POWDER MOUNTAIN WATER AND SEWER IMPROVEMENT DISTRICT

STANDARD TECHNICAL SPECIFICATIONS

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PREFACE

PART 1 GENERAL

The primary purpose of this document is to clearly define the current engineering standards to be used within Powder Mountain Water and Sewer Improvement District (PMWSID) Service Boundary. PMWSID has adopted the 2025 APWA Manual of Standard Specifications, however, while the District recognizes the extensive effort that APWA has executed to create a document that can be widely used across many municipalities and service districts, there are specific differences between many APWA standards and PMWSID Standards. PMWSID provides water and sewer infrastructure to communities located in harsh conditions and extreme, mountainous terrain. Therefore, certain components of infrastructure must be designed and constructed to a higher standard. This document serves to identify any modifications to or replacement of APWA Specifications.

PMWSID has not adopted the APWA Manual of Standard Plans. Instead, refer to the Powder Mountain Water and Sewer District Standard Details. Use of any particular APWA plan is only permitted with prior, written consent from the District Engineer.

PMWSID has modified some of the APWA Specifications as well as provided supplemental Specifications to reflect local requirements. References within the PMWSID Standard Details or Specifications to any section of APWA specifications shall be interpreted as a reference to PMWSID's modified or supplemental version (regardless of if specified). The following modified specifications have been included as a part of this document:

Section 00 00 50 S – Design Standards

Section 05 05 23 M – Bolts, Nuts, and Accessories

Section 09 90 00 S – High Performance Coatings

Section 31 05 13 M – Common Fill

Section 33 08 00 M – Commissioning of Water Utilities

Section 33 11 00 M – Water Distribution and Transmission

Section 33 12 16 M – Valves

Section 33 12 19 M – Hydrants

Section 33 12 33 M – Water Meter

Section 33 17 00 S – PRV Station

Section 33 18 00 S – Pump Station

Section 33 18 50 S – Water Wells

Section 33 31 00 M – Sanitary Sewerage Systems

Section 33 32 00 S – Sewer Lift Station

The suffixes "M" and "S" denote a specification as modified from the original APWA specification or supplemental to the original APWA specifications. Supplemental specifications do not currently have an APWA equivalent specification.

The following sections shall also be changed as described:

Section 00 72 00	General Conditions of the Conditions of the Contract shall be superseded by project specific requirements set forth in the respective project's contract documents and specifications, as approved by PMWSID. Otherwise, follow APWA.

Division 01	With prior written District approval, the General Requirements established Division 01 may be superseded by project specific requirements set forth in the respective project's contract documents and specifications. Otherwise, follow APWA.

This document is intended to be altered periodically to ensure that the most current PMWSID Standards are available for public use.

DOCUMENT 00 00 50 S

DESIGN STANDARDS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Codes and Standards

B. Design Standards

1.2 SUBMITTALS

A. Design Exceptions

1. All designs shall conform to the most recent, approved Powder Mountain Water and Sewer Improvement District (PMWSID) Standards and Specifications.

2. Any deviations from the PMWSID Standards and Specifications shall be clearly documented, identified, and submitted to the District Engineer for individual approval. The list of deviations from the PMWSID Standards and Specifications shall be updated and submitted with each plan submission to the District.

B. Easements and Land Acquisition

1. All Easements and Land Acquisitions shall be submitted on the District's Standard Easement form and shall be included on the recorded subdivision plat.

2. One copy of all necessary Easement forms shall be submitted to the District Engineer for review.

3. One signed copy of all necessary Easement forms shall be submitted to the District Engineer for final approval and recordation.

4. All necessary permits shall be submitted to the District Engineer for final approval. Required permits include but are not limited to state and county utility line permits, canal crossing permits, Railroad crossing permits, Army Corp. of Engineer permits, etc.

5. All necessary permits and easements must be submitted prior to final approval being granted by the District.

1.3 DISTRICT ENGINEER'S AUTHORITY

A. The District Engineer shall review submitted Construction Drawings for compliance to these Design Standards and Construction Specifications.

B. The District Engineer shall note any changes to Construction Drawings, required to bring Construction Drawings into compliance with these Design Standards and Construction Specifications.

C. Required changes shall be made to Construction Drawings and returned to the District Engineer for final approval. District approval of the plans consists of recognition that the Engineer-of-Record has certified their construction plans and supporting documentation to be in compliance with the District's Engineering Standards and Specifications. This acknowledgement shall not shift the responsibility and liability for the completeness and accuracy of the plans and supporting documentation from the Engineer-of-Record to the District Engineer.

D. The District Engineer shall have additional authority such as is stated in these Design Standards and Construction Specifications.

PART 2 PRODCUTS – NOT USED

PART 3 EXECUTION

3.1 CODES AND STANDARDS

A. Design shall be based on the following:

1. Sanitary Sewer Systems.

   a. ASCE Manual and Reports on Engineering Practice No. 60, Gravity Sanitary Sewer Design & Construction.
   b. Utah State Department of Health Code of Waste Disposal Regulations.
   c. Utah Division of Water Quality Administrative Rules for Design Requirements for Wastewater Collection, Treatment and Disposal Systems.
   d. Uniform Plumbing Code, Latest Edition.

2. Culinary Water Systems.

   a. State of Utah Administrative Rules for Public Drinking Water Systems.
   b. Uniform Plumbing Code, Latest Edition.

3.2 DESIGN STANDARDS

A. Design shall conform to the District Plan and to these design standards and technical specifications.

1. Local project conditions vary and may require more stringent standards and specifications, as determined necessary by the District.

3.3 SANITARY SEWER SYSTEM

A. Related Sections

1. 31 05 13 M Common Fill

2. 33 08 00 M Commissioning of Water Utilities

3. 33 11 00 M Water Distribution and Transmission

4. 33 31 00 M Sanitary Sewerage Systems

5. 33 32 00 S Sewer Lift Station

B. Sewer General Design Considerations

1. The State of Utah Administrative Rules for Water Quality, R317, provide minimum design requirements for wastewater facilities.

2. The impact of any proposed sewer system on the existing sewer system will be reviewed by the District Engineer. The developer may be required to add additional off-site sewer systems in order to provide adequate sewer service to his development.

3. Areas that will be serviced through the proposed development will be considered and the method of service to those areas will be determined and approved by the District Engineer. Increased system size may be required for future development, as approved by the District Engineer.

C. Sewer Line Size, Slope, and Cover Requirements

1. The minimum size of sewer main line shall be 8-inch diameter.

2. Sewer lines shall be designed to maintain a velocity of two feet per second (2 fps) during peak flows, unless otherwise accepted and approved by the District Engineer.

3. Unless otherwise accepted and approved by the District Engineer, the minimum sewer slopes shall be as follows:

   8-inch sewer lines – 0.0040 foot/foot
   10-inch sewer lines – 0.0028 foot/foot
   12-inch sewer lines – 0.0022 foot/foot
   15-inch sewer lines – 0.0015 foot/foot
   18-inch sewer lines – 0.0012 foot/foot
   21-inch sewer lines – 0.0010 foot/foot
   24-inch sewer lines – 0.0008 foot/foot
   Larger than 24-inch – District Engineer's recommendation

4. The minimum sewer depth shall be 13.0 feet under normal conditions. Depth requirement may be lessened with prior written District approval.

5. In areas of shallow sewer, the following note shall be added to the development plat: "Shallow Sewer Depths! Contractor shall verify sewer depths before excavating for basement. Home(s) with basement may not have sewer service available for basement."

6. The District Engineer may increase the minimum sewer depth if required to meet overall system requirements.

7. Check topography for low lots and problem service connections.

8. In areas of low lots, the following note shall be added to the development plat: “Low Lots! Contractor shall verify sewer depths before excavating for basement. Home(s) with basement may not have sewer service available for basement.”

9. Sewer grades shall be based upon Weber County or District benchmark elevations.

D. Sewer Manhole Requirements

1. The minimum size manhole shall be 4-foot diameter. 5-foot diameter manholes shall be used in the following situations:

   a. At all intersections of three or more 8-inch or larger pipe lines.
   b. Where the deflection angle of the pipe line is greater than or equal to 90 degrees.
   c. When both items “a” and “b” are designed in the same manhole, a six-foot manhole is required.

2. Recommended maximum manhole spans shall be approximately 400 feet, but no more than 450 feet, from center to center of manholes.

3. A 0.2-foot minimum elevation step shall be provided in all junction manholes; except where accepted otherwise by the District Engineer.

4. The maximum allowable drop, between inlet and outlet inverts, through a manhole is two feet. When the drop in a manhole is between one and two feet, a five-foot manhole is required. When a drop in excess of 2 feet is required, an external drop manhole shall be used.

5. Where pipes of different diameters connect into a manhole, the inside top of the smaller pipe shall match the inside top of the larger pipe, unless granted prior written District approval.

6. Where incoming slopes at manholes are greater than or equal to 5 percent, the incoming slope shall be carried through the manhole, unless otherwise accepted and approved by the District Engineer.

7. Where incoming slopes at manholes are greater than or equal to 5 percent and the deflection angle within the manhole is greater than or equal to 45 degrees but less than 90 degrees, a five-foot manhole with an extra deep trough is required.

8. Where incoming slopes at manholes are greater than or equal to 5 percent and the deflection angle within the manhole is greater than 90 degrees, a six-foot manhole with an extra deep trough is required.

9. Where new sewer lines are connected to existing sewer lines, a 5-foot diameter manhole shall be constructed over the existing sewer line.

10. The invert of the new sewer line shall match the top of the existing sewer line at connection of new pipe to existing sewer; except where accepted otherwise by the District Engineer.

11. Manholes must be constructed at the ends of sewer lines. Plugged ends of sewer lines are not allowed.

E. Sewer Alignment Requirements

1. Sewer shall be located on the low side of streets, preferably 5 feet from street centerlines; and a minimum of 5 feet from the lip of gutters.

2. A minimum of five feet shall be maintained between the edge of manhole collars to edge of the street pavement.

3. Sewer shall be located at 10-foot minimum horizontal distance from culinary waterlines.

4. Where possible, sewer shall be located at 10-foot minimum horizontal distance from all other public utilities, including but not limited to storm drains, and secondary water lines.

5. Sewer main lines shall be extended to property lines as per District Engineer's request to service future development.

F. Sewer Laterals

1. The minimum lateral size shall be 4-inch for residential connections; and 6-inch for commercial and industrial connections.

2. Sewer laterals shall tie directly into manholes in cul-de-sacs and at dead end manholes.

3. Sewer laterals may tie directly into manholes wherever possible and practical.

4. Sewer laterals shall conform to the requirements of the Utah State Department of Health Code and the Uniform Plumbing Code; with cleanouts at not more than 100-foot spacing; and no more than two bends in excess of 45 degrees without a cleanout.

5. Each building and/or unit of separate ownership shall require a separate sanitary sewer lateral, unless otherwise approved by the District Engineer.

G. Sewer Lift Stations

1. Local project conditions vary and may require more stringent standards and specifications, as determined necessary by the District. Sewer lift station requirements shall be evaluated on a case-by-case basis.

H. Sewer Easements

1. Easements will be required for all sewer facilities.

2. In the locations where the sewer line leaves the public right-of way, a twenty-foot-wide sanitary sewer easement will be required. This easement shall be centered on the sewer line, unless otherwise approved by the District Engineer. Sewer easements shall extend ten feet beyond dead end manholes. Show easements on the development plat and on the District's Standard Easement forms, which grant the easements to the District. Easements must be executed and returned to the District Office prior to final approval being granted.

3. Easement size and location requirements for other sewer facilities will be evaluated by the District on a case-by-case basis.

3.4 CULINARY WATER SYSTEM

A. Related Sections

1. 31 05 13 M Common Fill
2. 33 08 00 M Commissioning of Water Utilities
3. 33 11 00 M Water Distribution and Transmission
4. 33 12 16 M Water Valves
5. 33 12 19 M Hydrants
6. 33 12 33 M Water Meter
7. 33 13 00 Disinfection
8. 33 16 13 Water Tank
9. 33 17 00 S PRV Stations
10. 33 18 00 S Pump Stations
11. 33 18 50 S Water Wells

B. Culinary Water General Design Considerations

1. The State of Utah Administrative Rules for Public Drinking Water Systems, R309, provide minimum design requirements for drinking water facilities.
2. The impact of any proposed water system on the existing water system will be reviewed by the District Engineer. The developer may be required to add additional off-site water systems in order to provide adequate water supply to their development.
3. Areas that will be supplied through the proposed development will be considered and the method of service to those areas will be determined and approved by the District Engineer. Increased system size may be required for future development, as approved by the District Engineer.

C. Culinary Water Line Sizing

1. Water systems shall be sized as described in the District’s Capital Facilities Plan and Master Plan.

2. Maximum allowable pipeline flow velocities shall be 5 feet per second; unless prior written approval is granted by the District Engineer.

3. The minimum fire flow shall be 1500 gpm. Fire flow requirements will be evaluated on a case-by-case basis. The fire flow requirement may be increased as determined by the District Fire Marshal or District Engineer.

D. **Culinary Water Service Pressures**

1. The normal minimum pressure in all parts of the system is to be 50 psi.

2. The anticipated maximum operating pressure is to be 110 psi; unless otherwise approved by the District Engineer.

3. Water systems shall be designed so that pressures conform to the pressure zones shown in the District's Capital Facilities Plan; and as approved by the District Engineer.

E. Culinary Water Cover

1. The minimum cover over top of water lines shall be 94-inches. Insulation per PMWSID Standards and Specifications is required.

F. Culinary Water Valves

1. Valves shall be placed at the projection of the end of curb and gutter radius sections.

2. Valves shall be placed at intervals not to exceed 800 feet, unless granted prior written District approval.

3. At intersections, valves shall be placed on all branches of the system, unless granted prior written District approval.

4. Valves shall be placed within 10 feet of the upstream and downstream ends of casing pipes.

G. PRV Stations

1. Local project conditions vary and may require more stringent standards and specifications, as determined necessary by the District.

2. PRV stations shall be constructed, to provide water supply between pressure zones, and as required by the District Engineer

3. The station plumbing shall consist of a main line and a by-pass line. Sizes shall be determined by the District on a case-by-case basis

4. Plumbing shall include pressure reducing valves and meters on each line, isolation valves on each side of each regulating valve, upstream and downstream pressure transducers, a downstream air valve, and all appurtenant plumbing items, as indicated on the standard drawings and as directed by the District. Depending on design conditions, a pressure sustaining valve or a pressure relief valve and waste piping

may be required by the District. Additional requirements shall be determined by the District on a case-by-case basis.

5. Pressure Regulating station vaults shall include power, ventilation, heating, lighting, and an electrical system including duplex outlets, as approved by the District Engineer.

6. SCADA system equipment shall be provided and installed as described herein.

7. Wire and conduit shall be installed from the SCADA equipment to the location designated for a RTU to be installed by the District's SCADA contractor.

8. The District's SCADA contractor shall connect all SCADA equipment to the RTU.

9. See Section 33 17 00 – PRV Station for additional requirements and specifications.

H. Fire Hydrants

1. Fire hydrant laterals shall be insulated per PMWSID Standards and Specifications.

2. Fire hydrant shall be placed in locations where snow storage and removal will not impede access.

3. Fire hydrants shall have a maximum spacing of 500 feet in residential areas; and a maximum spacing of 300 feet in commercial and industrial areas. Fire hydrant spacing shall be approved by the District Engineer; additional fire hydrants may be required by the District Fire Marshal.

4. Fire hydrants shall be placed at the end of cul-de-sac pipe lines and at the end of dead-end streets. These hydrants shall not be considered as fire protection hydrants; but shall be used for flushing lines.

I. Air Valves and Blow Off Assemblies:

1. Air valve stations shall be placed at high points on transmission lines and at other locations as required for proper system operation, and as directed by the District Engineer.

2. Blow-off assemblies shall be placed at the ends of water lines, at low points in the system

J. Culinary Water Service Laterals

1. Water service laterals shall be constructed as shown on the District Standard drawings.

2. Fire suppression lines shall branch off the lateral **before** the meter.

3. Each building and/or unit of separate ownership shall require a separate water service line, unless granted prior written District approval.

K. Storage Reservoirs

1. Local project conditions vary and may require more stringent standards and specifications, as determined necessary by the District. Storage reservoir requirements shall be evaluated on a case-by-case basis.

L. Culinary Water Pump Stations

1. Local project conditions vary and may require more stringent standards and specifications, as determined necessary by the District. Culinary water pump station requirements shall be evaluated on a case-by-case basis.

M. Culinary Water Wells

1. Local project conditions vary and may require more stringent standards and specifications, as determined necessary by the District. Culinary water well requirements shall be evaluated on a case-by-case basis.

N. Culinary Water Easements

1. Easements will be required for all culinary water facilities.

2. In the locations where the water lines leave the public right-of way, a ten-foot-wide easement will be required. This easement shall be centered on the water line, unless otherwise approved by the District Engineer. Water easements shall extend ten feet beyond dead ends. Show easements on the development plat and on the District's Standard Easement forms, which grant the easements to the District. Easements must be executed and returned to the District Office prior to final approval being granted.

3. Easement size and location requirements for other culinary water facilities will be evaluated by the District on a case-by-case basis.

3.5 RESTORATION OF OFF-SITE IMPROVED SURFACES

A. Where offsite construction is required, all improved surfaces shall be restored to match original conditions, as acceptable to the District Engineer.

B. Paved surfaces shall be restored to the thickness and types as required to match adjacent paved surfaces; conforming to District standards or the Governing Agency, whichever is more stringent.

C. Landscaped areas shall be restored to match adjacent areas, conforming to the District standards or the Governing Agency, whichever is more stringent. Landscape materials shall conform to adjacent materials.

D. Cultivated areas shall be restored to match adjacent areas, conforming to the District standards or the Governing Agency, whichever is more stringent. These areas shall be seeded with material conforming to adjacent materials.

E. Open areas shall be restored with native grasses to match adjacent areas, conforming to the District standards or the Governing Agency, whichever is more stringent. These areas shall be seeded with material conforming to adjacent materials.

3.6 CONSTRUCTION DRAWINGS

A. Related Sections

1. 01 78 39 Project Record Documents

B. General Construction Drawing Minimum Requirements

1. Local project conditions and complexity varies and may require more stringent requirements.
2. Include street names and widths.
3. Include subdivision lot numbers.
4. Show street centerline stations and property line stations. Plan stations shall agree with profile stations.
5. Provide drawing scale.
6. Show north arrow.
7. Provide County or District benchmark elevations.
8. Clearly show any conflicts between new pipes and other existing utilities, including but not limited to sewer lines, culinary water lines, and/or storm drains shall be noted on the drawings.
9. Provide dimensions from pipes to monument lines or property lines shall be shown.
10. Connecting structures and pipes shall be labeled as existing or proposed.
11. Drawings shall be designed, signed and stamped by a professional engineer.
12. Construction Drawings shall include a signed dedication plat.
13. Construction Drawings shall include a final grading plan.
14. Construction Drawings shall contain plan and profile views of all sewer lines (including forced mains), storm drain lines, and water lines. Profile views shall show existing and final surface profiles above the center line of pipe.
15. All submitted preliminary Construction Drawings shall be Standard B-size drawings (11” x 17”).
16. All submitted final Construction Drawings shall be Standard D-size drawings (22" x 34").

C. Sewer System Drawing Minimum Requirements

1. Note size of all manholes.
2. Note rim elevation of all manholes.
3. Note invert-in and invert-out elevations at all manholes.
4. Show sewer pipe size, type, and class.

5. Show locations and complete details of all sewer facilities.

D. Culinary Water System Drawing Minimum Requirements

1. Show pipe sizes, types and class.
2. Show pipe cover.
3. Show locations of all fire hydrants assemblies.
4. Show locations, types, connection styles, and sizes of all valves.
5. Show locations, types, connection styles, and sizes of all fittings.
6. Show locations and complete details of all culinary water facilities.

DOCUMENT 05 05 23 M

BOLTS, NUTS, AND ACCESSORIES

Delete B of Article 2.1 MATERIALS in its entirety and replace with the following:

B. Standard Bolts: Steel, ASTM A307 with Tripac 2000 Blue Coating System.

SECTION 09 90 00 S

HIGH PERFORMANCE COATINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Furnishing and applying protective coatings of paint to all surfaces indicated on the Drawings or specified herein, including all surface preparation and related work.

B. Not all coating systems in this specification will be used on this project.

1.2 EXCLUSIONS

A. Painting is not required for the following surfaces or items unless otherwise shown on the Drawings, specified in other sections, or specified herein:

1. Stainless steel, aluminum (except where in contact with concrete), chrome, fiberglass, copper instruments, pressure gauge tubing, and structural FRP. (unless noted on plans or finish schedules.)

2. Electrical panels, motor control centers, pumps, and motors having a factory finish. The factory finish shall be approved by the Engineer. Non-approved factory finishes shall be painted as specified hereinafter.

3. Surfaces hidden from view such as piping, ducts, structural wood, and insulation.

1.3 ABBREVIATIONS

A. CSM - Coating System Manufacturer.

B. CSA - Coating System Applicator. Specialty subcontractor retained by the Contractor to install the coating systems specified in this Section.

C. CTR - Coating System Manufacturer's Technical Representative.

1.4 REFERENCES

A. The following is a list of standards that may be referenced in this section:

1. American National Standards Institute (ANSI)

   a. Standard Colors for Color Identification and Coding

   b. A13.1, Scheme for the Identification of Piping Systems

2. American Water Works Association (AWWA)

   a. C203, Coal-Tar Protective Coatings and Linings for Steel Water Pipelines-Enamel and Tape-Hot-Applied

   b. C210, Liquid Epoxy Coating System for the Interior and Exterior of Steel Water Pipelines

   c. C214, Tape Coating Systems for the Exterior of Steel Water Pipelines

3. NSF International (NSF): 61 Drinking Water System Components-Health Effects
4. National Association of Corrosion Engineers (NACE): Manual for Painter Safety
5. Occupational Safety and Health Act (OSHA)
6. Steel Structures Painting Council (SSPC)
    a. QP1, Standard Procedure for Evaluating Qualifications of Painting Contractors
    b. QP2, Standard Procedure for Evaluating the Qualifications of Painting Contractors to Remove Hazardous Paint
    c. SP 1, Surface Preparation Specification No. 1, Solvent Cleaning
    d. SP 2, Hand Tool Cleaning
    e. SP 3, Power Tool Cleaning
    f. SP 5, White Metal Blast Cleaning
    g. SP 6, Commercial Blast Cleaning
    h. SP 7, Brush-Off Blast Cleaning
    i. SP 8, Pickling
    j. SP 10, Near-White Blast Cleaning
    k. SP 11, Power Tool Cleaning to Bare Metal
    l. SP 12, High Pressure Water Jetting
    m. SP 13, Surface Preparation of Concrete
    n. SP 16, Brush off Blast Cleaning of Non-Ferrous Metals.
    o. PA1, Best Practices for Paints and Coatings Application
    p. PA2, Measurement of Dry Coating Thickness with Magnetic Gauges
    q. PA17, Determining Conformance to Steel Profile/Surface Roughness
    r. Guide No. 3, PA, Guide to Safety in Paint Applications
7. National Association of Pipe Fabricators (NAPF)
    a. 500-03-01, Solvent Cleaning
    b. 500-03-02, Hand Tool Cleaning
    c. 500-03-03, Power Tool Cleaning
    d. 500-03-04, Abrasive Blast Cleaning for Ductile Iron Pipe
    e. 500-03-05, Abrasive Blast Cleaning for Ductile Iron Fittings
8. International Concrete Repair Institute (ICRI)

a. 310.2, Surface Preparation of Concrete

b. CSP, Concrete Surface Profile

9. NACE International (NACE)

a. SP-0178, Design, Fabrication, and Surface Finish Practices for Tanks and Vessels to Be Lined for Immersion Service.

b. SP-0188-06, Discontinuity (Holiday) Testing of Protective Coatings

10. ASTM International (ASTM)

a. ASTM D 16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications.

b. ASTM D 3359 Standard Test Methods for Rating Adhesion by Tape Test

c. ASTM D 3960 - Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings.

d. ASTM D 4258, Standard Practice for Surface Cleaning Concrete for Coating.

e. ASTM D 4259, Standard Practice for Abrading Concrete.

f. ASTM D 4261, Standard Practice for Surface Cleaning Concrete Unit Masonry for Coating.

g. ASTM D 4262, Standard Test Method for pH of Chemically Cleaned or Etched Concrete Surfaces.

h. ASTM D 4263, Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.

i. ASTM D 4418, Standard Practice for Measurement of Wet Film Thickness by Notch Gages.

j. ASTM D 4417, Standard Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel.

k. ASTM D 4541, Standard Test Method for Pull-off Strength of Coatings Using Portable Adhesion Testers.

l. ASTM D 4787, Standard Practice for Continuity Verification of Liquid or Sheet Linings Applied to Concrete Substrates.

m. ASTM D 7091, Standard Practice for Nondestructive Measurement of Dry Film Thickness of Nonmagnetic Coatings Applied to Ferrous Metals and Nonmagnetic, Nonconductive Coatings Applied to Non-Ferrous Metals.

n. ASTM D 7234 Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers.

o. ASTM E 337, Standard Test Method for Measuring Humidity with a Psychrometer (the Measurement of Wet- and Dry-Bulb Temperatures).

p. ASTM F 1869, Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.

q. ASTM F 2170 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using In-situ Probes.

1.5 SUBMITTALS

A. Shop Drawings

1. Data Sheets, including catalog cuts and color charts.

    a. Material Safety Data Sheets (MSDS), the manufacturer's Technical Data Sheets, and paint colors available (where applicable) for each product used in the paint system.

    b. Submit required information on a system-by-system basis.

        i. Schedule of proposed coating materials.

        ii. Schedule of surfaces to be coated with each coating material.

    c. Furnish copies of paint system submittals to the coating applicator.

    d. Indiscriminate submittal of manufacturer's literature only is not acceptable.

    e. Thick film coating systems (greater than 25 mils):

        i. CSM's detailed written instructions for coating system treatment and graphic details for coating system terminations in coated structures, including pipe penetrations, metal embedments, gate frames, and other terminations encountered.

        ii. Include detail treatment for coating system at concrete joints.

        iii. Manufacturer's Representative's (CTR) Field Reports.

2. Detailed chemical and gradation analysis for each proposed abrasive material.

3. System Application Process (for each coating system):

    a. Contractor shall indicate surface preparation, primer, stripe coat, finish coat, and quality control parameters as indicated in Section 3.7.

    b. Submittal shall include a detailed pre-installation packet with on-site photographs of each edge and transition termination around pipes, gates, frames, edge of coating etc. Drawings on the photographs shall indicate the termination method to be used, in conformance with the coating system manufacturer's recommendations.

    c. Submittals shall be approved by the coating manufacturer, the applicator and the General Contractor that is specific to each application system.

B. Quality Control Submittals

1. Applicator's Qualification: List of references substantiating experience.

2. Factory-Applied Coatings: Manufacturer's certification stating factory-applied coating system meets or exceeds requirements specified.

3. If the manufacturer of finish coating differs from that of shop primer, provide both manufacturers' written confirmations that materials are compatible.

4. Manufacturer's written instructions and special details for applying each type of paint.

5. Manufacturer's written verification that submitted material is suitable for the intended use.

6. Qualifications of CSA, including:

    a. List of Similar Projects.

    b. Name and address of project.

    c. Year of installation.

    d. Year placed in operation.

    e. Point of contact: Name and phone number.

    f. Provide a minimum of 5 project references, each including contact name, address, and telephone number where similar coating work has been performed by their company in the past 5 years.

7. CSA Reports:

    a. Written daily quality control inspection reports.

8. CTR Reports:

    a. Reports on visits to project site to view and approve surface preparation of structures to be coated.

    b. Reports on visits to project site to observe and approve coating application procedures.

C. Extended Warranty Certificates

D. Contract Closeout Submittals: Extended Warranty Certificate

1.6 QUALITY CONTROL

A. Qualifications of Applicator: Minimum 5 years' experience in application of specified products.

B. Contractor's Responsibilities

1. The Contractor shall perform first-line, in-process QC inspections and testing in accordance with the level of quality control specified for each coating system.

2. The Contractor shall use the "Daily Coating Inspection Report" found at the end of this specification to record the results of quality control inspections and tests. The completed reports shall be turned in to the Engineer before work resumes the following day.

3. The Contractor shall supply all necessary equipment to perform the QC tests. The instruments shall be calibrated by the Contractor's personnel according to the equipment manufacturer's recommendations and the Contractor's QC Program. All inspection equipment shall be made available to the Engineer for QA observations on an as-needed basis.

4. Equipment shall include the following at a minimum:

    a. Recording thermometer.

    b. Hygrometer.

    c. Recording or comparable equipment for the recording of dew point and continuous recording of relative humidity.

    d. Surface temperature thermometer.

e. Hypodermic Needle Pressure Gage for determining blasting pressure at the nozzle.

f. Visual Standard for abrasive blast cleaning.

g. Testex Press-O-Film Replica Tape and Spring Micrometer.

h. Wet Film Thickness Gage.

i. Blotter paper and plate glass for compressed air cleanliness checks.

j. Magnetic Dry Film Thickness Gage with calibration standards.

k. Holiday Detector: Non-destructive wet sponge-type detector. Operating test voltage shall be per NACE RO-02-74 or as recommended by the Coating Manufacturer's representative.

l. A non-sudsing-type wetting agent such as Kodak Photo-Flo, or equal, shall be added to the water prior to wetting the detector sponge.

C. CSA qualifications:

1. Minimum of 5 years of experience applying specified type or types of coatings under conditions similar to those of the Work:

a. Provide qualifications of applicator and references listing 5 similar projects completed in the past 5 years.

2. SSPC QP 1 certified.

3. Manufacturer-approved applicator when manufacturer has approved applicator program or when required in these specifications.

D. CTR qualifications:

1. Certification, one of the following:

a. NACE Level 2 or 3 Certified Coating Inspector.

b. SSPC Level 3 Protective Coatings Inspector.

2. Minimum of 5 years of experience applying manufacturer's coatings under conditions similar to those of the Work:

a. Provide qualifications of applicator and references listing 5 similar projects completed in the past 5 years.

E. Pre-installation conference: Contractor to conduct coatings conference..

1. Coordinate Hold Point schedule

F. CSM services:

1. CSA shall arrange for CTR to attend pre-installation conference.

2. Visit the project site periodically to consult on and inspect specified surface preparation and application Hold Points.

3. CTR shall provide written inspection reports.

G. Conduct and continually inspect work so the coating system is installed as specified. The CSM shall provide written directions to correct coating work not conforming to the specifications or is otherwise unacceptable.

H. Provide written daily reports summarizing test data, work progress, surfaces covered, ambient conditions, quality control inspection test findings, and other information pertinent to the coating system application.

1. Confirm that compressed air used for surface preparation or blow-down cleaning is free of oil and moisture.

2. Monitor surface preparation daily at shift's beginning and end and at intervals not to exceed 4 hours during the shift.

3. Do not apply coatings when environmental conditions are outside of the CSM's published limits.

I. Quality Assurance (QA) Observations by Engineer

1. The Engineer will conduct QA observations of any or all phases of the work. The presence or activity of Engineer observations in no way relieves the Contractor of the responsibility to provide all necessary daily QC inspections of his/her own and to comply with all requirements of this Specification.

2. Hold Points: Work that requires a specific inspection upon completion is designated as a Hold Point. The Contractor shall provide the Engineer with a minimum one-day notification before a Hold Point inspection will be reached. Permission to proceed beyond a Hold Point without a QA inspection will be granted solely at the discretion of the Engineer, and only on a case-by-case basis.

3. The Engineer has the right to reject any work that was performed without adequate provision for QA observations.

4. The Engineer will issue a Non-Conformance Report when work is found to be in violation of the specification requirements and is not corrected to bring it into compliance before proceeding with the next phase of work.

5. Inspection Access and Lighting

a. The Contractor shall facilitate the Engineer’s observations as required, including allowing ample time to view the work. The Contractor shall furnish, erect, and move scaffolding or other mechanical equipment to permit close observation of all surfaces to be cleaned and painted. This equipment shall be provided during all phases of the work.

b. When the surface to be inspected is more than 1.8 m (6 ft) above the ground or water surface, the Contractor shall provide the Engineer with a safety harness and a lifeline according to OSHA regulations.

c. The Contractor shall provide artificial lighting in areas where natural light is inadequate, as determined by the Engineer, to allow proper cleaning, inspection, and painting. Illumination for inspection shall be at least 325 LUX (30-foot candles). Illumination for cleaning and painting, including the working platforms, access, and entryways shall be at least 215 LUX (20-foot candles).

J. Inspection at Hold Points:

1. Conduct inspections at Hold Points during the coating system application and record the results.

2. Coordinate Hold Points with the Engineer so the Engineer can observe Contractor’s inspections on a scheduled basis.

3. Provide the Engineer a minimum of [24] hours of notice before conducting Hold Point Inspections.

4. Hold Points shall be as follows:

    a. Conditions before surface preparation: Before starting surface preparation, observe, record, and confirm that oil, grease, and/or soluble salts are gone from the surface.

    b. Post surface preparation: After completing surface preparation, measure and inspect for cleanliness and proper surface profile as specified in this Section and in the CSM's written instructions.

    c. Coatings application: At the beginning of any coating system application, measure, record, and confirm acceptability of surface and ambient air temperature and humidity. Inspect applicator's equipment for serviceability and suitability for coatings application.

    d. Post application inspection: Identify defects in application work on all surfaces, including pinholes, holidays, excessive runs or sags, inadequate or excessive film thickness, and other problems.

    e. Follow-up corrective actions and final inspection: Measure and re-inspect corrective coating work performed to repair defects at prior Hold Points, and repeat until the surface condition is acceptable. Conduct final visual inspection with follow-up tests, such as holiday detection, adhesion tests, and DFT surveys.

1.7 SUBSTITUTIONS

A. Products of manufacturers other than those specified, and equal in type and quality to those specified, may be considered acceptable if said products are offered by the Contractor with satisfactory data on past performance, composition and directions for use. No request for substitution will be approved which decreases the film thickness specified and/or number of coats to be applied, or which offers a change from the generic type of paint and coating system specified.

1.8 DELIVERY, STORAGE AND HANDLING

A. All paint shall be delivered to the job site in the manufacturer's original, sealed and labeled containers and shall be subject to inspection and approval by the Engineer prior to use.

B. Shipping

1. Where pre-coated items are to be shipped to the site, protect coating from damage. Batten coated items to prevent abrasion.

2. Use non-metallic or padded slings and straps in handling.

C. Storage

1. Store products in a protected area that is heated or cooled to maintain temperatures within the range recommended by paint manufacturer.

2. Primed surfaces shall not be exposed to weather for more than two months before being topcoated, or less time if recommended by coating manufacturer.

1.9 SERVICES OF MANUFACTURER

A. For submerged and severe service coating systems, the Contractor shall require the paint manufacturer to furnish the following services:

1. The manufacturer's representative shall provide technical support to resolve field problems associated with the surface preparation requirements and application and curing of the manufacturer's products.

1.10 ENVIRONMENTAL REQUIREMENTS

A. Provide tenting, dehumidification, heating, and other environmental controls necessary to meet the preparation, application, and curing requirements of the coatings used.

1.11 EXTENDED WARRANTIES

A. When specified, provide manufacturer's and contractor's extended warranty for materials and workmanship with Owner named as beneficiary, and shall commence at the time of Substantial Completion.

1.12 PROTECTION OF EXISTING PAINTED STRUCTURES

A. The painting on existing structures and equipment shall be protected. Any damage caused by the Contractor's operation shall be repaired or restored to a condition equal to or better than before it was damaged.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer used as the basis of design: Product names used herein refer to materials manufactured and/or supplied by Tnemec Co. and are used as the basis of quality for design and bidding.

1. Approved Manufacturers – Paint

    a. Tnemec

    b. Sherwin Williams

    c. Pre-approved equal.

B. All paint materials selected for each system for each type of surface shall be the product of a single manufacturer. The type of paint material to be used and the number of coats to be applied are listed in the coating systems specified below.

C. All paint materials and equipment shall be compatible in use. Finish coats shall be compatible with prime coats. Prime coats shall be compatible with the surface to be coated. All tools and equipment shall be compatible with the coating to be applied.

D. Coal tar epoxy and products containing coal tar pitch will not be allowed.

E. Special systems as specified for surface conditions by the manufacturer specified; substitution only upon affidavit of alternate manufacturer that product will meet conditions and label for surface use.

2.2 COLORS

A. Alternating coats shall be contrasting but complimentary to finish coating.

B. All colors and glosses shall be as selected by the Owner.

C. Colors and painting schemes shall match existing colors at project for similar surfaces.

2.3 ABRASIVE MATERIALS

A. Select abrasive type and size to produce a surface profile that meets coating manufacturer's recommendations.

B. Abrasive blast cleaning shall be performed using either expendable abrasives (other than silica sand) or recyclable steel grit abrasives. Expendable abrasive shall be used one time and disposed of. Abrasive suppliers shall certify that the expendable abrasives meet the requirements of SSPC-AB1 and that recyclable

steel grit abrasives meet AB3. The Contractor shall verify that recycled abrasives meet the requirements of SSPC-AB2 during use. All surfaces prepared with abrasives not meeting the SSPC-AB1, AB2, or AB3 requirements, as applicable, shall be solvent cleaned or low pressure water cleaned as directed by the Engineer, and re-blast cleaned at the Contractor's expense.

2.4 THINNERS, CLEANERS, DRIERS, AND OTHER ADDITIVES

A. As recommended by manufacturer of the particular coating.

2.5 VISUAL STANDARD

A. When specified and to facilitate inspection, Contractor shall, on the first day of sandblasting operations, sandblast metal plates to the surface preparation standards specified. Plates shall measure 8½ inches by 6 inches. Plates shall be approved by the Engineer. Plates shall be coated with a clear, non-yellowing finish. One of these plates shall be prepared for each type of sandblasting and shall be used as the comparison standard throughout the project.

PART 3 EXECUTION

3.1 SURFACE PREPARATION, GENERAL

A. Prior to all surface preparation and painting operations, completely mask, remove or otherwise adequately protect all hardware, accessories, machined surfaces, plates, lighting fixtures, equipment, and similar items in contact with painted surfaces but not scheduled to receive paint.

B. All surfaces to be painted shall be in the proper condition to receive the specified paint before said paint is applied. Surface preparation shall be done in a workmanlike manner with the objective of obtaining a clean and dry surface. No more surface preparation than can be coated in a normal working day shall be permitted. No coating shall be applied before the prepared surfaces are approved by the Engineer.

C. Schedule all cleaning and painting so that dust and other contaminants from the cleaning process will not fall on wet, newly-painted surfaces.

D. Provide drop cloths to prevent paint materials from falling on or marring adjacent surfaces.

E. Protect working parts of mechanical and electrical equipment from damage during surface preparation and painting process. For process piping, mask bolt threads to allow nuts to be removed for maintenance.

F. Mask openings in motors to prevent paint and other materials from entering the motors.

G. Protect all surfaces adjacent to or downward of work area from overspray. Contractor shall be responsible for any damage resulting from overspray.

3.2 SURFACE PREPARATION DESIGNATIONS

A. General:

1. The following designations for surface preparation shall be utilized in the coating systems specified. In no case shall the surface preparation be less than that specified by the Paint Manufacturer. In case of conflict, the more restrictive requirement shall apply.

2. Inspect and provide substrate surfaces prepared in accordance with these Specifications and the printed directions and recommendations of paint manufacturer whose product is to be applied. The more stringent requirements shall apply.

3. Position diesel- or gasoline-powered equipment in a manner to prevent deposition of combustion contaminants on any part of the structure.

4. Do not perform abrasive blast cleaning whenever relative humidity exceeds 85 percent or whenever surface temperature is less than 5° F above dew point of ambient air.

5. Schedule all cleaning and painting so that dust and other contaminants from the cleaning process will not fall on wet, newly-painted surfaces.

6. No more surface preparation than can be coated in a normal working day shall be permitted.

7. No coating shall be applied before the prepared surfaces are approved by the Engineer.

B. Concrete and Masonry*:* All surfaces shall be cleaned of all dust, mortar splatter, curing compounds, grease and other foreign matter. Prepare concrete surfaces per SSPC-SP13, ICRI 310.2 with the appropriate concrete surface profile (CSP) as suggested by the coatings manufacturer. Surface preparation shall conform to the following table:

CONCRETE AND MASONRY SURFACE PREPARATION	
Designation	**Description**
CM-1	**Solvent Cleaning**: Solvent cleaning is a method for removing all visible oil, grease, soil, and other soluble contaminants. Low pressure (1500 – 4000 psi) high volume (3-5 gal/min) water washing with appropriate cleaning chemicals.
CM-2	**Acid Etch**: Clean and etch with 10% muriatic acid solution, scrub thoroughly, neutralize acid, rinse thoroughly, and allow to dry. If curing compound has been used on concrete, clean curing compound off with solenoid prior to acid etching.
CM-3	**Abrasive Blasting**

C. Metal: All surfaces shall be cleaned of all rust, scale, dust and other foreign matter. Sharp edges, burrs and weld spatter shall be removed. Surface preparation shall conform to the following table and shall be in accordance with the Steel Structures Painting Council (SSPC). Ductile Iron Pipe surface preparation requirements are detailed elsewhere.

METAL SURFACE PREPARATION	
Designation	**Description**
SSPC-SP1	**Solvent Cleaning**: Solvent cleaning is a method for removing all visible oil, grease, soil, drawing and cutting compounds and other soluble contaminants. Solvent cleaning does not remove rust or mill scale. Change rags and cleaning solution frequently so that deposits of oil and grease are not spread over additional areas in the cleaning process. Low-pressure (1500 - 4000 psi) high volume (3 - 5 gal/min.) water washing with appropriate cleaning chemicals is a recognized "solvent cleaning" method. All surfaces should be cleaned per this specification prior to using hand tools or blast equipment.
SSPC-SP2	**Hand Tool Cleaning**: Hand Tool Cleaning removes all loose mill scale, loose rust and other detrimental foreign matter. It is not intended that this process remove adherent mill scale, rust and paint. Mil scale, rust and paint are considered adherent if they cannot be removed by lifting with a dull putty knife. Before hand-tool cleaning, remove visible oil, grease, soluble welding residues and salts by the methods outlined in SSPC-SP1.
SSPC-SP3	**Power Tool Cleaning**: Power Tool Cleaning removes all loose mill scale, loose rust and other detrimental foreign matter. It is not intended that this process remove adherent mill scale, rust and paint. Mil scale, rust and paint are considered adherent if they cannot be removed by lifting with a dull putty knife. Before power tool cleaning, remove visible oil, grease, soluble welding residues and salts by the methods outlined in SSPC-SP1.

METAL SURFACE PREPARATION	
Designation	**Description**
SSPC-SP5	**White Metal Blast Cleaning**: A White Metal Blast Cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products and other foreign matter. Before blast cleaning, visible deposits of oil or grease shall be removed by any of the methods specified in SSPC-SP1 or other agreed upon methods.
SSPC-SP6	**Commercial Blast Cleaning**: A Commercial Blast Cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products and other foreign matter, except for staining. Staining shall be limited to no more than 33% of each square inch of surface area and may consist of light shadows, slight streaks or minor discoloration caused by stains of rust, stains of mill scale or stains of previously applied paint. Before blast cleaning, visible deposits of oil or grease shall be removed by any of the methods specified in SSPC-SP1 or other agreed upon methods.
SSPC-SP7	**Brush-Off Blast Cleaning**: A Brush-Off Blast Cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, loose mill scale, loose rust and loose paint. Tightly adherent mill scale, rust and paint may remain on the surface. Mil scale, rust and coating are considered adherent if they cannot be removed by lifting with a dull putty knife after abrasive blast cleaning has been performed. Before blast cleaning, visible deposits of oil or grease shall be removed by any of the methods specified in SSPC-SP1 or other agreed upon methods.
SSPC-SP10	**Near-White Blast Cleaning**: A Near-White Blast Cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products and other foreign matter, except for staining. Staining shall be limited to no more than 5 percent of each square inch of surface area and may consist of light shadows, slight streaks or minor discoloration caused by stains of rust, stains of mill scale or stains of previously applied paint. Before blast cleaning, visible deposits of oil or grease shall be removed by any of the methods specified in SSPC-SP1 or other agreed upon methods.
SSPC-SP11	**Power Tool Cleaning to Bare Metal**: Metallic surfaces that are prepared according to this specification, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxide corrosion products and other foreign matter. Slight residues of rust and paint may be left in the lower portions of pits if the original surface is pitted. Prior to power tool surface preparation, remove visible deposits of oil or grease by any of the methods specified in SSPC-SP1, Solvent Cleaning, or other agreed upon methods.
SSPC-SP13	Surface preparation of concrete by mechanical, chemical, or thermal methods prior to the application of bonded protective coating or lining systems. An acceptable prepared concrete surface should be free of contaminants, laitance, loosely adhering concrete, and dust, and should provide a sound, uniform substrate suitable for the application of protective coating or lining systems.
SSPC-SP16	**Brush-Off Blast Cleaning of Non-Ferrous Metals** SP 16 is intended for brush-off blast cleaning of coated or uncoated metal surfaces other than carbon steel prior to the application of a protective coating system. Surface preparation using this standard is intended to roughen and clean coated and uncoated non-ferrous metal substrates, including, but not limited to, galvanized surfaces, stainless steel, copper, aluminum, and brass. SP 16 requires the cleaned surface to be free of loose contaminants and loose coating as determined by visual inspection. A minimum surface profile of 19 micrometers (0.75 mil) on the bare metal surface is required. Intact coatings are required to be roughened to the degree specified in the project specification.

D. Wood: Wood surfaces shall be thoroughly cleaned and free of all foreign matter. Surface preparation shall conform to the following table:

WOOD SURFACE PREPARATION

Designation	Description
W-1	Clean with mineral spirits, scraping or wire-brushing. Properly fill cracks, nail holes and other defects. Wipe clean of dust.

E. PVC Pipe: PVC pipe shall be clean and dry. Surface preparation shall conform to the following table:

PVC PIPE SURFACE PREPARATION	
Designation	**Description**
P-1	Sand lightly and wipe clean with xylol or toluol solvent. Allow to dry completely.

F. Ductile Iron Pipe and Fittings: Prepare per NAPF 500-03.

1. Per 500-03-01:

   a. Solvent cleansing is a method which shall result in the surface being free of all oil, small deposits of asphalt paint, grease, soil, drawing and cutting compounds and other soluble contaminants from iron surfaces. It is intended that solvent cleaning, when necessary, be used prior to the application of special coating/lining and in conjunction with surface preparation methods specified for the removal of rust, annealing oxide, or mold coating.

2. Per 500-03-02:

   a. Hand tool cleaning is a method of preparing iron surfaces by the use of non-power hand tools which shall result in the surface being free of all loose annealing oxide, loose rust, loose mold coating and other loose detrimental foreign matter. It is not intended that adherent annealing oxide, mold coating and rust be removed by this process. Annealing oxide, mold coating, and rust are considered adherent if they cannot be removed by lifting with a dull putty knife. All asphalt paint must be removed prior to hand tool cleaning.

3. Per 500-03-03:

   a. Power tool cleaning is a method of preparing iron surfaces by the use of power assisted hand tools which shall result in the surface being free of all loose annealing oxide, loose rust, loose mold coating and other loose detrimental foreign matter. It is not intended that adherent annealing oxide, mold coating and rust be removed by this process. Annealing oxide, mold coating, and rust are considered adherent if they cannot be removed by lifting with a dull putty knife. All asphalt paint must be removed prior to power tool cleaning.

4. Per 500-03-04:

   a. Abrasive Blast Cleaning – **External** Pipe Surfaces is a method of preparing the exterior of ductile iron pipe surfaces which, when viewed without magnification, shall result in the surface being free of all visible dirt, dust, loose annealing oxide, loose rust, loose mold coating and other foreign matter. All oils, small deposits of asphalt paint and grease shall have been removed by solvent cleaning (see NAPF 500-03-01). After the entire surface to be coated is struck by the blast media, tightly adherent annealing oxide, mold coating and rust staining may remain on the surface provided they cannot be removed by lifting with a dull putty knife.

   b. Abrasive Blast Cleaning - **Internal** Pipe Surfaces is a method of preparing the interior of ductile iron pipe surfaces which, when viewed without magnification, shall result in the surface being free of all visible dirt, dust, loose annealing oxide, loose rust, loose mold coating and other foreign matter. Internal pipe surface preparation requirements shall be specified by the pipe manufacturer or pipe fabricator as well as the lining manufacturer and shall be based upon testing of a specific lining applied to ductile iron pipe exposed to a specific environment.

5. Per 500-03-05:

   a. Abrasive Blast Cleaning - Cast Ductile Iron Fittings. Internal and External Surfaces is a method of repairing the interior and exterior of cast ductile iron fittings surfaces which, when viewed without magnification, shall result in the surface being free of all visible dirt, dust, loose annealing oxide, loose rust, loose mold coating and other foreign matter. All oils, small deposits of asphalt paint and grease shall have been removed by solvent cleaning (see NAPF 500-03-01). Four degrees of abrasive blast cleaning for fittings are available, depending on the type of service for which the fitting is intended and upon the type of coating/lining specified.

3.3 APPLICATION

A. General

1. The application of all coatings shall be in strict accordance with the Manufacturer's Instructions and shall be performed in a manner satisfactory to the Engineer. Painting shall be done at such times as the Contractor and Engineer may agree upon in order that dust-free and neat work be obtained.

2. On metal surfaces, each coat shall be applied at the rate specified by the Manufacturer to achieve the dry mil thickness specified herein. If material has thickened or must be diluted for application by spray gun, the coating shall be built up to the same film thickness achieved with undiluted material. Deficiencies in film thickness shall be corrected by the application of additional coats of paint.

3. On masonry or wood, application rates will vary according to surface texture; however, in no case shall the Manufacturer's stated coverage rate be exceeded. On porous surfaces, it shall be the Contractor's responsibility to achieve a protective and decorative finish, either by decreasing the coverage rate or by applying additional coats of paint.

4. Additional coats of paint shall not be applied until the preceding coat has dried as evidenced by tests with a moisture meter. Drying time shall be construed to mean an interval under normal conditions and shall be increased to allow for adverse weather or drying conditions.

5. Thinning, when required, shall be done in strict accordance with the Manufacturer's recommendations using the Manufacturer's thinner, or that recommended by the Manufacturer, with knowledge and approval of the Engineer.

6. Use skilled craftsmen and experienced supervision.

7. Apply coating to produce an even film of uniform thickness. Give special attention to edges, corners, crevices, and joints. Ensure thorough cleaning and an adequate thickness of coating material. Apply coatings to produce finished surfaces free from runs, drips, ridges, waves, laps, brush marks, and variations in color, texture, and finish. Effect complete hiding so that the addition of another coat would not increase the hiding. Give special attention to ensure that edges, corners, crevices, welds, and similar areas receive a film thickness equivalent to adjacent areas. Apply a brushed stripe coat to all edges and welds after priming submerged or severe service areas.

8. Coordinate cleaning and coating so that dust and other contaminants from the cleaning process will not fall on wet, newly-coated surfaces.

9. Prime surfaces within 12 hours after they are blasted. Re-blast surfaces that have started to rust before they are painted.

10. No paint shall be applied in fog, snow, rain, or to wet or damp surfaces or when air temperatures are below 40° F.

11. Surface temperature shall be at least 5° F above the dew point during final surface preparation and

painting.

12. Vacuum clean surfaces free of loose particles. Use tack cloth just prior to applying next coat.

13. Coat units or surfaces to be bolted together or joined closely to structures or to one another prior to assembly or installation.

14. On pipelines, terminate coatings along pipe runs to 1 inch inside pipe penetrations.

15. Keep paint materials sealed when not in use.

16. Where more than one coat of a material is applied within a given system, alternate color to provide a visual reference that the required number of coats have been applied.

17. The Contractor shall be responsible for ensuring that the shop prime coating is compatible with the finish coating. Materials and application as specified herein shall govern regardless of whether coatings are factory-applied or field-applied. After installation, any damaged areas in prime or finish coatings shall be repaired as directed by the Engineer.

B. Stripe Coating

1. Stripe coat all field welds, edges, angles, fasteners, and other irregular surfaces.

2. Stripe coat shall consist of one coat, brush applied, to the coating thickness specified.

3. Apply stripe coat between primer and intermediate coats.

4. Stripe coat color shall contract with prime coat to allow visual verification of application.

3.4 FACTORY-APPLIED COATINGS AND TOUCH-UP

A. Except where factory or shop application of finish coatings is permitted elsewhere in these Specifications, or by the Engineer in writing, all items shall be finish-painted after installation with the color selected or approved by the Engineer. Shop priming shall be permitted in all cases. The Contractor shall be responsible for insuring that the shop prime coating is compatible with the finish coating. Materials and application as specified herein shall govern regardless of whether coatings are factory-applied or field-applied. After installation, any damaged areas in prime or finish coatings shall be repaired as directed by the Engineer.

3.5 INSPECTION

A. Do not apply additional coats until completed coat has been inspected and approved by the Engineer. Only inspected and approved coats of paint shall be considered in determining the number of coats applied.

3.6 CLEANUP

A. Prevent accidental spilling of paint materials and, in the event of such a spill, immediately remove all spilled material and the waste or other equipment used to clean up the spill, and wash the surfaces to their original, undamaged condition.

B. Upon completion of painting, visually inspect all surfaces and remove all paint and traces of paint from surfaces not specified to be painted.

3.7 QUALITY CONTROL TESTING

A. Owner-provided inspection or inspection by others does not limit the Contractor's or CSA's responsibilities for quality workmanship or quality control as specified or as required by the CSM's instructions. Owner

inspection is in addition to any inspection required of the Contractor.

B. Contractor shall perform and document quality control testing as specified for each coating system.

1. Level 1 – Minimum required QC test requirements for all painting and coating:

a. Weather conditions – every 4 hours

b. Ambient temperatures – every 4 hours

c. Surface temperature – every 4 hours

d. Wet film thickness – every ½ hour

e. Verify DFT of each coat and total DFT of each coating system are as specified using wet film and dry film gauges. DFT's shall be measured in accordance with SSPC-PA2.

2. Level 2 – Testing requirements in addition to Level 1 requirements:

a. Continuous ambient temperature (recording thermometer)

b. Relative humidity – every 4 hours

c. Dew point – every 4 hours

d. Compressed air cleanliness – prior to using compressed air for abrasive blast cleaning, blowing down the surfaces, and painting with conventional spray, the Contractor shall verify that the compressed air is free of moisture and oil contamination according to the requirements of ASTM D4285. The tests shall be conducted at least one time each shirt for each compressor system in operation. If air contamination is evident, the Contractor shall change filters, clean traps, add moisture separators or filters, or make other adjustments as necessary to achieve clean, dry air. The Contractor shall also examine the work performed since the last acceptable test for evidence of defects or contamination caused by the compressed air. Affected work shall be repaired at the Contractor's expense.

e. Blast pressure at nozzle – every 4 hours

f. Visual standard for abrasive blast cleaning

g. Surface profile – every 4 hours

h. Surface pH of concrete surfaces

i. Dry film thickness with magnetic dry film thickness gauge

j. Contractor shall perform holiday testing in accordance with NACE SP0188 to identify holidays or pinholes needing repair for coating over 100 percent of surfaces:

i. Coated steel that will be immersed or exposed to aggressively corrosive conditions.

ii. Coated concrete.

iii. Perform holiday tests after proper application and coating system cure.

iv. Where specifically noted, Contractor shall perform adhesion testing per ASTM D4541 – 17. Pass/fail test pressure, curing conditions required prior to testing, and test location(s) shall be per the coating system manufacturer.

C. Where specifically noted, contractor to perform adhesion testing per ASTM D 3359-17. Curing conditions required prior to testing hall be per coating system manufacturer. Engineer shall witness adhesion testing and contractor shall submit testing report. For Test Method A-X – cut Tape Test of ASTM D 3359-17, only tests resulting in a SA rating are acceptable, and considered as passing. For Test Method B – Cross-cut Tape Test of ASTM D 3359-17, only tests resulting in a 5B rating are acceptable, and considered as passing.

3.8 FINAL INSPECTION

A. Conduct final inspection of coating system work to determine whether it meets specifications requirements.

B. Conduct subsequent final inspection with Engineer to ensure work conforms to contract documents requirements.

C. Mark any rework required.

1. Re-clean and repair, as specified, at no additional cost to the Owner.

3.9 PIPING COLOR CODE AND IDENTIFICATION

A. General:

1. Unless required otherwise by the Engineer, all exposed process and building piping and accessories shall be identified and painted as specified herein and in conformance with this specification.

2. The following piping materials need not be painted with the basic identification color except for colored bands.

   a. Stainless steel

   b. chrome-plated piping

   c. Interior PE/HDPE Piping

   d. Interior PVC/CPVC Piping

3. Where piping is to be identified with colored bands, a three-band system shall be used. The background color, as identified on the pipe schedule, shall appear in the left and right-most bands, with the secondary color located in the center.

4. PVC Piping that extends to the exterior of buildings/structures (i.e., exposed to UV/sunlight) shall be painted completely. Submit to coordinate color with process identification and architectural elements.

5. The entire exposed surface of all other piping and accessories shall be painted according to the color codes indicated in the pipe schedule.

B. Identification Labels:

1. Identify all exposed piping and all piping on each side of each valve; on each side of a branch; on both sides and adjacent to each wall and floor penetrations and not more than 15 feet on center.

2. All chemical piping shall be identified a minimum of two (2) times in each interior room.

3. Identification Tag Requirements:

   a. Name of service as shown on Plans

   b. Flow direction arrows

c. Position identification so that it is readily visible from eye level.

d. Block letters on adhesive labels on the finished insulation or pipe with flat black or white enamel contrasting the background pipe color. Label/Text size shall be as noted below. In some instances, as an alternative to painting of identification, an adhesive decal pipe identification system may be approved upon review by the Engineer. Contractor shall submit product information for review by Owner and Engineer as an alternative to painted identification.

SIZE OF LETTERS / ARROWS	
Outside Diameter of Pipe or Covering	**Height of Adhesive Letter**
¾" to 1¼"	½"
1½" to 2"	¾"
2½" to 6"	1¼"
8" to 10"	2½"
Over 10"	3½"

3.10 COATING SYSTEMS

A. Architectural Finishes Including:

1. Gypsum Wall Board
2. Siding and Trim (interior and exterior)
3. Concrete Masonry Units - CMU (interior and exterior)
4. Exterior and Interior Metal Doors, Frames and Vision Lite Frames
5. Exterior Overhead Entry Canopies and Sun Shades
6. For other architectural finishes, reference Section 09 91 00 Architectural Painting.
    a. Where conflicts occur, contractor to adhere to more stringent specifications.

B. **General:** Surface preparation, prime coatings and finish coatings for the various surfaces and items to be painted are specified below. Prime coatings shall be contrasting but complimentary to finish coat.

C. Table 1: Coating System Application Area Descriptions

1. Description: Coating System Application Area Descriptions, includes general descriptions of a systems and a corresponding letter (for example: “A”) to be the designator throughout the rest of the document. Table 2: Applicable Manufacturer Products, includes approved manufacturers and materials for each system. The following pages each correspond to a single system (for example: “A”) and include some details that are necessary for installation. There is also a section labelled Notes at the bottom of each page. These notes can include requirements and reviews of how the systems have performed.

Table 1: Coating System Application Area Descriptions

COATING SYSTEM APPLICATION AREA DESCRIPTIONS	
System A-1	**Exterior Metal and Piping, Non-Submerged (unless specified elsewhere)** Includes, but not limited to, machinery, structural steel beams, columns, bracing, open web steel bar joists, and ancillary structural elements, pumps, pipe hangers, ductile iron pipe, cast iron pipe, galvanized steel pipe, copper pipe, fabrications, PVC pipe, and electrical conduit; *excludes others specifically noted or specified elsewhere.* "Non-submerged" is defined as those items located one (1) foot or more above the maximum water level.
System B-1	**Interior Metal and Piping (unless specified elsewhere)** Includes, but not limited to, machinery, pumps, pipe hangers, ductile iron pipe, cast iron pipe, galvanized steel pipe, steel pipe, copper pipe, fabrications, PVC pipe, and electrical conduit; *excludes others specifically noted or specified elsewhere.*
System B-2	**Interior Structural Components (unless specified elsewhere)** Includes, but not limited to, structural steel beams, columns, bracing, open web steel bar joists, and ancillary structural elements; *excludes others specifically noted or specified elsewhere. SEE NOTES 1, 2 and 3 in System B-2*
System C-1	**Submerged and Intermittently Submerged Metal (unless specified elsewhere)** “Submerged” is defined as all items below one (1) foot above the maximum water level, including submerged elements. Also includes all metal surfaces, structural steel, and metal fabrications in proximity noted above.
System D-1	**Metal, Concrete Encased (unless specified elsewhere)** All metal surfaces, encased in concrete, such as pipes, wall pipes, thimbles, pipe sleeves, gate guides. Excludes reinforcing steel, stainless steel, and galvanized metals.
System D-2	**Aluminum in Contact with Concrete (unless specified elsewhere)**
System E-1	**Epoxy coated floors, walls and sumps (as called-out on the drawings)**
System E-2	**Reinforced Epoxy coated floors, interior walls and ceilings of process tanks and secondary containment (as called-out on the drawings)** **Provide sand-grit floors in secondary chemical containment areas and equipment/pump areas**
System E-3	**Epoxy coated floors, interior walls and secondary containment (as called-out on the drawings)** **Provide sand-grit floors in secondary chemical containment areas and equipment/pump areas**
System F-1	**Concrete process tank interior floor and walls and sumps (unless specified elsewhere)**
System G-1	**Dry fall for interior ceilings**

D. Table 2: Applicable Manufacturer Products

Table 2: Applicable Manufacturer Products

System Designation	Manufacturer	Filler	Primer Coat(s)	Stripe Coat(s)	Intermediate Coat(s)	Finish Coat(s)
A-1	Sherwin-Williams	N/A	Corothane I Mio-Zinc	Macropoxy 5500LT	Macropoxy 5500LT	Acrolon Ultra
	Tnemec	N/A	Series 1 Omnithane	Series 66	N/A	Series 73
B-1	Sherwin-Williams	N/A	Corothane I Mio-Zinc	Macropoxy 5500LT	Macropoxy 5500LT	Macropoxy 5500LT
	Tnemec	N/A	Series 1 Omnithane	Series 66	N/A	Series 66
B-2	Sherwin-Williams	N/A	Shercryl 1300	Shercryl HPA	N/A	Shercryl HPA
	Tnemec	N/A	115 Unibond	Series 1029	N/A	Series 1029
C-1	Sherwin-Williams	N/A	N/A	Macropoxy 5500LT	Sher-Glass FF	Sher-Glass FF
	Tnemec	N/A	Series 1 Omnithane	Series 66	N/A	Series 69
D-1	Sherwin-Williams	N/A	Macropoxy 5500LT	N/A	N/A	Macropoxy 5500LT
	Tnemec	N/A	N/A	N/A	N/A	Series 69
D-2	Sherwin-Williams	N/A	Macropoxy 5500LT	N/A	N/A	Macropoxy 5500LT
	Tnemec	N/A	Series 66	N/A	N/A	Series N69
E-1	Sherwin-Williams	Dura-Plate 2300	Macropoxy 5500LT	N/A	Macropoxy 5500LT	Macropoxy 5500LT
	Tnemec	Series 218	Series 1	N/A	N/A	Series N69
				Series 206 SubFlex EP		
E-2	Sherwin-Williams	N/A	Corobond 100	N/A	Dura-Plate UHS Clear Laminate	Dura-Plate UHS
	Tnemec	Series 218	Thinned	N/A	Intermediate	Series 22

System Designation	Manufacturer	Filler	Primer Coat(s)	Stripe Coat(s)	Intermediate Coat(s)	Finish Coat(s)
			Series N140F		Base Coat: Series 215 with Series 211-15 Mesh Saturant Coat: Thinned Series 22 Epoxoline	Epoxoline
E-3	Sherwin-Williams	Dura-Plate 2300	Corobond 100	N/A	Int. Coat: Dura-Plate 8200 (includes sand grit for horizontal surfaces) Grout Coat: Dura-Plate 8200	General Polymers 4638
	Tnemec	Series 218	Series 201 Epoxoprime	N/A	Int. Coat: Series 280 Tneme-Glaze (includes sand grit for horizontal surfaces) Grout Coat: 280 Tneme-Glaze	Series 290 CRU-Urethane
F-1	Sherwin-Williams	Dura-Plate 2300	Macropoxy 5500LT 2-3	N/A	N/A	Macropoxy 5500LT
	Tnemec	Series 218	N/A	N/A	N/A	Series 141
G-1	Sherwin-Williams	N/A	Spraylastic Waterborne		N/A	Spraylastic Waterborne
	Tnemec	N/A	115 Unibond	Series 1029	N/A	Series 1029

The following pages include the System Application Data Sheets and their corresponding details.

1. System: A-1

	TNEMEC	SHERWIN-WILLIAMS
Surface Preparation:	1. Bare Metal (Steel). SSPC-SP6 or as approved by the Engineer 2. Primed Metal (Ductile or Cast Iron). SSPC-SP1 and SSPC-SP7 (or SP3) 3. PVC per this specification	• Same as Tnemec
Generic Type Primer:	• Modified Aromatic Polyurethane	• Same as Tnemec
Generic Type Intermediate Coat:	• N/A	• N/A
Generic Type Finish:	• Acrylic Polyurethane	• Same as Tnemec
Generic Type Stripe Coat:	• Per Manufacturer recommendations	• Same as Tnemec
Generic Type Surface/Filler:	• N/A	• N/A
Primer Thickness:	• 3.0 to 4.0 MDFT	• N/A
Intermediate Coat Thickness:	• N/A	• 4.0 to 6.0 MDFT
Finish Coat Thickness:	• 2.0 to 5.0 MDFT	• 2.0 to 3.0 MDFT
Stripe Coat Thickness:	• Stripe coat shall be used as necessary to insure proper dry film thickness and a pin-hole free surface.	• Same as Tnemec
Surface/Filler Thickness:	• N/A	• N/A
Quality Control:	• Level 1 and 2	• Same as Tnemec
Extended Warranty:	• Three (3) Years. At the completion of the work, stencil the date on the structure/machine in 2-inch-high capital letters containing the following wording: “PAINTED (insert month and year in which painting was completed)”.	• Same as Tnemec

2. System: B-1

	TNEMEC	SHERWIN-WILLIAMS
Surface Preparation:	1. Bare Metal (Steel). SSPC-SP6 2. Primed Metal (Ductile or Cast Iron). SSPC-SP1 and SSPC-SP7 (or SP3) 3. Galvanized Metal. SSPC-SP1 and SSPC-SP3 4. PVC. P-1	• Same as Tnemec
Generic Type Primer:	• Modified Aromatic Polyurethane	• Same as Tnemec
Generic Type Intermediate Coat:	• N/A	• N/A
Generic Type Finish Coat:	• Polyamide epoxy	• Polyamidoamine
Generic Type Stripe Coat:	• Polyamide epoxy	• Polyamidoamine
Generic Type Surface/Filler:	• N/A	• N/A
Primer Thickness: **Intermediate Coat Thickness:**	• 3.0 to 4.0 MDFT • N/A	• • 3.0 to 4.0 MDFT
Finish Coat Thickness:	• 3.0 to 4.0 MDFT	• Same as Tnemec
Stripe Coat Thickness:	• 3.0 to 4.0 MDFT. Stripe coat shall be used as necessary to insure proper dry film thickness and a pin-hole free surface as necessary.	• Same as Tnemec
Surface/Filler Thickness:	• N/A	• N/A
Quality Control:	• Level 1 and 2	• Same as Tnemec
Extended Warranty:	• Three (3) Years. At the completion of the work, stencil the date on the structure/machine in 2-inch-high capital letters containing the following wording: "PAINTED (insert month and year in which painting was completed)".	• Same as Tnemec

Notes:

1. All bituminous coated metals shall be sealed prior to the application of the prime coat to prevent bleeding. Sealer shall be compatible with other coatings.

2. Fabrications and elements that are not Factory Shop-Coated in conformance with this specification with Primer, Stripe and Finish Coats shall be prepared and field coated (or shop coated) per this specification prior to erection on-site. Following erection of structural steel elements, coatings shall be touched-up in the field to repair damaged areas per this specification.

3. System: B-2

	TNEMEC	SHERWIN-WILLIAMS
Surface Preparation:	1. Bare Metal: SSPC-SP6 2. Primed Metal SSPC-SP7	• Same as Tnemec
Generic Type Primer:	• Self-crosslinking Hydrophobic Acrylic	• Same as Tnemec
Generic Type Finish Coat:	• HDP Acrylic Polymer	• Same as Tnemec
Generic Type Stripe Coat:	• HDP Acrylic Polymer	• Same as Tnemec
Primer Thickness:	• 2 to 4 MDFT	• Same as Tnemec
Finish Coat Thickness:	• 2 to 4 MDFT	• Same as Tnemec
Stripe Coat Thickness:	• 2 to 4 MDFT Stripe coat shall be used to ensure proper coverage on all edges.	• Same as Tnemec
Quality Control:	• Level 1 and Level 2	• Same as Tnemec
Extended Warranty:	• Three (3) Years. At the completion of the work, stencil the date on the structure/machine in 2-inch-high capital letters containing the following wording: “PAINTED (insert month and year in which painting was completed)”.	• Same as Tnemec

Notes:

1. All bituminous coated metals shall be sealed prior to the application of the prime coat to prevent bleeding. Sealer shall be compatible with other coatings.
2. STRUCTURAL STEEL fabrications and elements that are not Factory Shop-Coated in conformance with this specification with Primer, Stripe and Finish Coats shall be prepared and field coated (or shop coated) per this specification prior to erection on-site. Following erection of structural steel elements, coatings shall be touched-up in the field to repair damaged areas per this specification.
3. Bar joist factory hold priming and dip priming shall not be considered in conformance with this specification and shall be removed and re-coated per these specifications on-site or at Contractors facility.

4. System: C-1

	TNEMEC	SHERWIN-WILLIAMS
Surface Preparation:	1. Bare Metal. SSPC-SP10 2. Primed Metal. SSPC-SP1 and SSPC-SP3, scarify the surface	• Same as Tnemec
Generic Type Primer:	• Modified Aromatic Polyurethane	• Same as Tnemec
Generic Type Finish Coat:	• Polyamidoamine Epoxy	• Polyamidoamine
Generic Type Stripe Coat:	• Polyamide Epoxy	• Same as Tnemec
Generic Type Surface/Filler:	• N/A	• N/A
Primer Thickness:	• 3.0 to 5.0 MDFT	• Same as Tnemec
Finish Coat Thickness:	• Two (2) coats, 8.0 to 10.0 MDFT/coat	• Same as Tnemec
Stripe Coat Thickness:	• Stripe coat shall be used as necessary to insure proper dry film thickness and a pin-hole free surface.	• Same as Tnemec
Surface/Filler Thickness:	• N/A	• N/A
Quality Control:	• Level 1 and 2	• Same as Tnemec
Extended Warranty:	• Three (3) Years. At the completion of the work, stencil the date on the structure/machine in 2-inch-high capital letters containing the following wording: “PAINTED (insert month and year in which painting was completed)”.	• Same as Tnemec

5. System: D-1

	TNEMEC	SHERWIN-WILLIAMS
Surface Preparation:	• Bare Metal (Steel). SSPC-SP6	• Same as Tnemec
Generic Type Primer:	• N/A	• N/A
Generic Type Intermediate Coat:	• N/A	• N/A
Generic Type Finish Coat:	• Polyamidoamine Epoxy	• Same as Tnemec
Generic Type Stripe Coat:	• Polyamidoamine Epoxy	• Same as Tnemec
Generic Type Surface/Filler:	• N/A	• N/A
Primer Thickness:	• N/A	• N/A
Intermediate Coat Thickness:	• N/A	• N/A
Finish Coat Thickness:	• Two (2) coats, 8.0 to 10.0 MDFT/coat	• Same as Tnemec
Stripe Coat Thickness:	• Stripe coat shall be used as necessary to insure proper dry film thickness and a pin-hole free surface.	• Same as Tnemec
Surface/Filler Thickness:	• N/A	• N/A
Quality Control:	• Level 1 and 2	• Same as Tnemec
Extended Warranty:	• None	• Same as Tnemec

6. System: D-2

	TNEMEC	SHERWIN-WILLIAMS
Surface Preparation:	• SSPC-SP1 and SSPC-SP16 (Scarify, degloss and provide 1 mil profile)	• Same as Tnemec
Generic Type Primer:	• Polyamide Epoxy	• Polyamidoamine
Generic Type Intermediate Coat:	• N/A	• N/A
Generic Type Finish Coat:	• Polyamidoamine Epoxy	• Same as Tnemec
Generic Type Stripe Coat:	• Polyamide Epoxy	• Polyamidoamine
Generic Type Surface/Filler:	• N/A	• N/A
Primer Thickness:	• 3-5 MDFT	• Same as Tnemec
Intermediate Coat Thickness:	• N/A	• N/A
Finish Coat Thickness:	• 6 to 8 MDFT	• Same as Tnemec
Stripe Coat Thickness:	• Stripe coat shall be used to insure proper coverage on all sharp edges.	• Same as Tnemec
Surface/Filler Thickness:	• N/A	• N/A
Quality Control:	• Level 1	• Same as Tnemec
Extended Warranty:	• None	• Same as Tnemec

7. System: E-1

	TNEMEC	SHERWIN-WILLIAMS
Surface Preparation:	• CM-1, and additional prep as recommended by manufacturer	• Same as Tnemec
Generic Type Surface/Filler:	• Epoxy Modified Cementitious Mortar	• Same as Tnemec
Generic Type Primer:	• Modified Aromatic Polyurethane Primer	• Same as Tnemec
Generic Type Stripe Coat:	• Polyamidoamine epoxy	• Same as Tnemec
Generic Type Finish Coat:	• Polyamidoamine Epoxy	• Same as Tnemec
Primer Thickness:	• 2.5 to 3.5 MDFT	• Same as Tnemec
Intermediate Coat Thickness:	• N/A	• N/A
Surface/Filler Thickness:	• Fill bug holes, rock pockets, and pinholes, 1/16” to ¼” thickness per lift, maximum ½” thickness	• Same as Tnemec
Stripe Coat Thickness:	• A stripe coat shall be used as necessary to insure proper dry film thickness and a pin-hole free surface.	• Same as Tnemec
Finish Coat Thickness:	• Two (2) coats, 4.0 to 6.0 MDFT/coat	• Same as Tnemec
Quality Control:	• Level 1 and 2	• Same as Tnemec
Extended Warranty:	• None	• Same as Tnemec

Notes:

1. Apply to all concrete sump surfaces; walls, floor. Apply after completion of all grouting and proper concrete cure.
2. Reference manufacturer’s application guide for termination details (edge of coating terminations). Upon full cure, the installed lining system shall be checked by high voltage spark detection in accordance with NACE RP0188-90 to verify a pinhole-free surface.

8. System: E-2

	TNEMEC	SHERWIN-WILLIAMS
Surface Preparation:	• Surface Preparation: Prepare in accordance with SSPC-13/NACE 6 and ICRI Technical Guidelines. Abrasive Blast, shot- blast or mechanically abrade concrete surfaces to provide a minimum ICRI-CSP 3 or greater surface profile.	• Same as Tnemec
Generic Type Surface/Filler:	• Epoxy Modified Cementitious Mortar	• Same as Tnemec
Generic Type Primer Coat:	• Polyamidoamine Epoxy	• Same as Tnemec
Generic Type Intermediate Basecoat:	• Modified Polyamine Epoxy	• Same as Tnemec
Saturant Coat:	• Modified Polyamine Epoxy	• Same as Tnemec
Generic Type Finish (top) Coat:	• Modified Polyamine Epoxy	• Same as Tnemec
Surface/Filler:	• Fill flush to plane all bug holes and surface voids as a result of the abrasive blasting process.	• Same as Tnemec
Primer Coat Thickness:	• To all horizontal and vertical surfaces, roller-apply a prime coat of Series N140F at a thickness of 3.0–4.0 mils DFT, thinned up to 10% with Tnemec No. 4 Thinner.	• To all horizontal and vertical surfaces, roller-apply a primer coat of Corobond 100 at a thickness of 3.0-4.0 mils DFT.
Intermediate Basecoat Thickness:	• To all horizontal (floors and ceilings) and vertical surfaces, trowel-apply, or spray transfer and trowel-finish full parge coat of Series 215 Surfacing Epoxy at a thickness of 60.0–80.0 mils DFT. • Embed Series 211-215, ¾ ounce fiberglass mat into basecoat while still wet, overlap edges 2 inches and smooth with ribbed roller to remove any voids or wrinkles.	• Apply Dura-plate UHS Clear Laminate to all surfaces at 40-50 mils DFT. For vertical surfaces, add ½ to 1 ½ lbs of fumed silica. 2.5-3.2 gallons of mixed material with 10.5 lbs of glass mat will cover approximately 100 sqft at 40-50 mils DFT.
Saturant Coat Thickness:	• Saturate top of fiberglass mat completely with Series 22 Epoxoline at 8.0–12.0 mils, thinned up to 5% with Tnemec No. 2 Thinner, until glass attains a uniform, wet-	• Same as Tnemec

	out appearance. Do not over-saturate. Once cured, sand to remove any imperfections or raised fibers that protrude through film. Grind if necessary.	
Finish (top) Coat and Thickness:	• To all horizontal and vertical surfaces, roller-apply topcoat of Series 22 Epoxoline at 20.0–30.0 mils DFT.	• Apply a finish coat of Dura-Plate UHS at 18.0-22.0 mils DFT.
Quality Control:	• Level 1 and 2	• Same as Tnemec
Extended Warranty:	• None	• Same as Tnemec

Notes:

1. Reference manufacturer's application guide for termination details (edge of coating terminations).
2. Reference manufacturer's application guide for termination details (edge of coating terminations). Upon full cure, the installed lining system shall be checked by high voltage spark detection in accordance with NACE RP0188-90 to verify a pinhole-free surface.

9. System: E-3

	TNEMEC	SHERWIN-WILLIAMS
Surface Preparation:	• Surface Preparation: Prepare in accordance with SSPC-13/NACE 6 and ICRI Technical Guidelines. Abrasive Blast, shot-blast or mechanically abrade concrete surfaces to provide a minimum ICRI-CSP 3 or greater surface profile.	• Same as Tnemec
Generic Type Surface/Filler:	• Epoxy Modified Cementitious Mortar	• Same as Tnemec
Generic Type Primer Coat:	• Moisture tolerant epoxy primer	• Same as Tnemec
Generic Type Intermediate Coat:	• Modified Polyamine Epoxy	• Novolac Epoxy
Grout Coat:	• Modified Polyamine Epoxy	• Novolac Epoxy
Generic Type Finish (top) Coat:	• Aliphatic Polyester Polyurethane	• Same as Tnemec
Surface/Filter Thickness:	• Fill flush to plane all bug holes and surface voids as a result of the abrasive blasting process.	• Same as Tnemec
Primer Coat Thickness:	• 6 to 12 mils DFT; Coverage at 160 - 200 square feet per gallon	• Apply Corobond 100 at 3.0-4.0 mils DFT
Intermediate Coat Thickness:	• 6 to 10 mils DFT; Coverage at 160-200 square feet per gallon • For texture/tread on horizontal walking surfaces - randomly broadcast 30/50 mesh aggregate into the wet Intermediate Coat to refusal	• Apply Dura-Plate 8200 at 15-20 mils DFT. For texture, broadcast to refusal with 20-40 mesh dry washed silica
Grout Coat Thickness:	• 8 to 10 mils DFT	• Apply Dura-Plate 8200 at 15-20 mils DFT.
Finish (top) Coat and Thickness:	• 2 to 3 mils DFT; Coverage at 390-425 square feet per gallon • The finished appearance and texture will depend on the film thickness and number of coats applied. 4'x 4' Mock-ups shall be applied to determine the desired finish appearance and texture.	• Apply finish coat of General Polymers 4638 at 3.0-4.0 mils.
Quality Control:	• Level 1 and 2	• Same as Tnemec

Extended Warranty:	• None	• Same as Tnemec

Notes:

1. Reference manufacturer's application guide for termination details (edge of coating terminations).
2. Reference manufacturer's application guide for termination details (edge of coating terminations). Upon full cure, the installed lining system shall be checked by high voltage spark detection in accordance with NACE RP0188-90 to verify a pinhole-free surface.

10. System: F-1

	TNEMEC	SHERWIN WILLIAMS
Surface Preparation:	• SSPC SP 13 to meet ICRI CSP5 surface profile all surfaces to be coated. Surface shall be clean, dry, and free of contaminants. CM-3 minimum.	• SSPC SP 13 to meet ICRI CSP2-3 surface profile all surfaces to be coated. Surface shall be clean, dry, and free of contaminants. CM-3 minimum.
Generic Type Primer:	• Modified Polyamine Epoxy	• Polyamidoamine
Generic Type Intermediate Coat:	• N/A	• N/A
Generic Type Finish Coat:	• Modified Polyamine Epoxy	• Polyamidoamine
Generic Type Stripe Coat:	• Modified Polyamine Epoxy	• Same as Tnemec
Generic Type Surface/Filler:	• Epoxy Modified Cementitious Mortar	• Same as Tnemec
Primer Thickness:	• N/A	• 2.0 to 3.0 mils DFT
Intermediate Coat Thickness:	• N/A	• N/A
Finish Coat Thickness:	• 14 to 16 MDFT in one-coat application	• 12 to 14 mils DFT
Stripe Coat Thickness:	• Per Manufacturer Recommendations.	• Same as Tnemec
Surface/Filler Thickness:	• 1/32" minimum thickness. Fill surface voids flush to plane to ensure finish is monolithic and pinhole free.	• Same as Tnemec
Quality Control:	• Level 1 and 2 and as specified below	• Same as Tnemec
Extended Warranty:	• Three (3) Years. At the completion of the work, stencil the date on the structure/machine in 2-inch-high capital letters containing the following wording: “PAINTED (insert month and year in which painting was completed)”.	• Same as Tnemec

Notes:

1. Coating system shall be applied only by coating-system certified contractor. Applicator must be trained and certified as an installer by the manufacturer of the product which they are applying.
2. Alternative coating systems submitted for substitution approval for this system shall be reviewed for approval by the Engineer.
3. Reference manufacturer's application guide for termination details (edge of coating terminations). Upon full cure, the installed lining system shall be checked by high voltage spark detection in accordance with NACE RP0188-90 to verify a pinhole-free surface.

11. System: G-1

	TNEMEC	SHERWIN-WILLIAMS
Surface Preparation:	1. Bare Metal: SSPC-SP6 2. Primed Metal SSPC-SP7 3. Galvanized Metal Composite Deck: SSPC-SP1 and SSPC-SP3. Clean galvanized metal deck with Clean n' Etch (Mfr. Great Lakes Laboratories) per manufacturers recommendations for passivated galvanized surfaces.	• Same as Tnemec
Generic Type Primer:	• Self-crosslinking Hydrophobic Acrylic	• Same as Tnemec
Generic Type Finish Coat:	• HDP Acrylic Polymer	• Same as Tnemec
Generic Type Stripe Coat:	• HDP Acrylic Polymer	• Same as Tnemec
Primer Thickness:	• 2 to 4 MDFT	• Same as Tnemec
Finish Coat Thickness:	• 2 to 4 MDFT	• Same as Tnemec
Stripe Coat Thickness:	• As required.	• Same as Tnemec
Quality Control:	• Level 1 and Level 2	• Same as Tnemec
Extended Warranty:	• Three (3) Years. At the completion of the work, stencil the date on the structure/machine in 2-inch-high capital letters containing the following wording: "PAINTED (insert month and year in which painting was completed)".	• Same as Tnemec

Notes:

1. Specifications for Open Web Steel Bar-Joists and structural steel are specified elsewhere.

END OF SECTION

Paint Inspection:

Daily Coating Inspection Report

Date: / / M T W Th F S Su | Pg. Of

Project #: | COPY To: ☐ QC Mgr ☐ Owner ☐ Contr ☐ _____

Inspector: | Attachments: ☐ DFT Sheet ☐ NCR/CAR ☐ _____

Project/Client:

Location:

Description:

Requirements:

Contractor: | Spec # | Revision #

Description of Areas & Work Performed

Hold Point Inspections Performed

- ☐ 1 Pre Surface Pep/Condition & Cleanliness
- ☐ 2 Surface Preparation Monitoring
- ☐ 3 Post Surface Preparation/Cleanliness & Profile
- ☐ 4 Pre Application Prep/Surface Cleanliness
- ☐ 5 Application Monitoring/Wet Film Thickness (WFT)
- ☐ 6 Post Application/Application Defects
- ☐ 7 Post Cure/Dry Film Thickness (DFT)
- ☐ 8 Nonconformance/Corrective Actions Follow-up
- ☐ 9 Final Inspection

Approved By: _____

Surface Conditions

☐ New ☐ Maint ☐ Primer/Paint ☐ Age/Dry/Cure_____

☐ Steel ☐ Galvanize ☐ Concrete ☐ Other_____

☐ Hazard _____ ☐ Sample Report # _____

☐ Degree of contamination: _____

Test: ☐ Cl_____ µg/cm² / ppm ☐ Fe ____ppm ☐ pH _____

☐ Degree of Corrosion: _____

☐ Scale ☐ Pitting/Holes ☐ Crevices ☐ Sharp Edges

☐ Weld _____ ☐ Moisture ☐ Oils ☐ Other_____

☐ Painted Surface Condition: _____

Dry to: ☐ Touch ☐ Handle ☐ Recoat

☐ Dry/Over Spray ☐ Runs/Sags ☐ Pinholes ☐ Holidays

☐ Abrasion ☐ Fall Out ☐ Other _____

Ambient Conditions

Time (Indicate AM or PM)	:	:	:	:
Dry Bulb Temp° (C/F)	°	°	°	°
Wet Bulb Temp° (C/F)	°	°	°	°
% Relative Humidity	%	%	%	%
Surface Temp° (C/F) Min/Max	/ °	/ °	/ °	/ °
Dew Point Temp° (C/F)	°	°	°	°
Wind Direction/Speed				
Weather Conditions:				

Surface Preparation

Start Time: Finish Time: Est Sq/ft:

☐ Solvent Clean ☐ Hand Tool ☐ Power Tool

☐ HP Wash PSI_____ ☐ Other _____

☐ Abrasive Blast ☐ Abrasive Type _____ ☐ Sample

☐ Blast Hose Size _____ ☐ Nozzle Size / PSI _____

☐ Air Supply CFM _____ ☐ Air Supply Cleanliness

☐ Water/Oil Trap Check ☐ Equipment Condition Check

Application

Start Time : Finish Time : Est. Sq/ft.

☐ Primer ☐ Intermediate ☐ Topcoat ☐ Touch-up

Generic Type:		Qty Mixed:	
Manuf.:		Mix Ratio:	
Prod Name:		Mix Method:	
Prod #:		Strain/Screen:	
Color:		Material Temp:	°F
Kit Sz/Cond.:		Sweat-in Time:	Min/Hrs
Shelf Life:		Pot Life:	Min/Hrs

Surface Cleanliness & Profile Measurement

☐ Job Specification ☐ SSPC/NACE - SP- _____

☐ SSPC/NACE Spec / Visual Stds ☐ _____

Profile Check: _____ ☐ Disc ☐ Tape ☐ Gauge

☐ Specified_____mils avg. / Achieved _____mils

☐ Surface effect on DFT Gauge/BMR_____mils

Batch #'s

(A)		Qty Added:	Pt/Qt/Gal
(B)		% by Vol:	%
(C)		Specified WFT Avg:	Mils
Reducer:		Achieved WFT Avg:	Mils

☐ Airless/Conv. Spray ☐ Brush ☐ Roller ☐ Other _____

Pump Pot	Hose Dia.	Air Check
Ratio/Size	Hose Lng.	SEP/Trap
GPM/CFM	Spray Gun	Filter
PSI	Tip Sz.	Agitator

Dry Film Thickness

Gage Type / Model	Gage Serial #	Gage Calib. Verified	Spec Avg. DFT	Total Avg DFT	DFT Last Coat	DFT This Coat

Inspector's Signature Date

SSPC the society for protective coatings Created03/03 by

DOCUMENT 31 05 13 M

COMMON FILL

Delete Article 2.1 BORROW in its entirety and replace with the following:

2.1 BORROW

A. Classification: A-1-a through A-3; ASTM D3282
B. 6-inch maximum

Delete Article 2.2 GRANULAR BORROW in its entirety and replace with the following:

2.2 GRANULAR BORROW

A. Classification: A-1-a
B. Non-Plastic, well graded, 3-inch maximum

Delete Article 2.5 Native in its entirety and replace with the following:

2.5 NATIVE

A. Material obtained from excavation may be used as fill, provided that the material meets the specifications for BORROW outlined in this Section and provided that all organic material, rubbish, debris, and other objectionable materials are removed.
B. CONTRACTOR shall provide material testing data, i.e. gradation analysis, Atterberg Limits, appropriate proctor, etc. on a weekly basis as a minimum, or upon request by the ENGINEER, or if a noticeable change to the NATIVE material being excavated is observed.
C. It shall be the contractor’s responsibility to verify the suitability of NATIVE material prior to backfilling operations. Failure to comply with these specifications for trench backfill may result in rejections of portions of the WORK where backfill is not in compliance.

Delete Article 2.10 SLAG, PUMICE, SCORIA in its entirety and replace with the following:

2.10 SLAG, PUMICE, SCORIA

A. Not allowed.

DOCUMENT 33 08 00 M

COMMISSIONING OF WATER UTILITIES

Delete Article 3.10 COMMISSIONING TEST SCHEDULE in its entirety and replace with the following:

2.7 COMMISSIONING TEST SCHEDULE

A. The following table identifies required commissioning tests.

Table 3 - Commissioning Test Schedule

	Alignment	Grade	Joint	Infiltration	Exfiltration	Distortion	Obstruction	Disinfection	Tracer Wire	CCTV
Sanitary Sewers	•	•	•	•	•	•	•			•
Forced Mains					•	•	•	•	•	
Potable Water					•	•	•	•	•	

Notes:

1. Operational testing:
    a. Perform operational testing after hydrostatic test is complete and backfill is in place.
    b. Demonstrate automatic controls (if any) function properly.
2. Exfiltration test for pressure pipeline systems.
3. Exfiltration when requested by ENGINEER or specified elsewhere.
4. Legally dispose disinfection and flushing water and ensure no damage to the environment.

DOCUMENT 33 11 00 M

WATER DISTRIBUTION AND TRANSMISSION

Delete subsection A of Article 1.3 PERFORMANCE REQUIREMENTS in its entirety and replace with the following:

A. Depth of Cover: 84 inches minimum. Prior District approval required for depths greater than 108 inches.

Add the following to Article 1.3 PERFORMANCE REQUIREMENTS:

C. Water systems shall be sized as described in the District's Capital Facilities Plan and Master Plan.
D. Maximum allowable pipeline flow velocities shall be 5 feet per second; unless prior written approval is granted by the District Engineer.
E. The minimum fire flow shall be 1500 gpm. Fire flow requirements will be evaluated on a case-by-case basis. The fire flow requirement may be increased as determined by the District Fire Marshal or District Engineer.
F. The normal minimum pressure in all parts of the system is to be 50 psi.
G. The anticipated maximum operating pressure is to be 110 psi; unless otherwise approved by the District Engineer.
H. Water systems shall be designed so that pressures conform to the pressure zones shown in the District's Capital Facilities Plan; and as approved by the District Engineer

Add the following to Article 2.1 PIPE AND FITTINGS

E. Tracer wire shall be installed above all water lines and laterals
   1. Tracer wire: 12 gauge or larger, splice connections with gel connectors
F. Install with minimum of 7 feet of cover to the finished grade. Prior District approval required for excess of 9 feet of cover.
G. Insulate with two horizontal layers of 2-inch insulation board and a single board on either side, as shown in PMWSID Standard Details. Offset seams. Insulation shall not interfere with operability or access to valves.
   1. Foam board insulation: 2-inches thick, R-20 min., 60 psi min. compressive strength.

Delete Article 2.3 VALVE BOX in its entirety and replace with the following:

2.3 VALVE BOX

A. Cast iron, single piece shaft. Product: 4" Soil Pipe. Length as required.
B. Markings: Cast appropriate utility lettering on cover.

Delete Article 2.6 TAPPING SADDLES in its entirety and replace with the following:

2.6 TAPPING SADDLES

A. PVC: Mueller or Ford brass double strap saddle
B. HDPE: Electrofused saddles. Mechanical saddles NOT allowed. CONTRACTOR to provide District with fusing log.
C. Straight Threads. Tapered threads not allowed
D. Rated working pressure, 300 psi minimum
E. Neoprene Buna N gaskets

Delete Article 2.7 SERVICE CONNECTION in its entirety and replace with the following:

2.7 SERVICE CONNECTION

C. Taps: See Article 2.2 TAPPING SADDLES. Provide plastic spacers or nipples to separate non-similar metals.
D. Service Line:
   1. Polyethylene Pipe: AWWA C901 with 200 psi compression fittings and ratings according to AWWA C800.
   2. Copper Pipe: Not Allowed.

Delete Section C. of Article 2.8 ACCESSORIES in its entirety and replace with the following:

C. Corporation Stops: Ford or Mueller. All bronze, straight threads, full port, ball valve.

Add the following to Article 2.8 ACCESSORIES:

A. Flanged Coupling Adapters: Romac Alpha FC wide range flange coupling adapter, or as required by District Engineer.

B. Mechanical Couplings: Romac. Model as required by District Engineer.

C. Service Clamps: Bronze, double-strap type; Mueller No. H-16134, or acceptable equal, for up to 2-inch service lines

Add the following to Subsection A of Article 3.6 INSTALLATION – VALVE AND VALVE BOX:

5. Valves shall be placed at the projection of the end of curb and gutter radius sections.
6. Valves shall be placed at intervals not to exceed 800 feet, unless granted prior written District approval.
7. At intersections, valves shall be placed on all branches of the system, unless granted prior written District approval.
8. Valves shall be placed within 10 feet of the upstream and downstream ends of casing pipes.

Add the following to Article 3.6 INSTALLATION -VALVE AND VALVE BOX:

D. Blow-off Assemblies
   1. Blow-off Assemblies shall be placed at the ends of water lines, at low points in the system.
   2. Install Blow-off Assemblies as shown in PMWSID Standard Drawings.

Add the following to Article 3.9 INSTALLATION – SERVICE LINE

D. Water service laterals shall be constructed as shown on the District Standard drawings.
E. Fire suppression lines shall branch off the lateral **before** the meter.
F. Each building and/or unit of separate ownership shall require a separate water service line, unless granted prior written District approval.

DOCUMENT 33 12 16 M

WATER VALVES

Delete A.2 of Article 2.1 VALVES – GENERAL in its entirety and replace with the following:

2. 3 inches and larger: Flanged or mechanical joint ends. Non-rising stem. Two inches square operating nut. Nuts and bolts shall be A307 Steel with Tripac 2000 Blue Coating System, AWWA C111.

Delete B.2 of Article 2.1 VALVES – GENERAL in its entirety and replace with the following:

2. For joining valve to piping system, use A307 Steel with Tripac 2000 Blue Coating System nuts and bolts, SECTION 05 05 23

Delete Article 2.2 GATE VALVES in its entirety and replace with the following:

2.2 GATE VALVES

A. AWWA C500, C509, C515.
B. Up to 3 inches: Powel U.S. Bronze Gate Valve or approved equal.
C. Over 3 inches: Mueller Gate Valve, Resilient Seat Gate Valve, American Flow Control Series 2500 Resilient Seat Gate Valve, or approved equal.

Delete Article 2.3 BUTTERFLY VALVES in its entirety and replace with the following:

2.3 BUTTERFLY VALVES

A. AWWA C504.
B. 2 to 24 inches: Mueller “Lineseal III” Butterfly Valve
C. Valve operator shall be geared to close valves slowly. Number of turns to close valve from full open position shall be:

10-inch and less:	32 turns
12-inch through 16-inch:	52 turns
18-inch through 24-inch:	76 turns

Delete Article 2.5 CHECK VALVES in its entirety and replace with the following:

2.5 CHECK VALVES

A. AWWA C508.
B. 2 to 24 inches: Mueller Swing-Type Check Valve or approved equal.

Add the following to Article 2.7 PRESSURE REDUCING VALVES – MAIN LINE:

F. Manufacturer: Cla-Val, no exceptions.

Add the following to Article 2.8 PRESSURE RELIEF VALVES – MAIN LINE:

G. Manufacturer: Cla-Val, no exceptions.

Add the following Articles to Part 2 PRODUCTS

2.10 AIR VALVES

A. Operation: Release large quantities of air from pipes during filling, admit large quantities of air into pipes during draining, and release small accumulations of air during normal operation of pipes.
B. Product: APCO Heavy-Duty Combination Air Release valves, No. 143C
C. Body: Cast Iron
D. Size: As required by District Engineer.

2.11 HOSE GATE VALVES

A. Operation: Hose gate valves shall be high grade brass with handwheel, inside screw ends, rising stem, screwed bonnet, taper wedge double disc. Valve shall be designed to operate at 200 psi water pressure.
B. Product: Hose gate valves shall be equal to Powell U.S. Bronze Hose Gate Valve No. 527, or District approved equal.

DOCUMENT 33 12 19 M

HYDRANTS

Delete subsection A of Article 2.1 DRY-BARREL FIRE HYDRANT in its entirety and replace with the following:

A. Mueller Super Centurion, or approved equal. AWWA C502.
   1. Place on side of road receiving the most sunlight.

Delete subsection A.6 of Article 2.1 DRY-BARREL FIRE HYDRANT in its entirety and replace with the following:

6. Depth of Burial: 84 inches minimum or consistent with main depth.

Add the following to Article 2.2 PIPE AND FITTINGS

E. Insulation, Section 33 11 00

Add the following to Article 3.2 INSTALLATION

I. Fire hydrant laterals shall be insulated per PMWSID Standards and Specifications.
J. Fire hydrant shall be placed in locations where snow storage and removal will not impede access.
K. Fire hydrants shall have a maximum spacing of 500 feet in residential areas; and a maximum spacing of 300 feet in commercial and industrial areas. Fire hydrant spacing shall be approved by the District Engineer; additional fire hydrants may be required by the District Fire Marshal.
L. Fire hydrants shall be placed at the end of cul-de-sac pipe lines and at the end of dead-end streets. These hydrants shall not be considered as fire protection hydrants; but shall be used for flushing lines.

DOCUMENT 33 12 33 M

WATER METER

Delete Articles 2.3 SERVICE LINE, VALVES, AND FITTINGS and 2.4 METER BOXES in their entirety and replace with the following:

2.3 SERVICE LINE, VALVES, AND FITTINGS

A. Service Pipe: Smooth wall polyethylene, Section 33 05 06.
B. Service Valves and Fittings: AWWA C800
C. Curb Stop: 2” Mueller Oriseal Mark II Valve
D. Bypasses: Not allowed.
E. Insultation, Section 33 11 00.
F. Heat tape: Raychem XL Heat Trace Wire, 8 W/ft, 120 V supply voltage, Raychem Rayclic-E End Seals
    1. Fasten heat tape to service lateral, fittings, and valves, beginning at main. Run along lateral, into meter box. Neatly coil 20’ (or 5’ beyond setback) of heat trace wire, seal within plastic bag, and place within meter pit.

2.4 METER BOXES

A. Laterals to 2 inches: Ford Thermocoil Meter Pit, PFCVH-488-72-NL
    1. Ford Foam Insulation Plug, CCID-18-4
    2. Frost free lid assembly, PPSC-18-L-REC-T
B. Laterals greater than 2 inches: prior District approval required.

DOCUMENT 33 17 00 S

PRV STATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. PRV Station

1. Concrete Vault
2. Pipe
3. Fittings
4. Valves

1.2 REFERENCES

A. PMWSID Standards and Specifications

Section 00 00 50 S – Design Standards
Section 05 05 23 M – Bolts, Nuts, and Accessories
Section 09 90 00 S – High Performance Coatings
Section 31 05 13 M – Common Fill
Section 33 08 00 M – Commissioning of Water Utilities
Section 33 11 00 M – Water Distribution and Transmission
Section 33 12 16 M – Water Valves
Section 33 12 19 M – Hydrants
Section 33 12 33 M – Water Meter

B. AWWA Standards

AWWA C111 Rubber Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
AWWA C504 Rubber-Seated Butterfly Valves
AWWA C508 Swing Check Valves for Waterworks Service
AWWA C509 Resilient Seated Gate Valves for Water and Sewerage Systems
AWWA C515Reduced Wall, Resilient Seated Gate Valves for Water Supply Service
AWWA C550 Protective Interior Coatings for Valves and Hydrants
AWWA C600 Installation of Ductile Iron Water Mains and their Appurtenances

C. ASTM Standards

ASTM A 53 Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM C 858 Standard Specification for Underground Precast Concrete Utility Structures

D. UAC Standards

R309 Environmental Quality, Drinking Water

1.3 SUBMITTALS

A. Section 01 33 00 – Submittal Procedure, for submittal procedures.

B. Product Data: Provide data on pipe materials, pipe fittings, valves and accessories.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Project Record Documents: Record actual locations of pipes, valves, connections, thrust restraints, and invert elevations. Identify and describe unexpected variations to subsoil conditions or discovery of unmarked utilities.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with Owner's requirements as described herein.

PART 2 PRODUCTS

2.1 REINFORCED CONCRETE VAULT

A. Vault: The reinforced concrete vault is shown in the Standard Drawings as precast. Cast-in-place may be used, with submission of stamped, engineered plans to the District and prior, written District approval.

B. Dimensions: The vault shall be sized to adequately accommodate all valves, pipe, fittings and appurtenant items to be enclosed in the vault; Vault dimensions shall meet or exceed the dimensions shown in the Standard Drawings. Site or design conditions may require an increase in size, as determined by the District.

C. Loading: Engineered, stamped, shop drawings shall be provided to the District for approval. Precast vaults shall have wall thickness of 9-inch minimum, bottom slab thickness of 8-inch minimum, and top slab thickness of 12-inch minimum; designed for HS-20 highway loading.

D. Manufacturer: Precast vault shall shall be manufactured by Old Castle Infrastructure, or District Engineer approved equal.

E. Access: Manholes shall be 30” diameter, double lid, frost-free frames and covers. Locate as shown in the Standard Drawings or as directed by District Engineer.

1. Loading: HS-20 highway loading, minimum.

2.2 VALVE STATION PLUMBING

A. Pipe and Fittings:

1. Ductile Iron Pipe:

See Section 35 05 05 – Ductile Iron Pipe

2. Copper Tubing:

See Section 33 05 03 – Copper Pipe

3. Galvanized Steel Pipe:

   See Section 05 05 10 – Metal Galvanizing
   See Section 33 05 09 – Steel Pipe – Lined and Coated

B. Fittings, Couplings, Adapters:

   See Section 33 11 00 M – Water Distribution and Transmission

C. Valves:

1. See Section 33 12 16 M Water Valves for valve requirements.

D. Strainers:

1. Strainers shall have cast iron bodies and covers, stainless steel strainer and stainless-steel bolts.

2. End flanges shall be ANSI class 125 standard flanges

3. Stainless steel strainers shall have an area of two times the nominal inlet pipe opening.

4. Strainers shall be designed for easy access and in-line servicing of strainer element; and shall have drain plugs for periodic flushing.

E. Hangers, Supports, and Blocks:

1. Provide all hangers, supports, clamps, guides, sleeves, inserts, anchors and other such devices required for hanging or supporting pipe, preserving alignment, prevention of movement, passage of pipe through walls and floors, or securing pipe in any manner. The required number, location and detail of such items may or may not be indicated on the drawings; but, in any case, such work shall be provided as work incidental to furnishing and installing any type of pipe, fittings and appurtenances, and no extra payment will be made for this work.

2. Hangers.

   a. Piping shall be supported or suspended in such manner as to prevent sagging or over stressing of pipe, valves, fittings or connections; and so that no pipe, fittings, valves or other items transfer load or strain to equipment of any kind.

3. Supports.

   a. Concrete supports shall be installed under pipe and valves wherever shown on the drawings. Concrete supports shall be neatly constructed and finished, as indicated on the drawings and as directed by the Engineer. No supports shall be made until all pipe is in its final position.

b. All other pipe supports shall be of the adjustable type of the style and size recommended by the manufacturer; and shall be located as indicated on the drawings and as directed by the Engineer. Floor flanges shall be of the size required to fit the pipe attached to the saddle support and as recommended by the manufacturer. Adjustable pipe supports shall be used as kick blocks for pipe in open locations.

4. Thrust Blocks:
   a. See Section 33 11 00 Water Distribution and Transmission for thrust blocking requirements.

2.3 SCADA

A. Equipment for a SCADA system shall be provided inside the PRV Station. The SCADA system equipment shall be as required to monitor and control the station operation. The equipment shall be compatible to the District's system and shall be approved by the District Engineer.

2.4 PRV VAULT ACCESSORIES AND MISCELLANEOUS ITEMS

A. Gauges:

1. Gauges. Gauges shall be as shown on the drawings and of the size and quality equal to or better than United States Gauge "A" Line, Figure No. 5000. Gauges shall have a range of 0 to 350 psi.

2. Gauge Cocks. Gauge cocks shall be of high-grade bronze with tee head; designed for 200 psi water pressure, and factory-tested to 300 psi; Crane Nos. 708, 712, 744, or accepted equal

B. Miscellaneous Metal Work: Furnish and erect miscellaneous metal work as required to complete the pressure regulating station, as described herein and as shown on the drawings.

1. Codes. Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings of the American Institute of Steel Construction shall govern the work. Welding shall be done in accordance with applicable American Welding Society Standards.

2. Substitutions. Substitutions of sections or modifications of details, or both, and the reasons therefor shall be submitted for acceptance by the District Engineer.

3. Responsibility for Errors. The Contractor shall be responsible for all errors of detailing, fabrication, erection, and correct fitting of the miscellaneous metal work.

C. Proprietary Items: Provide proprietary items of the type, size and manufacture noted on the drawings or as required to complete the work, or acceptable equals.

D. Access Ladder: Shall be as shown in the Standard Drawings. Extending safety post required.

E. Materials: Material shall conform to their respective specifications as follows:

1. Bolts and Nuts: ASTM Standard A-307 Steel with Tripac 2000 Blue Coating System.
2. Gray Iron Castings: A-48 Class 40 or Better
3. Structural Steel: ASTM Standard A-36
4. Washers: ASTM Standard B-27.2, Type B

F. Painting/Coatings: See Section 09 90 00 S High Performance Coatings.

G. Miscellaneous: Miscellaneous appurtenant items shall be as indicated on the drawings or as required to complete the station.

H. Power:

1. Power shall be provided to the PRV. CONTRACTOR's responsibility to coordinate with Rocky Mountain Power to provide power and power meter to the site.

I. Heating:

1. Markel 3.7 kW electric heater. Model number 5105NHF2B

J. Lighting:

1. Wall mounted 24" LED vapor tight light fixture
2. Vapor tight light switch. Mount accessible from exterior of vault.

2.5 BEDDING AND BACKFILL MATERIALS

A. Bedding:

Section 31 05 13 M – Common Fill
Section 33 11 00 M – Water Distribution and Transmission

B. Backfill:

Section 31 05 13 M – Common Fill

PART 3 EXECUTION

3.1 PREPARATION

A. Cut pipe ends square, ream pipe ends to full pipe diameter, remove burrs.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare pipe connections to equipment with flanges or mechanical joints.

D. See Section 33 11 00 M – Water Distribution and Transmission

3.2 EXCAVATION

1. Hand trim excavation for accurate placement of pipe to elevations indicated.

2. Form and place concrete for pipe thrust restraints at each change of pipe direction. Place concrete to permit full access to pipe and pipe accessories. Provide required square foot of thrust restraint bearing on undisturbed subsoil as indicated on the drawings.

3. Backfill around sides and to top of pipe with backfill material, tamp in place and compact, then complete backfilling.

3.3 CONSTRUCTION – VALVE VAULT

A. Construct the vault for the pressure regulating station at the location indicated on the drawings and as directed by the District Engineer; in accordance with the details shown on the construction drawings and as specified herein.

B. Earthwork shall be done in accordance with Section 31 05 13 Common Fill.

1. Foundation Material. Where native material encountered at the foundation depth is considered unsuitable by the Engineer, the unsuitable material shall be removed and replaced by Granular Borrow material.

2. Excess Material. Unsatisfactory and excess excavated materials shall be removed from the work site and legally disposed of.

C. Concrete Work. Comply with requirements of Section 03 30 04 - Concrete, for placement, consolidation, finishing and protection of cast-in-place concrete.

D. Precast Concrete Vault. Precast concrete vault shall be installed level and plumb, in accordance with the manufacturer's written instructions and recommendations.

E. Miscellaneous Metal Work.

1. Miscellaneous metal work shall be fabricated and assembled in the shop to the greatest extent possible.

2. Miscellaneous metal work shall be erected in conformity with AISC Code of Standard Practice.

F. Electrical Work.

1. Perform Work and install all materials in accordance with latest rules prescribed by local and/or State codes and ordinances.

3.4 INSTALLATION – PLUMBING

A. All pipe, fittings, valves, equipment and appurtenant items, together with supports and anchors, shall be installed as specified herein and as indicated on the drawings; in conformity with State plumbing codes.

B. Equipment shall be installed as shown on the drawings, and in accordance with accepted manufacturer's written instructions.

C. Strainers shall be installed upstream of all pressure regulating valves.

D. All material and workmanship shall conform to applicable requirements of the Utah Plumbing Code.

E. Establish elevations of buried piping to ensure not less than four feet of cover over pipe; or as indicated on the drawings and as directed by the District Engineer.

F. Install pipe to indicated elevation to within tolerance of one inch.

G. Install ductile iron piping and fittings to AWWA C600.

H. Install pipe to allow for expansion and contraction without stressing pipe or joints.

I. Install access fittings to permit disinfection of water system performed under Section 02515.

J. Set valves on concrete block or other acceptable solid bearing.

K. After plumbing system has been installed and completed, it shall be tested and disinfected as specified herein; including an operating test for acceptance of the work. Tests shall be performed in the presence of the District Engineer or his authorized representative. See Section 33 08 00 – Commissioning of Water Utilities.

3.5 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with the following Sections:

Section 01 43 00 – Quality Assurance
Section 01 45 00 – Quality Control

B. Pressure test water piping to 1.5 times working pressure in psi.

C. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

DOCUMENT 33 31 00 M

SANITARY SEWERAGE SYSTEMS

Add the following to Article 1.4 PERFORMANCE REQUIREMENTS:

C. Sewer shall be located on the low side of streets, preferably 5 feet from street centerlines; and a minimum of 5 feet from the lip of gutters.

D. A minimum of five feet shall be maintained between the edge of manhole collars to edge of the street pavement.

E. Sewer shall be located at 10-foot minimum horizontal distance from culinary waterlines.

F. Where possible, sewer shall be located at 10-foot minimum horizontal distance from all other public utilities, including but not limited to storm drains, and secondary water lines.

G. Sewer main lines shall be extended to property lines as per District Engineer's request to service future development.

Add the following to Article 2.1 PIPE AND FITTINGS:

D. The minimum size of sewer main line shall be 8-inch diameter.
E. Sewer lines shall be designed to maintain a velocity of two feet per second (2 fps) during peak flows, unless otherwise accepted and approved by the District Engineer.
F. Unless otherwise accepted and approved by the District Engineer, the minimum sewer slopes shall be as follows:

8-inch sewer lines – 0.0040 foot/foot
10-inch sewer lines – 0.0028 foot/foot
12-inch sewer lines – 0.0022 foot/foot
15-inch sewer lines – 0.0015 foot/foot
18-inch sewer lines – 0.0012 foot/foot
21-inch sewer lines – 0.0010 foot/foot
24-inch sewer lines – 0.0008 foot/foot
Larger than 24-inch – District Engineer's recommendation

G. The minimum sewer depth shall be 13.0 feet under normal conditions. Depth requirement may be lessened with prior written District approval.
H. In areas of shallow sewer, the following note shall be added to the development plat: "Shallow Sewer Depths! Contractor shall verify sewer depths before excavating for basement. Home(s) with basement may not have sewer service available for basement."
I. The District Engineer may increase the minimum sewer depth if required to meet overall system requirements.
J. Check topography for low lots and problem service connections.
K. In areas of low lots, the following note shall be added to the development plat: "Low Lots! Contractor shall verify sewer depths before excavating for basement. Home(s) with basement may not have sewer service available for basement."
L. Sewer grades shall be based upon Weber County or District benchmark elevations.

Delete Article 2.3 MANHOLES in its entirety and replace with the following:

2.3 MANHOLES

A. Basin: ASTM C478 precast concrete.
B. Steps: Polypropylene, spaced 12” on center.
C. Top: Eccentric Cone. Concentric flat slab allowed only with District approval, or where required by District.
D. Frame and Cover: D&L A-1180 30” Manhole Frame and Cover. Coordinate vented/non-vented style with District.
E. Collar: Whirlygig Thermoplatic collar/riser. In
F. Pipe Connectors: PSX Direct Drive Mountable Boot.
G. Joints in Sections:
    1. 12” wide BOA tape, and
    2. Conseal CS-80/85 Surface Primer with CS-1900 Hydrophillic Elastomeric Sealant, and
    3. Mastic waterstop, and
    4. Xypex paste
H. Size: 4-foot diameter, minimum. 5-foot diameter manholes shall be used in the following situations:
    1. At all intersections of three or more 8-inch or larger pipe lines.
    2. Where the deflection angle of the pipe line is greater than or equal to 90 degrees.
    3. When both items “1” and “2” are designed in the same manhole, a six-foot manhole is required.
    4. Where incoming slopes at manholes are greater than or equal to 5 percent and the deflection angle within the manhole is greater than 90 degrees, a six-foot manhole with an extra deep trough is required.
    5. Where new sewer lines are connected to existing sewer lines, a 5-foot diameter manhole shall be constructed over the existing sewer line.
I. Spacing: 450 feet maximum, center to center.
J. Manholes must be constructed at the ends of sewer lines. Plugged ends of sewer lines are not allowed.
K. Maximum allowable drop, between inlet and outlet inverts, through a manhole is two feet. When the drop in a manhole is between one and two feet, a five-foot manhole is required. When a drop in excess of 2 feet is required, an external drop manhole shall be used.
L. Where pipes of different diameters connect into a manhole, the inside top of the smaller pipe shall match the inside top of the larger pipe, unless granted prior written District approval.
M. Where incoming slopes at manholes are greater than or equal to 5 percent, the incoming slope shall be carried through the manhole, unless otherwise accepted and approved by the District Engineer.

DOCUMENT 33 32 00 S

SEWER LIFT STATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. These specifications and drawings apply to duplex dry pit lift stations proposed to serve a smaller service area. However, local project conditions and design parameters vary and may require more stringent standards and specifications, as determined necessary by the District. Moreover, lift stations proposed to serve larger service areas will be evaluated on a case-by-case basis. Larger lift stations may be significantly different from the specifications contained in this section.

1.2 REFERENCES

A. PMWSID Standards and Specifications

Section 00 00 50 S – Design Standards
Section 05 05 23 M – Bolts, Nuts, and Accessories
Section 09 90 00 S – High Performance Coatings
Section 31 05 13 M – Common Fill
Section 33 08 00 M – Commissioning of Water Utilities
Section 33 11 00 M – Water Distribution and Transmission
Section 33 12 16 M – Valves
Section 33 12 19 M – Hydrants
Section 33 12 33 M – Water Meter
Section 33 31 00 M – Sanitary Sewerage Systems

B. AWWA Standards

AWWA C111 Rubber Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
AWWA C504 Rubber-Seated Butterfly Valves
AWWA C508 Swing Check Valves for Waterworks Service
AWWA C509 Resilient Seated Gate Valves for Water and Sewerage Systems
AWWA C515Reduced Wall, Resilient Seated Gate Valves for Water Supply Service
AWWA C550 Protective Interior Coatings for Valves and Hydrants
AWWA C600 Installation of Ductile Iron Water Mains and their Appurtenances

C. ASTM Standards

ASTM A 53 Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM C 858 Standard Specification for Underground Precast Concrete Utility Structures

D. UAC Standards

R309 Environmental Quality, Drinking Water
R317 Water Quality

1.3 GENERAL

A. These specifications and drawings apply to duplex dry pit lift stations proposed to serve a smaller service area. Lift stations proposed to serve larger service areas will be evaluated on a case-by-case basis. Larger lift stations may be significantly different from the specifications contained in this section.

B. All proposed lift stations may be subject to additional requirements not included in this section, such as unique site characteristics, depth, pumping into a forced main served by another existing lift station, or having a wide range of initial and ultimate inflows.

C. Lift station designs must comply with Utah Administrative Code R317-3-3 Design Requirements for Sewage Pumping Stations. All engineering shall be performed by a Professional Engineer licensed in the state of Utah.

1.4 SUBMITTALS

A. In addition to subdivision collection system approval, preliminary information for the proposed sewer lift station shall be submitted to and approved by PMWSID. The submittal shall include, at a minimum, the following:

1. Drawings depicting plan, elevation and section views of the proposed lift station as well as electrical and control diagrams.

2. Design criteria and calculations, including:

   a. Initial and ultimate service area flows (in coordination with PMWSID)
   b. Pump and pressure main sizing including system curves. Minimum pressure main size is four (4) inch diameter. Minimum velocity at design pump rate is 2.5 feet per second.
   c. Uplift or buoyancy potential of wet well. Minimum factor of safety is 2.0

3. Catalog cut sheets of proposed pumps, valves, standby generator, and related appurtenances.

PART 2 MATERIALS AND EQUIPMENT

2.1 PIPE, VALVES, AND FITTINGS

A. All pipe installed inside the wet well, from the wet well to the valve vault, and through the valve vault shall be Ductile Iron Class 53 pipe. The ductile iron pipe shall have a 2-part high build coal tar epoxy coating (40 mil thickness) on interior and exterior surfaces. All bolts on piping (flange bolts, all threads, tie rods, etc.) shall be A307 steel with Tripac 2000 Blue Coating System. Unless otherwise directed, all pipe shall be flange connected with rubber gaskets meeting AWWA C111 specifications. Pipe installed from the valve vault to the point of discharge shall be IPS DR11 HDPE. All pipe from the valve vault to the gravity connection shall be installed with tracer wire.

B. Eccentric Plug Valves. Val-Matic, DeZurik, or equivalent manufacturer with rated working pressure of 125 psi. Plug valves shall be of full port design when fully opened.

C. Check Valves. Check valves shall be equipped with an external adjustable high-tensile strength steel outside lever arm and weight. The check valves shall have a cast iron body with stainless steel disc plate arm and replaceable seat ring, EPT seals and resilient seat, all suitable for clear cold water service, or approved equal. The disc of the check valves shall be easily removable without the need of any special training or tools. All the check valves shall be installed between flanges drilled to 125-pound ANSI Standard. When installed vertically, check valves shall be designed to operate in the vertical orientation.

D. Air and Vacuum Relief Valves. Air and vacuum relief valves may be required depending on project specific design. Combination air/vacuum valves shall be manufactured by A.R.I, model D-025, or approved equal. Threaded connections shall be made with an electrofused branch saddle, or approved equivalent, and stainless-steel ball valve.

E. Flow Measurement. Endress Hauser ProMag W400 magnetic flow meter shall be installed in the valve vault. The meter shall be installed per manufacturer recommendations and shall comply with straight run requirements. Valving shall be designed to allow for the meter to be easily removed for maintenance. Provide a pipe spool matching the length of the meter to allow the forced main to remain operational while the meter is being repaired.

F. Identification Tape. Identification tape shall be two inches wide with the marking "Caution – Buried Sewer Line Below", or equivalent, in 1-1/2-inch minimum black letters.

2.2 WET WELL AND VALVE VAULT

A. Wet Well. The wet shall consist of pre-cast concrete 8'x10' sections, or larger as appropriate for the number of pumps and piping arrangement, with steps and a base. The entire wet well shall be lined prior to exposure of any sewage with a smooth coating of corrosion resistant Tnemec, as specified below, or prior approved equal.

1. Corrosion resistant coating shall include epoxy cementitious resurfacer, aggregate reinforced epoxy mortar basecoat and epoxy top coat/epoxy metal coating.

a. Resurfacer:	Tnemec Series 218 Mortarclad
b. Basecoat:	Tnemec Series 434 Perma-Shield H2S
c. Epoxy Top Coat / Epoxy Metal Coating:	Tnemec Series 435 Perma-Glaze

B. Pump Vault. The pump vault shall be a minimum 10'x12' precast structure. A ladder with an extending safety post shall be provided for access. The pump vault shall contain the pumps, plug type isolation valves, check valves, dismantling joints, and manual bypass capabilities.

C. Valve Vault. The valve vault shall be a minimum 6'x12' precast structure. A ladder with an extending safety post shall be provided for access. The valve vault shall contain plug type isolation valves, check valves, a meter, dismantling joints, and manual bypass capabilities.

D. Materials. All interior fasteners, anchors and miscellaneous hardware shall be stainless steel.

E. A drain line with a minimum slope of 2% is required between the valve vault and wet well and the pump vault and the wet well. A flap gate shall be installed at the end of the drain line.

F. Lids shall be HS-20 load rated and have a minimum 12 inch thickness, unless otherwise indicated by the District.

G. The wet well, pump vault, and valve vault shall be designed to resist buoyancy. Assume groundwater depth at ground surface for design purposes.

2.3 SYSTEM PUMPS AND ACCESSORIES

A. Pumps. At a minimum, the lift station shall be a duplex pump station. The lift station shall be capable of pumping 110% of the projected peak hourly flow generated by its service area with any one pump out of service. The pumps shall be submersible rated, non-clog, capable of passing three-inch solids.

B. Manufacturer. Acceptable manufacturers are as follows:

1. Xylem Water Solutions – Flygt Products
2. Industrial Flow Solutions – Overwatch Direct In-Line Pump System

C. Pump Model. Pump selection needs to be verified and coordinated with the District and pump manufacturer's representative based on the operating characteristics of the proposed lift station. Additional design considerations may be required.

D. Pump System Components.

1. The pump system shall consist of the following components:

a. Two pumps (minimum).
b. Explosion-proof motor.
c. Carrier and sealing flange assembly.
d. Base plate and elbow assembly.
e. Rail guide assembly and stainless steel guide rail pipe, or District approved alternative solution.
f. A stainless steel loop connected to pump for lifting, or District approved alternative solution.
g. Control panel.
h. Emergency Provisions: Standby natural gas or diesel generator with automatic transfer switch and bypass connection for portable backup pump.

E. The pumps shall be designed to operate on 480 volt, three phase, 60 Hz power. Three-phase power shall be provided at the Contractor's expense at all new lift stations unless otherwise approved by the District.

F. The pumps shall be variable speed using VFD's approved by the District.

G. Each pump shall contain an identifying attached tag showing manufacturer's name, model number and rating/capacity.

H. Pumping equipment shall carry a five (5) year warranty.

I. With the exception of the integral supports on the pump and the base elbow, all pipe supports, anchors, and lifting chains shall be stainless steel.

J. Where piping penetrates the wall or ceiling of the wet well or valve vault, the space between the pipe and adjacent surface shall be sealed with Link-Seal modular mechanical assemblies on both sides, and filled with polyurethane sealant.

K. One (1) additional spare pump, ready for installation, is required for each lift station, provided at the Contractor's expense

2.4 GRINDER (As required by District)

A. Manufacturer. The grinder shall be a 3 HP Muffin Monster Model 30005-0012, or current equivalent version, as manufactured by JWC Environmental. No equals will be allowed. The Contractor shall coordinate with the grinder Manufacturer to determine electrical conduit requirements and to purchase and install the stainless steel guide rails and any other appurtenances required for grinder installation.

B. Grinder System Components

1. The grinder system shall consist of the following components:

a. One grinder installed at pipe invert.
b. Stainless steel wall-mounted frame assembly.

c. Immersible, explosion-proof motor.
d. Rail guide assembly and stainless steel guide rail pipe.
e. A stainless steel loop connected to grinder for lifting.
f. Built-in passive overflow into wet well.
g. Control panel.

C. Grinder shall be designed to operate on 480 volt, three phase, 60 Hz power. Three phase power shall be provided at all new lift stations unless otherwise approved by the District.

D. Grinder shall contain an identifying attached tag showing manufacturer's name, model number and rating/capacity.

E. Grinder shall carry a one (1) year warranty, minimum

2.5 ACCESS HATCHES

A. Shall be Bilco JDH20 or JH20. The frame and door shall support a HS-20 live load where subject to traffic loading conditions, or a minimum of 300 psf live load at other locations as approved by the District. The frame shall include accessories for attachment of the stainless steel pump removal guide rails. An orange safety grate shall be installed at the pump access hatch. The cover shall be equipped with a flush drop handle with a frame drain to the wet well or vault floor drain and staples for padlocks.

2.6 CONTROL PANEL AND SCADA

A. Equipment for a complete SCADA system shall be provided inside the Lift Station. The SCADA system equipment shall be as required to monitor and control the station operation. The equipment shall be compatible to the District's system and shall be approved by the District Engineer.

B. NFPA 70E arc flash hazard assessment shall be required for all new lift station control panels.

C. The control panels shall be mounted on the inside of the generator building. Enclosures must be NEMA 4 rated or above, service entrance rated, lockable by a single rotary handle, fan heated, and situated a minimum of 30" above ground level. Submit control panel shop drawings to District for approval.

D. One main disconnect is required. The disconnect shall be located adjacent to the wet well. Other items that should be included unless otherwise indicated by the District during the approval process are separate pump breakers, hand/off/auto switches, magnetic starters, automatic transfer switch, overload protection, manual resets, green run lights and hour meters for each pump.

E. The pumps will be controlled using float switches or pressure transducers, as directed by the District. The level setpoints will be recommended by the Engineer and adjusted in the field as required based on input from PMWSID.

F. Control panel shall be connected to SCADA with alarm capabilities. Required alarms include power failure, wet well high-water levels, pump default, including seal failure, and other causes of pump station malfunction.

2.7 STANDBY POWER GENERATOR

A. Manufacturer. Generac. No exceptions.

B. The standby generator shall be sized by the Contractor's engineer based upon all anticipated electrical loads at the facility. The standby generator shall be fueled using diesel or natural gas, as directed by the District. It is the Contractors responsibility to provide a natural gas service to the site. The standby power generator requirements will be reviewed on a case by case basis by the District.

2.8 JETTING VAULTS

A. Jetting Vaults shall be constructed per PMWSID Standards and Specifications.

B. Locations. Jetting Vaults shall be installed on the forced main, spaced at a maximum of 900 feet of piping. The first vault shall be placed no more than 450 feet of piping away from the valve vault. The last shall be placed no more than 450 feet of piping away from the gravity connection.

PART 3 SITE IMPROVEMENTS AND GENERATOR BUILDLING

3.1 LIFT STATION SITE WORK

A. The lift station must be accessible by all equipment necessary to operate and maintain the facility under normal or emergency conditions on a year-round basis.

B. Site Finishes. Site finishes (concrete, pavement, gravel) will be defined jointly with the District once a site has been secured. It is anticipated that much of the site will be a contiguous concrete slab with flatwork that will avoid steps and uneven transitions from one facility to another. This will require careful coordination of elevations for the driveway, wet well lid, valve vault lid and building floor so that proper drainage is achieved while providing a uniform surface for maintenance equipment. All site concrete shall be 6 inches thick on 6 inches of compacted road base.

C. Fencing. When required by the District, a chain link or other District-approved fence shall surround the site for security. Fencing shall conform to the District's fencing specifications. For chain link fencing, privacy slats shall be installed to block the view into the lift station. A 12-foot wide minimum vehicle access gate (large enough for a vactor sewer truck) shall to be provided. A 4-foot wide man-gate shall also be provided.

D. A fire hydrant shall be installed at the lift station for clean-up purposes, at a location to be determined during plan review and approval.

E. The site shall be designed to accommodate snow clearing and storage.

3.2 GENERATOR BUILDING

A. A split face CMU or reinforced concrete building shall be constructed to house the generator. The building footprint shall be a minimum of 8 feet larger than the generator skid in each direction (length and width), with additional room as required to access and maintain control panels, etc. Coordinate with generator supplier during design to ensure the building and generator foundation sizes are adequate, for intake air and exhaust opening requirements, and maintenance clearances.

B. The building shall feature separate rooms for the generator and the Controls.

C. A roll-up door, min. 2 feet wider than the generator skid, shall be installed for equipment access.

D. A 3-foot man-door shall be provided allowing access between the Generator Room and Controls Room, as well as access from the exterior into the Controls Room. Man-doors shall be insulated, exterior rated fiberglass doors.

E. The building shall have a gabled roof with a standing seam metal roof, or a monoslope, concrete slab roof, with all necessary soffits and flashings.

F. An external flood light, capable of lighting the work area of the site, shall be located on the building with a light switch.

G. Interior lighting with a light switch adjacent to the man-door shall be provided.

H. Heating, air conditioning, and ventilation shall be provided inside the building.

I. An additional exhaust fan shall be installed in the generator room, capable of exhausting an air change every 3 minutes.

J. A weather-proof electrical outlet as defined in Section 4.2 shall be provided on the building exterior.

K. Submit color samples of all building materials to the District for approval.

L. The building shall be designed by a Professional Engineer registered in the State of Utah. The final design shall be submitted to the District for review and approval.

PART 4 WORKMANSHIP AND PROJECT CLOSEOUT

4.1 GENERAL WORKMANSHIP

A. Excavation. The Contractor is responsible for means and methods to excavate, dewater, and install the structure on firm foundation material. Excavation shall be performed in accordance with OSHA requirements (latest revision). The Contractor shall be responsible for slope stability and erosion control on excavated slopes during construction. Dewatering discharge locations shall be approved by the District and County.

B. Backfill. Backfill materials and compaction shall meet the requirements of the PMWSID Standards and Specifications for structural backfill. Imported backfill may be required.

C. Pumps. Pumps shall be installed in strict accordance with the manufacturer's instructions and recommendations. The piping adjacent to the pumps shall be supported such that no weight is carried on the pump casings. The Contractor shall verify alignment of the pump and piping prior to start up.

D. Supports, Anchors and Sleeves. All work shall be done in a workmanlike manner and in accordance with the approved construction plans.

E. Permits and Inspections. The Contractor shall obtain and pay for all required permits and inspections in connection with this work.

F. Storage and Protection of Materials. Provide storage for materials and assume complete responsibility for losses due to any cause whatsoever. Storage shall not interfere with traffic conditions in any public thoroughfare. Protect completed work, work underway, and materials against loss or damage.

G. Field Measurements. Verify all measurements at the site and become fully acquainted with the existing conditions before beginning work.

H. Coordination. The Contractor shall coordinate the work under this section with other work being performed. The Contractor shall promptly notify the District and the Design Engineer of any conflicts within the Plans and Specifications. All changes required in the work of the Contractor as a result of his failure to notify Engineer shall be made by the Contractor at his own expense.

I. Shop Drawings. The Design Engineer shall be responsible for review of shop drawings and equipment submittals.

4.2 ELECTRICAL WORKMANSHIP

A. Standards. All electrical work shall be executed in strict accordance with the following:

1. National Electrical Code.

2. State of Utah and local rules and regulations.

3. If there is any conflict between these drawings and specifications and the applicable codes, rules and regulations, the codes, rules and regulations apply.

B. Tests. The Contractor shall completely test the electrical system to assure that circuits are wired as called for on the drawings and shall test the system for grounds and short circuits.

C. UL Listings. All equipment and material supplied shall be UL 508/913 listed or appropriate listing acceptable to the jurisdictional authority.

D. Close circuit openings with caps or plugs during installation. Cover fixtures and equipment and protect against dirt or damage caused by water, chemicals or mechanical accident.

E. Electrical cables to pumps shall be run in 1 ½ inch minimum diameter conduit. A tagged nylon pull wire shall be provided in all empty conduits with at least eighteen (18) inches coiled free at each end.

F. Convenience receptacles shall be duplex, ground fault interrupting type, 20 ampere, 125 volt rated.

G. Provide an extra 4-inch conduit from the wet well to the generator building for future use.

4.3 SYSTEM START-UP

A. General. The Contractor shall:

1. Notify the design engineer and the District five (5) days prior to start-up of each item.

2. Clean wet well of all construction debris and grit prior to starting pumps to prevent damage.

3. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, or other conditions which may cause damage.

4. Verify that tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

5. Verify wiring and support components for equipment are complete and tested.

6. Execute start up under supervision of responsible manufacturer's representative and Contractor's personnel in accordance with manufacturer's instructions.

B. Demonstration and Instruction.

1. Demonstrate operation and maintenance of the system to PMWSID personnel prior to final acceptance. The Contractor shall provide the equipment manufacturer's representative for a minimum of one (1) day of training operations staff personnel. The Contractor shall coordinate and schedule demonstration of the system with the District.

2. Sufficient water must be secured by the Contractor to demonstrate lift station operation at start-up for a minimum of five (5) cycles.

3. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with District personnel in detail to explain all aspects of operation and maintenance.

4. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at agreed-upon times, at equipment location.

5. Prepare and insert additional data in operations and maintenance manuals when needed for additional data becomes apparent during instruction.

4.4 LIFT STATION COMPLETION REQUIREMENT

The Contractor shall complete the following for station approval and acceptance:

A. Final Cleaning.

1. Execute final cleaning prior to final inspection.

2. Clean site; sweep paved areas, rake clean landscaped surfaces.

3. Remove waste, surplus materials and construction debris from the site.

B. Adjustments. Adjust equipment to ensure smooth and unhindered operation.

C. Project Record Documents

1. Maintain onsite, one (1) set of the following record documents:
   a. Construction drawings.
   b. Specifications.
   c. Reviewed shop drawings, product date, and samples.

2. Record Documents and Shop Drawings: Legibly mark each item to record actual construction including:

   a. Measured depths of foundations in relation to finish floor datum.
   b. Measured horizontal and vertical locations of underground utilities and appurtenances referred to permanent surface improvements.
   c. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the work.
   d. Field changes of dimension and detail.

e. Details not on original, approved construction drawings.
f. Submit documents to design engineer and District with written request for final approval and acceptance.
g. Product substitutions or alternates utilized.

D. Operation and Maintenance Data

1. Three (3) Operation and Maintenance Manuals, bound in 8-1/2 x 11-inch pages, D-size three-ring binders with durable plastic covers, are ultimately required prior to final acceptance.

2. Prepare binder covers with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS," and title of project.

3. Internally subdivide the binder contents with permanent page dividers, logically organized as described below with tab titling clearly printed under reinforced laminated plastic tabs.

4. Contents: Prepare a Table of Contents for each volume, with each product or system description identified, type on thirty (30) pound white paper in the following general organizational layout:

a. Part 1: Directory listing names, addresses, and telephone numbers of design engineer, Contractor, subcontractors, and major equipment suppliers.

b. Part 2: Operation and maintenance instructions. Identify the following:

i. Significant design criteria.
ii. List of equipment.
iii. Parts list for each component.
iv. Operating instructions.
v. Maintenance instructions for equipment and systems.
vi. Electrical to include: switchgear, manufacturer's recommended maintenance and operation instructions, parts list with name, address and phone number of local source of replacement parts.

c. Part 3: Project documents and certificates, including the following:

i. Shop drawings and product data.
ii. Certificates.
iii. Photocopies of warranties.

5. Submit one (1) copy of completed volumes in final form fifteen (15) days prior to final inspection. This copy will be returned after final inspection, with Engineer comments. Revise content of documents as required prior to final submittal.

6. Submit final three revised volumes prior to final acceptance. Also submit electronic pdf CD of final O&M Manuals.

E. Warranties

1. Provide duplicate notarized copies.

2. Submit prior to request for final approval and acceptance.

3. For items of Work delayed beyond date of Substantial Completion, provide updated submittal within ten (10) days after acceptance, listing date of acceptance as start of warranty period.

4. Start-up and demonstration in accordance with Section 4.3 must be completed prior to issuance of Substantial Completion.

F. Spare Parts and Maintenance Materials

1. All manufacturer's recommended spare parts, maintenance materials, and other required products shall be provided and delivered to the District.