field verify fire extinguisher locations and mounting heights with fire marshal and/or other authorities having jurisdiction prior to installation. Notify Engineer of any discrepancies.
- B. Install in accordance with manufacturer's instructions.
- C. Install brackets for surface-mounted fire extinguishers plumb and level, 42 inches from finished floor to top of bracket.
- D. Secure rigidly in place.
- E. Place extinguishers on wall brackets.

### 3.3 CLEANING

- A. Clean all surfaces of the work, and adjacent surfaces which are soiled as a result of the work.
- B. Remove from the site all construction equipment, tools, surplus materials and rubbish resulting from the work.

END OF SECTION



## SECTION 31 2200

### ROUGH GRADING

#### PART 1 - GENERAL

##### 1.1 SECTION INCLUDES

- A. Removing topsoil and stockpiling for later reuse.
- B. Excavating subsoil and stockpiling for later reuse.
- C. Grading and rough contouring site.

##### 1.2 PROJECT RECORD DOCUMENTS

- A. Submit documents under provisions of Section 01 7000.
- B. Accurately record location of utilities remaining, rerouted utilities, new utilities by horizontal dimensions, elevations or inverts, and slope gradients.

#### PART 2 - PRODUCTS

##### 2.1 MATERIALS

- A. Subsoil: As specified in Section 31 2324.
- B. Topsoil: As specified in Section 31 2324.

#### PART 3 - EXECUTION

##### 3.1 PREPARATION

- A. Identify required lines, levels, contours, and datum.
- B. Identify known below grade utilities. Stake and flag locations.
- C. Identify and flag above grade utilities.
- D. Maintain and protect existing utilities remaining which pass through work area.
- E. Notify utility company to remove and relocate utilities.
- F. Upon discovery of unknown utility or concealed conditions, discontinue affected work; notify ENGINEER.

##### 3.2 PROTECTION

- A. Protect trees, shrubs, lawns, and other features which are not removed.
- B. Protect bench marks, existing structures, fences, and roads.

- C. Protect above or below grade utilities which are to remain.
- D. Repair damage.

### 3.3 SUBSOIL EXCAVATION

- A. Excavate subsoil from areas to be re-landscaped or regraded.
- B. Do not excavate wet subsoil.
- C. Stock pile subsoil to depth not exceeding 8 feet.
  - 1. Coordinate stockpile locations with OWNER and ENGINEER.
- D. When excavation through roots is necessary, perform work by hand and cut roots with a sharp axe.
- E. Remove excess from site.

### 3.4 TOPSOIL EXCAVATION

- A. Excavate topsoil from areas to be further excavated, re-landscaped, or re-graded and stockpile on site.
- B. Do not excavate wet topsoil.
- C. Stockpile topsoil to depth not exceeding 8 feet.
  - 1. Coordinate stockpile locations with OWNER and ENGINEER.

### 3.5 TOLERANCES

- A. Top Surface of Subgrade: Plus or minus 1 inch.

END OF SECTION



## SECTION 31 2316

### EXCAVATION

#### PART 1 - GENERAL

##### 1.1 SECTION INCLUDES

- A. Excavation.
- B. Over-excavation.

##### 1.2 FIELD MEASUREMENTS

- A. Verify that survey benchmark and intended elevations for the Work are as indicated.

##### 1.3 BARRICADES AND WARNING SIGNS

- A. The CONTRACTOR shall provide and maintain in place all barricades, warning signs, lights and other safety devices required to protect the work, divert traffic and warn the general public of open excavations, unfilled trenches and other areas or conditions which might be hazardous or dangerous during the daylight or dark.

##### 1.4 SHORING AND BRACING

- A. All shoring, bracing and blocking shall be furnished and installed as required to preserve and maintain exposed excavation faces, to protect existing facilities, and to provide for the safety of workmen and the general public. All items of shoring and bracing shall be progressively removed as backfilling proceeds.

##### 1.5 OBSTRUCTIONS

- A. Care shall be used while excavating, trenching or performing other work adjacent to any facilities intended to remain in place; except as otherwise specified, the CONTRACTOR shall be responsible for any damage to existing items and any repairs required shall be promptly made at his expense.

#### PART 2 - PRODUCTS – NOT USED

#### PART 3 - EXECUTION

##### 3.1 PREPARATION

- A. Identify required lines, levels, contours, and datum.

##### 3.2 EXCAVATION

- A. Excavate subsoil required to accommodate building foundations, slabs-on-grade, paving site structures, and other construction operations, etc.
- B. Machine slope banks.
- C. Grade top perimeter of excavation to prevent surface water from draining into excavation.

- D. Hand trim excavation. Remove loose matter.
- E. Remove lumped subsoil, boulders, and rock up to 1/3 cu. yd. measured by volume.
- F. Notify OWNER of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.
- G. Correct unauthorized excavation at no extra cost to OWNER.
- H. Correct areas over-excavated by error in accordance with Section 31 2324.
- I. Stockpile excavated material in area designated on site and remove excess material not being reused, from site.

### 3.3 CLASSIFICATION OF EXCAVATION

- A. All excavation will be unclassified, and the CONTRACTOR shall remove all substances encountered in excavating and trenching to the designated limits of grades. No separate or additional payment will be made for classification of materials, regardless of the nature, condition or moisture content.

### 3.4 OVERDEPTH EXCAVATION

- A. Overdepth excavation shall be corrected and at no additional expense to the OWNER. Overdepth trenching shall be corrected by backfilling with gravel or crushed rock; suitable select material placed and compacted in light lifts to a uniform density equal to that of adjacent undisturbed material. Overdepth excavation under structures shall be filled with concrete.
- B. Overdepth excavation shall be required below the footings as shown on the Drawings. Overdepth excavation below the footings shall be backfilled in accordance with recommendations of the project specific Geotechnical Investigation and as shown on Construction Plans..

### 3.5 DEWATERING

- A. If water is encountered during trenching and excavating operations, Contractor shall immediately notify Owner. Contractor shall develop a plan to dewater the impacted area. Dewatering plan shall be submitted to Owner/Engineer for review and approval prior to commencement of dewatering.

### 3.7 PROTECTION

- A. Protect excavations by methods required to prevent cave-in or loose soil from falling into excavation.
- B. Protect bottom of excavations and soil adjacent to and beneath foundation, from freezing.

END OF SECTION

SECTION 31 2324

BACKFILL AND COMPACTION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Filling, backfilling, and compacting for footings, slabs-on-grade, paving, site structures, and utilities.
- B. Backfilling and compacting for utilities outside the building to utility main connections.

1.2 RELATED SECTIONS

- A. Geotechnical Report **“Geotechnical Engineering Services, Job No. 1-91220, La Mesa Water Cooperative Arsenic Treatment Building”, January 17, 2020.** A copy is included following this Section.
- B. Geotechnical Report **“Geotechnical Engineering Services, Job No. 1-00704, La Mesa Water Cooperative Percolation Tests”, July 23, 2020.** A copy is included following this Section

1.3 REFERENCES

- A. ASTM D 1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method; 1990 (Reapproved 1996).
- B. ASTM D 1557 - Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 kN m/m<sup>3</sup>)); 1991.
- C. ASTM D 2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 1994.
- D. ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth); 1991.
- E. ASTM D 3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 1988 (Reapproved 1993).

1.4 DEFINITIONS

- A. Finish Grade Elevations: Indicated on drawings.
- B. Rough Grading of site per SECTION 31 2200

1.5 SUBMITTALS

- A. See SECTION 01 0300 for submittal procedures.
- B. Compaction Density Test Reports.

1.6 PROJECT CONDITIONS

- A. Provide sufficient quantities of fill and select fill to meet project schedule and requirements. When necessary, store materials on site in advance of need.
- B. When fill materials need to be stored on site, locate stockpiles where designated.
  - 1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
  - 2. Prevent contamination.
  - 3. Protect stockpiles from erosion and deterioration of materials.
- C. Verify that survey bench marks and intended elevations for the Work are as indicated.

PART 2 PRODUCTS

2.1 FILL MATERIALS

- A. Site Grading:
  - 1. Contractor shall excavate all soils throughout the building area to such an extents as to provide for a minimum of 1.0-foot of structural fill beneath all footings and floor slabs, or to such an extent as to remove all man-made fill soils in their entirety, whichever is greater in depth of over-excavation.
  - 2. Over-excavation limits shall extend beyond the perimeter of the footings an equal distance to the depth of fill beneath their bases. Exposed native soils shall be densified.
  - 3. Densification of the exposed native soils shall consist of scarifying, moisture conditioning to the optimum moisture content or above, and compacting the area to a minimum of 90-percent of maximum dry density as determined in accordance with ASTM D-1557. The moisture content of the native soils during compaction shall be within 2-percent of the optimum moisture content.
  - 4. With removal of oversized material the over-excavated soils may be blended to meet the specifications below. Imported material must meet the criteria fro structural fill. All structural fill or backfill material shall be free of vegetation and debris and contain not rock larger than 3 inches. Gradation of the backfill material, as determined in accordance with ASTM D-422, shall be as follows:

Sieve Size (sq. opening)	% Passing (by wt.)
3-inch	100
No. 4	60 – 100
No. 200	15 - 45

5. The plasticity index shall be not greater than 15 when tested in accordance with ASTM D-4318.

B. Slab On-Grade

1. Granular base shall be placed beneath concrete slabs as shown in structural plans.
2. Heavily loaded floor slabs bearing on 6-inches thickness of granular fill placed and compacted per this specification shall have a modulus of subgrade reaction (k) value of 300 pounds per cubic inch (pci.)
3. Granular base used beneath slabs shall have a plasticity index of no greater than 3 and meet the following grading requirement:

Sieve Size (sq. opening)	% Passing (by wt.)
1-inch	100
¾-inch	85-100
No. 4	645-95
No. 200	0-10

4. Granular base shall be compacted to a minimum of 95-percent of maximum dry density as determined in accordance with ASTM D1557

2.2 EMBANKMENT

- A. General: The embankment shall consist of a controlled fill constructed in the areas indicated on the grading plans.
- B. Embankment Materials: Embankment material shall consist of soils that conform to the following physical characteristics:

Sieve Size (sq. opening)	% Passing (by wt.)
12-inch	100
No. 4	40 – 100
No. 200	10 - 50

- C. The plasticity index of the materials as determined in accordance with ASTM D-423 and D-424, shall not be more than 10.
- D. The fill material shall be free from roots, grass, other vegetation matter, clay lumps, or other deleterious materials. Nesting of large cobbles should be avoided.
- E. Site soils from the cuts may be used for fill, provided they meet the requirements above in Paragraph B of EMBANKMENT. Blending of soils may be required to meet specifications.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Identify required lines, levels, contours, and datum locations.

### 3.2 PREPARATION

- A. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

### 3.3 FILL AND COMPACTION

- A. Fill to contours and elevations indicated using unfrozen materials.
- B. Fill up to subgrade elevations unless otherwise indicated.
- C. Employ a placement method that does not disturb or damage other work.
- D. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.
- E. Maintain optimum moisture content of fill materials to attain required compaction density. The moisture content at the time of compaction shall be 2 percent below optimum or higher.
- F. Soil Fill: Place and compact material in equal continuous layers not exceeding 8 inches loose lifts, watered as necessary.
- G. Compaction shall be as required by the Geotechnical Report, or 95% maximum dry density, at optimum moisture content, as determined in accordance with ASTM D-1557 for the building foundations, roadways, drives, and rip-rapped ditches. Tests of degree of compaction shall be determined by the ASTM D-1556 method or ASTM D-6938. Observation and field test shall be carried on during fill and backfill placement by the geotechnical engineer to assist the contractor in obtaining the required degree of compaction. If less than 90 percent is indicated, additional compaction efforts shall be made with adjustment to moisture content as necessary until 95-percent compaction is obtained.
- H. Embankments outside the building foundations, roadways, drives, rip-rapped ditches and pads shall be compacted to 90 percent of maximum density.
- I. Native soils beneath fills or in cuts shall be compacted to the density specified for fills in that area in accordance with the Geotechnical Report.
- J. Optimum moisture and maximum density for each soil used shall be determined in accordance with ASTM D-1557.
- K. Slope grade away from building minimum 4 inches in 10 ft, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.

- L. Correct areas that are over-excavated.
  - 1. Load-bearing foundation surfaces: Use general fill, flush to required elevation, within 3% of optimum moisture compacted to 95 percent of maximum dry density. 8" lifts maximum.
  - 2. Other areas: Use general fill, flush to required elevation, compacted to minimum 90 percent of maximum dry density.
- M. Compaction Density Unless Otherwise Specified or Indicated:
  - 1. Under and adjacent to building foundations, walls, roadways, paving, slabs-on-grade, and similar construction: 95 percent of maximum dry density.
  - 2. At other locations: 90 percent of maximum dry density.

### 3.4 TOLERANCES

- A. Top Surface of General Filling: Plus or minus 1 inch from required elevations.
- B. Top Surface of Filling Under Paved Areas: Plus or minus 1/2 inch from required elevations.

### 3.5 FIELD QUALITY CONTROL

- A. The Contractor shall employ the services of an independent registered licensed soils engineer to observe and test all controlled earthwork. The soils engineer shall provide continuous on-site inspection by experienced personnel during construction of controlled earthwork.
- B. The contractor shall notify the Owner at least 2 working days in advance of any field operations of the controlled earthwork, or of any resumption of operations after stoppages.
- C. Perform compaction density testing on compacted fill in accordance with ASTM D1556, ASTM D2167, ASTM D2922, or ASTM D3017.
- D. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D 1557 ("modified Proctor").
- E. If tests indicate work does not meet specified requirements, remove work, replace and retest.
- F. Frequency of Tests:
  - 1. One field density test per each 250 square yards of original ground surface prior to placing fill or in cut areas.
  - 2. One field density test per each 350 cubic yards of fill placed, or each layer of fill for each work area, whichever is greater.
  - 3. One moisture-density curve for each type of material used, as indicated by sieve analysis and plasticity index.

4. Trench Backfill: In each compacted backfill layer, perform at least one field in-place density test for each 300 lineal feet or less of trench at intervals no greater than 2' vertical, but no fewer than two tests, to 95% compaction.
- G. Proof roll compacted fill at surfaces that will be under slabs-on-grade and paving.

### 3.6 CLEAN-UP

- A. Remove unused stockpiled materials; leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.
- B. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION



**GEOTECHNICAL  
ENGINEERING SERVICES  
JOB NO. 1-91210  
LA MESA WATER COOPERATIVE  
ARSENIC TREATMENT BUILDING  
PLACITAS, NEW MEXICO**

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PREPARED FOR  
**WILSON & COMPANY, INC.**



January 17, 2020

**Job No. 1-91210**

**Wilson & Company, Inc.  
Engineers & Architects  
4401 Masthead Street #100  
Albuquerque, New Mexico 87109**

**ATTN: Paul A. Romero, Operation Specialist**

**RE: Geotechnical Engineering Services  
La Mesa Water Cooperative  
Arsenic Treatment Building  
Placitas, New Mexico**

Dear Mr. Romero:

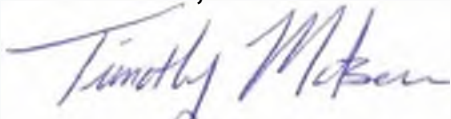
Submitted herein is the Geotechnical Engineering Services Report for the above referenced project. The report contains the results of our field investigation, laboratory testing, and recommendations for foundation design, slab support, as well as criteria for site grading.


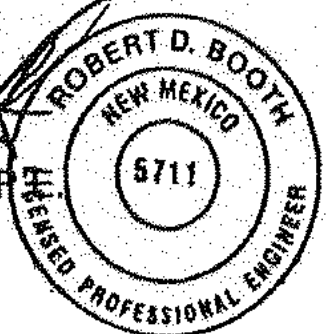
It has been a pleasure to serve you on this project. If you should have any questions, please contact this office.

Respectfully submitted:

Reviewed by:

**GEO-TEST, INC.**

  
Timothy Matson, Staff Engineer

  
Robert D Booth, P.E.  


cc: Addressee

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**TABLE OF CONTENTS**

INTRODUCTION .....	1
PROPOSED CONSTRUCTION.....	1
FIELD EXPLORATION .....	1
LABORATORY TESTING.....	2
SITE CONDITIONS .....	2
SUBSURFACE SOIL CONDITIONS.....	2
CONCLUSIONS AND RECOMMENDATIONS.....	2
FOUNDATIONS.....	3
LATERAL LOADS.....	4
SLABS ON GRADE .....	4
SITE-GRADING.....	5
MOISTURE PROTECTION .....	6
FOUNDATION REVIEW AND INSPECTION.....	7
CLOSURE .....	7
BORING LOCATION MAP.....	9
BORING LOGS.....	10
SUMMARY OF LABORATORY RESULTS.....	12
GRAIN SIZE DISTRIBUTION .....	13

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## **INTRODUCTION**

This report presents the results of a geotechnical engineering services investigation performed by this firm for the proposed new arsenic treatment building to be located in Placitas, New Mexico.

The objectives of this investigation were to:

- 1) Evaluate the nature and engineering properties of the subsurface soils underlying the site
- 2) Provide recommendations for foundation design, slab support, as well as criteria for site grading.

The investigation includes subsurface exploration, selected soil sampling, laboratory testing of the samples, performing an engineering analysis and preparation of this report.

## **PROPOSED CONSTRUCTION**

It is understood that the project consists of the construction of a new arsenic treatment building. The structure will be about 2,000 square feet and house arsenic removal equipment and several tanks. The proposed finish floor elevation of the structure will be 5,323.5 feet. No basements are planned, and concrete floor slabs will be cast on-grade. Structural loads are unknown at this time but are anticipated to be relatively light, not exceeding about 50 kips on columns and 2 kips per lineal foot on walls.

Should structural or other project details vary significantly from those outlined above, this firm should be notified for review and possible revision of the recommendations contained herein.

## **FIELD EXPLORATION**

Two exploratory borings were drilled at the site to depths ranging from approximately 10 to 14½ feet below existing site grade. The locations of the borings are shown on the Boring Location Map, Figure 1. The soils encountered in the borings were continuously examined, visually classified and logged during the drilling operation. The boring logs are presented in a following section of this report. Drilling was accomplished using a truck mounted drill rig equipped with 5.5-inch diameter continuous flight hollow stem auger. Subsurface materials were sampled at five-foot intervals or less

utilizing an open tube split barrel sampler driven by a standard penetration test hammer.

### **LABORATORY TESTING**

Selected soil samples were tested in the laboratory to determine certain engineering properties of the soils. Moisture contents were determined to evaluate the various soil deposits with depth. The results of these tests are shown on the boring logs.

Sieve analysis and Atterberg limits tests were performed to aid in soil classification. Results of these tests are presented in the Summary of Laboratory Results and on the individual test reports presented in a following section of this report.

### **SITE CONDITIONS**

A brief site reconnaissance was performed during our site exploration. The site for the proposed structure is located in a portion of an existing arroyo, east of the existing well and north of the existing access road that slopes down to the well and site. The site relatively flat, sloping gently to the northwest with about 3½ feet of vertical relief across the building site.

### **SUBSURFACE SOIL CONDITIONS**

As indicated by the exploratory borings, the soils underlying the site consist of about 2 to 2½ feet of man-made fill soils, that appear to have been placed during grading and construction of the existing well and access road. The man-made fill soils consisted of loose, low plasticity clayey sand. Below the man-made fill soils, native soils consisting of low plasticity, moderately firm to firm clayey sand with various amounts of gravel were encountered and extended to depths ranging from about 4 to 4½ feet below existing site grade. Below the native clayey sand, clayey gravels were encountered. These soils were low in plasticity, very dense and extended to full depths explored. Very difficult drilling was experienced in the clayey gravel stratum.

No groundwater was encountered in the borings and soil moisture contents were generally low throughout the extent of the borings.

### **CONCLUSIONS AND RECOMMENDATIONS**

The primary geotechnical concern with the project is the loose, man-made fill soils in the upper 2 to 2½ feet below existing site grades. These soils are

low in relative density and have the potential to create excessive settlements of footings and floor slabs, particularly upon significant moisture increases. Accordingly, the existing, near surface soils are not considered suitable in their present condition to provide reliable support of shallow footings and slabs on-grade.

However, with special site preparation, the proposed structure can be supported on shallow spread type footings bearing directly on properly compacted structural fill. The special site preparation would involve overexcavation of the existing soils throughout the building area. These soils should be overexcavated to such an extent as to provide for at least 1.0 feet of properly compacted structural fill below all foundations and floor slabs, or to such an extent as to remove all existing man-made fill soils and previous construction, whichever is the greater depth of overexcavation. The limits of the overexcavation should also extend laterally from the footing perimeters a distance equal to the depth of fill beneath their bases. The exposed native soils at the base of the excavation should be densified prior to placement of structural fill. Detailed recommendations concerning the required site preparation and for foundation design are presented in the following sections of this report.

## **FOUNDATIONS**

Shallow spread-type footings bearing directly on a minimum thickness of 1.0 feet properly compacted structural fill are recommended for the support of the proposed structure. An allowable bearing pressure of 2,000 pounds per square foot is recommended for footing design. This bearing pressure applies to full dead load plus realistic live loads and can be safely increased by one-third for totals loads including wind and seismic forces.

Exterior footings should be established a minimum of 2.0 feet below lowest adjacent finished grade, while interior footings should be at least 12 inches below finished floor grade. The minimum recommended width of square and continuous footings is 2.0 feet and 1.33 feet, respectively.

All bearing surfaces should be cleaned of all loose, disturbed materials prior to placement of structural fill or concrete. All foundation systems should be adequately reinforced to aid in redistributing loads and to minimize the effects of differential settlement.

Maximum settlements of foundations designed and constructed as recommended herein are estimated not to exceed  $\frac{3}{4}$  inch for the soil moisture contents encountered during this investigation or moisture contents

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introduced during construction. Differential movements should be less than 75 percent of total movements. Significant moisture increases in the supporting soils after construction could cause additional movements.

### **LATERAL LOADS**

Resistance to lateral forces will be provided by friction between the base of floor slabs and footings and the soil and by passive earth resistance against the sides of footings and stem walls. A coefficient of friction of 0.40 should be used for computing the lateral resistance between bases of footings and slabs and the soil. With backfill placed as recommended in the site grading section of this report, a passive soil resistance equivalent to a fluid weighing 325 pounds per cubic foot should be used for analysis.

### **SLABS ON GRADE**

Adequate support for lightly loaded slab-on-grade floors will be provided by the structural fill when placed as recommended in a following section of this report. Thus, the use of granular base for structural support of lightly loaded slabs is not considered necessary. However, should it be desired as a working surface, a course of granular base can be placed beneath concrete floor slabs.

Heavily loaded floor slabs bearing directly on the structural fill can be designed using a modulus of subgrade reaction (k) value of 200 pci. This value can be increased to 300 pci provided a 6-inch thickness of granular base is placed and compacted beneath the slabs.

Where granular base is used beneath the slabs, it should have a plasticity index of no greater than 3 and meet the following grading requirements:

Sieve Size (Square Openings)	Percent Passing by Dry Weight
1 Inch	100
¾ Inch	85-100
No. 4	45-95
No. 200	0-10

The granular base should be compacted to a minimum of 95 percent of maximum dry density as determined in accordance with ASTM D1557.

The granular base will act as a capillary barrier but will not totally eliminate the rise of moisture to the slabs. If floor coverings are proposed which are

highly sensitive to moisture, it is recommended the slab be placed in accordance with the procedures recommended by the American Concrete Institute (ACI 302.1R-04).

### **SITE-GRADING**

The following guidelines should be included in the project construction specifications to provide a basis for quality control during site grading. It is recommended that all structural fill and backfill be placed and compacted under engineering observation and in accordance with the following:

- 1) The existing soils throughout the building area should be overexcavated to such an extent as to provide for a minimum thickness of 1.0 feet of structural fill beneath all footings and floor slabs, or to such a depth as to remove all man-made fill soils in their entirety, whichever is the greater depth of overexcavation. The overexcavation limits should extend beyond the perimeter of the footings equal to the depth of fill beneath their bases. The exposed native soils should then be densified.
- 2) Densification of the exposed native soils should consist of scarifying, moisture conditioning to the optimum moisture content or above, and compacting the area to a minimum of 95 percent of maximum dry density as determined in accordance with ASTM D-1557. The moisture content of the native soils during compaction should within 2 percent of the optimum moisture content.
- 3) The results of this investigation indicate that most the overexcavated soils will not be suitable for use as structural fill, however, some blending, and removal of oversized material may be required to meet the specification below. Any imported material must also meet the criteria for structural fill. All structural fill or backfill material should be free of vegetation and debris and contain no rocks larger than 3 inches. Gradation of the backfill material, as determined in accordance with ASTM D-422, should be as follows:

Size	Percent Passing
3-inch	100
No. 4	60 - 100
No. 200	15 - 45



- 4) The plasticity index should be no greater than 15 when tested in accordance with ASTM D-4318.
- 5) Fill or backfill, should be placed in 8-inch loose lifts and compacted with approved compaction equipment. Lifts should be reduced to 4-inches if hand-held compaction equipment is used. Each lift should be firm and non-yielding.
- 6) All compaction of fill or backfill should be accomplished to a minimum of 95 percent of the maximum dry density, and within 2 percent of the optimum moisture content, as determined in accordance with ASTM D-1557.
- 7) Tests for degree of compaction should be determined by the ASTM D-1556 method or ASTM D-6938. Observation and field tests should be carried on during fill and backfill placement by the geotechnical engineer to assist the contractor in obtaining the required degree of compaction. If less than 95 percent is indicated, additional compaction effort should be made with adjustment of the moisture content as necessary until 95 percent compaction is obtained.

### **MOISTURE PROTECTION**

As stated above, precautions should be taken during and after construction to minimize moisture increases of foundation soils. Positive drainage should be established away from the exterior walls of the structure. If necessary, to provide positive drainage, the building area should be raised above adjacent site grades with structural fill. Backfill should be well compacted and should meet the specifications outlined in the site grading section of this report. Irrigation within 10 feet of foundations should be carefully controlled. All utility trenches leading into the structure should be backfilled with compacted fill. Special care should be taken during installation of the subfloor sewers and water lines to reduce the possibility of post-construction soil moisture increases beneath the structure.

Proper landscaping and drainage maintenance are required to preclude the accumulation of excessive moisture in the soils beneath the structure. Accumulations of excessive moisture could be harmful to some types of interior flooring, to HVAC ductwork beneath the slabs, and can weaken or cause other changes in the soils supporting the foundations. This can cause additional differential movement of foundations and can result in cosmetic or structural damage to structure.

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If any water line leaks or if irrigation system leaks are detected, they should be promptly repaired. In addition, if any depressions develop from the settlement of soils in utility trenches or other areas, they should be promptly backfilled to maintain the grade so that surface water drains rapidly away from the structure.

The foregoing recommendations should only be considered minimum requirements for overall site development. It is recommended that a civil/drainage engineer be consulted more detailed grading and drainage recommendations.

### **FOUNDATION REVIEW AND INSPECTION**

This report has been prepared to aid in the evaluation of this site and to assist in the design of this project. It is recommended that the geotechnical engineer be provided the opportunity to review the design drawings and specifications in order to determine whether the recommendations in this report are applicable to the design. Review of the design drawings and specifications should be noted in writing by the geotechnical engineer.

In order to permit correlation between the conditions encountered during construction and to confirm recommendations presented herein, it is recommended that the geotechnical engineer be retained to perform continuous observations and testing during the earthwork portion of this project. Observation and testing should be performed during construction to confirm that suitable fill soils are placed upon competent materials and properly compacted, and foundation elements penetrate the recommended soils.

### **CLOSURE**

Our conclusions, recommendations and opinions presented herein are:

- 1) Based upon our evaluation and interpretation of the findings of the field and laboratory program.
- 2) Based upon an interpolation of soil conditions between and beyond the explorations.
- 3) Subject to confirmation of the conditions encountered during construction.
- 4) Based upon the assumption that sufficient observation will be provided during construction.

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- 5) Prepared in accordance with generally accepted professional geotechnical engineering principles and practice.

This report has been prepared for the sole use of Wilson & Company, Inc., specifically to aid in the design of the proposed arsenic treatment building to be located in Placitas, New Mexico and is not for the use by any third parties.

We make no other warranty, either express or implied. Any person using this report for bidding or construction purposes should perform such independent investigation as he deems necessary to satisfy himself as to the surface and subsurface conditions to be encountered and the procedures to be used in the performance of work on this project. If conditions encountered during construction appear to be different than indicated by this report, this office should be notified.

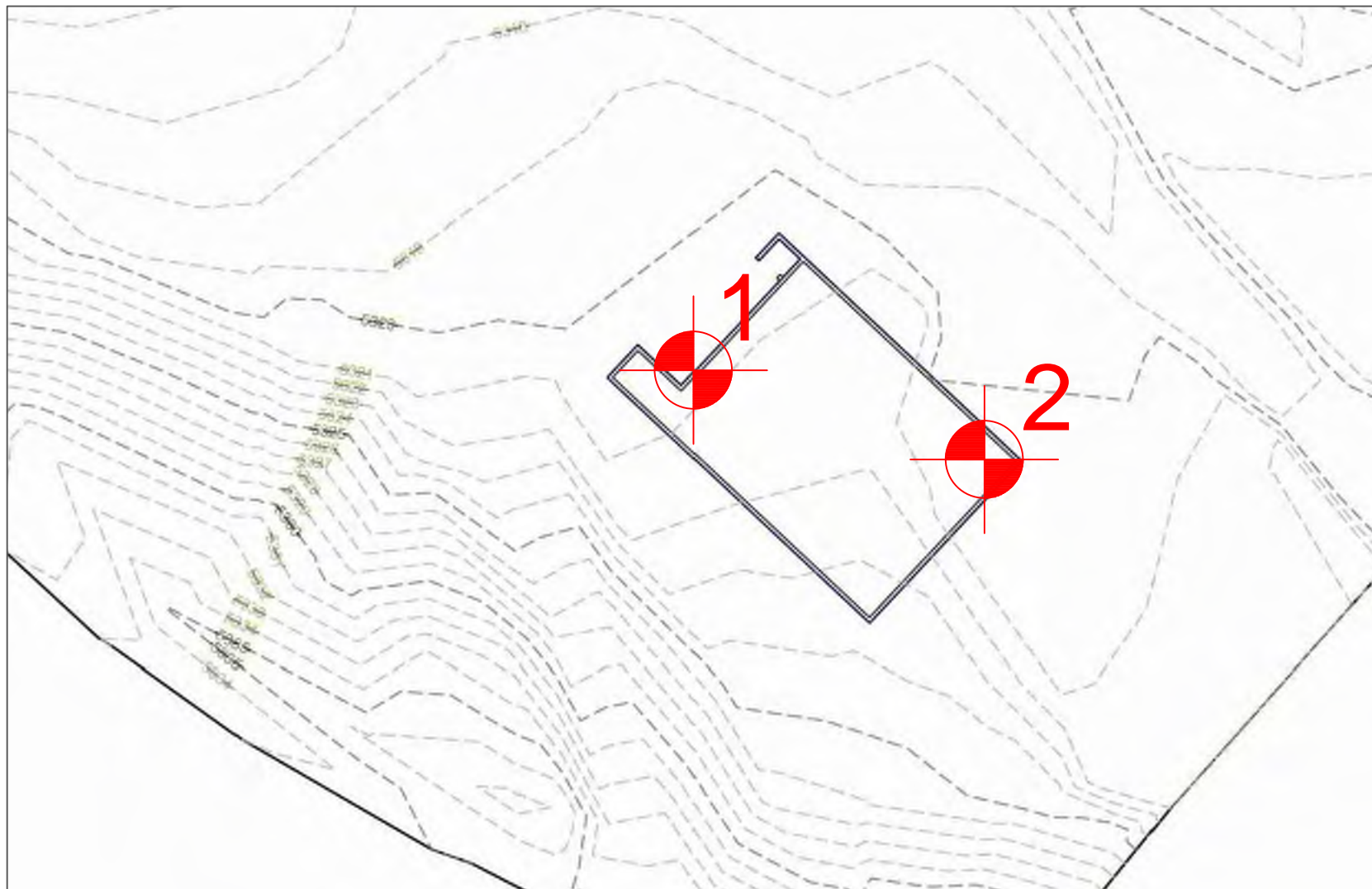
All soil samples will be discarded 60 days after the date of this report unless we receive a specific request to retain the samples for a longer period of time.

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# BORING LOCATION MAP

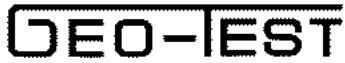


La Mesa Water Cooperative-Arsenic Treatment Building  
Placitas, New Mexico  
Job No. 1-91115

Figure 1



**GEO-TEST**  
GEOTECHNICAL ENGINEERING  
AND MATERIAL TESTING



Project: La Mesa Water-Arsenic Treatment Building  
 Date: 01/09/2020 Project No: 1-91210  
 Elevation: Type: 5.5" OD HSA

LOG OF TEST BORINGS

GROUNDWATER DEPTH

NO: 01

During Drilling: none

After 24 Hours:

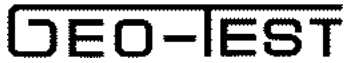
DEPTH (Ft)	LOG	SAMPLE INTERVAL	SAMPLE					SUBSURFACE PROFILE		
			TYPE	N. BLOWS/FT	MOISTURE %	DRY DENSITY (pcf)	USC	DESCRIPTION	N blows/ft	
									20 40 60 80	
			AC		8			SM	SILTY SAND, fine grained, low plasticity, medium dense, moist to slightly moist, brown to tan *possible fill in upper 2.0'	
			SS	3-4-9 13	3					
5			SS	11-28-31 59	1		GC-GM	SILTY, CLAYEY GRAVEL, fine to coarse grained, low plasticity, very dense, dry, brown to light brown		
			SS	16-50/6" 50/6"	2					
10										
15										
20										

LOG OF TEST BORING 1-91210 LA MESA WATER-ARSENIC TREATMENT BUILDING, SANDOVAL COUNTY.GPJ GEO TEST.GDT 1/15/20

LEGEND

- SS - Split Spoon
- AC - Auger Cuttings
- UD/SL - Undisturbed Sleeve
- AMSL - Above Mean Sea Level
- CS - Continuous Sampler
- UD - Undisturbed
- ST - Shelby Tube

Stratification lines represent approximate boundaries between soil types. Transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.



Project: La Mesa Water-Arsenic Treatment Building  
 Date: 01/09/2020 Project No: 1-91210  
 Elevation: Type: 5.5" OD HSA

LOG OF TEST BORINGS

GROUNDWATER DEPTH

NO: 02

During Drilling: none

After 24 Hours:

DEPTH (Ft)	LOG	SAMPLE						SUBSURFACE PROFILE	
		SAMPLE INTERVAL	TYPE	N. BLOWS/FT	MOISTURE %	DRY DENSITY (pcf)	USC	DESCRIPTION	N blows/ft 20 40 60 80
0-1	[Cross-hatched pattern]		SS	4-3-3 6	9		FILL	SILTY SAND (SM), fine grained, low plasticity, loose, moist, dark brown	6
1-3	[Dotted pattern]		SS	3-7-8 15	4		SC-SM	SILTY CLAYEY SAND, fine grained, some gravel, low plasticity, medium dense, dry, tan	15
3-5	[Diagonal lines]		SS	9-10-11 21	3				21
5-10	[Gravel pattern]		NR	50/8" 50/8"			GC-GM	SITLY, CLAYEY GRAVEL, fine to coarse grained, low plasticity, very dense, dry, brown to light brown	
10-14	[Solid black]		AC		2				
14-15	[Diagonal lines]		NR	50/6" 50/6"					
15-20	[Empty]							Stopped Auger @ 14 feet Stopped Sampler @ 14.5 feet	

LEGEND

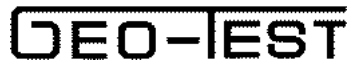
- SS - Split Spoon
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Stratification lines represent approximate boundaries between soil types. Transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

# SUMMARY OF LABORATORY RESULTS

SUMMARY OF LABORATORY RESULTS 1-91210 LA MESA WATER-ARSENIC TREATMENT BUILDING, SANDOVAL COUNTY, G.P.J. GEO TEST.GDT. 1/14/20

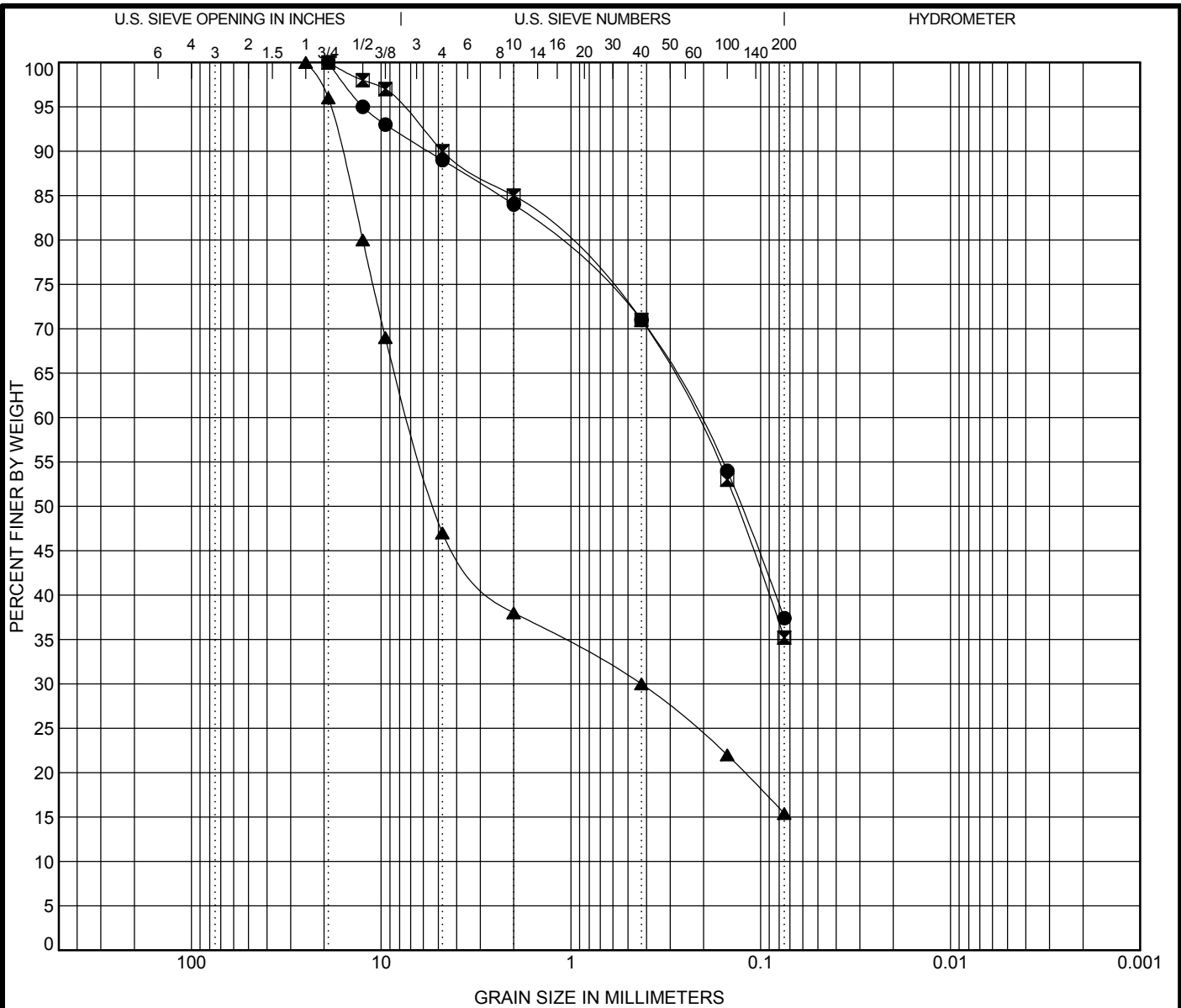
TEST HOLE	DEPTH (FEET)	UNIFIED CLASS	(% MOIST)	LL	PI	SIEVE ANALYSIS PERCENT PASSING											
						NO 200	NO 100	NO 40	NO 10	NO 4	3/8"	1/2"	3/4"	1"	1 1/2"	2"	4"
01	0.0 - 2.5	SM	7.7	20	3	37	54	71	84	89	93	95	100				
01	3.0		3.4														
01	5.0		1.3														
01	10.0		1.9														
02	1.0		8.6														
02	3.0	SC-SM	4.2	21	5	35	53	71	85	90	97	98	100				
02	5.0	GC-GM	2.8	20	4	15	22	30	38	47	69	80	96	100			
02	10.0 - 14.0		1.8														



LL = LIQUID LIMIT  
PI = PLASTICITY INDEX  
NP = NON PLASTIC or NO VALUE

Project: La Mesa Water-Arsenic Treatment Building  
Location: Sandoval County, New Mexico  
Number: 1-91210

U.S. GRAIN SIZE 1-91210 LA MESA WATER-ARSENIC TREATMENT BUILDING, SANDOVAL COUNTY.GPJ\_GEO\_TEST.GDT 1/14/20



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification	Classification	LL	PL	PI	Cc	Cu
● 01 0.0 - 2.5	<b>SILTY SAND(SM)</b>	20	17	3		
☒ 02 3.0	<b>SILTY, CLAYEY SAND(SC-SM)</b>	21	16	5		
▲ 02 5.0	<b>SILTY, CLAYEY GRAVEL with SAND(GC-GM)</b>	20	16	4		

Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● 01 0.0 - 2.5	19	0.217			11.0	51.6	37.4	
☒ 02 3.0	19	0.225			10.0	54.8	35.2	
▲ 02 5.0	25	7.154	0.425		53.0	31.6	15.4	



**GRAIN SIZE DISTRIBUTION**

Project: La Mesa Water-Arsenic Treatment Building  
 Location: Sandoval County, New Mexico  
 Number: 1-91210



**GEOTECHNICAL  
ENGINEERING SERVICES  
JOB NO. 1-00704  
LA MESA WATER COOPERATIVE  
PERCOLATION TESTS  
PLACITAS, NEW MEXICO**

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PREPARED FOR  
**WILSON & COMPANY, INC.**

July 23, 2020  
**Job No. 1-00704**

**Wilson & Company, Inc.  
Engineers & Architects  
4401 Masthead Street #100  
Albuquerque, New Mexico 87109**

**ATTN: Paul A. Romero, Operation Specialist**

RE: Geotechnical Engineering Services  
La Mesa Water Cooperative  
Arsenic Treatment Building-Percolation Tests  
Placitas, New Mexico

Dear Mr. Romero:

Submitted herein is the Geotechnical Engineering Services Report for the above referenced project. The report contains the results of our field investigation regarding percolation testing at the above referenced site.


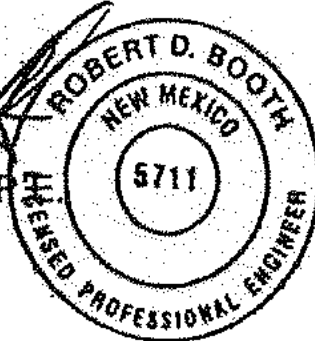
It has been a pleasure to serve you on this project. If you should have any questions, please contact this office.

Respectfully submitted:

Reviewed by:

**GEO-TEST, INC.**

  
Timothy Matson, Staff Engineer

  
Robert D Booth, P.E.  


cc: Addressee

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**TABLE OF CONTENTS**

INTRODUCTION ..... 1

PROPOSED CONSTRUCTION..... 1

FIELD EXPLORATION ..... 1

LABORATORY TESTING ..... 1

SUBSURFACE SOIL CONDITIONS ..... 1

PERCOLATION TESTING..... 2

MOISTURE PROTECTION ..... 2

CLOSURE ..... 2

BORING LOCATION MAP..... 3

BORING LOGS..... 4

PERCOLATION TEST RESULTS..... 6

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**INTRODUCTION**

This report presents the results of our geotechnical engineering services investigation performed by this firm regarding percolation testing at the proposed arsenic treatment building in Placitas, New Mexico. Geo-Test, Inc., performed a geotechnical investigation for the proposed building (Job No. 1-91210, dated January 17, 2020.

The objective of this investigation was to provide percolation rates of the soils in the proposed drain field.

**PROPOSED CONSTRUCTION**

It is understood that the project consists of the construction of a drain field for the proposed arsenic treatment building. The drain field is to be located on the east side of the proposed structure and the site slopes to the west. It is understood that the drain field will be used about once every 18 months with 26,000 gallons each time.

Should project details vary significantly from those outlined above, this firm should be notified for review and possible revision of the recommendations contained herein.

**FIELD EXPLORATION**

Two exploratory borings were drilled at the site to depths of about 5 feet below existing site grade. The locations of the borings and percolation tests are shown on the Boring Location Map, Figure 1. The soils encountered in the borings were continuously examined, visually classified and logged during the drilling operation. The boring logs are presented in a following section of this report. Drilling was accomplished using a truck mounted drill rig equipped with 5.5-inch diameter continuous flight hollow stem auger.

**LABORATORY TESTING**

No laboratory work performed for this investigation.

**SUBSURFACE SOIL CONDITIONS**

As indicated by the exploratory borings, the soils encountered consisted of about 3 to 4 feet of low plasticity silty, clayey sands. Below this horizon, low

plasticity silty, clayey gravels were encountered and extended to full depth explored.

No groundwater was encountered in the borings and soil moisture contents were very low throughout the extent of the borings.

### **PERCOLATION TESTING**

The percolation tests were performed at depths of approximately 5 feet below existing site grade and had an average percolation rate of **32.0 minutes per inch**. Percolation test data is included in a following section of this report.

### **MOISTURE PROTECTION**

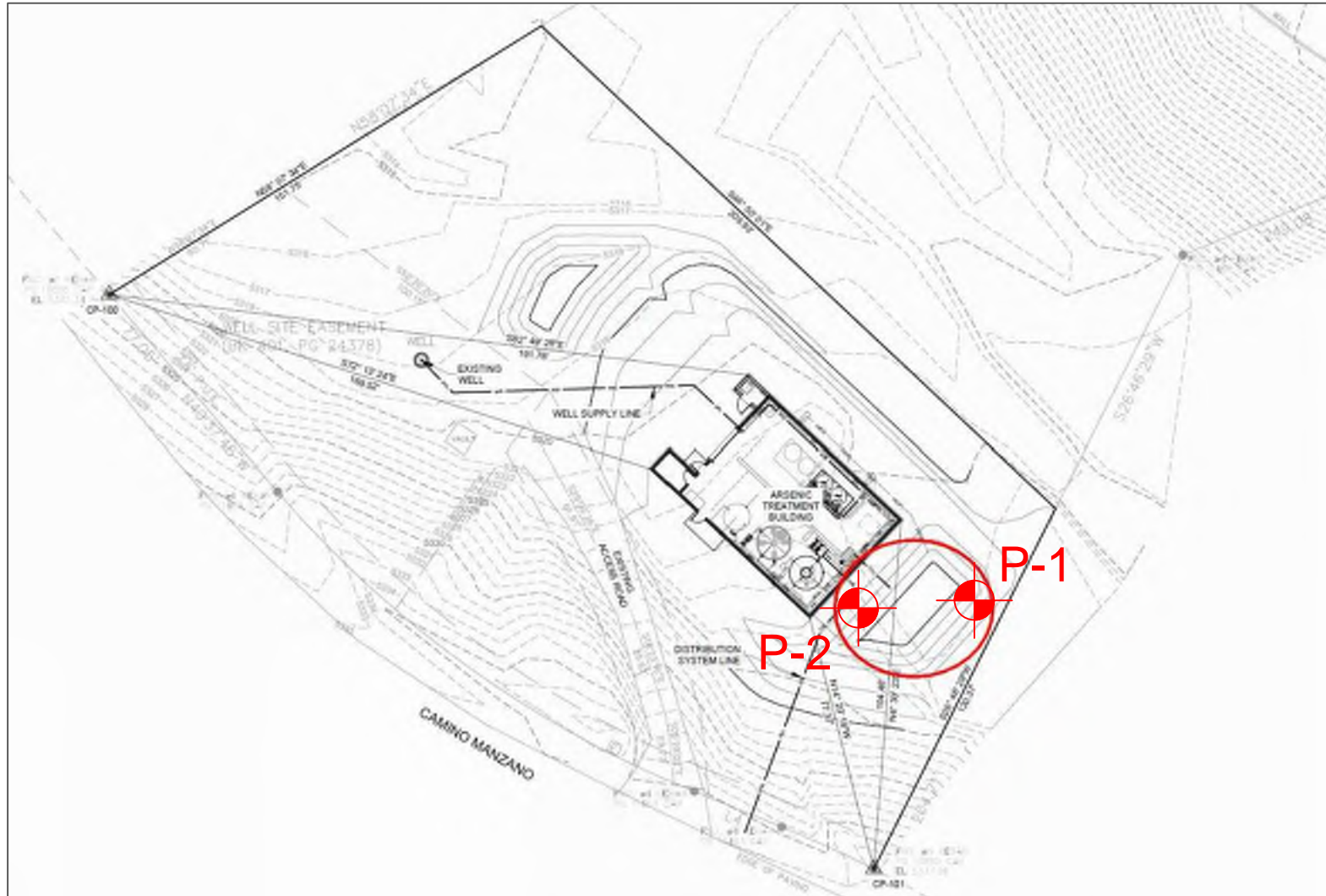
As stated in our original report, precautions should be taken during and after construction to minimize moisture increases of the foundation soils underlying the proposed treatment building.

### **CLOSURE**

This report has been prepared for the sole use of Wilson & Company, Inc., specifically to aid in the design of the proposed drainage field for the arsenic treatment building to be located in Placitas, New Mexico and is not for the use by any third parties.

We make no other warranty, either express or implied. Any person using this report for bidding or construction purposes should perform such independent investigation as he deems necessary to satisfy himself as to the surface and subsurface conditions to be encountered and the procedures to be used in the performance of work on this project. If conditions encountered during construction appear to be different than indicated by this report, this office should be notified.

# BORING LOCATION MAP

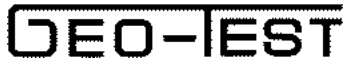


La Mesa Water Cooperative Percolation Tests  
Placitas, New Mexico  
Job No. 1-00704

Figure 1



**GEO-TEST**  
GEOTECHNICAL ENGINEERING  
AND MATERIAL TESTING



Project: La Mesa Water Cooperative Percolation Tests  
 Date: 07/21/2020 Project No: 1-00704  
 Elevation: Type: 5.5" O.D. HSA

LOG OF TEST BORINGS

GROUNDWATER DEPTH

NO: P-1

During Drilling: NONE

After 24 Hours:

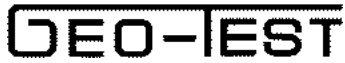
LOG OF TEST BORING 1-00704-LA MESA WATER PERCOLATION TESTS.GPJ GEO TEST.GDT 7/23/20

DEPTH (Ft)	LOG	SAMPLE						SUBSURFACE PROFILE				
		SAMPLE INTERVAL	TYPE	N. BLOWS/FT	MOISTURE %	DRY DENSITY (pcf)	USC	DESCRIPTION	N blows/ft			
									20	40	60	80
							SC-SM	SILTY, CLAYEY SAND, fine grained, some gravel, low plasticity, dry, tan				
							GC-GM	SILTY, CLAYEY GRAVEL, fine to coarse grained, low plasticity, dry, brown to light brown				
5								STOPPED AUGER AT 5'				

LEGEND

- SS - Split Spoon
- AMSL - Above Mean Sea Level
- AC - Auger Cuttings
- CS - Continuous Sampler
- UD/SL - Undisturbed Sleeve
- UD - Undisturbed
- ST - Shelby Tube

Stratification lines represent approximate boundaries between soil types. Transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.



Project: La Mesa Water Cooperative Percolation Tests  
 Date: 07/21/2020 Project No: 1-00704  
 Elevation: Type: 5.5" O.D. HSA

LOG OF TEST BORINGS

GROUNDWATER DEPTH

NO: P-2

During Drilling: NONE

After 24 Hours:

LOG OF TEST BORING 1-00704-LA MESA WATER PERCOLATION TESTS.GPJ GEO TEST.GDT 7/23/20

DEPTH (Ft)	LOG	SAMPLE						SUBSURFACE PROFILE				
		SAMPLE INTERVAL	TYPE	N. BLOWS/FT	MOISTURE %	DRY DENSITY (pcf)	USC	DESCRIPTION	N blows/ft			
									20	40	60	80
							SC-SM	SILTY, CLAYEY SAND, fine grained, some gravel, low plasticity, dry, tan				
							GC-GM	SILTY, CLAYEY GRAVEL, fine to coarse grained, low plasticity, dry, brown to light brown				
5								STOPPED AUGER AT 5'				

LEGEND

- SS - Split Spoon
- AMSL - Above Mean Sea Level
- AC - Auger Cuttings
- CS - Continuous Sampler
- UD/SL - Undisturbed Sleeve
- UD - Undisturbed
- ST - Shelby Tube

Stratification lines represent approximate boundaries between soil types. Transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.



## Percolation Test

Project Name: La Mesa Water Cooperative Percolation Tests  
 Job Number: 1-00704  
 Client: Wilson & Company  
 Test By: Geo-Test

**P-1**

Test Duration: 300 min

Total Hole Depth: 60 inches

<u>Time</u>	<u>Water Drop</u>
<u>11:50</u>	<u>3</u> inches
<u>12:20</u>	<u>2.5</u> inches
<u>12:50</u>	<u>1.75</u> inches
<u>13:20</u>	<u>1.75</u> inches
<u>13:50</u>	<u>1.5</u> inches
<u>14:20</u>	<u>1.75</u> inches
<u>14:50</u>	<u>1.25</u> inches
<u>15:20</u>	<u>1</u> inches
<u>15:50</u>	<u>0.75</u> inches
<u>16:20</u>	<u>0.75</u> inches
<u>16:50</u>	<u>0.75</u> inches

Percolation Rate: 40.0 min/inch

**P-2**

Test Duration: 300 min

Total Hole Depth: 54 inches

<u>Time</u>	<u>Water Drop</u>
<u>11:50</u>	<u>4.5</u> inches
<u>12:20</u>	<u>3.75</u> inches
<u>12:50</u>	<u>3</u> inches
<u>13:20</u>	<u>2.25</u> inches
<u>13:50</u>	<u>2</u> inches
<u>14:20</u>	<u>2</u> inches
<u>14:50</u>	<u>1.75</u> inches
<u>15:20</u>	<u>1.5</u> inches
<u>15:50</u>	<u>1.5</u> inches
<u>16:20</u>	<u>1.25</u> inches
<u>16:50</u>	<u>1.25</u> inches

Percolation Rate: 24.0 min/inch

Average Percolation Rate: **32.0** min/inch

GEO-TEST, INC.  
 3204 RICHARDS LANE  
 SANTA FE,  
 NEW MEXICO  
 87507  
 (505) 471-1101  
 FAX (505) 471-2245

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 87113  
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2805-A LAS VEGAS CT  
 LAS CRUCES,  
 NEW MEXICO  
 88007  
 (575) 526-6260  
 FAX (575) 523-1660



SECTION 31 2325

SUBGRADE PREPARATION

PART 1 GENERAL

1.01 DESCRIPTION

- A. The work performed under this specification shall include, but not be limited to providing the equipment, labor and materials for the preparation of soil subgrade and maintenance of the prepared subgrade for the construction of graded aggregate base on the Driveway and parking area, and under paved roadway where the new piping is connected to the existing distribution system.

1.02 REFERENCES

- A. ASTM:  
C136 D423  
D424 D698  
D1140 D1557  
D2844 D2922  
D3017

PART 2 MATERIALS

- 2.01 Subgrade material may be on site soil, combinations of pulverized asphalt concrete and soil, and/or pulverized Portland cement concrete and soil, imported soils, complying with the requirements of this specification. Flowing, sugar sands shall not be used for subgrade material.
- 2.02 All soft and unstable material and other portions of the subgrade which will not compact readily or serve the intended purposes shall be removed and replaced with suitable material from excavation or borrow or suitable materials shall be added and, by manipulations, be incorporated into the subgrade to produce a material meeting subgrade requirements.
- 2.03 All subgrade material shall have a minimum Resistance Value (R-Value), as determined by ASTM D-2844, equal to or greater than the design R-Value for the pavement section. If the subgrade soils encountered during construction have a R-Value less than the design R-Value, those subgrade materials shall be removed to a depth of not less than two (2') feet below the finished subgrade elevation or as authorized by the ENGINEER and to the horizontal limits authorized by the ENGINEER, and replaced with subgrade material having an R-Value greater than the design R-Value. On small projects, in areas that just involve replacement of existing roadway items or when no design R-Value has been established this R-Value requirement may be waived if authorized by the ENGINEER.

PART 3 EXECUTION

3.01 SUBGRADE COMPACTION

- A. Subgrade preparation shall extend to one foot (1') beyond the limits of the improvement to be placed on the subgrade except when that improvement abuts an existing structure and/or the limits of the right of way. Where an improvement abuts an existing structure and/or the limits of right of way, the subgrade preparation shall extend to the edge of the existing structure and/or the limits of right of way, as specified in the plans, specifications, supplemental technical specifications or as directed by the ENGINEER. Where existing structures are in the right of way or construction easements, subgrade preparation shall extend to the face of the structure, as specified above. Subgrade preparation shall not extend below the bottom of the foundation of an existing structure without specific authorization by the ENGINEER.
- B. Subgrade preparation after completion of earthwork construction, subsurface utility installation and trenching back fill within the limits specified, as directed by the ENGINEER. The subgrade preparation shall extend as specified in the plans and specifications. as directed by the ENGINEER.
- C. Subgrade preparation for sidewalks and drive pads shall extend a minimum of one (1') beyond the free edge of the improvement, and/or to the limits of right of way, and/or to the face of existing structures.
- D. The subgrade preparation for roadway construction without curb and gutter, shall extend one (1 ') beyond the edge of the pavement, and/or to the face of existing structures, and/or to the limits of right of way, as specified in the plans and specifications, as authorized by the ENGINEER.
- E. Subgrade preparation shall extend the full width of roadway medians four (4) feet wide or less. In areas that the medians are wider than four feet (4') the subgrade compaction shall extend one foot (1') beyond the median edge of the pavement or back of the median curb.
- F. The subgrade for arterial/collector roadway shall be ripped to a minimum depth of one (1) foot, brought to uniform moisture content, and compacted to the requirements of plans and specification, as authorized by the ENGINEER. Subgrade material with either 20 per cent or more material passing a no. 200 sieve shall be uniformly mixed and moisture conditioned using a tractor mounted mixer or disced after ripping, as specified in the plans and specifications, as authorized by the ENGINEER. The subgrade shall be scarified to a minimum depth of six (6) inches, brought to uniform compaction moisture content, and compacted to the requirements of plans and specification, as authorized by the ENGINEER.

- G. Subgrade area shall be compacted to a dry density greater than 95 per cent of maximum dry density in a moisture range of optimum moisture +/-2% as determined in accordance with ASTM D1557, unless the material contains 35% or more material finer than the No.200 sieve. If the subgrade material has 35% or more material finer than the No.200 sieve, the subgrade shall be compacted to a dry density greater than 95 percent of maximum dry density in a moisture content range of at least optimum moisture to optimum moisture +4%, as determined in accordance with ASTM D698.
- H. Areas on which roadway pavement items are to be placed shall be compacted uniformly to the required subgrade density at the same time. Obtaining the required subgrade density in trench areas at a different time than obtaining the required subgrade density in the adjacent pavement areas will not be permitted.
- I. Upon completion of the subgrade preparation, the CONTRACTOR shall maintain the compacted subgrade density and moisture content at the specified levels until the next lift of material is completed. The CONTRACTOR shall provide continuous moisture protection of the subgrade by either sprinkling or the application of a prime coat, as directed by the ENGINEER.

3.02 SUBGRADE TOLERANCES

- A. Subgrade upon which pavement, sidewalk, curb and gutter, drive pads, or other structures are to be placed shall not vary more than +1/4 inch or -1/2 inch per 10 foot in any direction from the specified grade and cross section. Subgrade upon which base material is to be placed shall not vary more than +1/2 inch or -1 inch per 20 foot in any direction from the specified grade and cross section. Variations within the above specified tolerances shall be compensating so that the average grade and cross section specified are met.

3.03 TESTING:

- A. A sample of each type of soil encountered shall be classified in accordance with the requirements of ASTM D2487, the moisture density relationship determined in accordance either ASTM D698 or D1557, whichever is applicable and an estimated resistance R-value assigned based on plasticity index, PI, and percent material passing the No.200 sieve.
- B. Compaction tests shall be taken for each 250 sy or less, as directed by the ENGINEER. Compaction tests shall be taken in accordance with ASTM D2922 and D3017. Areas represented by non complying tests shall be reworked as specified, and retested for compliance.
- C. Test reports shall include but not be limited to the requirements of TABLE 301.A.

TABLE 301.A  
TEST REPORT INFORMATION

1.	Field Data
2.	Date of Sampling/Field Test
3.	Project Number or
4.	Permit Number
5.	Project Title
6.	Location of sample/field test as defined by the project plans and specifications
7.	Time of Sampling/field testing
8.	Field test results with reference specification limits
9.	Laboratory Data
10.	Soil classification
11.	Soil gradation
12.	Plasticity index
13.	Liquid limit
14.	Optimum moisture/maximum dry density relationship and graph
15.	Estimated soil resistance R-Value

- D. Test results shall be reported to the ENGINEER and CONTRACTOR in writing, within 4 working days of completion of the sampling and or field test. Non-complying test shall be reported within 1 working day of completion of the test.

END OF SECTION

SECTION 32 1123  
AGGREGATE BASE COURSE

PART 1 GENERAL

1.01 DESCRIPTION

A.

The work provided under this specification shall include the furnishing, placement and compaction of aggregate base course (ABC) to the lines, grades, dimensions, moisture, density and typical sections as specified in the plans and specifications, and or as directed by the OWNERS REPRESENTATIVE. The CONTRACTOR shall be solely responsible for the aggregate base course either batched at and/or delivered to the site. A job mix formula for aggregate base course, shall be certified in accordance with the of these specifications. Each job mix formula submitted and authorized for use under this specification shall be identified by a number, unique to that job mix formula and aggregate production plant/pit. If a change in material(s) from that specified in the job mix formula occur during a project, the CONTRACTOR shall submit a new job mix have formula to include the changed materials for approval by the OWNERS REPRESENTATIVE. A job mix formula shall not be used on a project without written approval of the OWNERS REPRESENTATIVE. A job mix formula, upon request by an aggregate supplier, may be authorized by the OWNER for a period of 14 months, from the date of sampling of aggregates used in the job mix formula.

1.02 REFERENCES

A. ASTM:

C136 D75  
D422 D423  
D424 D1557  
D2419 D2844  
D2922 D2940  
D3017

B. This Publication:

C. SECTION 31 2325 – SUBGRADE PREPARATION

PART 2 MATERIALS

- A. Aggregate base course shall be coarse aggregate of either crushed stone, or crushed gravel, or crushed asphalt concrete, or crushed Portland cement concrete, or any combination, and natural sand, the combination of materials conforming to the requirements of ASTM D2940 and the plans and specifications, as authorized by the OWNERS REPRESENTATIVE.
- B. Coarse aggregates retained on the No.4 sieve shall consists of durable particles of either crushed gravel, or crushed asphalt concrete pavement, or crushed portland cement concrete, or any combination, capable of withstanding the effects of handling, spreading and compacting without degradation production of deleterious fines. At least 50% of the particles retained on the 3/8-inch sieve, shall have two or more fractured faces. Coarse aggregate shall comply with the requirements of TABLE 302.A.

- C. Fine aggregate passing the No.4 sieve shall consists of fines from the operation of crushing coarse aggregate; where available and suitable, natural sand or finer mineral matter or both, may be added. Fine aggregate shall comply with the requirements of TABLE 302.A.
- D. The job mix formula and gradation shall comply with the requirements of TABLE 302.B, and have the same or similar characteristic gradation curve as either range limit, when graphically plotted on a standard "0.45 POWER" Gradation Chart.
- E. Aggregate base course furnished and placed under this specification shall have a resistance value, (R-Value), not less than 76 as determined by ASTM D2844.
- F. A job mix formula, shall comply with the requirements of this specification, and be submitted to and authorized for use by the OWNERS REPRESENTATIVE before the material may be incorporated in the construction. A submittal shall include, but not be limited to, the items in TABLE 302.C. Prior to delivery of the material, the CONTRACTOR may be required to furnish samples of the aggregates base course to the OWNERS REPRESENTATIVE for testing. Gradations for the aggregate base course used in a particular day's placement shall be submitted to the OWNERS REPRESENTATIVE upon request.

### PART 3 EXECUTION

#### 3.01 TRANSPORTATION AND PLACEMENT

- A. Aggregate base course shall be transported in suitable vehicles with a cover. A load shall be covered immediately after loading and remain covered until unloading.
- B. The CONTRACTOR shall provide to the OWNERS REPRESENTATIVE with each load of batched and/or delivered to the job site, before unloading at the site. a copy of the delivery ticket on which is printed, stamped or written. the information defined in TABLE 302.D.
- C. Aggregate base course shall be placed on prepared subgrade, prepared in accordance with the requirements of SECTION 31 2325, the plans and specifications, and or as directed by the OWNERS REPRESENTATIVE.
- D. Aggregate base course shall be placed in lifts which will provide not less than four (4) inches and not more than 6 inches compacted thickness. The material shall be moisture conditioned within a range of optimum moisture plus or minus two percent (+/-2%), and compacted to a dry density greater than ninety-five (95) percent of maximum dry density as determined in accordance under the procedures specified in ASTM D1557.
- E. The finish surface of the compacted aggregate base course shall not deviate from finish grade in excess of 1/2 inch in 10 feet when tested with a 10-foot straight edge in any direction. All deviations in excess of the specified shall be corrected by the CONTRACTOR prior to authorization for placement of the next life of material.
- F. Immediately upon completion of compaction, the CONTRACTOR shall seal the surface of the compacted aggregate base course with a prime coat. The prime coat shall be applied as required



to provide a uniform coverage of the surface. Application shall be between 0.05 and 0.15 gallons per square yard of surface. If final surfacing is to be placed within twenty four (24) hours after completion of compaction, the prime coat may be waived as authorized by the OWNERS REPRESENTATIVE. The surface shall be kept at compaction moisture until the final surfacing is placed in the event the prime coat is waived.

- G. Traffic on compacted aggregate base course shall be limited to moisture control application and final surfacing traffic only, as authorized by the OWNERS REPRESENTATIVE.

3.02 TESTING

- A. A sample of material delivered to the project shall be taken for each days placement and tested for gradation and moisture density relationship. The average value of individual gradation tests, for all sieve size determinations, shall comply with the job mix formula within the tolerances specified in TABLE 302.B. Individual sample gradation test results, for all sieve size determinations, shall comply with the tolerance range plus two (2) percent. Non complying material shall be re-sampled and tested for compliance. Material not in compliance after the initial and follow up testing shall be removed and replaced by the CONTRACTOR at no cost to the OWNER, as directed by the OWNERS REPRESENTATIVE.
- B. Compaction tests shall be taken at the rate of one test for each 200 sy/lift placed, or as directed by the OWNERS REPRESENTATIVE, in accordance with the requirements of ASTM D 2922 and D 3017. Areas represented by non complying tests shall be reworked and retested for compliance.
- C. Test reports shall include but not be limited to the requirements of TABLE 302.E.
- D. Test Results shall be reported to the OWNERS REPRESENTATIVE, CONTRACTOR, and OWNER in writing, within 4 working days of completion of the sampling and or field test. Non-complying test shall be reported within 1 working day of completion of the test.

TABLE 302.A  
OWNERS REPRESENTATIVEING REQUIREMENTS

CHARACTERISTIC	SPECIFICATION LIMIT(S)	
	Fine	Course
Aggregate type		
Los Angeles Abrasion Wear (ASTM C 131)		40% Max
Soundness (5 cycles ASTM C 88)	15% Max	15% Max
Crushed Aggregate (% Material Retained on 3/8-inch Sieve by wt., having at least two (2) fractured faces)		50% Max.
Maximum % passing no 200	60% of No. 30	
Plasticity Index (Material finer than No. 40 sieve)	4.0 Max	
Sand Equivalent Value	in.	

TABLE 302.B  
GRADATION RANGES AND TOLERANCES

SIEVE SIZE/TYPE	PRODUCTION RANGE (% Passing)		PRODUCTION TOLERANCE (± %)
	I	II	
1-1/2-INCH	100	100	
1-INCH	95-100	100	
¾-INCH		90-100	8
½-INCH	64-75		8
3/8-INCH		65-80	8
NO. 4	35-46	48-55	8
NO. 30	12-18	18-25	5
NO. 200	5-12	6-15	3

TABLE 302.C  
SUBMITTAL REQUIREMENTS

A.	Supplier
B.	Date
C.	Design Mix Identification Number
D.	Contractor
E.	Construction Project Number
F.	Construction Project Title (Contract)
G.	Certification of compliance
H.	Target Gradation of Material
I.	Optimum moisture and maximum dry density relationship of material and graph

The Submittal shall be rejected without review if the specified data is not included

TABLE 302.D  
DELIVERY TICKET INFORMATION

A.	Name of Supplier
B.	Date of Delivery
C.	Delivery Ticket Number
D.	Name of Contractor
E.	Project Name
F.	Job Mix Formula Identification Number
G.	Weight of Load
H.	Time Loaded

TABLE 302.E  
TEST REPORT INFORMATION

A.	Field Data	
		Date of Sampling/Field Test
		Project Number or Permit Number
		Project Title
		Location of sample/field test as defined by the project plans and specifications
		Time of sampling/Field testing
		Field test results with reference specification limitations
B.	Laboratory Data	
		Base course classification
		Gradation
		Plasticity Index
		Liquid Limit
		Optimum moisture/maximum dry density relationship and graph
		Estimated soil resistance R-value

END OF SECTION



## SECTION 33 1005

### PROCESS PIPING AND FITTINGS

#### PART 1 GENERAL

##### 1.01 SECTION INCLUDES

- A. This specification is intended to cover all site piping of the following types:
  - 1. PVC pipe
  - 2. Ductile Iron Pipe
  - 3. Stainless Steel Pipe.
- B. Service Saddles
- C. Unions
- D. Hangers and Supports
- E. Pipes through walls and slabs
- F. Pipe seals through foundation and wall penetrations

##### 1.02 REFERENCES

- A. ANSI A21.10 Gray Iron and Ductile Iron Fittings 2-inch through 48-inch
- B. ANSI A21.11 Rubber gasket Joints for Cast-Iron and Ductile Iron Pressure Pipe and fittings
- C. ANSI A21.51 Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand Lined Molds for Water and Other Liquids.
- D. ANSI B2.1 Pipe Thread Specifications.
- E. ANSI B16.4 Cast Iron Threaded Fittings
- F. ANSI B16.10 Face-to-Face and End-to-End Dimensions of Ferrous Valves
- G. ASTM A307B Carbon Steel Externally Threaded Standard Fasteners

- H. ASTM 563 Carbon and Alloy Steel Nuts.
- I. ASTM D1784 Rigid Polyvinyl Chloride (PVC) compounds and Chlorinated Polyvinyl Chloride (CPVC) Compounds.
- J. ASTM D1785 Polyvinyl Chloride (PVC) Plastic Pipe.
- K. ASTM D2464 Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
- L. ASTM D2564 Solvent Cements for Polyvinyl Chloride (PVC) Plastic Pipe and Fittings
- M. ASTM D2467 Socket-Type Poly (Vinyl-Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
- N. ASTM D2855 Making Solvent-Cemented Joints with Poly (vinyl Chloride) (PVC) Pipe and Fittings.
- O. AWWA C110 Ductile Iron and Gray-Iron Fittings, 3-in through 48-inch for Water and Other Liquids.
- P. AWWA C111 Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings.

### 1.03 DEFINITIONS

- A. Pressure Pipe: Pipe that is completely full with an upstream head condition, or the possibility thereof resulting on radial stressed on the inside wall of the pipe.
- B. Non-Pressure Pipe: Pipe that has a free water surface within the pipe, and has no or infrequent potential of being completely full.

### 1.04 SUBMITTALS

- A. Submit Shop Drawings, installation instructions, and other materials, under provisions of Section 01 3000 – Submittals, for the following:
  - 1. pipe
  - 2. valves
  - 3. valve boxes
  - 4. flexible seals
  - 5. flexible couplings
  - 6. couplings and other appurtenances

- B. Submit Operation and Maintenance data in accordance with Section 01 3000 , for the following:
  - 1. Valves
  - 2. Electronically Actuated Valve Operators
- C. Quality Control Submittals:
  - 1. Manufacturer's Certificate of Compliance.
  - 2. Testing Plan: Submit at least 15 days prior to testing and at minimum include the following:
    - a. Testing dates.
    - b. Piping systems and section(s) to be tested.
    - c. Method of isolation
    - d. Method of conveying water from source to system being tested
    - e. Calculation of maximum allowable leakage for piping section to be tested.
  - 3. Certification of Calibration: Approved testing laboratory certificate of pressure gauge for hydrostatic test has been previously used. If the gauge is new, no certificate is required.
  - 4. Test report documentation.

#### 1.05 DELIVERY, STORAGE, AND PROTECTION

- A. Arrange delivery of products in accordance with construction schedule and to allow inspection of materials prior to installation.
- B. Coordinate deliveries to avoid conflict with conditions at site.
- C. Products shall be delivered in undamaged condition in original containers or packaging, with identifying labels intact and legible.
- D. Clearly mark identity of partial deliveries of component parts to facilitate assembly.
- E. Store products immediately on delivery and protect until installed. Store in accordance with manufacturer's instructions, with seals and labels intact and legible.
- F. Provide platforms, blocking or skids, or coverings required to protect products from deterioration or damage.
- G. Arrange storage in a manner to provide easy access fro inspection.

- H. Maintain storage conditions to prevent deterioration or damage.
- I. Protect products after installation to prevent damage from subsequent operations. Remove when no longer needed.
- J. Provide equipment and Personnel necessary to handle products by methods to prevent damage to products or packaging.

1.06 SCHEDULE:

- A. Piping materials, type and diameter are scheduled as shown in contract drawings.

PART 2 PRODUCTS

2.01 GENERAL

- A. Refer to pipe schedule in drawings and to standards referenced.
- B. Deviation from piping specification:
  - 1. If pipe wall thickness specified is not available, use next heavier wall thickness.
  - 2. Allow 10% additional wall thickness for pipe wall thinning on steel pipe bends.

2.02 MATERIALS

- A. Small Diameter Above ground Polyvinyl Chloride Piping (Less than 4-in. diameter)
  - 1. Pipe type:
    - a. Schedule 40, Schedule 80, and Schedule 120 PVC, per ASTM D1785
    - b. Minimum Pressure Class 150 unless otherwise noted.
  - 2. Minimum thickness of pipe wall shall be per class specified.
  - 3. Joints:
    - a. Pipe Joints shall be PVC couplings of the same schedule as the pipe.
    - b. Joints shall be solvent welded using solvent cements, per ASTM D2564.
  - 4. Fittings:
    - a. Fittings shall be PVC, schedule 80 minimum, and no less than the same schedule as the pipe.
    - b. Fittings shall be solvent welded using solvent cements, per ASTM D2564.
- B. Buried Polyvinyl Chloride Piping:



1. Pipe type:
  - a. Pressure Applications: DR 18, per AWWA C900.
  - b. Non-Pressure Applications: Schedule 80 PVC
2. Minimum thickness of pipe wall shall be per class specified.
3. Joints:
  - a. Pipe joints shall be rubber gasket and conform to AWWA C900, AWWA C905, and AWWA C909.
4. Fittings:
  - a. Pressure Applications:
    - 1.) Ductile Iron, conforming to AWWA C153 or C110.
  - b. Non-Pressure Applications:
    - 1.) Solvent welded PVC fittings of the same schedule as the pipe.
5. bolts, Nuts, and Gaskets:
  - a. Bolts: ASTM 307B
  - b. Nuts: ASTM A307B, Hex.
  - c. Gaskets: Full face rubber, 1/8" thickness.

C. Ductile Iron Piping:

1. Pipe Type:
  - a. ANSI A21.51, with 60-42-10 ductile iron.
2. Minimum Thickness of pipe wall shall be per class specified on Drawings.
3. Joints:
  - a. Exposed: ANSI A21.15, flanged
  - b. Underground: ANSI A21.11, Mechanical Joint
4. Fittings:
  - a. Ductile Iron, Flanged ANSI A21.10, Working Pressure 150 psi min.

- D. Stainless Steel Piping:
1. Pipe Type:
    - a. AWWA C220-17 Standard for Stainless-Steel Pipe, ½ in. (13MM) and Larger.
  2. Minimum thickness of pipe wall shall be per size and class specified.
  3. Joints:
    - a. welded steel.
  4. Fittings:
    - a. Fittings for stainless steel pipe shall conform to the dimensions of AWWA C208 and shall be made of segmentally welded sections of hydrostatically tested pipe (same material and thickness), with ends compatible for type of joints shown. The minimum radius of elbows shall be 2.5 times the pipe diameter and the maximum miter angle on each section of elbow shall not exceed 11.25 degrees. Fittings shall be equal in pressure design strength and shall have the same lining and coating as the abutting pipe.
    - b. Flanges: Stainless Steel Pipe flanges shall be in accordance with AWWA C228-19
  5. Coatings: Uncoated
- E. Service Saddles:
1. Double strap type with minimum strap width of 2-inches.
  2. Straps shall be of type 304 stainless steel. Saddles shall be ductile iron, epoxy coated, 10-mils minimum thickness.
  3. Minimum Pressure Rating: 200 psi
- F. Unions:
1. Unions shall be provided for pipe assemblies at all locations where disassembly may be required and to allow removal of connecting equipment.
  2. unions shall be single open arch flexible expansion couplings with 304 stainless steel bolts and nuts by Proco, Inc. or approved equal
- G. Hangers and Supports:
1. Provide hangers and supports as necessary to support piping properly. Hanger types shall comply with applicable equipment for the application shown on Drawings.

## H. Pipes through walls and slabs

1. Wall Pipes: Provide cast iron wall sleeves or wall castings, at all designated points on the Drawings where pipelines pass through structure walls. Wall pipes shall be grouted in place in holes through existing construction. Cutting of new work will not be permitted except where specific authorization of Engineer is obtained by Contractor.
  - a. Provide with intermediate flange.
  - b. Material, thickness, and ends shall match connecting piping.
  - c. Provide tapped holes where wall pipes are flush with concrete.
  - d. Use where shown for pipes passing through floors or walls.
2. All wall penetrations in building walls shall be finished with a trim ring on both sides of the wall to cover and seal any gaps around the pipe.

## I. Pipe Seals Through Foundation and Wall Penetrations.

1. General: Seals shall be modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and wall opening. Links shall be loosely assembled with bolts to form a continuous rubber belt around the pipe with a pressure plate under each bolt head and nut. After the seal assembly is positioned in the sleeve, tightening of the bolts shall cause the rubber sealing elements to expand and provide an absolutely water-tight seal between the pipe and wall opening. The seal shall be constructed so as to provide electrical insulation between the pipe and wall, thus reducing chances of cathodic reaction between these two members.
2. The Contractor shall determine the required inside diameter of each individual wall opening or sleeve before ordering, fabricating, or installing. The inside diameter of each wall opening shall be sized as recommended by the manufacturer to fit the pipe and Link-Seal to assure a water-tight joint.
3. Space between sleeves and piping passing through top slabs, walls and partitions for un-insulated piping, and around yard hydrants shall be sealed watertight and gastight using mechanical seals.
4. Installation: Install seals in strict accordance with the manufacturers recommendations. All bolts and nuts for the seals shall be 304 stainless steel.
5. Manufacturer: Link-Seal, Thunderline Corporation, Inc., or approved equal.

## PART 3 EXECUTION

### 3.01 PREPARATION

- A. General: fabrication, assembly, and erection shall be in accordance with manufacturer's requirements and all code requirements that pertain.
- B. Verification of Measurements:
  - 1. Before fabrication, Verify measurements at Site, including actual location of equipment connections and verification of flange facings and drillings to which piping connects.
  - 2. Make field measurements necessary to accurately determine piping make-up lengths or closures and to permit working piping into place without forcing or springing.
- C. Adequately protect surrounding work so as ton prevent damage during installation.
- D. Interior surfaces of all piping shall be kept clean, and free from dirt and debris.
- E. All pipe edges shall be smoothed and removed from ridges and burrs.
- F. During the progress of construction the open end of the pipe shall be properly capped or plugged with appropriate fittings.

### 3.02 BURIED PIPE INSTALLATION

- A. Prepare trench in accordance with NMAPWA 701.
- B. All piping shall have a minimum of 4' earth cover, unless otherwise noted.
- C. Lay pipe in the dry.
- D. All materials shall be handled in a manner to ensure placement in the trench in undamaged condition, including damage to pipe coatings.
- E. Plug or cap and block pipe ends or fittings left for future connections.
- F. Uncover existing pipe, to which connections are to be made, sufficiently ahead of pipe laying operation to determine fittings required.
- G. Make connections between existing and new pipe with special fittings to suit actual conditions.
- H. Follow recommendations of pipe manufacturer.
- I. Place metallic detectable warning tape in trench 18-inches above all non-metallic sub-grade piping. The tape shall be detectable with a standard pipe locator. The color and cautionary message of the tape shall be in accordance with industry standard for specific applications. The tape shall be 2-inches wide, and impervious to alkalis, acids, chemical reagents, and solvents found in the soil.

### 3.03 THRUST RESTRAINT

- A. Use restrained joints for all pressure piping where buried piping changes direction, changes size, and at dead ends.
- B. Provide length of pipe restraint as shown on Drawings; adjust length in accordance with varying conditions

### 3.04 INSTALLATION OF EXPOSED PIPE NOT DETAILED

- A. Install essentially as indicated and required; modify as required to clear structures and equipment.

### 3.05 PIPE JOINTS AND METHODS

- A. Flanged joints:
  - 1. Make up flanges prior to completing last weld in connecting piping; alignment of piping shall be correct without forcing or drifting.
  - 2. Coat bolt threads with suitable lubricant.
- B. Solvent cemented joints: conform to ASTM D2855
- C. Welding:
  - 1. metallic arc process, in accordance with ANSI/ASME B31.1
  - 2. Shielded arc or coated electrodes specifically designed for pipe material.
  - 3. Use only one welding operator on each joint.
  - 4. Thoroughly grind or wire brush each weld pass and remove welding slag and defective material before next pass is applied.
  - 5. Welds shall be neat; remove excessive spatter by chipping or grinding.
- D. Mechanical Joint:
  - 1. Install mechanical joint restraints per restraint manufacturers' recommendation.
  - 2. Coat bolts with suitable lubricant.
- E. Victaulic Joint:
  - 1. Install Victaulic joints in accordance with fitting manufacturer's recommendations.
- F. Expansion Joints:

1. Expansion joints are intended to provide flexibility and vibration dampening to piping. Expansion joints shall not be used to compensate for misalignment of piping or flange bolt holes, and shall be installed per joint manufacturer's recommendations. Contractor shall not stretch expansion joints to exceed their normal laying length when installed.
- G. Rubber gasket:
1. Rubber gaskets shall be placed in accordance with manufacturer's recommendations.
- H. Pipe bending for Horizontal or Vertical Curves:
1. Radius of curves shall not exceed 75% of the manufacturer's recommended value.
  2. Use blocks or braces at pipe joints to ensure axial deflection in gasketed or mechanical joints does not exceed allowable deflection.
- I. Joint deflection:
1. Deflection of pipe at joints shall not exceed 75% of the manufacturers recommended deflection angle.

### 3.06 INSPECTION AND HYDROSTATIC TESTING

- A. General:
1. Notify ENGINEER in writing at least 5 days in advance of testing. Perform testing in presence of ENGINEER or Approved Inspector.
  2. Using water as test medium. All newly installed pressure pipelines shall successfully pass hydrostatic leakage test prior to acceptance. All newly installed non-pressure pipelines shall successfully pass air
  3. Hydrostatic testing shall be done with valves closed during testing, and each segment of pipe shall be individually tested between valves.
  4. Test reports shall be maintained by CONTRACTOR, and submitted to ENGINEER at the completion of hydrostatic testing. Reports shall be completed on the form at the end of this Section.
  5. Conduct field hydrostatic test on buried piping after trench has been completely backfilled. Testing may, as approved by ENGINEER, be done prior to placement of asphaltic concrete or roadway structural section.
  6. CONTRACTOR may, if field conditions permit and as approved by ENGINEER, partially backfill trench and leave joints open for inspection and conduct initial service leak test. Final field hydrostatic test shall not, however, be conducted until backfilling has been completed as specified above.

7. Supply of Temporary Water: In accordance with section CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS.
8. Install temporary thrust blocking or other restraint as necessary to prevent movement of pipe and protect adjacent piping or equipment. Make necessary taps in piping prior to testing.
9. Prior to test, remove or suitably isolate appurtenant instruments or devices that could be damaged by pressure testing.
10. New piping connected to existing piping: isolate new piping with grooved-end pipe caps, blind flanges, or other means as acceptable to ENGINEER.
11. In Lieu of hydrostatic testing, Low-pressure air testing shall be performed in accordance with ASTM F1417 for gravity sewer lines only.
12. CONTRACTOR shall submit all testing reports to the ENGINEER for review and final acceptance.

B. Hydrostatic Testing Procedure:

1. Furnish testing equipment, as approved by ENGINEER, which provide observable and accurate measurements of leakage under specified conditions.
2. Test Pressure: 150 psi as measured at low point of pipeline.
3. Apply and maintain specified test pressure with hydraulic force pump. Valve off piping system when test pressure is reached.
4. Maintain hydrostatic test pressure continuously for 2 hours minimum adding make-up water only as necessary to restore test pressure.
5. Verify there are no visible leaks and test pressure is maintained for 2 hour test period.

END OF SECTION





## SECTION 33 1700

### ARSENIC TREATMENT SYSTEM (AdEdge)

#### PART 1 GENERAL

##### 1.1 WORK INCLUDED

- A. This Section covers the work necessary by the Arsenic Treatment System (ATS) Supplier to supply, startup, and commission for operation an on-site arsenic treatment system utilizing an adsorption process.
- B. The ATS Supplier shall furnish the following components of the ATS:
1. Skid support frame with anchor plates
  2. Pressure vessels, internal components, and media
  3. Internal mechanical components: piping, fittings, flanges, and supports
  4. Manually operated process control valves, flow control valves, isolation valves
  5. Instruments to measure flow, pressure, and perform water sampling
  6. Skid-mounted relay panel with electrical components
- C. The ATS Supplier shall be responsible for the following:
1. Submit with Submittal Package ATS Supplier's Qualifications
  2. Submit with Submittal Package ATS Supplier's Warranty Information
  3. Submit with Submittal Package ATS Supplier's Scope of Supply
  4. Size all equipment to be supplied per this specification
  5. Prepare submittals with design report, shop drawings, equipment specs
  6. Procure / Fabricate final ATS equipment
  7. Conduct in-house Quality Assurance & Quality Control prior to shipment
  8. Deliver the equipment to the project job site
  9. Provide as-built P&ID, GA, and electrical one-line diagrams
  10. Provide O&M Manual with as-built documents
  11. Provide a pre-installation checklist or System Commissioning Plan
  12. Collaborate with contractor during installation to ensure proper installation
  13. Field start-up, commissioning, and operator training
- D. The Contractor shall be responsible for the following:
1. Interface with engineer during the submittals approval process.
  2. Build the facility housing and foundation.
  3. Receive, offload, and store all equipment delivered by the ATS Supplier
  4. Install the ATS equipment and provide anchoring to structural pad.
  5. Install interconnecting piping, hosing, joints, fittings and valves between equipment supplied by ATS supplier and adjacent equipment.
  6. Provide control connections from the ATS's control panel to adjacent equipment.
  7. Providing electrical supply connections to the ATS equipment.
  8. Providing chemicals necessary during startup (if applicable).
  9. Correcting installation-related problems if they occur.
  10. Perform lab-tests to demonstrate contaminant removal compliance
  11. Load underbedding gravel and adsorption media into initial treatment vessel, and prepare vessels for functional use in accordance with ATS Suppliers recommendations.

- E. Following the completion of installation by the Contractor, the ATS Supplier shall perform functional, performance, and start-up testing of the System to demonstrate that performance criteria are being achieved. The ATS Supplier shall train Owner's personnel and provide detailed instructions in the operation of the Treatment Equipment. This training shall be provided at the time of startup and coordinated closely with the Owner's operator.

## 1.2 RELATED DOCUMENTS

### 1.3 GENERAL

- A. All civil, structural, electrical, mechanical and painting work included herein shall conform to the applicable Sections or Divisions of this project except as otherwise shown or specified, and shall be the responsibility of the General Contractor.
- B. The Drawings show details of the components and their overall relationships. Not all items incidental to the ATS are shown or specified. It is the intent of these Contract Documents that the ATS Supplier is to provide a complete workable system whether or not any specific component is shown or specified.

### 1.4 REFERENCES

- A. The following references apply:
  1. American National Standards Institute (ANSI).
  2. American Society of Mechanical Engineers (ASME).
  3. American Society for Testing Materials (ASTM).
  4. American Water Works Association (AWWA).
  5. Confinement of Substances Hazardous to Health (COSHH).
  6. Institute of Electrical and Electronics Engineers (IEEE).
  7. International Standards Organization (ISO).
  8. National Electrical Code (NEC).
  9. National Electrical Manufacturers Association (NEMA).
  10. National Institute of Occupational Safety & Health (NIOSH).
  11. Occupational Safety and Health Administration (OSHA).
  12. Water Environment Federation (WEF)

### 1.5 SUBMITTALS AND O&M MANUAL

- A. System Description Documents: Submit for review/approval the following in one comprehensive submittal package within 4 weeks of project award:
  1. Complete design report including description of technology and system operation, media quantities and its expected performance, any required chemical addition, description and location of valves and instruments, wastewater flows and volumes, and other required technical information required to describe a fully-functioning system.
  2. Complete Equipment Scope of Supply for a fully functioning system.
  3. Control Logic Table, Electrical Connections Table, and Electrical Single-Line Diagram.
  4. Media manufacturer's technical information, including physical and chemical characteristics, MSDS sheets, media specifications, ANSI/NSF 61 certification,

- recommended media loading rates for service, backwash/regeneration, and rinse cycles.
5. Spent media disposal methods and procedures, including analytical methods used to assure disposal in accordance with the Resource Conservation and Recovery Act.
  6. Manufacturer's literature, cut sheets, illustrations, specifications, and engineering data, including dimensions, materials, size, weight, and performance data for all components including valves, instruments, pumps, and other ancillary equipment.
- B. Shop Drawings: Submit for review/approval the following in one comprehensive submittal package within 4 weeks of project award:
1. Shop drawings shall include, but not be limited to the following:
    - a. General Arrangement (GA) drawings showing general dimensions, connections, elevations and overall system configuration
    - b. Process Flow (PFD) and Piping & Instrumentation Diagrams (PID) showing the general process, valves and instruments used to control and monitor the system.
- C. Post Installation Documents: Submit
1. Operation & Maintenance Manuals:
    - a. As-built shop drawings: PFD, PID, GA and electrical drawings including one-line diagrams, control schematics, panel drawings.
    - b. Provide two (2) hard copies and one (1) digital PDF copy at project completion. Manuals shall include complete installation instructions; operation procedures (including start-up and shut-down procedures for all modes of operation); preventative maintenance procedures and schedules; lubrication charts and schedules; spare parts list and any tools required for general operation and maintenance; troubleshooting instructions; safety considerations; names, addresses, and telephone numbers of Contractor, Treatment System manufacturer, and major system component manufacturers; and copies of all approved shop drawings.
    - c. Format Requirements: Use 8-1/2 inch by 11-inch paper and provide in a PDF format on compact disk. Larger drawings or illustrations are acceptable if folded neatly to the specified size in a manner which will permit easy unfolding without removal from the binder. Provide reinforced punched binder tab. All text shall be legible typewritten or machine printed or high quality copies of same.
    - d. Each page shall have a binding margin of 1-inch and be punched for placement in a triple post binder.
    - e. Use dividers and indexed tabs between major categories of information. Provide a table of contents for each complete O&M.
    - f. All Operations & Maintenance Manuals and technical information provided shall be specific to this project. All information unrelated to this project shall be deleted.
  2. SPARE PARTS: A list of recommended spare parts must be provided in the O&M Manual identifying AdEdge part number, description, and quantity. Any special tools required for operation and maintenance of the system shall be identified and listed in the O&M Manual.

## 1.6 QUALIFICATIONS

- A. ATS Supplier's Qualifications
  - 1. The ATS Supplier shall have experience in furnishing equipment of similar capacity and service capability to the equipment described herein. As part of their Submittal submittal package (to be submitted with the Submittal), the ATS Supplier shall provide the following:
    - a. A list of at least 25 installations where similar equipment by the ATS Supplier is currently in comparable service; include contact name, telephone number, mailing address, engineer, owner, and date of installation.
    - b. Participation in at least 7 unique locations as part of the U.S. EPA Arsenic Removal Technology Demonstration Program as detailed in EPA Document EPA/600/R-11/090 "Cost of Arsenic Removal Technologies for Small Water Systems: U.S. EPA Arsenic Removal Technology Demonstration Program."
    - c. A proven track record of successfully deploying and implementing fully packaged water treatment systems for Municipal, Public and Community Water Systems for at least 10 years.
    - d. Evidence of manufacturing capability and supply of the completed packaged system herein within a single manufacturing facility that includes the system, relay panel(s), and complete assembled unit which shall be QC and factory acceptance tested prior to shipment.

## 1.7 QUALITY ASSURANCE

- A. Factory Acceptance Test (FAT)
  - 1. The ATS supplier shall certify Piping Hydrostatic Pressure Test passed:
    - a. System Hydrotest administered at Maximum Working Pressure for a period of 60 minutes with no leaks observed (130 psi minimum).
  - 2. System dimensions match submittal drawings

## 1.8 WARRANTY REQUIREMENTS

- A. As part of their Submittal Package, the ATS Supplier shall provide the equipment warranty associated with their system to address any material or component defects during the warranty period.
  - a. ATS shall be warranted for a period of 12 months after start-up and initial demonstration of required arsenic treatment performance in accordance with Section 3.4.D.
  - b. Should any component experience a structural failure or material defect under the designed operating conditions within the warranty period, the component shall be replaced or repaired free of charge, exclusive of labor, replacement media or shipping costs, assuming operation of the system per O&M procedures with documentation log.
- B. Provide a written warranty from the ATS Supplier on the O&M Manual
- C. The ATS Supplier shall provide the following after sales services:
  - a. Availability of technician to timely respond to and address any warranty issues that arise with the system during the warranty period.

- b. Must maintain an inventory of spare parts on this system such as valves, actuators, media, pressure gauges, metering and control valves.

## PART 2 – PRODUCTS

### 2.1 PRODUCTS / MANUFACTURER

- A. Approved Manufacturer: AdEdge Water Technologies, LLC, Duluth, GA. No “or Equals” or substitutions shall be accepted.
- B. Approved Technology: Adsorption Technology
- C. Acceptable Model: APU33-6060CS-2-MVH
- D. Acceptable Media: Bayoxide E33 granular ferric oxide media

### 2.2 FUNCTIONAL REQUIREMENTS

- A. The ATS shall be complete packaged treatment system that is piped and mounted at the factory prior to shipment.
- B. The ATS shall be skid-mounted on an epoxy-coated structural steel frame.
- C. All piping, fittings and flanges shall be SCH80 PVC.
- D. The vessels shall be equipped with flanged connections to facilitate repairs
- E. The vessels shall be of carbon steel construction, with an internal ANSI/NSF 61 approved epoxy liner, and shall be equipped with air vent and water drain valves.
- F. The system shall consist of two (2) vessels.
- G. The system shall perform manual backwash operations using manual butterfly valves seated on a valve harness and it shall consist of the following cycles: service, backwash, and fast rinse.
- H. Backwash water shall be treated water from pressurized distribution and shall enter the system through a Backwash Supply Inlet connection with manual on/off valve and check valve.
- I. During backwash and fast rinse, the well pump shall be locked-out.
- J. Backwash shall be initiated manually based on time, flow throughput, or differential pressure across system inlet / outlet exceeding 10 psi. Operator shall monitor system operations to determine when a backwash should be initiated.
- K. The system shall be supplied with a stainless steel mounted hydraulic panel to monitor the system inlet and outlet for pressures and water sampling.
- L. Sodium Hypochlorite and Carbon Dioxide will be injected prior to the ATS system. Carbon Dioxide Equipment will be provided by AdEdge and chemical supply by Others.

### 2.3 SERVICE CONDITIONS

- A. The system shall be designed and constructed for installation indoors and continuous operation with the following service conditions, and based on the following parameters:
  - 1. Design Flow Rate: 150 gallons per minute (gpm)
  - 2. Empty Bed Contact Time: 3.6 min
  - 3. Media Bed Depth: 36 inches plus underbedding material
  - 4. Vessel Configuration: Series or Parallel
  - 5. Site Electrical Service: 120 or 240 volts, single phase, 60 Hz
  - 6. Design Pressure: 118 pounds per square inch (psi) max
  - 7. Backwash Flow Rate: 220 gpm

B. Representative water chemistry data for the well that operate at the site is as follows:

Parameter	Value	Parameter	Value
pH	7.5 to 7.8	Sodium (mg/L)	45
Total As (ppb)	25 to 28	Nitrate (mg/L as N)	0.4
Hardness (mg/L as CaCO <sub>3</sub> )	140	Chloride (mg/L)	19
Alkalinity (mg/L as CaCO <sub>3</sub> )	190	Fluoride (mg/L)	0.4
Calcium (mg/L)	42	TSS (mg/L)	ND
Magnesium (mg/L)	9	Temperature (°F)	70
Silica (mg/L)	75 to 78	Conductivity (µmho/cm)	470
Phosphate (mg/L)	ND	TDS (mg/L)	340
Iron (mg/L)	0.12	Turbidity (NTU)	ND
Manganese (mg/L)	0.01	Total Organic Carbon (mg/L)	ND
Ammonia (mg/L)	ND	Vanadium (mg/L)	ND

(ND = Non Detect)

#### 2.4 MINIMUM PERFORMANCE REQUIREMENTS

- A. Under the service conditions set forth in Paragraph 2.3, the ATS shall consistently reduce arsenic to below 8 ppb as As in the final 150-gpm effluent after blending.
- B. As part of their Submittal Package, the ATS Supplier shall provide a system performance guarantee to ensure the system and media perform to expectations of the Owner based on the Supplier's predictions of performance. Samples for determining performance will be the responsibility of the Owner or Owner's operator and reported to the Supplier at least quarterly. At a minimum, the system must attain the treatment goal for the first year of operation assuming influent water quality matches water quality provided.

#### 2.5 VESSELS

- A. Carbon Steel Vessels:
  1. Shell and Heads Acceptable Material
    - a. Shell: ASTM A36C or Equal
    - b. Head: ASTM A36C or Equal
  2. Acceptable Head Types:
    - a. 2:1 Semi-elliptical Heads
    - b. Flanged and Dished Heads
  3. Materials of Construction:
    - a. Heads: SA414G Carbon Steel, or Equal
    - b. Shell: SA414G Carbon Steel, or Equal
  4. Exterior Coat:
    - a. Surface Preparation: SSPC-SP10 Near White Metal Blast
    - b. Film Thickness: 5-7 mils DFT
    - c. Acceptable Product: Tnemec N69F safety blue epoxy
  5. Inner Liner:
    - a. Surface Preparation: SSPC-SP5 near white blast
    - b. Film Thickness: 7-9 mils DFT
    - c. Acceptable Product: Devoe #BAR-RUST 233H epoxy (NSF61)
  6. Lifting Lugs: Two (2) on vessels 36" Ø and larger
  7. Connections:
    - a. Process Inlet: 4" DDPF located in Side Shell

- b. Process Outlet: 4" NPT, located in Bottom Head
- c. Air Vent: 1" NPT half coupling located on top head
- d. Media Loading: 12" x 16" manway on top head
- e. Accessing Tank Internals: 4" x 6" handhole on lower side shell
- 8. Vessel Internals
  - a. Inlet distributor:
    - 1. Type: Single-Point upturned on vessels 66" Ø and smaller
    - 2. Type: Four-Point upturned on vessels 72" Ø and larger
    - 3. Material: SCH 80 PVC
  - b. Outlet Collector:
    - 1. Type: Hub and slotted laterals w/ 0.010" slots
    - 2. Material: SCH80 PVC
  - c. Internal clips shall be provided whenever required to support the weight of vessel internals; this shall remain at the discretion of the ATS manufacturer.
- 9. Leg Requirements:
  - a. Four (4) angle legs with foot pads and anchor holes SHALL be provided on vessels 48" Ø and larger
- 10. Maximum Working Pressure (MWP): 150 psi
- 11. ASME Certification: None
- 12. Maximum Operating Temperature: 120° F

## 2.6 MEDIA

- A. Adsorption Media:
  - 1. General: Arsenic reduction media. The media shall be loaded with sufficient freeboard to allow for 40-50% bed expansion during backwash.
  - 2. Specification:
    - a. Type: Bayoxide E33 Granular Ferric Oxide Adsorption Media
    - b. Characteristics: Dry Granular, Amber color, < 15% by wt. moisture
    - c. Size: 10 x 30 mesh
    - d. ANSI/NSF 61 certified for drinking water.
    - e. Disposal: Material shall be discardable as a solid waste in an RCRA subtitle D (non-hazardous) landfill at the end of its life
- B. Underbedding: Coarse gravel 1/8-inch x 1/16-inch quartz (100 lbs/cuft)

## 2.7 SYSTEM VALVES

- A. Process Valves:
  - 1. General: Process valves shall be installed in a valve harness suitable for the control of all operations required by the system.
  - 2. Specification:
    - a. Type: Lug-style butterfly valves; AWWA C504-compliant
    - b. Materials: Ductile Iron body, EPDM seat, 416 SS stem, and Ductile Iron with Nylon 11 Coated disc
    - c. Operation: 175 psi max pressure
    - d. Process Mounting: ANSI class 125/150 flanges
    - e. Actuator Mounting: ISO 5211-compliant
    - f. Manufacturer: Bray S31 or Engineer-approved equal

## 2.8 FLOW CONTROL VALVES

- A. Throttling Valves:
1. General: Throttling valves shall be installed to provide throttling of the common treated water outlet and the common backwash water outlet.
  2. Plastic Valve Specification:
    - a. Type: Diaphragm
    - b. Materials: PVC body conforming to ASTM D1784, EPDM diaphragm, glass-filled polypropylene upper body
    - c. Operation: Manual with lockable handle, 150 psi at 68° F
    - d. Mounting: Flanged or Socket ends
    - e. Manufacturer: Georg Fischer 317, 514 or Engineer-approved equal
- B. Check Valves:
1. General: Check valves shall be installed for backflow prevention between connecting pipes of different water qualities.
  2. Plastic Valve Specification:
    - a. Type: Y-check weighted piston seat
    - b. Materials: PVC body conforming to ASTM D1784, EPDM seals
    - c. Operation: Horizontal or vertical operation, max 150 psi @ 68° F
    - d. Mounting: Spigot-end pipe connections
    - e. Manufacturer: Georg Fischer or Engineer-approved equal

## 2.9 SYSTEM INSTRUMENTATION

- A. Flow Sensors:
1. General: Flow sensors shall be installed on each vessel's inlet and shall have a local readout for flow indication
  2. Specification:
    - a. Type: Electromagnetic Flow Sensor
      - i. Sensor Body: Compact Aluminum Coated
      - ii. O-Rings: EPDM
      - iii. Electronics Housing: Cast powder-coated aluminum
      - iv. Electrodes: 1.4435/316L
    - c. Accuracy:  $\pm 0.5\%$  of full scale
    - d. Output: 4-20mA
    - e. Range: 0.2-20 ft/sec
    - f. Manufacturer: Endress + Hauser or Engineer-approved equal
- B. Differential Pressure Gauge:
1. General: A differential pressure gauge shall be installed on the system to measure system differential pressure
  2. Specification:
    - a. Type: Diaphragm
    - b. Materials: Aluminum body/316SS, ceramic, and acetal moving components
    - c. Dial Size & Type: 2.5" Round, Black on White Dial with Engraved Plastic Dial Case
    - d. Seal Materials: Buna-N
    - c. Output: Digital



- d. Differential Pressure Range: 0-20 psi
  - e. Manufacturer: Midwest or Engineer-approved equal
- C. Pressure Gauges:
- 1. General: Pressure gauges shall be installed on each vessel's inlet and outlet, and in the hydraulic panel, which shall house the system inlet and outlet pressure gauges.
  - 2. Specification:
    - a. Type: Glycerin-filled 2.5" dial, ¼-inch NPT connection
    - b. Materials: Brass or 316SS internals; 304SS case
    - c. Accuracy: ±2.5% of full scale
    - d. Output: Local reading only
    - e. Pressure Range: 0-100 psi
    - f. Manufacturer: Environmental World Products or Engineer-Approved Equal
- D. Sample Ports:
- 1. General: PVC ball valves shall be installed on each vessel's inlet & outlet, and on the system backwash outlet. SS toggle valves shall be installed in a central hydraulic panel, which shall house the system inlet & outlet sampling valves.
  - 2. PVC ball valve specification:
    - a. Type: PVC ball valves, ¼-inch, rugged unibody construction
    - b. Material: PVC body conforming to ASTM D1784, EPDM O-rings
    - c. Operation: 150 psi @ 70° F; lever handle for 90° turn operation
    - d. Manufacturer: Asahi or Engineer-approved equal
  - 3. SS toggle valve specification:
    - a. Type: SS toggle valves, ¼-inch NPT, panel-mounted
    - b. Material: 316 SS body conforms to ASTM A182
    - c. Operation: 450 psi max working pressure, quick opening & closing
    - d. Manufacturer: Hylok or Engineer-approved equal

## 2.10 SYSTEM CONTROL

- A. The ATS Supplier shall provide a Relay Panel, which shall house the power supply, relays, terminal blocks and other ancillary components for proper operation of the system. All wiring to field devices shall be terminated at a numbered terminal strip mounted directly in the panel. A separate stainless steel hydraulic panel shall be provided in addition to the control panel to monitor pressures and to obtain samples for compliance.
- B. Relay Panel Components:
- 1. Main Disconnect Switch and Emergency Stop Button: Power to all components
  - 2. System Alarm: Red Light and Buzzer
- C. Enclosure:
- 1. General: The Relay Panel components shall be housed in a skid-mounted enclosure. The panel shall face the front of the skid, or as required by site conditions, and shall be positioned to avoid interference with other system components.
  - 2. Specification:
    - a. Type: Wall Mounted Enclosure
    - b. Rating: NEMA 3R, 4, 4X, 12, 13

- c. Materials: 304 Stainless Steel
- d. Panel Door: Fitted with quarter-turn latches; no door window
- e. Manufacturer: Hoffman or Engineer-approved equal

## 2.11 MECHANICAL COMPONENTS

### A. PVC Piping, Fittings and Flanges:

- 1. Piping: Schedule 80 PVC: IPS, ASTM D1785
- 2. Fittings: Schedule 80 PVC, ASTM D2467
- 3. Pipe Threads: ASTM F1498, ANSI B1.20.1
- 4. Flanges:
  - a. Type: Van-Stone, 2-holed
  - b. Bolt hole pattern: ANSI B16.5, ASTM D4024
  - c. Material: ASTM D1784, PVC Cell Classification 12454-B
  - d. Mounting: ANSI Class 150

### B. Anchor Bolts, Nuts, and Washers

Type 316 stainless steel

## PART 3 – EXECUTION

### 3.1 SYSTEM COMMISSIONING PLAN

- A. The ATS Supplier shall provide a detailed pre-installation checklist and System Commissioning Plan (SCP) as a communication tool for proper installation, starting and testing, and shall work closely with the Contractor to ensure the system is installed, started up, and tested in accordance with the Manufacturer's instructions and the contract requirements. The SCP shall address disinfection of all equipment prior to connection to LMWC water distribution system in accordance with NMED regulatory requirements.

### 3.2 TRANSPORTATION AND PREPARATION

- A. ATS Supplier shall coordinate with the Contractor to arrange for transportation and delivery of the ATS equipment. Estimated shipping costs shall be provided by the ATS Supplier in their Submittal. The equipment shall be delivered to the site Monday through Friday only (excluding holidays) during the hours between 8 AM and 3 PM local time, and consigned to the proper party giving name of the project and the full address of Owner's project site. Notify Contractor's representative by telephone 48 hours prior to the anticipated arrival at the project site.
- B. Throughout shipment, all pipe ends or flanged connections shall remain sealed with watertight caps or blind flanges/plates that remain in place until installation of the equipment and completion of all piping connections.
- C. The Contractor shall offload and inspect, in the presence of the Owner's Representative, all equipment and materials against approved Shop Drawings at time of delivery and before installation. Equipment and materials damaged or not conforming to the approved Shop Drawings shall be noted. The ATS supplier shall be notified immediately and the necessary steps shall be taken to repair or replace damaged and non-conforming equipment. **DO NOT INSTALL DAMAGED EQUIPMENT.**

- D. Equipment and materials received by the Contractor are under the care and responsibility of the Contractor. These items shall be stored by the Contractor in a dry location and protected from the elements, and shall be handled in an approved manner in accordance with the ATS Supplier's recommendations. Contractor shall make provisions to protect materials on-site from theft, damage, or vandalism. Contractor is responsible for replacement of all damaged or stolen materials at the work site until final acceptance by Owner. If the Contractor elects to temporarily store the ATS equipment in a local warehouse, the warehouse shall be secure and bonded. If the Contractor stores the ATS equipment in the new building at the project site, the building shall be secure and all entrance doors installed and locked when the Contractor is not present on the site.

### 3.3 INSTALLATION

- A. Installation of the ATS and related appurtenances shall be performed by the Contractor, and shall be in accordance with the Engineer's Drawings and with the ATS Supplier's drawings, instructions and recommendations. Conflicts of information shall be called to the attention of the Engineer.
- B. The Contractor shall secure the ATS skid to the building's concrete foundation with appropriate anchor bolts, in accordance with the Engineer's and ATS Supplier's recommendations. The skid shall be accurately leveled on the ground surface.
- C. Contractor shall support external piping or tubing tying to the ATS components so as to impose minimal loads and stresses on the ATS equipment.

### 3.4 START-UP SERVICES AND TESTING

- A. The ATS Supplier's field services shall be retained for a period of not less than three (3) 8-hr day for startup and commissioning.
- B. The ATS Supplier's representative shall perform the following services:
  - 1. Inspect the completed installation and prepare an inspection report
  - 2. Supervise the correction of any defective or faulty work by the Contractor
  - 3. Test, calibrate and adjust all components for optimum performance
  - 4. Perform oversight of media loading (by contractor) and perform initial media flush
  - 5. Instruct Owner's personnel in the operation and maintenance of all components and conduct a training seminar at the site
- C. The ATS Supplier and Engineer shall verify that the ATS, as installed by the Contractor, is compatible with other adjacent equipment, instruments, controls and structures; and that all necessary external connections, being electrical and hydraulic, have been properly made to provide for a complete and working system. The ATS Supplier or Engineer shall supervise the correction of any defective or faulty work by the Contractor.
- D. The Contractor and ATS Supplier shall make equipment adjustments required to place system in proper operating conditions and shall test the ATS for proper operation in the presence of the Owner and Engineer.
- E. Startup testing shall include collection and independent laboratory analysis of three treated water samples for total arsenic concentration, following media installation and once normal

ATS system operation is established, at a flow of 150-gpm through the treatment vessels, with zero bypass. Each sample of treated water shall be collected at intervals one hour apart. All work to operate the ATS system and collect and transport samples to the laboratory shall be by Contractor. Laboratory analysis costs shall be paid by Contractor. Laboratory analysis of arsenic shall use EPA Test Method 200.8 for metals. Laboratory work shall be ordered on a "RUSH" basis to provide test results within 3 days. The ATS will be considered to have successfully met this initial performance test if all samples analyzed produce a test result of zero, or Non Detect, arsenic concentrations. This sample testing shall also be used to satisfy the requirement in Paragraph 3.4.E.

- F. The Contractor shall be responsible for first compliance sample through a State-certified laboratory. Costs for this analysis should be included in the Contractor's Submittal. If any sample indicates non-compliance, that sample will be re-run. Results shall be provided to the Engineer and Owner. Additional future sampling shall be the responsibility of the Owner. All work required for re-sampling, re-testing, and ATS system modifications shall be at no extra cost to the Owner.
- G. If the treatment system fails to meet any of the specified performance requirements, the Contractor and ATS Supplier shall modify and/or replace the necessary equipment to bring the system into compliance. After the modifications, the finished water shall be re-sampled and analyzed to verify satisfactory operation.
- H. The ATS Supplier shall provide O&M Manuals to the Owner at project completion per Section 1.5.

END OF SECTION

## SECTION 33 1710

### BACKWASH RECYCLE SYSTEM (AdEdge)

#### PART 1 GENERAL

##### 1.1 WORK INCLUDED

- A. This Section covers the work necessary by the Backwash Recycle System (BRS) Supplier to supply, startup and commission for operation of a backwash recycle system to supplement the operations of the Treatment System. The BRS supplier shall be the same as the Arsenic Treatment System (ATS) supplier.
- B. The BRS Supplier shall furnish the following components as part of the BRS:
1. Backwash Holding Tank with Fittings and Level Switch
  2. Recycle Pump Skid
  3. Sediment Filter Housing
  4. In-line Flow Meter
  5. Integration to interface BRS with Treatment System
- C. The BRS Supplier shall be responsible for the following deliverables:
1. Submit with Submittal Package BRS Supplier's Warranty Information
  2. Submit with Submittal Package BRS Supplier's Scope of Supply
  3. Size all equipment to be supplied per this specification
  4. Prepare submittals with design report, shop drawings, equipment specs
  5. Procure / Fabricate final BRS Equipment
  6. Conduct in-house Quality Assurance & Quality Control prior to shipment
  7. Deliver the equipment to the project job site
  8. Provide as-built P&ID, GA and electrical one-line diagrams
  9. Provide O&M Manual with as-built documents
  10. Provide a pre-installation checklist or System Commissioning Plan
  11. Collaborate with contractor during installation to ensure proper installation
  12. Field start-up, commissioning and operator training
- D. The Contractor shall be responsible for:
1. Interface with engineer during the submittals approval process.
  2. Construction of the structural pads and foundations (concrete work and reinforcing) for the Backwash Holding Tank and Recycle Pump Skid.
  3. Receive, offload and store all equipment delivered by the BRS Supplier
  4. Installation of the Backwash Holding Tank including setting tank in place, providing and installing cable restraints, anchor bolts and base plates for the tie-down system (if applicable).
  5. Procurement and installation of additional equipment for sludge pump-out.
  6. Install interconnecting piping, hosing, joints, fittings and valves between equipment supplied by BRS supplier and adjacent equipment.
  7. Providing control connections from the Treatment System's Relay Panel to the Recycle Pump Skid and the Level Sensor.
  8. Providing electrical supply connections to the BRS equipment.
  9. Correcting installation-related problems if they occur.

- E. Following the completion of installation by the Contractor, the BRS Supplier shall perform functional, performance and start-up testing of the System to demonstrate the system is operating per this specification. The BRS Supplier shall train Owner's personnel and provide detailed instructions in the operation of the BRS. This training shall be provided at the time of startup and be coordinated closely with the Owner's operator.

## 1.2 RELATED DOCUMENTS

- A. Treatment System specifications

## 1.3 GENERAL

- A. All civil, structural, electrical, mechanical and painting work included herein shall conform to the applicable Sections or Divisions of this project except as otherwise shown or specified, and shall be the responsibility of the General Contractor.
- B. The Drawings show details of the components and their overall relationships. Not all items incidental to the BRS are shown or specified. It is the intent of these Contract Documents that the BRS Supplier is to provide a complete workable system whether or not any specific component is shown or specified.

## 1.4 REFERENCES

- A. The following references apply:
  1. American National Standards Institute (ANSI).
  2. American Society of Mechanical Engineers (ASME).
  3. American Society for Testing Materials (ASTM).
  4. American Water Works Association (AWWA).
  5. Confinement of Substances Hazardous to Health (COSHH).
  6. Institute of Electrical and Electronics Engineers (IEEE).
  7. International Standards Organization (ISO).
  8. National Electrical Code (NEC).
  9. National Electrical Manufacturers Association (NEMA).
  10. National Institute of Occupational Safety & Health (NIOSH).
  11. Occupational Safety and Health Administration (OSHA).
  12. Water Environment Federation (WEF)

## 1.5 SUBMITTALS AND O&M MANUAL

- A. System Description Documents: Submit for review/approval the following in one comprehensive submittal package within 4 weeks of award:
  1. Complete design report including description of technology and system operation, description and location of valves and instruments, and other required technical information required to describe a fully-functioning system.
  2. Complete Equipment Scope of Supply for a fully functioning system.
  3. Control Logic Table and Electrical Connections Table
  4. Manufacturer's literature, cut sheets, illustrations, specifications, and engineering data, including dimensions, materials, size, weight, and performance data for all components including valves, instruments, pumps, and other ancillary equipment.

- B. Shop Drawings: Submit for review/approval the following in one comprehensive submittal package within 4 weeks of award:
1. Shop drawings shall include, but not be limited to the following:
    - a. General Arrangement (GA) drawings showing general dimensions, connections, elevations and overall system configuration
    - b. Process Flow (PFD) and Piping & Instrumentation Diagrams (PID) showing the general process, valves and instruments used to control and monitor the system.
- C. Post Installation Documents: Submit for approval the following:
1. Operation & Maintenance Manuals:
    - a. As-built shop drawings: PFD, PID, GA and electrical drawings including one-line diagrams, control schematics, panel drawings.
    - b. Provide two (2) hard copies and one (1) electronic PDF copy at project completion. Manuals shall include complete installation instructions; operation procedures (including start-up and shut-down procedures for all modes of operation); preventative maintenance procedures and schedules; lubrication charts and schedules; spare parts list and any tools required for general operation and maintenance; troubleshooting instructions; safety considerations; names, addresses, and telephone numbers of Contractor, Treatment System manufacturer, and major system component manufacturers; and copies of all approved shop drawings.
    - c. Format Requirements: Use 8-1/2 inch by 11-inch paper and provide in a PDF format on compact disk. Larger drawings or illustrations are acceptable if folded neatly to the specified size in a manner which will permit easy unfolding without removal from the binder. Provide reinforced punched binder tab. All text shall be legible typewritten or machine printed or high quality copies of same.
    - d. Each page shall have a binding margin of 1-inch and be punched for placement in a triple post binder.
    - e. Use dividers and indexed tabs between major categories of information. Provide a table of contents for each complete O&M.
    - f. All Operations & Maintenance information provided shall be specific to this project. All unrelated information shall be deleted from Operations & Maintenance manuals.
  2. SPARE PARTS: A list of recommended spare parts must be provided in the O&M Manual identifying part number, Supplier, and contact information. Any special tools required for operation and maintenance of the system shall be identified and listed in the O&M Manual.

## 1.6 QUALIFICATIONS

- A. BRS Supplier's Qualifications
1. The BRS Supplier shall have experience in furnishing equipment of similar capacity and service capability to the equipment described herein. As part of their Submittal Package, the BRS Supplier shall provide the following:
    - a. A list of ten (10) installations where similar equipment by the BRS Supplier is currently in comparable service; include contact name,

telephone number, mailing address, engineer, owner, and date of installation.

- b. A proven track record of successfully deploying and implementing fully packaged water treatment systems for Municipal, Public and Community Water Systems for at least 10 years.

## 1.7 QUALITY ASSURANCE

- A. Factory Acceptance Test (FAT)
  - 1. The BRS supplier shall test each and every component prior to shipment, and a fully functional test shall be performed on the system to certify the following:
    - a. All mechanical and hydraulic components operate properly.
    - b. The control panel operates and controls the correct components in the manner intended.
    - c. Confirmation of the control panel settings and any provided safety alarm features.
    - d. All system alarms and faults shall be confirmed and documented.
    - e. Verify that system dimensions match submittal drawings.

## 1.8 WARRANTY REQUIREMENTS

- A. As part of their Bid Submittal Package (to be submitted with the bid), the BRS Supplier shall provide an equipment warranty to address any material or component defects during the warranty period.
  - a. BRS shall be warranted for a period of 12 months after start-up.
  - b. Should any component experience a structural failure or material defect under the designed operating conditions, the component shall be replaced or repaired free of charge, exclusive of labor, replacement media or shipping costs, assuming operation of the system per O&M procedures with documentation log.
- B. As part of the Operation & Maintenance Manual, provide written warranty from the BRS Supplier that includes the following statements:
  - 1. BRS Supplier has inspected the installation of the BRS and has found it free from faults and defects and being in conformance with the Contract Documents.
  - 2. BRS Supplier must provide the following after sales services:
    - a. Availability of technician to timely respond to and address any warranty issues that arise with the system during the warranty period.
    - b. Must maintain an inventory of spare parts on this system such as valves, actuators, media, pressure gauges, metering and control valves.



## PART 2 – PRODUCTS

### 2.1 PRODUCTS / MANUFACTURER

- A. Model H2Zero Backwash Recycle System as manufactured by AdEdge Water Technologies, LLC.
- B. Engineer approved equal. Alternate suppliers are acceptable but demonstrations of equivalency must be submitted to the Engineer and approved in writing at least 14 days prior to bid date for consideration and approved in writing. Included must be drawings, submittals, and cut sheets of sufficient detail to determine equivalency for Engineer review and written approval prior to bid.

### 2.2 FUNCTIONAL REQUIREMENTS

- A. Volume of the Backwash Holding Tank shall be a minimum of 25% larger than the Expected Backwash Volume for a single vessels.
- B. The Recycle Pump shall be designed to deliver a maximum Recycle Backwash Flow of 10% of the Design Treatment System Flow.
- C. The Backwash Recycle Pump will be stated manually after:
  - a. The backwash water has been allowed to remain quiescent in the Backwash Holding Tank for the specified time
  - b. The well pump is in operation
  - c. The water level in the Backwash Holding Tank is high enough such that the low level switch is wet.
- D. A Cartridge Filter Housing shall be located downstream of Recycle Pump Skid.

### 2.3 SERVICE CONDITIONS

- A. The Recycle Pump Skid and Cartridge Filter Housing shall be designed and constructed for installation indoors. The Backwash Holding Tank shall be designed for installation indoors. The following service conditions apply:
  - 1. Expected Backwash Volume: 3,300 gallons (from Treatment System)
  - 2. Design Treatment System Flow: 150 gpm
  - 3. Backwash Outlet on Treatment System: 4" diameter
  - 4. Treatment System Expected Inlet Pressure: 38 psi
  - 5. Site Electrical Service: 120 / 240 VAC, single phase, 60 Hz

### 2.4 BACKWASH HOLDING TANK

- A. Storage Tank
  - 1. Design: Upright, cylindrical, cone bottom, single wall tank, molded in one-piece seamless construction by the rotational molding process.
  - 2. Storage Content: Temporary storage of non-hazardous backwash water with high suspended solids content.
  - 3. Standards: ASTM D1998
  - 4. Materials: HDLPE (High Density Linear Polyethylene)
  - 5. Certifications: ANSI/NSF 61 certified
  - 6. Minimum Specific Gravity: 1.5
  - 7. Manway: Minimum 32" flanges access opening, with 150# flange, located on top

- head
8. Tie-down / lifting lugs: Minimum of 4 integrally molded on top head
  9. Tank Color:
    - a. Natural resin for tanks to be installed indoors away from sunlight
  10. Seismic and Wind Restraint tie-down system:
    - a. Required on seismic-prone areas
    - b. Designed for seismic zone D seismic loads. Provide non-site-specific wet stamped calculations from Registered Professional Engineer.
    - c. Seismic design should always meet or exceed site-specific requirements as defined under the local building code.
    - d. Restraint system shall include galvanized steel or stainless steel cables, cable clips, thimbles, and ASTM A36 anchor plates. Installation shall be performed per the recommendations set forth in the wet stamped calculations.
    - e. Anchor bolts to be provided by Contractor
  11. Stand for cone-bottom tanks shall be a minimum of 30 degrees inclined in the horizontal plane, and shall be of carbon steel construction. The stand shall be seismic-rated if in seismic-prone zone. Acceptable product for tank stand paint: Tnemec N69F safety blue epoxy.
  12. Manufacturer Qualifications and Workmanship:
    - a. The tank manufacturer must have over 10 years of experience in the design and manufacture of rotationally molded chemical storage tanks using high density linear polyethylene.
    - b. Tank shall be manufactured in ANSI/NSF 61 Approved Facility
    - c. The finished tank shall be free, as commercially practical, of visual defects such as foreign inclusions, air bubbles, pinholes, pimples, crazing, cracking and delamination that will impair the serviceability of the tank.
    - d. A Factory Test Report shall be supplied with the tank showing:
      1. Verification of wall thickness
      2. Impact Test
      3. Hydrostatic Test
      4. Verification of Fitting Placement
      5. Visual Inspection
      6. Verification of Materials
  13. Markings: The tank shall be marked to identify the product, date (month and year) of manufacture, capacity and serial number.
  14. Manufacturer: Snyder Industries or Engineer-approved equal

**B. Fittings and Tank Connection Specifications**

1. Fittings located on the sidewall shall be PVC Bulkheads with EPDM gaskets on fittings 2" and smaller; they shall be PVC double-flanged bolted on fittings larger than 2".
2. Fittings located on the sidewall shall be located a minimum of 6" from the bottom and top of tank on sizes smaller than 3,000 gallons, and minimum of 9" from the bottom and top of tank on sizes 3,000 gallons or larger. The exception is if a Unitized Molded Outlet fitting is used as a drain on flat-bottom tanks.
3. Fitting gasket shall be at least 1-1/2" above or below the end of any knuckle radius on tanks smaller than 3,000 gallons, and 3" above or below the end of any knuckle radius on tanks 3,000 gallons or larger. In addition, fittings shall be installed away from flange lines and molded-in tank features such as gallon

markers, logos, ribs, edges of tank flats, etc.

4. Fittings must be located to avoid interference with tie-down devices.
5. Tank Connections:
  - a. All tank connections must have a provision for minimum 4% dimensional movement for tank expansion and contraction due to temperature and load changes.
  - b. Flexible connections such as flex hose or expansion joints rated for less than 20 psig are recommended for tank connections.
  - c. External rigid piping must be supported separately such that flexible connections do not carry any piping weight.
  - d. Use a suction-rated flexible connection on the Recycle Outlet.

C. Fittings and Tank Levels

1. Backwash Inlet shall be located on side wall and sized same as Backwash Outlet on Treatment System
2. Overflow shall be located and sized such that the head generated at the Design Treatment System Flow is below the Backwash Inlet connection. Overflow piping shall be oriented on the tank and connected to overflow piping as detailed in the Plans.
3. LOCKOUT: backwash shall be disabled (locked out) when the level switch detects a 'low level' in the tank.
4. BACKWASH ENABLE: backwash shall be enabled when the level switch detects a 'high level' in the tank.
5. PUMP DISABLE: pump shall be disabled when the low level switch is vertical and not floating on the water
6. PUMP ENABLE: pump shall be enabled when the high level switch is floating on the water
7. Recycle Outlet shall be located minimum 5" above the top of the conical section of the tank and oriented as shown in Plans. The Recycle Outlet shall be sized to handle the Recycle Backwash Flow where pipe velocity is less than 5 fps and avoiding choking of the Recycle Pump.
8. Sludge Outlet shall be 2" in size and shall be located either at the bottom of the tank in a Unitized Molded Outlet fitting.

D. Liquid Level Switches:

1. Type: Ultrasonic Level Switch;
2. Materials: 316SS
3. Electrical Rating: 30 VDC
4. Manufacturer: Omega, model LVSW-701

## 2.5 RECYCLE PUMP SKID

A. General

1. Frame: 304SS Tubular Steel Frame located 4" from floor
2. Pipe Connections: 304SS threaded piping with class 150# flanged ends
3. Mounting: Suction of pump skid connects to Recycle Outlet on Backwash Holding Tank
4. Manufacturer: AdEdge Water Technologies, LLC

B. Control Panel

1. Type: NEMA 4X Local Panel with terminal connections
2. Electrical: 230/60Hz/1 phase (3 phase is an option)

3. Control: Hand-Off-Auto (HOA) switch. Automatic operation is controlled from Facility Control Panel in electrical room
  4. Indicator Lights: Pump Run-light
- C. Recycle Pump
1. Type: Multi-stage Vertical Centrifugal, TEFC motor w/ NEMA 56 frame
  2. Features: Maintenance-free mechanical shaft seal
  3. Discharge-mounted gauge, 0-100 psi, 2-1/2" aluminum dial, 304SS body
  4. Manufacturer: Grundfos or Engineer-Approved equal
- D. Manual Ball Valve (suction)
1. Type: Full-port, 2-piece body, (F)NPT
  2. Material: 316 Stainless Steel ball and stem
  3. Manufacturer: Flowtek or Engineer-Approved equal
- E. Check Valve (discharge)
1. Type: Swing check valve, screwed cap, integral seats, ASTM A351, FNPT
  2. Materials: CF8M Body, cover and disc; Teflon gasket
  3. Manufacturer: Sharpe or Engineer-Approved equal
- F. Throttling Valve (discharge)
1. Type: Circuit Balancing Valve, CBV-VT NPT, Y-pattern, (F)NPT
  2. Features: (5) Five full 360° handwheel turns, valve position locking
  3. Materials: Brass alloy CW617 Body and Bonnet; EPDM seals
  4. Manufacturer: Armstrong or Engineer-Approved equal

## 2.6 IN-LINE FLOW METER

- A. Flow Sensors:
1. General: Flow sensors shall have a local readout for flow indication
  2. Specification:
    - a. Type: Electromagnetic Flow Sensor
      - i. Sensor Body: Compact Aluminum Coated
      - ii. O-Rings: EPDM
      - iii. Electronics Housing: Cast powder-coated aluminum
      - iv. Electrodes: 1.4435/316L
    - c. Accuracy:  $\pm 0.5\%$  of full scale
    - d. Output: 4-20mA
    - e. Range: 0.2-20 ft/sec
    - f. Manufacturer: Endress + Hauser or Engineer-approved equal

## 2.7 CARTRIDGE FILTER

1. Type: Heavy Duty in-line housing and filter
  - i. Housing: Polypropylene
  - ii. Cap: High-Flow Polypropylene
  - iii. Length: 10"
  - iv. Maximum Pressure: 90-psi
  - v. Cartridge Filter diameter: 4-1/2"
  - vi. Integral pressure relief/bleed on inlet side of cap.
  - vii. Port size: 1" NPT
  - viii. Manufacturer: Pentair/Pentek, Big-Blue Model 150233-75

## PART 3 EXECUTION

### 3.1 SYSTEM COMMISSIONING PLAN

- A. The BRS Supplier shall provide a detailed pre-installation checklist and System Commissioning Plan (SCP) as a communication tool for proper installation, and shall work closely with the Contractor to ensure the system is installed in accordance with the manufacturer's recommendations.

### 3.2 TRANSPORTATION AND PREPARATION

- A. BRS Supplier shall coordinate with the Contractor to arrange for transportation and delivery of the BRS equipment. Estimated shipping costs shall be provided by the BRS Supplier in their bid. The equipment shall be delivered to the site Monday through Friday only (excluding holidays) during the hours between 8 AM and 3 PM local time, and consigned to the proper party giving name of the project and the full address of Owner's project site. Notify Contractor's representative by telephone 48 hours prior to the anticipated arrival at the project site.
- B. Throughout shipment, all pipe ends or flanged connections shall remain sealed with watertight caps or blind flanges/plates that remain in place until installation of the equipment and completion of all piping connections.
- C. The Contractor shall offload and inspect all equipment and materials against approved Shop Drawings at time of delivery and before installation. Equipment and materials damaged or not conforming to the approved Shop Drawings shall be noted. The BRS supplier shall be notified immediately and the necessary steps shall be taken to repair or replace damaged and non-conforming equipment. **DO NOT INSTALL DAMAGED EQUIPMENT.**
- D. Equipment and materials received by the Contractor are under the care and responsibility of the Contractor. These items shall be stored by the Contractor in a dry location and protected from the elements, and shall be handled in an approved manner in accordance with the BRS Supplier's recommendations. Contractor shall make provisions to protect materials on-site from theft, damage, or vandalism. Contractor is responsible for replacement of all damaged or stolen materials at the work site until final acceptance by Owner.

### 3.3 INSTALLATION

- A. Installation of the BRS and related appurtenances shall be performed by the Contractor, and shall be in accordance with the Engineer's Drawings and with the BRS Supplier's drawings, instructions and recommendations. Conflicts of information shall be called to the attention of the Engineer.
- B. The Contractor shall secure the BRS to the building's concrete foundation with appropriate anchor bolts, in accordance with the Engineer's and BRS Supplier's recommendations. The BRS shall be accurately leveled on the ground surface.
- C. Contractor shall support external piping or tubing tying to the BRS components so as to impose minimal loads and stresses on the BRS equipment.

3.4 START-UP SERVICES AND TESTING

- A. The BRS Supplier's field services shall be retained for a period of not less than one (1) 8-hr day for startup and commissioning, independent of Arsenic Treatment System startup and commissioning.
- B. The BRS Supplier's representative shall perform the following services:
  - 1. Inspect the completed installation and prepare an inspection report
  - 2. Supervise the correction of any defective or faulty work by the Contractor
  - 3. Test, calibrate and adjust all components for optimum performance
  - 4. Instruct Owner's personnel in the operation and maintenance of all components and conduct a training seminar at the site
- C. The BRS Supplier and Engineer shall verify that the BRS, as installed by the Contractor, is compatible with other adjacent equipment, instruments, controls and structures; and that all necessary external connections, being electrical and hydraulic, have been properly made to provide for a complete and working system. The BRS Supplier or Engineer shall supervise the correction of any defective or faulty work by the Contractor.
- D. The Contractor and BRS Supplier shall make equipment adjustments required to place system in proper operating conditions and shall test the BRS for proper operation in the presence of the Owner and Engineer.
- E. The BRS Supplier shall provide O&M Manuals to the Owner at project completion per Section 1.5.

END OF SECTION

## SECTION 33 1720

### CARBON DIOXIDE FEED SYSTEM (AdEdge)

#### PART 1 GENERAL

##### 1.1 WORK INCLUDED

- A. General Description: The ATS SUPPLIER shall furnish a complete carbon dioxide gas feed system and ancillary equipment to provide pH adjustment for arsenic treatment.
- B. pH Adjust Chemical Feed Equipment:
  - 1. The CO<sub>2</sub> equipment shall be installed inside a panel for field installation
  - 2. Panel shall include the following equipment:
    - a. Two (2) ball valves
    - b. One (1) low pressure switch with indicator light
    - c. One (1) high pressure regulating valve
    - d. One (1) pressure relief valve
    - e. One (1) pressure gauge
    - f. One (1) rotameter
    - g. One (1) solenoid valve
    - h. One (1) check valve
    - i. One (1) corp stop with injection quill and isolation ball valve
  - 3. CO<sub>2</sub> storage and supply by others
  - 4. Pressure relief valve and regulator required on CO<sub>2</sub> storage and provided by others
- C. Submittals: The ATS Supplier shall supply at a minimum, provide the following Submittals for review in accordance with Section 1.04 by the Engineer within 2 weeks of award:
  - 1. Chemical feed module and controls cut sheets, specs, and calculations
  - 2. Chemical feed equipment specification sheets
  - 3. Prepare electrical connections diagram for the pump and monitor or other chemical feed controls

##### 1.2 WARRANTY REQUIREMENTS

- A. Warranty requirements are specified in Section 33 1700, Paragraph 1.8

##### 1.3 START-UP SERVICES AND TESTING

- A. The ATS Supplier shall provide a detailed pre-installation checklist and work closely with the General Contractor to ensure the system is installed in accordance with the Supplier or manufacturer's recommendations. General Contractor shall correct installation-related problems if they occur and shall provide a Certification of Proper Installation for the System.

- B. The ATS Supplier's field services – The labor/days required for installation and startup assistance for the system as part of the ATS system is noted in the ATS Section 33 1700, Paragraph 3.4. ATS supplier to provide a field service technician with demonstrated ability and experience in the installation and operation of the equipment. The field services technician shall perform the services described in Section 33 1700, Paragraph 3.4 and as described below:
1. Inspect the completed installation and prepare an inspection report.
  2. Test, calibrate, and adjust all components for optimum performance.
  3. Assist in initial media loading, start-up, and field-testing.
  4. Instruct Owner's personnel in the operation and user maintenance of all components. Conduct a training seminar at the site.
  5. Supervise the correction of any defective or faulty work before and after acceptance by Owner.
  6. Field service representative shall be responsible for ensuring that all operator training is completed.
- C. The ATS Supplier shall provide Operations & Maintenance Manual in accordance with Section 01 7000 – Contract Closeout and Section 33 1700.

#### 1.4 SPARE PARTS

- A. A list of recommended spare parts must be provided, identified by part number, Supplier, and contact information in the Operation and Maintenance Manual for the system. Any special tools required for operation and maintenance of the system shall be identified and listed in the O&M Manual.

END OF SECTION



## SECTION 33 1730

### HIGH-DENSITY POLYETHYLENE (HDPE) TANKS

#### PART 1 GENERAL

##### 1.1 WORK INCLUDED

- A. This Section covers the work necessary to supply, install, and start up the HDPE Finished Water Tank (FWT), and Waste Tank (WT.)

##### 1.2 RELATED DOCUMENTS

- A. Treatment System specifications

##### 1.3 GENERAL

- A. All civil, structural, electrical, mechanical and painting work included herein shall conform to the applicable Sections or Divisions of this project except as otherwise shown or specified, and shall be the responsibility of the General Contractor.
- B. The Drawings show details of the components and their overall relationships. Not all items incidental to the HDPE Tanks are shown or specified. It is the intent of these Contract Documents that the HDPE Tank Supplier is to provide a complete workable Tank capable of being connected to system piping as shown in Plan, and in compliance with all governing codes whether or not any specific component is shown or specified.

##### 1.4 REFERENCES

- A. The following references apply:
  - 1. American National Standards Institute (ANSI).
  - 2. American Society of Mechanical Engineers (ASME).
  - 3. American Society for Testing Materials (ASTM).
  - 4. American Water Works Association (AWWA).
  - 10. National Institute of Occupational Safety & Health (NIOSH).
  - 11. Occupational Safety and Health Administration (OSHA).
  - 12. Water Environment Federation (WEF)

##### 1.5 SUBMITTALS AND O&M MANUAL

- A. Shop Drawings: Submit for review/approval the following in one comprehensive submittal package within 4 weeks of award:
  - 1. Shop drawings shall include, but not be limited to the following:
    - a. General Arrangement (GA) drawings showing general dimensions, connections, elevations and overall system configuration
    - b. Material Data Sheets verifying that materials used to manufacture tanks is in compliance with the project design requirements.
    - c. Factory certified test report verifying that the HDPE tank is free from leaks.

- d. Seismic Loading and Restraint System calculations completed by a Registered Professional Engineer in the State of New Mexico.

## 1.6 QUALIFICATIONS

- A. The tank manufacturer must have over 10 years of experience in the design and manufacture of rotationally molded chemical storage tanks using high density linear polyethylene.
- B. Tank shall be manufactured in ANSI/NSF 61 Approved Facility
- C. The finished tank shall be free, as commercially practical, of visual defects such as foreign inclusions, air bubbles, pinholes, pimples, crazing, cracking and delamination that will impair the serviceability of the tank.
- D. A Factory Test Report shall be supplied with the tank showing:
  - 1. Verification of wall thickness
  - 2. Impact Test
  - 3. Hydrostatic Test
  - 4. Verification of Fitting Placement
  - 5. Visual Inspection
  - 6. Verification of Materials
- 1. Markings: The tank shall be marked to identify the product, date (month and year) of manufacture, capacity and serial number.

## 1.7 WARRANTY REQUIREMENTS

- A. Tank manufacturer shall provide a 1-year warranty for all HDPE Tanks provided under this specifications against all manufacturing and material defects and in compliance with these Contract Documents.
- B. Written Warranty shall be submitted with Shop Drawing submittal and included in the Contractors final Operations and Maintenance Manual.

## PART 2 – PRODUCTS

### 2.1 PRODUCTS / MANUFACTURER

- A. HDPE Tanks included in this specification shall be manufactured and provided by Miller Plastics, Inc.,

### 2.3 FINISHED WATER TANK (FWT)

- A. Design:
  - 1. Geometry: Circular tank with flat bottom and domed top, with manway located on top of tank; including 3 top ports, and 4 sidewall ports.
  - 2. Dimensions: 10'-0"-dia. X 10'-0" Tall
  - 3. Storage Content: Temporary storage of potable water
  - 4. Standards: ASTM D1998
  - 5. Materials: HDLPE (High Density Linear Polyethylene)
  - 6. Certifications: ANSI/NSF 61 certified
  - 7. Minimum Specific Gravity: 1.5
  - 8. Manway: Minimum 32" flanges access opening, with 150# flange, located on top head

9. Tie-down / lifting lugs: Minimum of 4 integrally molded on top head
10. Tank Color: White
11. Natural resin for tanks to be installed indoors away from sunlight
12. Seismic tie-down system:
  - i. Required on seismic-prone areas
  - ii. Designed for seismic zone D seismic loads. Provide non-site-specific wet stamped calculations from Registered Professional Engineer.
  - iii. Seismic design should always meet or exceed site-specific requirements as defined under the local building code.
  - iv. Restraint system shall include galvanized steel or stainless steel cables, cable clips, thimbles, and ASTM A36 anchor plates. Installation shall be performed per the recommendations set forth in the wet stamped calculations.
  - v. Anchor bolts to be provided by Contractor

**B. Fittings and Tank Connection Specifications**

1. Fittings located on the sidewall shall be PVC Bulkheads with EPDM gaskets on fittings 2" and smaller; they shall be PVC double-flanged bolted on fittings larger than 2".
2. Fittings located on the sidewall shall be located a minimum of 6" from the bottom and top of tank on sizes smaller than 3,000 gallons, and minimum of 9" from the bottom and top of tank on sizes 3,000 gallons or larger. The exception is if a Unitized Molded Outlet fitting is used as a drain on flat-bottom tanks.
3. Fitting gasket shall be at least 1-1/2" above or below the end of any knuckle radius on tanks smaller than 3,000 gallons, and 3" above or below the end of any knuckle radius on tanks 3,000 gallons or larger. In addition, fittings shall be installed away from flange lines and molded-in tank features such as gallon markers, logos, ribs, edges of tank flats, etc.
4. Fittings must be located to avoid interference with tie-down devices.
5. Tank Connections:
  - i. All tank connections must have a provision for minimum 4% dimensional movement for tank expansion and contraction due to temperature and load changes.
  - ii. Flexible connections such as flex hose or expansion joints rated for less than 20 psig are recommended for tank connections.
  - iii. External rigid piping must be supported separately such that flexible connections do not carry any piping weight.
  - iv. Use a suction-rated flexible connection on the Recycle Outlet.
  - v. Ports/Openings:
    1. Spray Nozzle Ports:
      - a. Qty: 2
      - b. Diameter: 4"
      - c. Connection Type: 150# Flange
      - d. Location: Top of tank oriented as shown in Plans
    2. Finished Water Tank Overflow and Drain Line:
      - a. Qty: 1
      - b. Diameter: 4"
      - c. Connection Type: 150# Flange
      - d. Location: Sidewall, 6" from bottom oriented as shown in Plans
    3. Finished Water Line Connection:
      - a. Qty: 1

- b. Diameter: 4"
  - c. Connection Type: 150# Flange
  - d. Location: Sidewall, 8.5" from bottom oriented as shown in Plans
4. Air Stripper Blower Line Connection:
    - a. Qty: 1
    - b. Diameter: 4"
    - c. Connection Type: 150# Flange
    - d. Location: Sidewall, 7'-6" from bottom oriented as shown in Plans
  5. Treated Water Line and Bypass Line Connection:
    - a. Qty: 1
    - b. Diameter: 4"
    - c. Connection Type: 150# Flange
    - d. Location: Sidewall, 7'-6" from bottom oriented as shown in Plans
  6. Level Sensor Port:
    - a. Qty: 1
    - b. Diameter: 3/4"
    - c. Connection Type: NPT
    - d. Location: Top of Tank from bottom oriented as shown in Plans

## 2.4 WASTE TANK (WT)

### A. Design:

1. Geometry: Circular tank with conical bottom and stand, and domed top, with manway located on top of tank; including 2 top ports, and 1 sidewall ports.
2. Dimensions: 8'-0"-dia. X 8' Tall
3. Storage Content: Temporary storage of non-potable water
4. Standards: ASTM D1998
5. Materials: HDLPE (High Density Linear Polyethylene)
6. Certifications: ANSI/NSF 61 certified
7. Minimum Specific Gravity: 1.5
8. Manway: Minimum 32" flanges access opening, with 150# flange, located on top head
9. Tie-down / lifting lugs: Minimum of 4 integrally molded on top head
10. Tank Color: White
11. Natural resin for tanks to be installed indoors away from sunlight
12. Seismic tie-down system:
  - i. Required on seismic-prone areas
  - ii. Designed for seismic zone D seismic loads. Provide non-site-specific wet stamped calculations from Registered Professional Engineer.
  - iii. Seismic design should always meet or exceed site-specific requirements as defined under the local building code.
  - iv. Restraint system shall include galvanized steel or stainless steel cables, cable clips, thimbles, and ASTM A36 anchor plates. Installation shall be performed per the recommendations set forth in the wet stamped calculations.
  - v. Anchor bolts to be provided by Contractor
    1. Stand for cone-bottom tanks shall be a minimum of 30 degrees

inclined in the horizontal plane, and shall be of carbon steel construction. The stand shall be seismic-rated if in seismic-prone zone. Acceptable product for tank stand paint: Tnemec N69F safety blue epoxy.

vi. Manufacturer Qualifications and Workmanship:

E. Fittings and Tank Connection Specifications

1. Fittings located on the sidewall shall be PVC Bulkheads with EPDM gaskets on fittings 2" and smaller; they shall be PVC double-flanged bolted on fittings larger than 2".
2. Fittings located on the sidewall shall be located a minimum of 6" from the bottom and top of tank on sizes smaller than 3,000 gallons, and minimum of 9" from the bottom and top of tank on sizes 3,000 gallons or larger. The exception is if a Unitized Molded Outlet fitting is used as a drain on flat-bottom tanks.
3. Fitting gasket shall be at least 1-1/2" above or below the end of any knuckle radius on tanks smaller than 3,000 gallons, and 3" above or below the end of any knuckle radius on tanks 3,000 gallons or larger. In addition, fittings shall be installed away from flange lines and molded-in tank features such as gallon markers, logos, ribs, edges of tank flats, etc.
4. Fittings must be located to avoid interference with tie-down devices.
5. Tank Connections:
  - a. All tank connections must have a provision for minimum 4% dimensional movement for tank expansion and contraction due to temperature and load changes.
  - b. Flexible connections such as flex hose or expansion joints rated for less than 20 psig are recommended for tank connections.
  - c. External rigid piping must be supported separately such that flexible connections do not carry any piping weight.
  - d. Use a suction-rated flexible connection on the Recycle Outlet.
  - e. Ports/Openings:
    1. Waste Line Connection:
      - a. Qty: 1
      - b. Diameter: 4"
      - c. Connection Type: 150# Flange
      - d. Location: Top of tank oriented as shown in Plans
    2. Sump Pump Drain Line Connection:
      - a. Qty: 1
      - b. Diameter: 4"
      - c. Connection Type: 150# Flange
      - d. Location: Top of tank oriented as shown in Plans
    3. Waste Tank Pumpout Connection:
      - a. Qty: 1
      - b. Diameter: 4"
      - c. Connection Type: 150# Flange
      - d. Location: Bottom of Tank oriented as shown on Plans
    4. Level Sensor Port:
      - a. Qty: 1
      - b. Diameter: 3/4"
      - c. Connection Type: NPT
      - d. Location: Top of Tank from bottom oriented as shown in Plans

- 2.5 LIQUID LEVEL SWITCH
- A. Type: Ultrasonic Level Switch;
  - B. Materials: 316SS
  - C. Electrical Rating: 30 VDC
  - D. Manufacturer: Omega, model LVSW-701

## PART 3 EXECUTION

### 3.1 TRANSPORTATION AND PREPARATION

- A. The Tanks shall be delivered to the site Monday through Friday only (excluding holidays) during the hours between 8 AM and 3 PM local time, and consigned to the proper party giving name of the project and the full address of Owner's project site. Notify Contractor's representative by telephone 48 hours prior to the anticipated arrival at the project site.
- B. Throughout shipment, all flanged connections and manways shall remain sealed with watertight caps or blind flanges/plates that remain in place until installation of the equipment and completion of all piping connections.
- C. The Contractor shall offload and inspect Tanks against approved Shop Drawings at time of delivery and before installation. Equipment and materials damaged or not conforming to the approved Shop Drawings shall be noted. The Tank supplier shall be notified immediately and the necessary steps shall be taken to repair or replace damaged and non-conforming equipment. **DO NOT INSTALL DAMAGED TANKS.**
- D. Tanks received by the Contractor are under the care and responsibility of the Contractor. These items shall be stored by the Contractor in a dry location and protected from the elements, and shall be handled in an approved manner in accordance with the Tank Supplier's recommendations. Contractor shall make provisions to protect materials on-site from theft, damage, or vandalism. Contractor is responsible for replacement of all damaged or stolen materials at the work site until final acceptance by Owner.

### 3.3 INSTALLATION

- A. Installation of Tanks and related appurtenances shall be performed by the Contractor, and shall be in accordance with the Engineer's Drawings and with the Tank Supplier's drawings, instructions and recommendations. Conflicts of information shall be called to the attention of the Engineer.
- B. The Contractor shall secure Tanks to the building's concrete foundation with appropriate anchor bolts and seismic restraint systems, in accordance with the Tank Supplier's recommendations and sealed calculations. Tanks shall be accurately leveled on the ground surface using non-shrink grout under all anchor points.
- C. Contractor shall support external piping connecting to Tanks so as to impose minimal loads and stresses on the Tank connections.

END OF SECTION





SECTION 33 2010  
FINISHED WATER PUMP PACKAGE SYSTEM

Part I – GENERAL

1.1 WORK INCLUDED

- A. Variable Speed Packaged Pumping System

1.2 RELATED SECTIONS

- A. Section 33 1005 – Process Piping and Fittings

1.3 REFERENCE STANDARDS

The work in this section is subject to the requirements of applicable portions of the following standards:

- A. Hydraulic Institute
- B. ANSI – American National Standards Institute
- C. ASTM – American Society for Testing and Materials
- D. IEEE – Institute of Electrical and Electronics Engineers
- E. NEMA – National Electrical Manufacturers Association
- F. NEC – National Electrical Code
- G. ISO – International Standards Organization
- H. UL – Underwriters Laboratories, Inc.

1.4 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide equipment performance data, dimensional drawing, control information, and wiring diagrams.
- C. Shop Drawings: Indicate details of component supports, openings, perimeter construction details, and tolerances.
- D. Manufacturer's Installation Instructions: Indicate special requirements for installation, start-up, and operation.

Part 2 – PRODUCTS

2.1 VARIABLE SPEED PACKAGED PUMPING SYSTEM

- A. Furnish and install a prefabricated and tested variable speed packaged pumping system to maintain constant water delivery pressure.
- B. The packaged pump system shall be a standard product of a single pump manufacturer. The entire pump system including pumps and pump logic controller, shall be designed, built, and tested by the same manufacturer.

- C. The complete packaged water booster pump system shall be certified and listed by UL (Category QCZJ – Packaged Pumping Systems) for conformance to U.S. and Canadian Standards.
- D. The complete packaged pumping system shall be NSF61 Annex G listed for drinking water and low lead requirements.

2.2 PUMPS

A. In-line Vertical Multi-Stage Pumps shall have the following features:

- 1. The pump impellers shall be secured directly to the smooth pump shaft by means of a split cone and nut design.
- 2. The suction/discharge base shall have ANSI Class 150 flange connections in a slip ring (rotating flange) design as indicated in the drawings or pump schedule.
- 3. Pump Service Conditions:
  - a. Finished Water Pump system shall be a duplex (2) pump variable speed pump system with one (1) pump running, and one (1) pump in standby capable of 150-gpm at 273-ft TDH, each pump.
  - b. Pump motors shall be rated for 20-Hp with 230V/1-Ph power.
  - c. Pump Connections: 4” Flange

4. Pump Construction.

- |  |                              |
|--|------------------------------|
| a. Suction/discharge base, pump head           | Ductile Iron (ASTM 65-45-12) |
| b. Shaft couplings, flange rings:              | Ductile Iron (ASTM 65-45-12) |
| b. Shaft                                       | 431 Stainless Steel          |
| c. Motor Stool                                 | Cast Iron (ASTM Class 30)    |
| d. Impellers, diffuser chambers, outer sleeve: | 304 Stainless Steel          |
| e. Impeller wear rings:                        | 304 Stainless Steel          |
| f. Intermediate Bearing Journals:              | Tungsten Carbide             |
| g. Intermediate Chamber Bearings:              | Leadless Tin Bronze          |
| h. Chamber Bushings:                           | Graphite Filled PTFE         |
| I. O-rings:                                    | EPDM                         |

5. The shaft seal shall be a single balanced metal bellows cartridge with the following construction:

- |   |                      |
|---|----------------------|
| a. Bellows:                                 | 904L Stainless Steel |
| b. Shaft Sleeve, Gland Plate, Drive Collar: | 316 Stainless Steel  |
| c. Stationary Ring:                         | Carbon               |
| d. Rotating Ring:                           | Tungsten Carbide     |
| e. O-rings:                                 | EPDM                 |

6. Shaft seal replacement shall be possible without removal of any pump components other than the coupling guard, motor couplings, motor and seal cover. The entire cartridge shaft seal shall be removable as a one-piece component. Pumps with motors equal to or larger than 15 hp (fifteen horsepower) shall have adequate space within the motor stool so that shaft seal replacement is possible without motor removal.

## 2.3 VARIABLE FREQUENCY DRIVES (Panel Mount)

- A. The VFD shall convert incoming fixed frequency single-phase or three-phase AC power into a variable frequency and voltage for controlling the speed of three-phase AC induction motors. The VFD shall be a six-pulse input design, and the input voltage rectifier shall employ a full wave diode bridge; VFD's utilizing controlled SCR rectifiers shall not be acceptable. The output waveform shall closely approximate a sine wave. The VFD shall be of a PWM output design utilizing current IGBT inverter technology and voltage vector control of the output PWM waveform.
- B. The VFD shall include a full-wave diode bridge rectifier and maintain a displacement power factor of near unity regardless of speed and load.
- C. The VFD shall produce an output waveform capable of handling maximum motor cable distances of up to 1,000 ft. (unshielded) without tripping or derating.
- D. The VFD shall utilize an output voltage-vector switching algorithm, or equivalent, in both variable and constant torque modes. VFD's that utilize Sine-Coded PWM or Look-up tables shall not be acceptable.
- E. VFD shall automatically boost power factor at lower speeds.
- F. The VFD shall be able to provide its full rated output current continuously at 110% of rated current for 60 seconds.
- G. An empty pipe fill mode shall be available to fill an empty pipe in a short period of time, and then revert to the PID controller for stable operation.
- H. Switching of the input power to the VFD shall be possible without interlocks or damage to the VFD at a minimum interval of 2 minutes.
- I. Switching of power on the output side between the VFD and the motor shall be possible with no limitation or damage to the VFD and shall require no additional interlocks.
- J. The VFD shall have temperature-controlled cooling fans for quiet operation, minimized internal losses, and greatly increased fan life.
- K. VFD shall provide full torque to the motor given input voltage fluctuations of up to +10% to -15% of the rated input voltage.
- L. The VFD shall provide internal DC link reactors to minimize power line harmonics and to provide near unity power factor. VFD's without a DC link reactor shall provide a 5% impedance line side reactor.
- M. VFD to be provided with the following protective features:
  - 1. VFD shall have input surge protection utilizing MOV's, spark gaps, and Zener diodes to withstand surges of 2.3 times line voltage for 1.3 msec.
  - 2. VFD shall include circuitry to detect phase imbalance and phase loss on the input side of the VFD.

3. VFD shall include current sensors on all three-output phases to detect and report phase loss to the motor. The VFD will identify which of the output phases is low or lost.
4. VFD shall auto-derate the output voltage and frequency to the motor in the presence of sustained ambient temperatures higher than the normal operating range, so as not to trip on an inverter temperature fault. The use of this feature shall be user-selectable, and a warning will be exported during the event. Function shall reduce switching frequency before reducing motor speed.
5. VFD shall auto-derate the output frequency by limiting the output current before allowing the VFD to trip on overload. Speed can be reduced, but not stopped.
6. The VFD shall have the option of an integral RFI filter. VFD enclosures shall be made of metal to minimize RFI and provide immunity.

N. VFD to be provided with the following interface features:

1. VFD shall provide an alphanumeric backlit display keypad, which may be remotely mounted using standard 9-pin cable. VFD may be operated with keypad disconnected or removed entirely. Keypad may be disconnected during normal operation without the need to stop the motor or disconnect power to the VFD.
2. VFD shall display all faults in plain text; VFD's, which can display only fault codes, are not acceptable.
3. All VFD's shall be of the same series and shall utilize a common control card and LCP (keypad/display unit) throughout the rating range. The control cards and keypads shall be interchangeable through the entire range of drives used on the project.
4. VFD keypad shall be capable of storing drive parameter values in non-volatile RAM uploaded to it from the VFD, and shall be capable of downloading stored values to the VFD to facilitate programming of multiple drives in similar applications, or as a means of backing up the programmed parameters.
5. A red FAULT light, a yellow WARNING light and a green POWER-ON light shall be provided. These indications shall be visible both on the keypad and on the VFD when the keypad is removed.
6. A start guide menu with factory preset typical parameters shall be provided on the VFD to facilitate commissioning.
7. VFD shall provide full galvanic isolation with suitable potential separation from the power sources (control, signal, and power circuitry within the drive) to ensure compliance with PELV requirements and to protect PLC's and other connected equipment from power surges and spikes.
8. All inputs and outputs shall be optically isolated. Isolation boards between the VFD and external control devices shall not be required.
9. There shall be three programmable digital inputs for interfacing with the systems external control and safety interlock circuitry. An additional digital input is preprogrammed for start/stop.
10. The VFD shall have two analog signal inputs. One dedicated for sensor input and one for external set point input.

11. One programmable analog output shall be provided for indication of a drive status.
12. The VFD shall provide two user programmable relays with selectable functions. Two form 'C' 230VAC/2A rated dry contact relay outputs shall be provided.
13. The VFD shall store in memory the last 5 faults with time stamp and recorded data.
14. The VFD shall be equipped with a standard RS-485 serial communications port for communication to the multi-pump controller. The bus communication protocol for the VFD shall be the same as the controller protocol.

O. VFD service conditions:

1. Ambient temperature operating range, -10 to 45°C (14 to 113°F).
2. 0 to 95% relative humidity, non-condensing.
3. Elevation: 5323-ft above mean sea-level (Vertical Datum SLD29)
4. VFD's shall be rated for line voltage 200 to 240VAC; with +10% to -15% variations. Line frequency variation of  $\pm 2\%$  shall be acceptable.
5. No side clearance shall be required for cooling of the units.

## 2.4 PUMP SYSTEM CONTROLLER

- A. The pump system controller shall be a standard product developed and supported by the pump manufacturer.
- B. The controller shall be microprocessor based capable of having software changes and updates via personal computer (notebook). The controller user interface shall have a color display with a minimum screen size of 3-1/2" x 4-5/8" for easy viewing of system status parameters and for field programming. The display shall have a back light with contrast adjustment. Password protection of system settings shall be standard.
- C. The controller shall provide internal galvanic isolation to all digital and analog inputs as well as all fieldbus connections.
- D. The controller shall have the ability to be connected to a battery to maintain power on controller during periods of loss of supply power.
- E. The controller shall have built in data logging capability. Logged values shall be graphically displayed on the controller and able to be exported to computer via standard connection. A minimum of 3600 samples per logged value with the following parameters available for logging:
  - Estimated flowrate
  - Speed of pumps
  - Inlet pressure
  - Discharge pressure
  - Power consumption
  - Controlling parameter (process value)

- F. The controller shall display the following as status readings from a single display on the controller (this display shall be the default):
- Current value of the control parameter, (typically discharge pressure)
  - Most recent existing alarm (if any)
  - System status with current operating mode
  - Status of each pump with current operating mode and rotational speed as a percentage (%)
  - Estimated flowrate, (not requiring flow meter connection)
- G. The controller shall have as a minimum the following hardware inputs and outputs:
- Three analog inputs (4-20mA or 0-10VDC)
  - Three digital inputs
  - Two digital outputs
  - Ethernet connection
  - Field Service connection to PC for advanced programming and data logging
- H. Pump system programming (field adjustable) shall include as a minimum the following:
- Water shortage protection (analog or digital)
  - PI Controller (Proportional gain and Integral time) settings
  - High system pressure indication and shutdown
  - Low system pressure indication and shutdown
  - Low suction pressure/level shutdown (via digital contact)
  - Low suction pressure/level warning (via analog signal)
  - Low suction pressure/level shutdown (via analog signal)
  - Flow meter settings (analog signal)
- I. The system controller shall be able to accept up to seven programmable set-points via a digital input, (additional input/output module may be required).
- J. The controller shall have advanced water shortage protection. When analog sensors (level or pressure) are used for water shortage protection, there shall be two indication levels. One level is for warning indication only (indication that the water level/pressure is getting lower than expected levels) and the other level is for complete system shutdown (water or level is so low that pump damage can occur). System restart after shut-down shall be manual or automatic (user selectable).
- K. The system pressure set-point shall be capable of being automatically adjusted by using an external set-point influence. The set-point influence function enables the user to adjust the control parameter (typically pressure) by measuring an additional parameter. (Example: Lower the system pressure set point based on a flow measurement to compensate for lower friction losses at lower flow rates).
- L. The controller shall be capable of receiving a remote analog set-point (4-20mA or 0-10 VDC) as well as a remote system on/off (digital) signal.
- M. The controller shall be able to adjust the ramp time of a change in set point on both an increase or decrease change in set point.

N. The pump system controller shall store up to 24 warning and alarms in memory. The time, date and duration of each alarm shall be recorded. A potential-free relay shall be provided for alarm notification to the building management system. The controller shall display the following alarm conditions:

High System Pressure	Low system pressure
Low suction pressure (warning and alarm)	Individual pump failure
VFD trip/failure	Loss of sensor signal (4-20 mA)
Loss of remote set-point signal (4-20mA)	System power loss

O. The pump system controller shall be mounted in a UL Type 12 rated enclosure. A self-certified NEMA enclosure rating shall not be considered equal. The entire control panel shall be UL 508 listed as an assembly. The control panel shall include a main disconnect, circuit breakers for each pump and the control circuit and control relays for alarm functions.

Control panel options shall include, but not be limited to:

Pump Run Lights	System Fault Light
Audible Alarm (80 db[A])	Surge Arrestor
Emergency/Normal Operation Switches	Service Disconnect Switches
Qty (9) Configurable Digital Outputs available for monitoring	

P. The controller shall be capable of receiving a redundant sensor input to function as a backup to the primary sensor (typically discharge pressure).

Q. The controller shall have a pump “Test Run” feature such that pumps are switched on during periods of inactivity (system is switched to the “off” position but with electricity supply still connected). The inoperative pumps shall be switched on for a period of two to three (3-4) seconds every 24 hours, 48 hours or once per week and at specific time of day (user selectable).

R. The controller shall be capable of changing the number of pumps available to operate or have the ability limit the maximum power consumption by activation of a digital input for purposes of limited generator supplied power.

S. The controller shall be capable of displaying instantaneous power consumption (Watts or kilowatts) and cumulative energy consumption (kilowatt-hours).

T. The controller shall be capable of displaying instantaneous specific energy use (kw/gpm), (optional flow meter must be connected).

U. The actual pump performance curves (5<sup>th</sup> order polynomial) shall be loaded (software) into the pump system controller or be able to input manually into controller based on three points on pump curve of pumps controlled.

V. The controller shall be capable of displaying an estimated flowrate on the default status screen.

W. The controller shall have the ability to compensate for pipe friction loss by decreasing pressure set-point at lower flowrates and increasing pressure set-point at higher flowrates without the requirement of a flow meter.

X. The controller shall have the ability to communicate common field-bus protocols, (BACnet, Modbus, Profibus, and LON), via communication expansion card installed inside controller.

- Y. The controller shall have a built in Ethernet connection allowing controller to connected to network and access of controller via web browser and internet any where around the world where internet communication is available.
- Z. The controller shall have a programmable Service Contact Field that can be populated with service contact information including: contact name, address, phone number(s) and website.

## 2.5 SEQUENCE OF OPERATION

- A. The system controller shall operate equal capacity variable speed pumps to maintain a constant discharge flow (system set point). The system controller shall receive an analog signal [4-20mA] from the field installed magnetic flow meter (FWM-FWL-601) installed on the discharge piping. As system head increases the pump speed shall be increased to maintain the system set-point flow rate. When the operating pump(s) reach 96% of full speed (adjustable), an additional pump will be started and will increase speed until the system set point is achieved. When the system flow is equal to the system set point all pumps in operation shall reach equal operating speeds. As head demand decreases the pump speed shall be reduced while system set-point flow rate is maintained. When all pumps in operation are running at low speed the system controller shall switch off pumps when fewer pumps are able to maintain system demand.
- B. The system controller shall be capable of switching pumps on and off to satisfy system demand without the use of flow switches, motor current monitors or temperature measuring devices.
- C. All pumps in the system shall alternate automatically based on demand, time and fault. If flow demand is continuous (no flow shutdown does not occur), the system controller shall have the capability to alternate the pumps every 24 hours, every 48 hours or once per week. The interval and actual time of the pump change-over shall be field adjustable.
- D. The system controller shall be able to control a pressure maintenance pump, (jockey pump), in the system. The set point of the pressure maintenance pump shall be able to be any value above or below the pump system's set point. The pressure maintenance pump shall be able to be staged on as back-up pump when capacity of pump system is exceeded.

## 2.6 LOW FLOW STOP FUNCTION

The system controller shall be capable of stopping pumps during periods of low-flow or zero-flow without wasting water or adding unwanted heat to the liquid. Temperature based no flow shut-down methods that have the potential to waste water and add unwanted temperature rise to the pumping fluid are not acceptable.

### Standard Low Flow Stop and Energy Saving Mode

If a low or no flow shut-down is required (periods of low or zero demand) a bladder type diaphragm tank shall be installed with a pre-charge pressure of 70% of system set-point. The tank shall be piped to the discharge manifold or system piping downstream of the pump system. When only one pump is in operation the system controller shall be capable of detecting low flow (less than 10% of pump nominal flow) without the use of additional flow sensing devices. When a low flow is detected, the system controller shall increase pump speed until the discharge pressure reaches the stop pressure (system set point plus 50% of programmed on/off band). The pump shall remain off until the discharge pressure reaches the start pressure (system set point





### 3.1 EXAMINATION

- A. Verify that field measurements are as indicated on drawings.
- B. Verify that opening sizes and dimensional tolerances are acceptable.
- C. Verify that supports are correctly positioned.

### 3.2 INSTALLATION

- A. Install components in accordance with manufacturer's instructions.
- B. Place frames in correct position, plumb and level.
- C. Mechanically cut galvanized finish surfaces. Do not flame cut.
- D. Anchor by bolting through saddle clips.
- E. Set perimeter closure flush with top of grating and surrounding construction.
- F. Secure to prevent movement.

### 3.3 TESTING

- A. The entire pump station shall be factory tested for functionality. Functionality testing shall include the following parameters: Dry Run Protection, Minimum Pressure and Maximum Pressure alarms (where applicable), Setpoint Operation, and Motor Rotation.
- B. The system shall undergo a factory hydrostatic test at the end of the production cycle. The system shall be filled with water and pressurized to 1.5 times the nameplate maximum pressure. Systems with 150# flange connections shall be tested at 350 psig, and systems with 300# flange connections shall be tested at 450 psig. The pressure shall be maintained for a minimum of 15 minutes with no leakage (slight leakage around pump(s) mechanical seal is acceptable) prior to shipment.

### 3.4 WARRANTY

- A. The warranty period shall be a non-prorated period of 24 months from date of installation, not to exceed 30 months from date of manufacture.

END OF SECTION