



RINCON DEL DIABLO MUNICIPAL

WATER DISTRICT

TECHNICAL SPECIFICATIONS

**TECHNICAL SPECIFICATIONS  
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# TECHNICAL SPECIFICATIONS

| [PROJECT TITLE]

Prepared by:

| ENGINEER'S STAMP

| [DATE]

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**SECTION 01010****SUMMARY OF THE WORK****PART 1 - GENERAL****1.01 DESCRIPTION OF WORK**

- A. Provide all labor, materials, and equipment to [EXAMPLE install new water mains, complete and functional, and abandon portions of existing water mains] as indicated in the Contract Documents including all miscellaneous or incidental work whether shown or specified, or not, as follows:

[EXAMPLE: Construct approximately \_\_\_ linear feet (lf) of \_\_\_-inch diameter water main, installation of gate valves; water meters and private water services; asphalt concrete pavement restoration; Portland cement concrete pavement restoration, dispose of piping and fittings.]

[EXAMPLE: Work includes surveying and construction staking; excavation; installation of below grade polyvinyl chloride (PVC) pipe and fittings; gate valves; thrust blocks and/or thrust restraint fittings; water meters and private water services; connections to existing pipelines; backfill and compaction; asphalt concrete paving removal, Portland cement concrete paving removal, trench paving, cold milling and overlay; restoration of the site and existing improvements damaged during construction;] and procurement of permits by the Contractor and coordination with agencies having jurisdiction over the Work including, but not limited to, the Rincon del Diablo Municipal Water District, and City of Escondido.

- B. Work shall conform to the Rincon del Diablo Municipal Water District General Standard Specifications for Construction of Water Transmission Facilities (latest edition), the Standard Specifications for Public Works Construction (Greenbook), latest edition, and applicable jurisdictional agency standards and specifications.

**1.02 PROJECT LOCATION**

- A. The project is located at (insert address) in the City of [XX], CA.

**1.03 WORK UNDER THIS SECTION**

- A. This section defines the Lump Sum Prices, Unit Prices and Allowances listed in the Proposal Bidding Schedule, and the manner in which they will be used to determine measurement and payment for all items included in the Bid Schedule.
- B. Payment for all items of the Bid Schedule whether lump sum or unit price shall include all compensation to be received by the Contractor for furnishing all tools, equipment, supplies, and manufactured articles, and for all labor, operations, and incidentals appurtenant to the items of work being described, as necessary to complete the various items of the work all in accordance with the requirements of the Contract Documents, including all appurtenances hereto, and including all costs of permits and costs of compliance with the regulations of public agencies having jurisdiction, including Safety and Health Requirements of the California Division of Industrial Safety and the

Occupational Safety and Health Administration of the U.S. Department of Labor (OSHA). No separate payment will be made for any item that is not specifically set forth in the Bid Schedule, and all costs shall be included in the prices named in the Bid Schedule for the various items of work.

- C. Final payment for work covered by Unit Prices will be made on the basis of the actual measured quantities accepted by the Engineer multiplied by the Unit Price of the Bid Schedule.
- D. Monthly pay requests are due on a certain day of each month (to be determined by District), and while pay requests will be accepted prior to this date, pay request processing will not begin until this date for purposes of meeting the District's pay request processing obligations under the California Public Contract Code. Failure of the Contractor to submit his pay requests by this day may be cause for rejection of the pay request. If rejected, the Contractor may have to resubmit his pay request the next month. Should the submittal date fall on a holiday or weekend day during the month, the Contractor shall consider the next working day as the due date.
- E. The work to be performed under this Contract shall consist of furnishing all tools, equipment, materials, supplies, and manufactured articles and furnishing all labor, transportation and services, including fuel, power, water, and essential communications, and performing all work, or other operations required for the fulfillment of the Contract in strict accordance with the Contract Documents. The work shall be complete, and all work, materials, and services not expressly indicated or called for in the Contract Documents which may be necessary for the complete and proper construction of the work in good faith shall be provided by the CONTRACTOR as though originally so indicated, at no increase in cost to the DISTRICT.
- F. Work shall conform to the District's General Standard Specifications for Construction of Water Transmission Facilities and the Standard Specification for Public Works Construction (Green Book), latest edition.

#### **1.04 LAND FOR CONSTRUCTION PURPOSES**

- A. The Contractor shall coordinate and supply his own construction staging area(s), as necessary. The Contractor shall use these areas at his own risk and shall not be entitled to extensions of time or additional compensation caused by delays in securing such areas, or due to loss of materials stored or maintained at these sites. Additionally, the Contractor shall not interfere in the normal operation of any ancillary or other facilities, either District-owned or not, during the completion of the Work. The Contractor shall maintain full access at all times to all homes, businesses, equipment or other facilities for the conduct of normal and emergency operations.
- B. **WORK ON PRIVATE PROPERTY**
  - 1. Easements on private property are indicated on the Drawings. The Contractor shall stay within the boundaries of easements on private property. The Contractor shall not enter any private property outside the easement boundaries without written permission from the property owner, the Engineer, and the District.



**C. WORK ON PUBLIC ROW**

1. Use of public Right of Way for laydown shall be cleared and permitted by the governing agency prior to start of work. The District does not have authority to grant permission to use public ROW for laydown, all costs associated with obtaining proper permits shall be included in Contractor's bid.

**1.05 NOTICES TO OWNERS AND AUTHORITIES**

- A. The Contractor shall, as provided in the General Conditions, notify owners of adjacent property and utilities five (5) working days prior to prosecution of any Work which may affect them.
- B. When it is necessary to temporarily limit access to a property, or when any utility service connection must be interrupted, the Contractor shall give notices ten (10) working days in advance to the affected persons. Written notices will conform to any applicable local ordinance and will include appropriate information concerning the interruption and instructions on how to limit their inconvenience. All interruptions caused by the Contractor or the Work shall be coordinated and pre-approved by the District, without exception. Failure to acquire prior District approval shall result in the Contractor being liable for all costs associated with the interruption of services.
- C. The Contractor shall notify District and District will distribute notices for the following circumstances:
  1. Water service interruptions.
- D. The Contractor shall notify District and the Contractor will be responsible for distributing notification for the following:
  1. Pre-construction videotaping or photographs;
  2. Excavation, pavement construction, or pavement slurry seal which temporarily prohibits access to public or private streets or properties.

**1.06 UNFAVORABLE CONSTRUCTION CONDITIONS**

- A. During unfavorable weather, wet ground, or other unsuitable construction conditions, the Contractor shall confine his operations to Work which will not be affected adversely by such conditions. No portion of the Work shall be constructed under conditions which would adversely affect the quality or efficiency thereof, unless special means or precautions are taken by the Contractor to perform the Work in a proper and satisfactory manner.

**1.07 CONFINED SPACE PROGRAM**

- A. The Contractor shall develop and implement a confined space program meeting the requirements of CFR 1910.146 and California Title 8, Art. 108, Sec. 5157. This program shall be submitted to the District for review, within ten (10) days after the Notice to Proceed.

**1.08 COOPERATION AND COLLATERAL WORK**

- A. The Contractor shall be responsible for ascertaining the nature and extent of any simultaneous, collateral, and essential work by others. The District, its workers and contractors, and others shall have the right to operate within or adjacent to the Work site during performance of such Work. The District, the Contractor, and each of such workers, contractors and others, shall coordinate their operations and cooperate to minimize interference.
- B. The Contractor shall include in his/her Bid all costs involved as a result of coordinating his/her Work with others. The Contractor shall not be entitled to additional compensation from the District or the Engineer for damages resulting from such simultaneous, collateral, and essential work. If necessary to avoid or minimize such damage or delay, the Contractor shall re-deploy its work force to other parts of the Work. Should the Contractor be delayed by the Agency, and such delay could not have been reasonably foreseen or prevented by the Contractor, the Engineer will determine the extent of the delay, the effect on the project, and any extension of time. The decision of the Engineer shall be final.

**1.09 MAINTENANCE OF SYSTEM OPERATIONS**

- A. The Contractor shall maintain all District facilities in operation during the progress of the Work. All costs incurred as a result of the Contractor's disabling of system operations prior to the approval of the District and the Engineer shall be the sole responsibility of the Contractor, including any fines or other mitigatory costs resulting from the Contractor's actions.

**1.10 SUMMARY OF CONSTRUCTION PROCEDURES**

- A. The Contractor shall provide to the District and the Engineer, within fifteen (15) calendar days after the Notice to Proceed, a schedule denoting the sequence of construction to be followed during the project. The Contractor shall revise his/her construction sequence based on this review at no additional cost to the District to avoid potential coordination impacts. This review is for the benefit of the Contractor and shall in no way relieve the Contractor of his/her responsibilities discussed in Paragraph 1.10 of these Specifications.

**PART 2 – MEASUREMENT AND PAYMENT**

## **2.01 MEASUREMENT**

### **A. LINEAR MEASUREMENTS**

Linear measurements shall be based upon the projection of the centerline of the pipeline or structure onto a horizontal plane and inclusive of the length through tees, bends, valves, and fittings and as shown on the Drawings for its limits unless otherwise specified. Appurtenances shall be included in the bid item for which the linear measurement is made unless such appurtenances are described for payment in a separate pay item.

### **B. AREA MEASUREMENTS**

Area measurement shall be based upon the projection of the surface area onto a horizontal plane and measured in acres, square yards, square feet, or as indicated for the bid item.

### **C. VOLUME MEASUREMENTS**

Measurement for bid items involving volume units shall be based upon the volume measured in cubic feet, cubic yards, or as indicated for the bid item.

### **D. WEIGHT MEASUREMENTS**

Measurement for bid items involving weight units of the item shall be based upon the number of pounds, tons, or as indicated for the bid item.

### **E. UNIT MEASUREMENTS**

Measurement for bid items involving units of the item shall be based upon the number of units installed and counted as indicated in the bid item.

### **F. LUMP SUM MEASUREMENT**

Lump sum items shall include all labor, materials, equipment, and incidentals as required by the Contract Documents for the complete installation of the bid items. No separate payment shall be made for items not included by the Contractor in the total contract Bid Price.

## **2.02 PAYMENT**

### **A. LUMP SUM PRICES:**

The Contractor shall provide Lump Sum Prices in the Bid Schedule for all work in the Contract Documents, except items of work listed in the Contract as Unit Priced Items. For Lump Sum items, only the total amount needs be filled in.

### **B. UNIT PRICED ITEMS:**

Unit Price Items are provided by the District for additive or deductive Work not presently identified in the Contract Documents. In the appropriate places on the Bid Schedule, each Bidder shall quote Unit Prices for the items of work in the units stated. Each unit price, whether additive or deductive, shall cover all costs and charges, including, without limitation, the costs of material, fabrication, delivery, installation or application, supervision, bond and insurance charges, overhead, profit, and taxes. Unit Prices shall be the exact amount per unit to be applied to the units of work actually provided or not provided for the purpose of modifying the Contract Price or establishing the payment due the Contractor, as applicable. Unit Prices provided by the District shall be held good and in effect until the work is completed and accepted by the District. Contractor-proposed Unit Prices which are so unbalanced as to be detrimental to the District's interest may be rejected or cause rejection of the Bidder's entire bid at the discretion of the District.

C. ALLOWANCE ITEMS:

Allowance Item amounts are provided by the District to cover the cost of additive Work not presently identified in the Contract Documents. Payment for Allowance Items will be made only when authorized as described in Part 1.03, below.

D. RETENTION:

Payment for all bid items is subject to the retention provisions set forth in these specifications, or five percent (5%), whichever is greater.

E. SCHEDULE:

All scoped Allowance Bid Items and Unit Priced Bid Items are included in the scope of the Contract without specific locations for the work provided. The District reserves the right to direct that these scoped items of work be performed when they are encountered, and the Contractor is obligated to accommodate this work within the original contract duration. The Contractor will not be entitled to additional time regardless of where work is encountered.

The District reserves the right to vary the total contract price by +/- 25% by varying the Unit Price quantities and authorized Allowance amounts within their respective individual limits.

F. STIPULATED OR BID UNIT PRICES:

When the District's use of a Unit Price Bid Item exceeds 200% of the Bid Item quantity, the Contractor or District may demand that the Unit Price Item be renegotiated for quantities in excess of 200%, whether the price is stipulated or bid. This provision is to prevail over any conflicting general condition provision.

G. SPECIFIED ITEMS AND STIPULATED PRICES:

The stipulated price for these items cannot be invoiced until the item is complete and accepted by the Engineer and the District.

## 2.03 BID ITEMS

The CONTRACTOR shall provide all labor, materials, equipment and incidentals for the work described within these specifications and construction drawings. Payment for each bid item shall be included in the contract unit price or lump sum price shown on the Bidder's proposal. Measurement for payment of lump sum items will be based on the component parts listed in the Bid Items, as required in this specification. Payment for component parts will be based on the Schedule of Values approved by the DISTRICT. The cost breakdown shall include quantities and items aggregating the Bid Item in payments during construction. All measurements of quantities shall be approved by the DISTRICT. Payment for each bid item shall include full compensation for all labor, materials, tools, and equipment necessary to complete the work as shown on the construction drawings and within these specifications and no additional compensation shall be allowed. This includes the cost of work not specifically listed in the Bid Schedule or Schedule of Values but is necessary to complete the project as described and shown in the Contract Documents. Work for which no separate payment has been provided will be considered a subsidiary obligation of the CONTRACTOR, and the cost therefore shall be included in the applicable contract price for the item to which the work applies. All measurements of work done will be made by the DISTRICT or its representative.

### A. MOBILIZATION, DEMOBILIZATION, PERMITS, AND SITE CLEANUP (BID ITEM NO. 1)

Payment for mobilization, demobilization, permits, and site cleanup shall be made at the contract price complete and in accordance with the Contract Documents. The contract price shall include, but is not limited to the following principal items: obtaining and complying with permits not included in any other bid item; mobilizing labor force, equipment and construction facilities; providing field offices and storage yard; securing construction water supply; providing all temporary construction fencing and safety barriers; providing on-site sanitary facilities; providing project signs; filing of Notice of Intent with the Regional Water Quality Control Board for groundwater discharge or pipeline dewatering permits or waivers; procuring encroachment, construction, or traffic control permits from the City of [XX]; posting OSHA requirements and establishing safety programs; preparing the Construction Schedule and Schedule of Values prior to the pre-construction meeting; daily cleanup; material submittals; This work also includes the cost for maintaining and submitting the project record drawings at the end of the project. These record drawings must be reviewed monthly with the DISTRICT to receive payment for any work; and all incidentals for the mobilization, final cleanup, punchlist, demobilization, and permits for construction of the project as described in the Contract Documents.

Payment for this bid item shall be limited to 4 percent of the total contract price.

### B. INSURANCE AND BONDS (BID ITEM NO. 2)

Payment for insurance and bonds shall be made at the contract price complete and in accordance with the Contract Documents including, but not limited to all insurance and bonds required for performance of the work, including additional insureds as required by agency permits, and all incidental expenses involved in obtaining insurance and bonds.

Payment for this bid item shall be limited to 5 percent of the total contract price.

C. PRE/POST CONSTRUCTION VIDEOTAPES AND PHOTOGRAPHS (BID ITEM NO. 3)

Payment for the pre/post-construction videotapes and photographs will be paid for at the contract lump sum price, complete and in accordance with the Contract Documents, and as directed by the DISTRICT. The contract price for work under this item shall include but not be limited to furnishing all labor, material, tools, and equipment and performing all work required at each construction site location for the completion of the pre/post-construction videotapes and photographs as described in the Contract Documents. All work shall be considered as compensated for in the lump sum price and no additional compensation shall be made thereafter.

Payment for this bid item will be made at the lump sum bid price.

D. TEMPORARY EROSION CONTROL/STORM WATER POLLUTION PREVENTION PLAN (SWPPP) (BID ITEM NO. 4)

Payment for the temporary erosion control/storm water pollution prevention plan (SWPPP) shall be made at the contract lump sum price, complete and in accordance with the Contract Documents and as directed by the DISTRICT. The Contract Price for work under this item shall include but is not limited to furnishing all labor, material, tools, and equipment and performing all work required for establishing, maintaining, operating, and providing all reporting for a complete site erosion control and storm water pollution prevention plan to be implemented throughout construction. This includes but is not necessarily limited to preparation of all required plans and regulatory DISTRICT submittals, the operation and protection of the site drainage systems (at a minimum, daily street sweeping with a wet vacuum enabled street sweeper), sampling, monitoring, reporting, desilting basins and risers, fiber rolls, erosion control blankets, silt fences, gravel bags, berms, stabilized construction entrances, or other measures as described in the CONTRACTOR's project-specific storm water pollution prevention plan and as necessary to provide a complete erosion control program in complete compliance with all applicable Regional Water Quality Control Board (RWQCB) and all other jurisdictional requirements. The CONTRACTOR shall be responsible for providing a certified QSD to prepare Permit Registration Documents (PRD) and comply with the SMARTS system and coordinate with the DISTRICT's designated Legally Responsible Party (LRP) throughout the duration of the project. The CONTRACTOR shall also provide a certified QSP for the duration of the construction and comply with all monitoring, reporting, and inspection as designated by the RWQCB.

Payment for TEMPORARY EROSION CONTROL/STORM WATER POLLUTION PREVENTION PLAN (SWPPP) will be made at the lump sum bid price. All work shall be considered as compensated for in the lump sum price and no additional compensation shall be made thereafter. For bidding purposes CONTRACTOR shall assume Type 2 risk level for Linear Underground Project (LUP).

[The project has an estimated disturbance area of less than one acre and is exempt from the requirements of the Construction General Permit. (VERIFY ON PER PROJECT BASIS)]

E. EXCAVATION SUPPORT SYSTEM (BID ITEM NO. 5)

Payment for excavation support system shall be made at the contract price complete and in accordance with the Contract Documents. The contract price shall include, but is not limited to obtaining and complying with all permits and regulations of the California Occupational Safety and Health (Cal/OSHA); preparing and submitting plans by a licensed Engineer and obtaining State Division of Industrial Safety permit(s) for excavations that are 5 feet deep or greater, and incidental work for sheeting, shoring, or bracing systems; sloping or benching of excavation side slopes; or other protective systems necessary for the support of trench excavations or for worker protection from materials or equipment that could pose a hazard by falling or rolling into excavations.

Payment for this bid item, will be made at the lump sum bid price.

#### F. TRAFFIC CONTROL (BID ITEM NO. 6)

Payment for traffic control will be made at the contract price complete and in accordance with the Contract Documents. The contract price for work under this item shall include but not be limited to furnishing all labor, material, and equipment and performing all work required to prepare traffic control plans per City of [XX], including permit fees and implement all traffic control for the entire project. This shall include furnishing, installing, and maintaining all barriers, signage, boards, flagging, and all other work necessary for performance of the work and for compliance with all regulatory requirements and permits. The Traffic Control plans must be submitted to and approved by the DISTRICT and prepared by a licensed Civil Engineer in the State of California.

Traffic control shall include a CalTrans permit for traffic control equipment (cones, etc.) if placed in the CalTrans right of way. This includes traffic control for mainline work, connection work, potholing and all other work requiring traffic control.

Payment for TRAFFIC CONTROL will be made at the lump sum bid price.

#### G. UTILITY LOCATING & POTHOLING (BID ITEM NO. 7)

Payment for utility locating and potholing will be made at the contract price complete and in accordance with the Contract Documents. The contract price for work under this item shall include but not be limited to furnishing all labor, material, and equipment and performing all work required for coordination of standby utility company personnel; potholing existing utilities prior to any excavation work at pipeline connection points, crossing utilities, and all utilities within 5 feet on either side of the centerline of the proposed construction or outermost limits of the proposed structures as required by the Contract Documents. Potholing of existing utilities that parallel the proposed pipeline shall be conducted at an interval sufficient to establish their locations relevant to the Work and not to exceed 50 feet measured parallel to the centerline of construction. Potholing must be done and report submitted with the findings at least one week prior to beginning trenching operations. The report must contain at a minimum; pictures, depths, type of utility, location, and note any conflicts with contract drawings.

Payment for this bid item will be made at the lump sum bid price.

#### H. WATER MAIN - PVC (BID ITEM NO. 8)

Payment for water main of the type, size and class specified in the Contract Documents and on the bid schedule will be made at the contract price, complete in place, in accordance with the Contract Documents. The contract price for work under this item shall include, but not be limited to pavement saw cutting and/or cold milling, removal, and disposal; excavation, removing and/or plugging interfering abandoned conduits or structures; dewatering and any required treatment; water disposal; surplus material disposal; pipe; fittings; pipe supports; linings and coatings; wax tape and coating; utility marker tape; tracer wire; thrust blocks and/or restraint devices; temporary trench plating; bedding, backfill and compaction; third party compaction testing; pipeline pressure testing and disinfection; temporary materials required for pressure testing and disinfection; aggregate base; placement and removal of temporary paving materials; third party bacteria and plate count testing; final pavement replacement per City of [XX]; following shutdown and outage requirements; removal and abandonment of old appurtenances, gate wells, and pipe; removal and disposal of asbestos concrete pipe; installation, disinfection, removal, and maintenance of highline; removing and protecting trees and landscape as shown on plans and all other incidental work.

Measurement of installed pipeline shall be made to the nearest foot along the centerline projection of the pipeline into a horizontal plane. Payment for WATER MAIN – PVC will be made at the linear foot unit bid price.

#### I. WATER MAIN – DUCTILE IRON PIPE (BID ITEM NO. 9)

Payment for the construction of new water main of the type, size and class specified in the Contract Documents and on the bid schedule will be made at the contract price, complete in place, in accordance with the Contract Documents and as directed by the District. The contract price for work under this item shall include, but not be limited to pavement saw cutting and/or cold milling, removal, and disposal; excavation, removing and/or plugging interfering abandoned conduits or structures; dewatering and any required treatment; water disposal; surplus material disposal; pipe; fittings; pipe supports; linings and coatings; polyethylene encasement; wax tape and coating; utility marker tape; tracer wire; thrust blocks and/or restraint devices; temporary trench plating; bedding, backfill and compaction; third party compaction testing; pipeline pressure testing and disinfection; temporary materials required for pressure testing and disinfection; aggregate base; placement and removal of temporary paving materials; third party bacteria and plate count testing; final pavement replacement per City of [XX]; following shutdown and outage requirements; removal and abandonment of old appurtenances, gate wells, and pipe; removal and disposal of asbestos concrete pipe; installation, disinfection, removal, and maintenance of highline; removing and protecting trees and landscape as shown on plans and all other incidental work.

Measurement of installed pipeline shall be made to the nearest foot along the centerline projection of the pipeline into a horizontal plane. Payment for WATER MAIN – DUCTILE IRON PIPE will be made at the linear foot unit bid price.

#### J. WATER MAIN – CML&C STEEL (BID ITEM NO. 10)

Payment for water main of the type, size and class specified in the Contract Documents and on the bid schedule will be made at the contract price, complete in place, in accordance with the Contract Documents. The contract price for work under this item shall include,



but not be limited to pavement saw cutting and/or cold milling, removal, and disposal; excavation, removing and/or plugging interfering abandoned conduits or structures; dewatering and any required treatment; water disposal; surplus material disposal; pipe; fittings; pipe supports; linings and coatings; wax tape and coating; utility marker tape; tracer wire; thrust blocks and/or restraint devices; concrete pier supports; temporary trench plating; bedding, backfill and compaction; third party compaction testing and special inspection; pipeline pressure testing and disinfection; temporary materials required for pressure testing and disinfection; aggregate base; placement and removal of temporary paving materials; third party bacteria and plate count testing; following shutdown and outage requirements; air vac on top of pipe.

Measurement of installed pipeline shall be made to the nearest foot along the centerline projection of the pipeline into a horizontal plane. Payment for WATER MAIN – CML&C STEEL will be made at the linear foot unit bid price.

#### K. RESILIENT SEAT GATE VALVE (BID ITEM NOS. 11)

Payment for resilient seat gate valves of the size and type specified in the Contract Documents and on the bid schedule will be made at the contract price for each valve assembly, complete in place, in accordance with the Contract Documents. The contract price for work under this item shall include, but not be limited to, procurement, delivery, installation, and testing; actuators of the type shown or specified; polyethylene encasement; concrete anchor blocks; valve stem extensions; valve wells and covers; and fittings and all miscellaneous hardware. No separate measurement or payment will be made for items incidental to open trench construction (i.e., excavation, dewatering, pavement restoration, etc.) for the pipeline on which the valves are installed and that are included under a separate bid item.

Payment for this bid item will be made at the per each unit bid price.

#### L. BUTTERFLY VALVE (BID ITEM NOS. 12)

Payment for butterfly valves of the size and type specified in the Contract Documents and on the bid schedule will be made at the contract price for each valve assembly, complete in place, in accordance with the Contract Documents. The contract price for work under this item shall include, but not be limited to, procurement, delivery, installation, and testing; actuators of the type shown or specified; polyethylene encasement; concrete anchor blocks; valve stem extensions; valve wells and covers; and fittings and all miscellaneous hardware. No separate measurement or payment will be made for items incidental to open trench construction (i.e., excavation, dewatering, pavement restoration for the pipeline on which the valves are installed and that are included under a separate bid item.

Payment for this bid item will be made at the per each unit bid price.

#### M. AIR AND VACUUM VALVE ASSEMBLY (BID ITEM NOS. 13)

Payment for air and vacuum valve assemblies of the size specified in the Contract Documents and on the bid schedule will be made at the contract price for each assembly, complete in place, in accordance with the Contract Documents. The contract price for work under this item shall include all labor, materials, equipment and incidentals for the

installation and testing including service saddles; fittings; tubing; corporation stops; polyethylene encasement; isolation valves; valve well and cover; air valves and enclosures; concrete support pads; and miscellaneous hardware. The contract price for each assembly shall include all costs for pavement removal and disposal; excavation; backfill; compaction; replacement of pavements, curbs, gutters, asphalt concrete berms; and all incidental work along the lateral piping regardless of length or depth.

Payment for this bid item will be made at the per each unit bid price.

#### N. BLOW-OFF ASSEMBLY (BID ITEM NOS. 14)

Payment for blow-off assemblies of the size specified in the Contract Documents and on the bid schedule will be made at the contract price for each assembly, complete in place, in accordance with the Contract Documents. The contract price for work under this item shall include all labor, materials, equipment and incidentals for installation and testing and including piping; fittings; service saddles; linings and coatings; polyethylene encasement; concrete anchor or thrust blocks; restrained joint fittings; isolation valves; valve wells, covers, and stem extensions; guard posts; concrete support pads; and miscellaneous hardware. The contract price for each assembly shall include all costs for pavement removal and disposal; excavation; backfill; compaction; replacement of pavements, curbs, gutters, asphalt concrete berms; and all incidental work along the lateral piping regardless of length or depth.

Payment for this bid item will be made at the per each unit bid price.

#### O. FIRE HYDRANT ASSEMBLY (BID ITEM NOS. 15)

Payment for fire hydrant assemblies of the type specified in the Contract Documents will be made at the contract price for each fire hydrant assembly, complete in place, in accordance with the Contract Documents. The contract price for work under this item shall include all labor, materials, equipment and incidentals for installation and testing and including hydrants, lining and coatings; guard posts; concrete splash/housekeeping pad; concrete anchor blocks; valve stem extensions; valve wells and covers; fittings; and all miscellaneous hardware. The contract price for each assembly shall include all costs for pavement removal and disposal; excavation; backfill; compaction; replacement of pavements, curbs, gutters, asphalt concrete berms; and all incidental work along the lateral piping regardless of length or depth.

Payment for this bid item will be made at the per each unit bid price.

#### P. WATER SERVICE (BID ITEM NOS. 16)

Payment for this bid item will be made at the contract price in accordance with the Contract Documents. The contract price for work under this item shall include, but not be limited to, all labor, materials, equipment, and incidentals required to install new water service from the new water main to the existing or new water meter (new water meters to be furnished by District). Payment shall include notification to and coordination with the property owners and the District; service saddles, corporation stops, water service tubing, meter box, testing and disinfection; capping and abandonment of existing water services; disposal of removed materials; site restoration; and all incidental work necessary for a

complete and properly functioning installation. This item shall include all excavation; bedding; backfilling; compaction; dewatering; water control; exporting and disposal of excavated or surplus material; and trench resurfacing per SD County G-24 not included in any other bid item. Payment shall include the Contractor's field locating of water services and verification of existing conditions sufficiently ahead of time to allow for design revisions if actual conditions differ than what is shown on the plans.

Payment for this bid item will be made at the per each unit bid price.

Q. ABANDON EXISTING WATER SERVICES (SIZE MATCHES QUANTITY OF NEW SERVICES) (BID ITEM NOS. 17)

Payment for the work to abandon each existing water service (size matches the size of the new service) shall be made at the contract unit price, complete and in accordance with the Contract Documents and as directed by the DISTRICT. The Contract Price for work under this item shall include furnishing all labor, material, tools, and equipment and performing all work required to abandon each water service per the District Standard Specifications, and all other work necessary to complete the installation work as described within the Contract Documents. All work shall be considered as compensated for in the unit price and no additional compensation shall be made thereafter.

Payment for this bid item will be made at the per each unit bid price.

R. PIPELINE CONNECTIONS (BID ITEM NOS. 18)

Payment for pipeline connections at the locations specified on the bid schedule will be made at the contract price, complete in place, in accordance with the Contract Documents. The contract price for work under this item shall include but not be limited to the following: coordination with the District, City of Escondido, and/or utility companies for work during or outside of normal working hours; submittal of a shutdown plan identifying the shutdown and construction sequence and schedule; and all excavation, dewatering, water disposal, surplus material disposal, connections to existing pipelines, closing and/or removing interfering abandoned conduits or structures, bedding, backfill, compaction, trench plating, temporary asphalt concrete paving, hydrostatic pressure testing, disinfection, hot tap, and all other labor, materials, and equipment that are incidental to pipeline connections and that are not included in any other bid item.

Payment for this bid item will be made at the per each unit bid price. Payment for pipeline connections at locations other than those listed in the bid schedule shall be considered included in the bid item for Water Main for which the connections are incidental thereto.

S. ASPHALT AND PAVING (BID ITEM NOS. 19)

Payment for work described as asphalt and paving shall be made at the contract unit price in accordance with the Contract Documents and as directed by the CITY. The work shall include, but not be limited to, furnishing all labor, materials, tools, equipment, supplies, supervision, and incidentals required to perform full width 1.5-inch pavement grind or removal and 1.5-inch overlay, all site grading, AC paving, concrete paving, curb and gutter, removal and replacement of existing fencing where necessary, and all other work necessary to prepare the surfaces for an asphalt overlay such that the final grade of the asphalt cement

paving matches the existing grade, in accordance with requirements within the Contract Documents. This work shall also include protection of existing facilities to remain.

Payment for this bid item will be made at the linear foot unit bid price. For bidding purposes, Contractor shall assume [##]-ft wide road.

#### T. OVER EXCAVATION (BID ITEM NOS. 20)

Payment for Over Excavation shall be made at the contract unit price, complete and in accordance with the Contract Documents and as directed by the DISTRICT. The Contract Price for work under this item shall include furnishing all labor, material, tools, and equipment and performing all work required to the trench over excavation to 2 feet below the bottom of the trench, only when ordered in advance by the DISTRICT, and as described within the Contract Documents, not included elsewhere, per Rincon Design Standards, and Rincon Standard Drawing W-3. All work shall be considered as compensated for in the unit price and no additional compensation shall be made thereafter.

Payment for this bid item will be made at the cubic yard unit bid price.

#### U. ROCK REMOVAL (BID ITEM NOS. 21)

Payment for the Rock Removal shall be made at the contract unit price, complete and in accordance with the Contract Documents and as directed by DISTRICT. The contract price for work under this item shall include, but not be limited to, furnishing all labor, material, tools and equipment, to remove rock and shall include any method of rock removal including, but not limited to rock breaking equipment, including, but not limited to, protecting existing features, monitoring, and all other work necessary for rock removal. The term "rock removal" shall be understood to indicate a method of removal and not geological formation, refer to Section 02223. The contract price for work under this item shall also include hauling, transportation, disposal, processing and all other work necessary to complete this item of work as described in the Contract Documents. The DISTRICT reserves the right to vary quantities plus or minus 50% using the bid unit price to accommodate conditions encountered on the project. These adjustments are considered to be within the original contract scope and as such will not be considered as a basis for extra work, extra cost, or extra time.

Payment for this bid item will be made at the cubic yard unit bid price.

#### V. DEWATERING (BID ITEM NOS. 22)

Payment for the work described as dewatering shall be made at the contract lump sum complete and in accordance with the Contract Documents. The work shall include, but not be limited to, furnishing all labor, material, tools and equipment, and performing all work required for water control, treatment, legal disposal, additional shoring, testing, obtaining and complying with a Special Use Discharge Permit from the San Diego Regional Water Quality Control Board (SDRWQCB) and all other work necessary to complete this work.

Payment for this bid item will be made at the lump sum bid price.

#### W. SITE RESTORATION, PAVEMENT MARKINGS AND STRIPING (BID ITEM NOS. 23)

Payment for restoration, pavement markings and striping of the project site shall be made at the contract lump sum price, complete and in accordance with the Contract Documents, and as directed by the DISTRICT. The Contract Price for work under this item shall include furnishing all labor, material, tools, and equipment and performing all work required to complete the restoration of the project sites including, but not limited to mailboxes, survey monuments, landscaping, irrigation, any replacement of other public or private property damaged during the course of construction, replacement of pavement marking striping complete and in accordance with 2018 Caltrans Standards. Contractor shall submit a plan to be approved by City personnel prior to completing the markings and striping. All work shall be considered as compensated for in the lump sum price and no additional compensation shall be made thereafter.

Payment for this bid item will be made at the lump sum bid price.

#### X. TEMPORARY BYPASS PUMPING (BID ITEM NOS. 24)

Payment for work described as temporary bypass pumping shall be made at the contract lump sum complete and in accordance with the Contract Documents. The work shall include, but not be limited to, furnishing all labor, material, tools, equipment, and performing all work required for procurement, delivery, installation, and testing of the equipment required to perform temporary bypass pumping and all other work necessary to complete this work as described in the Contract Documents

Payment for this bid item will be made at the lump sum bid price.

### **PART 3 – EXECUTION**

#### **3.01 WORK SEQUENCE:**

- A. All of the following sequence items shall be contingent on the CONTRACTOR obtaining approval from the CITY's and/or COUNTY's Traffic Engineer as a part of CONTRACTOR's prepared Traffic Control Plans.
- B. The general sequence of work shall be as follows:
  - 1. The CONTRACTOR shall provide a two-week written notice to the District notifying of any shutdown activities.
  - 2. Submit proposed schedule of work, insurance and bonds. The CONTRACTOR is responsible for supplying electrical power for the entire project length. Obtain required permits, licenses, and jurisdictional approvals. After construction survey, call Underground Service Alert (DIGALERT) and utility owners to obtain mark out of buried utilities.
  - 3. If required, the CONTRACTOR is responsible for obtaining a construction water meter from the DISTRICT for any temporary water usage throughout duration of construction.
  - 4. Secure laydown/staging areas. The CONTRACTOR shall obtain written approval for use of any public or private rights-of-way.
  - 5. Take pre-construction photographs and video log of pipeline alignment and along proposed work areas (potential layout or staging areas, etc.).

6. Identify and pothole all points of connection and existing utilities crossing the pipeline alignment and those parallel to it within 5 feet, and submit potholing record drawing results to DISTRICT for review, prior to starting any construction. Allow 10 working days for review.
7. Submit shop drawings and other submittals required by the plans or Contract Documents.
8. Begin manufacturing and shipping materials and equipment after receiving approved submittals.
9. Complete work according to approved Proposed Work Schedule.
10. Complete Punch List items.
11. Finalize clean up and restore construction areas.
12. Provide warranty as specified.

**END OF SECTION**

**SECTION 01015****GENERAL REQUIREMENTS****PART 1 - GENERAL****1.01 DEFINITIONS**

- A. Wherever the following terms or pronouns occur in these Standard Specifications or in related documents, the intent and meaning shall be interpreted as follows:
1. **"Approved Plans"** shall mean the official plans, profiles, typical cross-sections, working drawings, detail drawings, or exact reproductions thereof, approved by the DISTRICT and other appropriate government agencies, which show the locations, character, dimensions, and details of the work required to construct the specified public improvements.
  2. **"Approved Materials List"** shall mean the listing of those materials reviewed, tested, and allowed for use by the DISTRICT for installation of its facilities (which may include potable water, recycled water and sewer facilities).
  3. **"Board"** shall mean the Board of Directors of the DISTRICT.
  4. **"Contractor"** shall mean the independent person, firm, corporation or partnership with whom the DISTRICT or Developer contracts for the performance of the work or any part thereof covered by the Approved Plans and these Standard Specifications. Instructions or information given by the DISTRICT to the Contractor's superintendent or agent on the Project shall be considered as having been given to the Developer.
  5. **"Standards"** shall mean the current version of the DISTRICT's Standard Design Standards and Specifications for Potable Water, Recycled Water and Sewer Facilities.
  6. **"Developer"** shall mean the independent person, firm, corporation or partnership whose purpose is the development of property. The Developer shall, at all times be represented on the Project in person or by a duly designated agent (Contractor or Private Engineer). Instructions or information given by the DISTRICT to the Contractor's superintendent or agent on the Project shall be considered as having been given to the Developer.
  7. **"DISTRICT"** shall mean the Rincon del Diablo Municipal Water DISTRICT.
    1. For the unique purpose of these Standard Specifications, DISTRICT shall also refer to the DISTRICT's representative(s) acting within the scope of the particular duties entrusted to them.
    2. The DISTRICT shall resolve any and all issues which may arise with regard to the quality or acceptability of approved materials furnished or work performed, to the manner of performance and rate of progress of the work and shall answer all questions relating to the interpretation of the Standard Drawings, the Approved Plans, the job

specifications, if any, and these Standard Specifications as well as the acceptable fulfillment of the Contract on the part of the Developer.

8. **"DISTRICT Engineer"** or **"Engineer"** shall mean the DISTRICT's Chief Engineer, or the DISTRICT's General Manager, acting either directly or through properly authorized agents, such agents acting severally within the scope of the particular duties entrusted to them.
9. **"Engineer of Work"** or **"Private Engineer"** shall mean a Civil Engineer or Structural Engineer registered or licensed in California who is qualified to act as an agent of the Developer in preparing plans for facilities to be approved and accepted by the DISTRICT and incorporated thereafter into the DISTRICT's system
10. **"Inspector"** shall mean the DISTRICT's authorized agent whose duties shall include those defined elsewhere within these Standard Specifications, but who shall not direct the work being performed.
11. **"Owner"** shall mean one of two things:
  3. For CIP projects, **"Owner"** shall mean the Rincon del Diablo Municipal Water District.
  4. For development projects, **"Owner"** shall mean the developer until the project has been handed over to the DISTRICT, after project closeout.
12. **"Project"** or the **"Work"** shall mean the public improvement to be constructed in whole or part within the boundaries of the DISTRICT.
13. **"Standard Drawings"** shall mean the standard details issued by the DISTRICT for construction of DISTRICT facilities.
14. **"Standard Specifications"** shall mean the current version of the Water Agencies' Standard Specifications for Potable Water, Recycled Water and Sewer Facilities as adopted and published by the member agencies of the Water Agencies' Standards Committee.

## 1.02 LICENSE

- A. The Contractor installing any new facilities or performing work on existing facilities within the DISTRICT shall possess, prior to the start of the Project, a License, defined by the latest edition of the California Contractor's License Law and Reference Book, as:
  1. Class A or C-34 for water pipeline installations.
  2. Class A or C-42 for sewer pipeline installations.
  3. Class A for major water and sewer facilities such as pump stations, reservoirs, and treatment plants.
- B. Any Contractor possessing a license other than a Class A must receive written approval from the DISTRICT prior to initiating the work.



**1.03 OPERATIONS IN PUBLIC RIGHT-OF-WAY**

- A. Work in public right-of-way shall be done in accordance with the requirements of the permit issued by the public agency in whose right-of-way the work is located, in addition to the requirements of the Approved Plans and Standard Specifications. If a permit is not required, the work shall conform to the standards of the public agency involved in addition to conforming to the Approved Plans and Standard Specifications.

**1.04 STORM WATER POLLUTION PREVENTION PLAN (SWPPP) REQUIREMENTS**

- A. The Contractor shall abide by the conditions of the Regional Water Quality Control Board, General Construction Activity Storm Water Permit and the project Storm Water Pollution Prevention Plan (SWPPP).

**1.05 REFERENCE STANDARDS**

- A. The reference standards of the organizations listed below form a part of these Standard Specifications to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise stated.

	<u>AGENCY</u>	<u>ADDRESS</u>
AASHTO	American Association of State Highway and Transportation Officials	444 N. Capital St. Washington, D.C. 20004
ACI	American Concrete Institute	P.O. Box 19150 Detroit, MI 48219
ANSI	American National Standards Institute	1430 Broadway New York, NY 10018
ASA	American Standards Association	70 East 45th Street New York, NY 10017
ASME	American Society of Mechanical Engineers	345 E. 47th Street New York, NY 10017
AISC	American Institute of Steel Construction	130 East Randolph, Chicago, IL 60601
AISI	American Iron and Steel Institute	25 Massachusetts Ave. Washington, DC 20001
ANSI	American National Standards Institute	1899 L Street, Washington, DC 20036

ASTM	American Society for Testing and Materials	1916 Race Street Philadelphia, PA 19103
AWS	American Welding Society	550 N.W. Le Jeune Rd. Miami, FL 33135
AWWA	American Water Works Association, Inc.	6666 W. Quincy Ave. Denver, CO 80235
CAL/ OSHA	State of California Occupational Safety and Health Administration	1006 Fourth Street Sacramento, CA 95814
CFR	Code of Federal Regulations	Office of Federal Register National Archives Administration Washington, D.C. 20408
CRSI	Concrete Reinforcing Steel Institute	228 N. La Salle St. Chicago, IL 60601
CSLB	Contractors State License Board	9821 Business Park Dr. Sacramento, CA 95827
IEEE	Institute of Electrical and Electronics Engineers	445 Hoes Lane, Piscataway, NJ 08854
NACE	National Association of Corrosion Engineers	1440 South Creek Dr. Houston, TX 77084
NFPA	National Fire Protection Agency	Battery March Park Quincy, MA
NSF	National Sanitation 130140 Foundation 48113	P.O. Box Ann Arbor, MI
SSPC	Steel Structures Painting Council	4400 Fifth Ave. Pittsburgh, PA 1521
SSPWC	Standard Specifications for Committee Public Works Construction General (Greenbook)	Joint Cooperative c/o Associated  Contractors of California 1255 Corporate Center Dr., Suite 100 Monterey Park, CA 91754
UBC	Uniform Building Code	International Conference of Building Officials 5360 Workman Mill Rd.

		Whittier, CA 90601
UNI-B	Uni-Bell PVC Pipe Association	2655 Villa Creek Dr., Ste. 155 Dallas, TX 75234
UPC	Uniform Plumbing Code	International Conference of Plumbing and Mechanical Officials 20001 E. Walnut Dr. South Walnut, CA 91789

## 1.06 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

- A. Without limiting the generality of other requirements of the specifications, all Work specified herein shall conform to or exceed the requirements of all applicable codes and the applicable requirements of the following documents to the extent that the provisions of such documents are not in conflict with the requirements of these Specifications nor the applicable codes.
- B. References herein to "Building Code" or UBC shall mean the Uniform Building Code of the International Conference of Building Officials (ICBO). The latest edition of the code as approved and used by the local agency as of the date of award, as adopted by the agency having jurisdiction, shall apply to the Work herein, including all addenda, modifications, amendments, or other lawful changes thereto. The UBC is hereby incorporated in and made a part of these Contract Documents, to the extent of the applicable references thereto.
- C. No provisions of any referenced standard specification, manual or code, whether or not specifically incorporated by reference in the Contract Documents, shall be effective to change the duties and responsibilities of the Owner, Engineer, or Contractor from those set forth in the Contract Documents. Nor shall they be effective to assign to the Engineer any duty of authority to supervise or direct the furnishing or performance of the Work or any duty or authority to undertake responsibility contrary to the provisions of the Contract Documents.
- D. In case of conflict between codes, reference standards, drawings and the other Contract Documents, the most stringent requirements shall govern. All conflict shall be brought to the attention of the Engineer for clarification and directions prior to ordering or providing any materials or labor. The Contractor shall bid the most stringent requirements.
- E. Applicable Standard Specifications: The Contractor shall construct the Work specified herein in accordance with the requirements of the Contract Documents and the referenced portions of those referenced codes, standards, and specifications listed herein.
- F. References herein to "SSPWC" or "Green Book" shall mean "Standard Specifications for Public Works Construction," latest addition, including the County of San Diego Regional Supplement Amendments as applicable to the agency of jurisdiction.

- G. References to "San Diego Regional Standard Drawings" shall mean the San Diego Regional Standard Drawings, latest edition, including all current supplements, regional supplements, addenda, and revisions thereof.
- H. Reference to Standard Specifications or Standard Drawings shall mean the standard specifications or drawings of the District including all current supplements, addenda, and revisions thereof.
- I. References herein to "Cal-OSHA" shall mean State of California, Department of Industrial Relations, Construction Safety Orders, as amended to date, and all changes and amendments thereto which are effective as of the date of construction.
- J. References herein to "OSHA Regulations for Construction" shall mean Title 29, Part 1926, Construction Safety and Health Regulations, Code of Federal Regulations (OSHA), including all changes and amendments thereto.
- K. References herein to "OSHA Standards" shall mean Title 29, Part 1910, Occupational Safety and Health Standards, Code of Federal Regulations (OSHA), including all changes and amendments thereto.

#### **1.07 TRADE NAMES AND ALTERNATIVES**

- A. For convenience in designation in the Contract Documents, materials to be incorporated in the Work may be designated under a trade name or the name of a manufacturer and its catalog information. The use of alternative material which is equivalent in quality and of the required characteristics for the purpose intended will be permitted subject to the following requirements:
  - 5. The burden of proof as to the quality and suitability of such alternative equipment, products or other materials shall be upon the Contractor.
  - 6. The Engineer will be the sole judge as to the comparative quality and suitability of such alternative equipment, product or other materials and its decision shall be final.
- B. Wherever the name or the name and address of a manufacturer or distributor is given in the Contract Documents for a product or other material, or if any other source of a product or material is indicated therefore, such information is given for the convenience of the Contractor only and no limit, restriction or direction is indicated or intended thereby, nor is the accuracy or reliability of such information guaranteed. It shall be the responsibility of the Contractor to determine the accurate identity and location of any such manufacturer, distributor or other source of any product or material called for in the Contract Documents.
- C. The Contractor may offer any material, process or equipment which it considers equivalent to that indicated. Unless otherwise authorized in writing by the Engineer, submission of data substantiating a request for a substitution of "an equal" item shall be submitted after bid opening and prior to 60 days after award of the Contract. The Contractor, at its sole expense, shall furnish data concerning items it has offered as equivalent to those specified. The Contractor shall provide any materials as required by the Engineer to determine that the quality, strength, physical, chemical, or other characteristics, including durability,

finish, efficiency, dimensions, service and suitability are such that the item(s) will fulfill the intended function(s).

- D. Installation and use of a substitute item shall not be made until approved by the Engineer. If a substitute offered by the Contractor is found to be not equivalent to the specified material, the Contractor shall furnish and install the specified material.
- E. The Contractor's attention is further directed to the requirement that its failure to submit data substantiating a request for a substitution of an "equivalent" item within said period prior to and after the award of the contract, shall be deemed to mean that the Contractor intends to furnish one of the specific brand-named products named in the specification, and the Contractor does hereby waive all rights to offer or use substitute products in each such case. Wherever a proposed substitute product has not been submitted within said period, or wherever the submission of a proposed substitute product fails to meet the requirements of the specifications and an acceptable resubmittal is not received by the Engineer within said period, the Contractor shall furnish only one of the products originally named in the Contract Documents.

### **1.08 PROPOSED SUBSTITUTES OR "OR EQUAL" ITEM**

The Contractor shall conform to the requirements of this section and that of Section 00700 General Conditions, Article 9.4, of these Specifications. In the event of a conflict, the requirements of Section 00700 shall take precedence.

- A. Whenever reference to a specific brand name is made in the Contract Documents, it is illustrative and to be construed as a term of specification which describes a component that has been tested or evaluated by the District as best meeting the specific operational, design, performance, maintenance, quality, service and/or reliability standards and requirements of the District, thereby incorporating these requirements by reference within the specifications, and shall be deemed to be followed by the word "or equal." A listing of materials is not intended to be comprehensive, or in order of preference. The Contractor may offer any material, process, or equipment considered to be equivalent to that indicated. Materials, equipment, or service of other suppliers may be accepted if sufficient information is submitted by the Contractor to allow the Engineer to determine that the material or equipment proposed is equivalent or equal to that named, subject to the following requirements:
  - 1. It shall be the sole responsibility of the bidder to provide at bidder's expense any product information, test data and other information the District may require to fully evaluate the acceptability of the offered substitute. Where appropriate, independent testing including destructive testing or evaluation at qualified test facilities at bidder's expense may be required as a condition of acceptance. Exceptions to the foregoing are permissible for procurement for replacement parts, or for testing and evaluation purposes or where compatibility with existing District equipment and/or facilities is mandated.
  - 2. The Engineer will be the sole judge as to the type, function, and quality of any such substitute and the Engineer's decision shall be final.

3. The Engineer may require the Contractor to furnish at the Contractor's expense additional data about the proposed substitute.
  4. The District may require the Contractor to furnish at the Contractor's expense a special performance guarantee or other surety with respect to any substitute.
  5. Acceptance by the Engineer of a substitute item proposed by the Contractor shall not relieve the Contractor of the responsibility for full compliance with the Contract Documents and for adequacy of the substitute.
  6. The Contractor shall be responsible for resultant changes including design and construction changes and all additional costs resulting from the changes which the accepted substitution requires in the Contractor's Work, the Work of its subcontractors and of other Contractors, and shall effect such changes without cost to the District.
- B. The procedure for review of substitution request will include the following:
1. If the Contractor wishes to provide a substitute item, the Contractor shall make written application to the Engineer on the "Substitution Request Form." The substitution request form, along with all descriptive and technical information normally required for an item's approval, shall be submitted to the Engineer following the standard submittal process.
  2. Unless otherwise provided by law or authorized in writing by the Engineer, the "Substitution Request Form(s)" shall be submitted within the thirty-five (35) day period after issuance of the Notice to Proceed.
  3. Wherever a proposed substitute item has not been submitted within said thirty-five (35) day period, or wherever the submission of a proposed substitute material or equipment has been judged to be unacceptable by the Engineer, the Contractor shall provide the material or equipment indicated in the Contract Documents.
  4. The Contractor shall certify that the proposed substitute will adequately perform the functions and achieve the results called for by the general design, and be similar and of equal substance to that indicated, and be suited to the same use as that specified.
  5. The Engineer will evaluate each proposed substitute and respond as to the substitution's acceptability within thirty (30) days of receiving complete information from the Contractor.

6. As applicable, no substitute item shall be ordered, installed or utilized without the Engineer's prior written acceptance of the Contractor's "Substitution Request Form."
  7. The Engineer will record the time required, by the Engineer, in evaluating substitutions proposed by the Contractor and in making changes to the Contract Documents required by the substitution. Whether or not the Engineer accepts a proposed substitute, the Contractor may be required to reimburse the District for the charges of the Engineer for evaluating each proposed substitute at the discretion of the Engineer.
- C. C. The Contractor's application using the "Substitution Request Forms" shall contain the following statements and information which shall be considered by the Engineer in evaluating the proposed substitution:
1. The evaluation and acceptance of the proposed substitute will not prejudice the Contractor's achievement of substantial completion on time.
  2. Whether or not acceptance of the substitute for use in the Work will require a change in any of the Contract Documents to adopt the design to the proposed substitute.
  3. Whether or not incorporation or use of the substitute in connection with the Work is subject to payment of any license fee or royalty.
  4. All variations of the proposed substitute from the items originally specified will be identified.
  5. Documentation which includes experience and qualifications with respect to the ability of the proposed substitute manufacturer or supplier to provide the specified equipment, material, or service.
  6. Available maintenance, repair, and replacement service will be indicated. The manufacturer shall have a local service agency (within 50 miles of the site) which maintains properly trained personnel and adequate spare parts and is able to respond and complete repairs within twenty-four (24) hours.
  7. Itemized estimate of all costs that will result directly or indirectly from acceptance of such substitute, including cost of redesign and claims of other Contractors affected by the resulting change.

## **1.09 ORDER OF PRECEDENCE**

- A. The Approved Plans, together with these Standard Specifications, shall govern the work to be done. Anything indicated in the Standard Specifications but not shown on the Approved

Plans, or shown on the Approved Plans but not indicated in the Standard Specifications, shall be of like effect as though shown or indicated in both. In resolving inconsistencies between the Approved Plans and the various sections of the Standard Specifications, the order of precedence shall be as follows:

1. Change Orders (Fully Executed)
  2. Addenda
  3. CEQA MMRP and/or certified CEQA documents (if applicable)
  4. Permits
  5. Special Conditions
  6. Technical Specifications
  7. Approved Plans (Contract Drawings)
  8. Contract
  9. General Conditions
  10. Instructions to Bidders
  11. Notice Inviting Bids
  12. Contractor's Bid Forms
  13. District Standard Specifications and Drawings
  14. Approved Materials Lists
  15. Standard Specifications for Public Works Construction (Green Book) (Sections 1-9 excluded)
  16. Standard Plans for Public Works Construction
  17. Applicable Local Agency Standards and Specifications
  18. General Specifications (Standard Specifications Section 1)
  19. Reference Documents
- B. Figure dimensions on drawings shall take precedence over scale dimensions. Detailed drawings shall take precedence over general drawings. The Contractor shall immediately notify the DISTRICT if any conflict, inconsistency, omission, error, or ambiguity is discovered between the Approved Plans and the various sections of the Standard Specifications.

## **PART 2 - MATERIALS (NOT USED)**

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION OF APPROVED PLANS, SPECIFICATIONS, AND SITE**

- A. The Contractor shall carefully examine the site of the proposed work, the Approved Drawings, the Specifications, and all other pertinent documents. Contractor shall be



satisfied as to the character, quality, and quantities of work to be furnished, and as to the requirements of the Approved Plans and these Standard Specifications. The DISTRICT will not be liable for any loss sustained by the Contractor as a result of any variance between conditions as shown on the Approved Plans and the actual conditions revealed during the progress of the work or otherwise.

- B. Ascertain suitability of native soil for backfill before submitting bid. If native soil is found to be unsuitable, provide suitable material for meeting compaction requirements at no additional cost to District.
- C. Items furnished shall be capable of fulfilling their intended purpose in environment in which they are installed. Allow for local temperature extremes, climactic conditions and corrosive environments where necessary to ensure proper functioning of furnished products.

### **3.02 QUALITY OF WORK AND MATERIALS**

- A. The work shall be performed in a thorough, worker-like manner in accordance with the Approved Plans and these Standard Specifications. All work shall conform to the lines and grades shown on said plans.
- B. At least one member of the Contractor's workforce who is thoroughly familiar with the specified requirements of work and who is completely trained and experienced in the construction skills necessary for satisfactory completion of the work shall be present at the site, directing the work, at all times.
- C. Adequate number of skilled workers and sufficient and appropriate equipment shall be present at the site prior to commencing daily construction operations.
- D. The Engineer shall inform the Contractor if any person in the employ of the Contractor fails to or refuses to comply with the requirements of these Specifications or appears to the Engineer to be incompetent or unfit, or acts in a disorderly, improper or unsafe manner. It shall be the Contractor's responsibility to dismiss any such person from the work site or take any other action deemed appropriate by the Contractor.
- E. All equipment, materials, and supplies to be incorporated in the work shall be new. All equipment, material and supplies shall be produced in a good and worker-like manner. Materials to be used within the scope of work on the project shall be those listed in the current Approved Materials List. When the quality of a material, process, or article is not specifically set forth in the Approved Materials List, the Approved Plans, or the Specifications, the best available quality of the material, process, or article shall be provided.
- F. The Contractor may offer as substitution any material, process, or article substantially equal or better in every respect to that so indicated or specified; provided, however, that if the material, process, or article offered by the Contractor is not, in the opinion of the DISTRICT, substantially equal or better in every respect to that specified, then the Contractor must furnish the material, process, or article specified or one that in the opinion of the DISTRICT is substantially equal or better in every respect.

- G. Carefully lay out work in advance to minimize cutting, channeling, chasing or drilling of structural pads or elements. Cuts, channeling, drilling, or welding required to accommodate mechanical or electrical equipment shall be reviewed in advance with DISTRICT. Do not begin such work until notified by DISTRICT. Repair damage to structures, piping equipment or finishes using skilled workers of appropriate trades.
- H. Relocations or adjustment of existing facilities needed to facilitate construction must be approved in writing by the DISTRICT and subsequently relocated or adjusted by the Contractor as directed. If existing items are lost or damaged during construction, replace with new items of equal or better quality.
- I. Make field measurements needed to fabricate and install Work before ordering or beginning work. Make minor changes in alignments and dimensions as needed to remedy or avoid utilities and structural conflicts.
- J. Install products according to manufacturer's installation and warranty requirements. Manufacturers requirements for installation, application, connection, erection, maintenance, operating, cleaning, conditioning and startup of products shall be strictly followed.
- K. Products shall be installed by the Contractor at the location shown on the Plans and Submittals.
- L. Install products to tolerances recommended by manufacturer. Unless otherwise shown, install equipment true and level, using precision gauges and levels.
- M. Refer variances between manufacturer's installation instructions and Contract Documents to the DISTRICT.
- N. Construct walls, floors and flatwork plumb, straight, level, square and true. Acceptable deviations from plumb or level shall not exceed 1/4 inch in any 32 inch section. Flatwork shall not deviate from plan elevation by more than 3/4 inch at any location.
- O. Welds, unless otherwise shown, shall be continuous, watertight, and conforming to Structural Welding Code of American Welding Society. Welds shall be free of sharp points or edges.
- P. Exposed surfaces shall be finished in appearance. Grind smooth exposed welds. Round or chamfer corners of exposed structural shapes for personnel protection.
- Q. Roofing systems shall be leak free, demonstrated by a 1-hour hose test.
- R. Prime and paint exposed surfaces of ferrous products, piping, and conduit except for stainless steel or galvanized or sherardized surfaces or unless otherwise shown. Clean painted surfaces and touch up bare or marred spots with finish to match factory finish.
- S. Paint and coat in workmanlike manner so as to produce an even film of uniform thickness. Pay attention to edges, angles, flanges, corners, crevices, and joints to ensure that they have been thoroughly cleaned and that they receive specified thickness of paint or coating. Finished surfaces shall be free from runs, drops, ridges, waves, shiners, laps, brush marks, and variations in color, texture and finish. The finish shall be so complete that addition of

another coat would not increase the finish. Apply coats so as to produce film of uniform thickness.

- T. Repair damage to work that is not cause for rejection.
- U. Repair, correct or replace Work failing tests or inspection. Repeat tests until results satisfy specifications. Repair damages resulting from tests.
- V. Furnish mounts, guides, bearing plates, flanges, anchor and attachment bolts and screws, saddles, supports, pads and skids necessary to securely mount products and equipment.
- W. Tighten bolts to manufacturers' specifications using torque wrenches. Unless otherwise directed, use lubricant such as Copperkote when making up bolts.
- X. Manufacturer's instructions and warranty requirements for installation, application, connection, erection, maintenance, operating, cleaning and conditioning of products shall be strictly followed.

### **3.03 MATERIALS**

- A. All materials shall be new and unused, of the quality defined in these Standard Specifications, selected from the Approved Materials List, and approved by the DISTRICT Engineer. All materials to be used within a specific project and intended for equivalent uses shall be identical as to manufacturer and model number. Materials not identical as to manufacturer and model number to those approved by the DISTRICT Engineer, materials that are damaged, or materials that are otherwise unacceptable to the DISTRICT Engineer shall be rejected and immediately removed from the job site.
- B. All materials shall be of the makes and models tested and approved for use. Selections shall be made from the current Approved Materials List. It is the Contractor's responsibility to verify that materials received for the job conform to the current Approved Materials List.
- C. Products on the Approved Materials List may be disqualified at any time if the quality of the product is no longer judged as acceptable by the Engineer or if a higher-quality product becomes available.
- D. Job-specific approval of materials not shown on the Approved Materials List is solely at the discretion of the DISTRICT Engineer, and materials so approved shall not be construed as approved for general use. For job-specific consideration of materials not shown on the Approved Materials List, the shop drawing procedures outlined in the standard specifications shall be followed.
- E. Products and workmanship shall match Contractor's submittals as reviewed by DISTRICT's Representative.
- F. Connections and mountings required to install products shall comply with connections and mountings shown in the Contract Documents and Submittals on a location-specific basis. Do not assume that approval of connections or mountings at a specific location constitutes approval of same at all locations.

- G. Materials and materials sources shall be reviewed by DISTRICT at least three days before use of materials in Work. However, information for materials and materials sources shall be submitted in accordance with Section 01300 of these Specifications.
- H. Conform to federal, state and local regulations governing VOC content, percentage solids by volume, and other paint and solvent properties.
- I. Similar items on project shall be products of same manufacturer.
- J. Corresponding parts of identical products shall be interchangeable.
- K. Materials for a complete paint or sealant system, including primer, finish coats, thinners, cleaners and drying agents, and other additives shall be the end products of one manufacturer to ensure product compatibility and unit responsibility.
- L. Design and fabrication of products shall ensure products withstand stresses and loads which may occur during testing, installation, start-up and normal operation.

### **3.04 DELIVERY, STORAGE AND HANDLING**

- A. Deliver products to jobsite in manufacturer's original, unopened, labeled packaging. Tag or label packages as needed to identify contents and name of the equipment.
- B. Only products of approved manufacturers shall be delivered and stored at the site.
- C. Store materials in a protected area at a temperature between 35°F and 110°F.
- D. Store products so as to preserve their quality and fitness for the Work. All products and equipment to be incorporated in the Work shall be available for prompt inspection. Contractor shall be responsible for damage or loss to products until Final Acceptance.
- E. Protect products against moisture, extreme temperatures, dust, debris, tampering, vandalism, ultraviolet radiation, or damage from improper handling, storage, or exposure to adverse elements. Protect exposed metals from rust and corrosion even though they will be sandblasted or otherwise cleaned before painting.
- F. Openings on valves and equipment shall be covered, plugged or capped.
- G. Stringing of pipe along right of way shall be done in a manner that will not interfere with free passage of vehicles and shall only be allowed if approved by the agency having jurisdiction.
- H. Store items not designed for outdoor exposure off ground and under cover.
- I. Handle products with care and using proper equipment according to manufacturer's recommendations. Lift large heavy items only at points designated by manufacturer. Do not drop, drag, bump or handle products in manner that causes bruises, cracks, scratches or other damage. Use padded slings and hooks for lifting as needed to prevent damage. Improper handling shall be cause to reject mishandled products.

- J. Inspect each product item for damage, defects, completeness and correct operation before installing.
- K. Notify DISTRICT in writing if delivered or stored product is damaged. Exterior surfaces of delivered items shall be in perfect unblemished condition. Do not repair damaged products without prior written approval.
- L. Maintain records for DISTRICT's review of deliveries to show Contractor's order number, purchase order number and equipment number. Include labeling or shipping tag in records.

### **3.05 HOURS OF WORK**

- A. CONTRACTOR shall conduct all Work in accordance with the provisions as directed by the local Jurisdiction that the project is located in.
- B. Exceptions to this Work schedule shall be only as approved in writing by the said Jurisdiction.
- C. CONTRACTOR shall obtain special permission from City and DISTRICT to work on City or DISTRICT holidays.
- D. Hours of work shall be 7:30 A.M. to 4:30 P.M. Overtime and shift work may be established as short-term procedure by Contractor with written notice to and written permission from Owner. No work other than overtime and shift work approved by Owner shall be done between the hours of 4:30 P.M. and 7:30 A.M., nor on Saturdays, Sundays, or Owner recognized holidays, except such work as is necessary for the proper care and protection of the Work already performed, except in case of emergency, and as specified herein. The Owner recognized holidays are as follows:
  - New Year's Day
  - Martin Luther King Jr. Day
  - President's Day
  - Memorial Day
  - Independence Day
  - GM Holiday (TBD)
  - Labor Day
  - Veteran's Day
  - Thanksgiving Day
  - Day after Thanksgiving Day
  - Christmas Day

### **3.06 CONTRACTOR WORK AREA**

- A. The use of the project area will not be available beyond the limits of the project site as identified on the drawings or in accordance with approved traffic control permits. The CONTRACTOR must operate entirely within the limits of the project site. No equipment or materials may be parked or stockpiled outside the project site or CONTRACTOR staging areas. The CONTRACTOR is responsible for locating and securing legal storage and staging areas. The CONTRACTOR shall provide a storage and staging plan to the DISTRICT, including written permission from legal owner of property stating they are allowing the CONTRACTOR to use their property.

- B. It shall be understood that responsibility for protection and safekeeping of equipment and materials on or near the site will be entirely that of the CONTRACTOR and that no claim shall be made against the DISTRICT or authorized representatives by reason of any act. It shall be further understood that should any occasion arise necessitating access to the sites occupied by these stored materials or equipment, the Engineer shall direct the CONTRACTOR owning or responsible for the stored materials and equipment to immediately move the same. No materials or equipment may be placed upon the property of the DISTRICT other than the designated areas on the Drawings unless the DISTRICT has agreed to the location contemplated by the CONTRACTOR to be used for storage.

### **3.07 INDEMNIFICATION**

- A. CONTRACTOR hereby releases and agrees to indemnify, defend, hold harmless the DISTRICT for any and all damage to persons or property or wrongful death regardless of whether or not such claim, damage, loss or expense is caused in whole or in part by the negligence, active or passive, of the DISTRICT, excepting only the sole negligence of DISTRICT to the fullest extent permitted by law. Such indemnification shall extend to all claims, demands, actions, or liability for injuries, death or damages occurring after completion of the project, as well as during the work's progress. CONTRACTOR further agrees that it shall accomplish the above at its own cost, expense and risk exclusive of and regardless of any applicable insurance policy or position taken by any insurance company regarding coverage.
- B. CONTRACTOR shall defend, indemnify and hold the DISTRICT, harmless against any and all claims by any parties arising from, or related to, any and all damages, including legal costs and attorney's fees, resulting from interference with, interruption of, damage to, or any and all injuries which result from damage caused to subsurface installation, which is unforeseen, excepting only the sole negligence of DISTRICT to the fullest extent permitted by law.

### **3.08 JOB SAFETY AND HEALTH REGULATIONS**

- A. CONTRACTOR acknowledges responsibility for job-site safety and acknowledges that the Engineer will not have any such responsibility. To the fullest extent permitted by law the CONTRACTOR shall indemnify, defend and hold harmless DISTRICT from and against all claims, damages, losses and expenses, including but not limited to attorney fees and claim costs, arising out of or resulting from performance of work by the CONTRACTOR, its subcontractors, or their agents and employees, which results in damage to persons or property including wrongful death regardless of whether or not such claim, damage, loss or expense is caused in whole or in part by the negligence, active or passive, of DISTRICT, excepting only the sole negligence of DISTRICT.
- B. All necessary machinery guards, railings, and other protective devices shall be provided as specified and/or required by the State of California Division of Industrial Safety and the Occupational Safety and Health Administration. It is accepted that all fabricators, electrical and machinery manufacturers and other equipment suppliers are conversant with such regulations and they shall be responsible for the industrial safety aspects of such equipment. All equipment shall comply with all rules and regulations of the Safety Orders of the State of California Division of Industrial Safety and all local building, plumbing,

and electrical codes and ordinances. Safety guards shall be easily removed to permit inspection, removal and repair of the moving parts.

- C. The Contractor shall comply with Safety and Health Regulations for Construction, promulgated by the Secretary Standards Act, as set forth in Title 9 C.F.R. Copies of these regulations may be obtained from Labor Building, 14th and Constitution Avenue NW, Washington, DC 20013.
- D. The Contractor shall also comply with the provisions of the Federal Occupational Safety and Health Act, as amended, and with all applicable State of California, Department of Industrial Relations, Construction Safety Orders (Cal-OSHA) requirements.

### **3.09 INSPECTION**

- A. Notify DISTRICT of time and place of shop tests five working days before they begin. Complete manufacturing operations, checks, adjustments, and tests before factory inspection.
- B. The DISTRICT REPRESENTATIVE will inspect products after delivery and throughout construction process. Products will be subject to rejection at any time on account of failure to meet Contract Documents even though samples may have been accepted as satisfactory at place of manufacture.
- C. Before backfilling, request inspection by the Engineer to verify proper installation of buried work.
- D. Before finishing, request inspection by the DISTRICT REPRESENTATIVE to verify that no surfaces to receive product have defects or errors which could result in poor or potentially defective application or cause latent defects in workmanship.

### **3.10 FIELD QUALITY CONTROL**

- A. Maintain complete set of Contract Documents at jobsite field office or superintendent's truck at all times.
- B. Frequency of sampling and testing shall be as shown and shall be performed at such other times as necessary to document contract compliance.
- C. Notify the Engineer and regulating authorities three days before field tests.
- D. Perform field tests in presence of the Engineer who will record results.
- E. Repair damage to work that is not cause for rejection.
- F. Repair, correct or replace work failing tests or inspection. Repeat tests until results satisfy specifications. Repair damages resulting from tests.

### **3.11 TESTING LABORATORY SERVICES**

- A. Where required by these specifications, the DISTRICT will hire an independent laboratory to perform testing and certify results. The Contractor shall provide labor, products, tools, instruments, water, and power as directed for sampling for required tests.
- B. Tests of products shall follow commonly recognized standards of national technical organizations and specified sampling and testing methods.
- C. The DISTRICT shall pay for all passing tests, the contractor shall pay for all failing tests, for quality assurance testing unless otherwise shown.
- D. DISTRICT may test representative samples of each type and size of product furnished. Failure of samples to pass tests will be deemed sufficient cause to reject entire lot delivered.

### **3.12 CONSTRUCTION STAKING AND PRESERVATION OF MONUMENTS**

- A. Staking of the various public improvements required shall be performed by the Contractor's surveyor. Generally, stakes for alignment and grade shall be set at 25' intervals. The survey shall conform to the lines, grades, and dimensions shown on the Approved Plans and shall be conducted by a surveyor licensed in the State of California. The DISTRICT shall give an account of the adequacy, readability, and frequency of the stakes provided and shall comment on any remedies required.
- B. The Contractor shall preserve all monuments, benchmarks, survey marks, and stakes. In case of their removal or destruction by Contractor or its employees, agents or subcontractors, the Contractor shall be liable for the cost of their replacement.

### **3.13 ENVIRONMENTAL CONTROL**

- A. The Contractor shall abide by all applicable local, state, and federal regulations, and by the conditions of the Regional Water Quality Control Board.
- B. The Contractor shall provide effective measures where necessary to prevent operations from producing dust in an amount damaging to property or causing a nuisance as determined by the DISTRICT. The Contractor shall be responsible for any damage due to dust originating from its operations.
- C. The Contractor shall anticipate and correct any erosion problem arising from its operations.

### **3.14 CONNECTIONS TO EXISTING FACILITIES**

- A. Perform all construction necessary to complete connections and tie-ins to existing facilities under DISTRICT observation.
- B. Keep existing facilities in operation, unless otherwise specifically permitted in these Specifications or approved by the DISTRICT.
- C. CONTRACTOR shall perform all construction activities so as to avoid interference with operations of the facility and the work of others.



- D. CONTRACTOR shall provide sub-surface investigations for locating and field verifying all existing piping, structures and equipment affected by the work. All sub-surface investigations shall be performed by the CONTRACTOR at no additional cost to the DISTRICT. Delays in the work, as a result of insufficient sub surface investigations, will be solely the CONTRACTOR'S responsibility. No time extensions will be allowed for work that is delayed as a result of insufficient sub-surface investigations and field verification.
- E. Insofar as possible, all equipment shall be tested and in operating condition before the final tie-ins are made to connect equipment to the existing facility.
- F. CONTRACTOR shall carefully coordinate all work and schedules and shall provide DISTRICT written requests for all shutdowns in advance of the proposed shutdown for review and approval by the DISTRICT in accordance with DISTRICT System Shutdown Request procedures.
- G. Submit detailed schedule of proposed connections, disconnections, and reconnections, including laterals, listing sequence and durations of all activities including shutdowns and tie-ins. The detailed schedule must be submitted by the CONTRACTOR and approved by the DISTRICT prior to submitting System Shutdown Request(s).

### **3.15 PROTECTION OF LANDSCAPING**

- A. The Contractor shall be responsible for the protection of all trees, shrubs, fences, and other landscape items adjacent to or within the work area, unless specific removals are indicated on the Approved Plans.
- B. In the event of damage to landscape items, including the thickness of topsoil, the Contractor shall replace the damaged items in kind, in a manner satisfactory to the DISTRICT and the Developer.
- C. When pipelines are proposed within planted or otherwise improved areas in public or private easements, the Contractor shall restore such areas to original condition after completion of the work.
- D. When pipelines are proposed within unimproved areas, the ground surface shall be dressed smooth to the contour of the original ground and left in a neat, presentable condition, free of cleared vegetation, rubbish and other construction wastes. Rocks and clumps that cannot be readily covered by spreading shall be hauled away and disposed of by the Contractor.
- E. Unimproved areas disturbed during construction of the pipeline shall be hydro seeded in accordance with these Standard Specifications.

### **3.16 PROTECTION OF PAVEMENT SURFACES**

- A. The CONTRACTOR shall exercise all necessary precautions so as not to damage any existing pavement surfaces. All paved areas including asphaltic concrete berms cut or damaged during construction shall be restored or replaced in accordance with the standard specifications.

**3.17 PUBLIC UTILITIES**

- A. In case it should be necessary to relocate or temporarily maintain the property of any public utility or any other property, and it is understood that the cost of such relocation or temporary maintenance is not required to be borne by the owner of the utility or property, the Contractor shall bear all expenses incidental to the removal or temporary maintenance of such property in a manner satisfactory to said owner. It is understood that in such cases, the utility or property owner has the option of doing such work with his or her own forces or permitting the work to be performed by the Contractor.
- B. The right is reserved to the State, County, City, DISTRICT, or utility owners to enter at any time upon any street, alley, right of way or easement for the purpose of making changes for maintenance or repairs to their property necessitated by the Contractor's work.

**3.18 UTILITIES CROSSING WATER, RECYCLED WATER OR SEWER FACILITIES**

- A. Wherever new utilities cross under or over water, recycled water or sewer facilities, the minimum vertical separation shall be 300mm (12”) unless otherwise approved by the DISTRICT Engineer. All new utilities crossing under or over water, recycled water or sewer facilities shall remain exposed until inspected and approved by the DISTRICT Engineer. Wherever new utilities cross under or over water, recycled water or sewer facilities, backfill and compaction within the limits of the water, recycled water, or sewer facility trench width shall be in strict conformance with the backfill and compaction requirements specified herein.

**3.19 HORIZONTAL SEPARATION OF UTILITIES PARALLELING WATER, RECYCLED WATER OR SEWER FACILITIES**

- A. Wherever new utilities parallel water, recycled water or sewer facilities, the minimum horizontal separation shall be such that 900mm (36”) of undisturbed soil separates adjacent trench edges, unless otherwise approved by the DISTRICT Engineer.

**3.20 WATER AND POWER FOR CONSTRUCTION PURPOSES**

- A. Water for construction purposes:
  - 1. All water used on the project shall be obtained from DISTRICT’s sources using a construction meter.
  - 2. The construction meter and service connection shall be obtained from the DISTRICT. The Contractor shall make arrangements with the DISTRICT for payment of the deposit and installation of the meter.
  - 3. The Contractor shall pay for all construction water used in accordance with DISTRICT’s Rules and Regulations.
  - 4. Damage caused to the meter will be charged to the Contractor.
  - 5. Water for construction purposes outside the DISTRICT’s service area shall be obtained from the DISTRICT within which the project lies.

- B. Contractor shall make all arrangements for electrical power required during construction.

### **3.21 HAZARDOUS WASTE AND UNKNOWN PHYSICAL CONDITIONS**

- A. If conditions listed below are found during construction, or if any other conditions are found during construction that may be detrimental to the DISTRICT's facilities being constructed, or to the health and safety of the public, the Contractor shall promptly notify the DISTRICT.
- B. Material that the Contractor or Engineer believes may be hazardous waste, as defined in Section 25117 of the Health and Safety Code and is thus required to be removed to a Class I, Class II, or Class III disposal site in accordance with the provisions of existing law. If such material is discovered, Contractor shall immediately cease work and shall not disturb the job site except as required to protect public safety.
- C. Subsurface or latent physical conditions at the site differing from those indicated.
- D. Unknown physical conditions at the site of any unusual nature, different materially from those ordinarily encountered and generally recognized as inherent in work of the character provided in the Contract.
- E. The Contractor shall promptly inform the DISTRICT of any such conditions found during construction. The DISTRICT shall investigate the conditions, and if it finds that the conditions do materially differ from those shown or expected, or do involve material that may be hazardous waste, Contractor shall cease work in the impacted area. If material that may be hazardous waste is discovered, the Developer shall ensure that the appropriate government agencies are contacted prior to any further work being performed and that a solution is implemented.

### **3.22 WORK TO BE DONE**

- A. The work to be done consists of furnishing all materials, equipment, labor and all other items necessary for the construction and installation of a complete facility as shown on the Approved Plans and in accordance with these Standard Specifications. In some instances, the DISTRICT may furnish certain materials and services, which will be expressly called out on the Approved Plans.
- B. The DISTRICT's approval of the plans prepared by a Private Engineer denotes agreement with the plans as prepared and is not an acceptance of responsibility as to accuracy. The Private Engineer shall be responsible for any errors, coordination with other agencies/utilities and interpretation of plans. The intent is that the completed Work shall be in general conformance with the Approved Plans and in accordance with the requirements of these Standard Specifications.

### **3.23 CHANGES TO THE WORK**

- A. If the DISTRICT, due to conditions that change during the progress of the work, determines it impracticable for the Contractor to strictly comply with the Approved Plans or the Standard Specifications, the DISTRICT may prescribe a modification of requirements. The DISTRICT may at any time during the life of the project, by written order, make such

changes as it may find necessary in the design, line, grade, form, location, dimensions, plan or material of any part of the work originally specified or shown on the Approved Plans.

- B. If such changes increase the cost of material, or work to be performed, the difference in cost shall be borne by the Developer. All changes so performed shall be at no cost to the DISTRICT.
- C. The DISTRICT shall provide written authorization for all changes to the work.
- D. The following procedure shall be followed for revisions or changes to the Approved Plans:
  - 1. Prints showing proposed changes shall be submitted to the DISTRICT for review and approval.
  - 2. If the changes will require an increase in bond amount, plans will be held until a new estimate has been prepared and a new bond has been placed with the DISTRICT.
  - 3. If the changes do not affect the bonding amount, as determined by the DISTRICT Engineer, the plans shall be reviewed and upon approval, the Private Engineer shall be notified to make the corrections on the original drawings. A print of the revised plan shall then be submitted to the DISTRICT for final checking and approval. A signature block shall be added to the plans to indicate approval of changes made.
  - 4. After these steps have been taken, the Contractor may proceed with the revised construction.

### **3.24 RECORD DRAWINGS**

- A. During the course of the work, the Contractor shall keep accurate legible, and updated records of the changes made to the work. The changes may be dictated by field conditions, unknown obstructions, design oversight, or other circumstances determined to be in the best interest of the DISTRICT.
- B. Refer to Specification Section 01720 Record Documents for additional detail.

### **3.25 CLEANING DURING CONSTRUCTION**

- A. Requirements of Regulatory Agencies:
  - 1. In addition to the requirements herein, the CONTRACTOR shall maintain the cleanliness of the work and surrounding premises within the work limits so as to comply with federal, state, and local fire and safety laws, ordinances, codes and regulations.
  - 2. The CONTRACTOR shall comply with all federal, state and local anti-pollution laws, ordinances, codes and regulations when disposing of waste materials, debris and rubbish.
- B. Scheduling of Cleaning and Disposal Operations:
  - 1. The CONTRACTOR shall schedule all clean-up and disposal operations so that dust, wash water or other contaminants generated during such operations do not damage or mar painted or finished surfaces.

2. The CONTRACTOR shall prevent accumulation of dust, dirt, debris, rubbish and waste materials on or within the work or on the premises surrounding the work.
- C. Waste Disposal:
1. The CONTRACTOR shall legally dispose of all waste materials, surplus materials, debris and rubbish off the site.
  2. The CONTRACTOR shall not burn or bury rubbish and waste materials on site.
  3. The CONTRACTOR shall not dispose of volatile or hazardous wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains.
  4. The CONTRACTOR shall not discharge wastes into streams or waterways.
- D. Materials:
1. The CONTRACTOR shall use only cleaning materials recommended by manufacturer of surface to be cleaned.
  2. The CONTRACTOR shall use each type of cleaning material on only those surfaces recommended by the cleaning material manufacturer.
  3. The CONTRACTOR shall use only materials, which will not create hazards to health or property.
- E. Maintain areas covered by Contract, adjacent properties, and public access roads. Keep these areas free from waste, debris and rubbish caused by construction.
- F. Sweep streets daily using self-loading motor sweeper with spray nozzles. If streets are kept clean, a lesser frequency may be approved by DISTRICT.
- G. Conduct cleaning and disposal to comply with local ordinances and antipollution laws. Contractor shall obtain a NPDES permit as required by the DISTRICT Standard Specifications and Drawings.
- H. Provide containers for collection and disposal of waste materials, debris, and rubbish.
- I. Clean public access roads to site. Remove material falling from haul trucks.
- J. Clean up and Dust Control. Throughout all phases of construction, including suspension of work, and until final acceptance, the CONTRACTOR shall keep the site clean and free from rubbish and debris. The CONTRACTOR shall also abate dust nuisance by cleaning, sweeping and sprinkling with water, or other means as necessary. The use of water resulting in mud on public streets will not be permitted as a substitute for sweeping or other methods.
- K. The CONTRACTOR shall furnish and operate a motorized vacuum sweeper with spray nozzles at least once each workday for the purposes of keeping paved areas acceptably clean wherever construction activity, including restoration, is incomplete.

### 3.26 SCHEDULING OF CLEANING AND DISPOSAL OPERATIONS

- B. The Contractor shall schedule cleaning and disposal operations to prevent the accumulation of dust, debris or waste materials on or within the Work or the premises surrounding the Work.
- C. The Contractor shall schedule all cleaning and disposal operations so that dust, wash water or other contaminants generated during such operations do not damage or mar finished surfaces.
- D. The Contractor shall perform the following during construction:
  - 1. Keep the Work and the areas within the project limits free of accumulations of dust, waste materials, debris and rubbish.
  - 2. Keep exposed soil areas wetted down to prevent the generation of dust.
  - 3. Provide suitable containers for the storage of waste materials and debris.
  - 4. Dispose of waste and debris off site at legal disposal areas.
- E. The Contractor shall perform the following upon project completion and shall continue cleaning operations until final acceptance of the project by the District:
  - 1. Remove and dispose of all excess or waste materials, debris, rubbish, and remove temporary facilities from the site.
  - 2. Repair pavements, roads, hardscape, sod and all other improved or unimproved areas affected by construction operations to restore them to their original condition or to the minimum condition specified.
  - 3. Remove spatter, grease, stains, fingerprints, dirt, dust, labels, packing materials and other foreign items from interior and exterior surfaces, equipment, signs and lettering.
  - 4. Repair, patch and touch up chipped, scratched, dented or otherwise marred surfaces to match the specified finish.
  - 5. Remove paint, clean and restore all equipment and material nameplates, labels and other identification markings.
  - 6. Wash and shine glazing and polished surfaces and clean all floors, slabs, pavements and ground surfaces.

### 3.27 FINAL CLEANING

- A. Restore construction areas to preconstruction conditions after completion of Work and prior to final inspection.
- B. Repair pavement, roads, sod, and all other areas affected by construction operations and restore them to original condition or to minimum condition specified by the DISTRICT.

- C. Restore lines and grades of areas used for earthwork storage.
- D. Clean, sweep, and wash Work and equipment including finishes.
- E. Remove grease, dust, dirt, stains, labels, fingerprints and foreign materials from sight-exposed interior and exterior finished surfaces. Polish surfaces so designated.
- F. Repair, patch and touch up marred surfaces to specified finish to match adjacent surfaces.
- G. Broom-clean paved surfaces.
- H. Rake-clean other surfaces of grounds.
- I. Remove from DISTRICT's property temporary structures and materials, equipment and appurtenances not required as part of, or appurtenant to, completed Work.
- J. After Work is complete, loose concrete, lumber, wire, aggregate or rock piles, reinforcing bars, rubbish, debris and materials not incorporated in Work shall be removed from the site. Remove excess pointing mortar materials and other debris within pipes.
- K. The CONTRACTOR shall maintain cleaning until acceptance and occupation by DISTRICT.

### **3.28 PROJECT CLOSEOUT AND FINAL ACCEPTANCE**

- A. The DISTRICT's Board of Directors or designee shall be responsible for final acceptance of all projects. The following items of work shall be completed prior to final acceptance by DISTRICT:
  - 1. The project has been completed in accordance with the Approved Plans, the job specifications and these Standard Specifications.
  - 2. Final inspection has been performed by DISTRICT. Any "punch list" items generated by preliminary inspection shall have been completed.
  - 3. Record drawings reflecting any changes to the project have been submitted to the DISTRICT's Inspection Department in accordance with these Standard Specifications.
  - 4. A Soils Test Report has been submitted to the DISTRICT in accordance with Section 02223 of these Standard Specifications.
  - 5. All costs and fees relevant to the work have been paid to DISTRICT by the Developer.
  - 6. All aspects of the Construction Agreement have been completed to the satisfaction of the DISTRICT.
- B. Valve box cover elevations are not shown on drawings. Determine and set cover elevations in field so that finished rim elevations are flush with finished pavement where directed by DISTRICT.
- C. Spare parts required shall be delivered in manufacturer's original containers labeled to completely describe contents and equipment for which it is furnished.

- D. Following final acceptance by the DISTRICT, the DISTRICT will prepare a Notice of Completion and will have such Notice recorded by the County Recorder.
- E. Refer to Specification Section 01700 Project Closeout for additional detailed closeout procedures.

### **3.29 WARRANTY**

- A. One year warranty inspection shall be conducted prior to release of bonds. Any work failing to comply with specifications or performance standards stated in manufacturers submittals or printed promotional literature will at that time be tagged as defective and scheduled for repair. Repair all defective work in strict accordance with the Contract Documents and to the satisfaction of the DISTRICT.
  - 1. DISTRICT will establish inspection date and will notify Contractor at least 30 days in advance.
  - 2. Warranty Inspection Report will be prepared by DISTRICT and delivered to Contractor. It will set forth the number and type of failures observed and the names of persons making the inspection.
  - 3. Repairs shall proceed promptly. Upon completion of inspection and receipt of Inspection Report, DISTRICT will establish a date for Contractor to proceed with remedial Work. Delay on the part of the Contractor to proceed with remedial work on schedule shall constitute a breach of this Contract. In such case, DISTRICT may proceed to have defects remedied as outlined in Contract Documents.
- B. Costs of warranty inspection and repair shall be borne by Contractor, who shall include an appropriate amount for testing and repair in his bid. No additional allowance will be paid by DISTRICT for Warranty Inspection and repairs.
- C. The work shall be guaranteed against failure due to defective materials or workmanship for a period of one (1) year from the recording date of the Notice of Completion. The one-year warranty period shall not, in any way, affect the liability of any party for latent or patent defects allowed for under State law.
- D. All repairs shall be made pursuant to the Development Agreement with the DISTRICT and in accordance with the DISTRICT's Rules and Regulations and current Standard Specifications.

### **3.30 WARRANTY INSPECTION**

- A. The DISTRICT will perform a warranty inspection prior to the expiration of the one-year warranty period. The CONTRACTOR will be notified in writing of any deficiencies revealed by this inspection. The warranty bond will not be released until the required repairs are completed. If the warranty inspection is satisfactory, the DISTRICT will release the warranty bond at the end of the one-year warranty period.

**END OF SECTION**



**SECTION 01043****COORDINATION WITH DISTRICT OPERATIONS****PART 1 - GENERAL****1.01 DESCRIPTION**

- A. This section describes the requirements for coordination with the District for the construction of the work including requirements for developing a construction sequence and schedule, coordinating and scheduling all work involving interruption of service to District facilities or other public facilities, and maintaining service to existing facilities or systems as required.

**1.02 ORDER OF THE WORK**

- A. The work shall be carried on at such places on the project and in such order or precedence as may be found necessary by the Engineer to expedite the completion of the project. After work has begun on any portion, heading, or designated part of the project, it shall be carried forward to its final completion.

**1.03 SHUTDOWNS**

- A. Proposed shutdowns of existing public water mains must be indicated on the Contractor's construction schedule. All valve operations required for shutdowns are to be performed by District Staff. Shutdowns are subject to some flow-by through closed valves that may require the Contractor to manage some nuisance water during the required tie-ins.
1. Follow phasing as described in contract plans
  2. All water shutdowns/outages must be scheduled to take place on Wednesdays, contractor will be responsible to plan their work accordingly.
- B. Proposed shutdowns of existing private water service connections must be indicated on the Contractor's construction schedule. Shutdowns of individual properties are limited to a single shutdown of a maximum 2-hour duration and are to be arranged with each private property owner at a mutually convenient time. Refer to Section 01015 and 15041 for special provisions applicable to connections, flushing, testing, and disinfection of the new service laterals.
- C. The Contractor shall make specific written requests for all shutdowns fourteen (14) calendar days in advance of the proposed shutdown. The written request shall include an approved detailed plan of the Contractor's proposed activities including schedule, manpower, equipment, materials, methods, sequence, and the estimated shutdown duration which will be utilized to perform the required work during the proposed shutdown. The Contractor shall revise the proposed plan to the satisfaction of the District if, in the opinion of the District, the Contractor's proposed plan is insufficient to demonstrate that the proposed work can be successfully completed during the shutdown period.

**1.04 CONSTRUCTION SEQUENCE**

- A. Work under the Contract shall be scheduled and performed in such a manner as to result in the least possible disruption to the operation of the existing facilities. At the sole discretion of the Engineer, deviation from the proposed sequence may be permitted if an alternate sequence or techniques and methods proposed by the Contractor will reduce the durations of service interruptions or will improve the operation of the existing system upon the concurrence of the Engineer.
- B. The Contractor shall coordinate all connections to existing mains and/or water meters with the District. The Contractor shall install all highline piping necessary, at no additional cost, to maintain continuity of service where service interruptions will exceed 8 hours in duration unless otherwise approved by the District. If temporary highlines are not specified or shown on the Drawings, but will be required based on the Contractor's means and methods of construction and the estimated duration of the shutdown, then the Contractor shall prepare and submit a plan for the proposed highlining in accordance with Section 01300.
- C. The Contractor shall adhere to the following general construction phasing guidelines, in order of precedence, for the performance of the Work. Deviations from these guidelines shall be submitted to the Engineer per Section 01300 and shall not be carried out until written approval is obtained by the Contractor from the Engineer.
  - 1. Secure permits and approvals from agencies which have jurisdiction over the Work area.
  - 2. Conduct surveys, construction staking, and request utility mark-outs. Pothole all existing utilities that cross or parallel (within 5 feet horizontally) the proposed centerline of construction or outermost limits of new structures, including connection points to existing pipelines. Provide potholing results to the District and advise the District of any discrepancies at connection points, or at crossing or paralleling utilities.
  - 3. Restore public and private improvements damaged by the Contractor's operations and restore fully the site to the condition existing prior to the start of work.

**END OF SECTION**

## **SECTION 01201**

### **PRECONSTRUCTION CONFERENCE**

#### **PART 1 – GENERAL**

##### **1.01 DESCRIPTION**

- A. A Preconstruction Conference will be held after execution of the Contract and prior to the start of construction. The District will fix the date, time and location of the meeting in accordance with requirements of the General Conditions.
- B. The Resident Engineer or Construction Manager shall prepare agenda, preside at meeting, and prepare and distribute a transcript of proceedings to all parties.
- C. The Contractor shall provide data required, contribute appropriate items for discussion and be prepared to discuss the agenda items. Shop drawings shall be submitted following the Notice to Proceed (NTP).

##### **1.02 REQUIRED ATTENDANCE**

- A. Contractor and major Subcontractors.
- B. District Representative.
- C. Resident Engineer or Construction Manager or Inspector.
- D. Representatives of government or utility agencies having any degree of control or responsibility, if available.
- E. Engineer's design subconsultants, when necessary.

##### **1.03 AGENDA**

- A. The agenda will include, but is not limited to, the following:
  - 1. Designation of responsible District, Contractor, and Subcontractor personnel and communication procedures
  - 2. Construction Schedule (To be provided by the Contractor).
  - 3. Schedule of Values (To be provided by the Contractor)
  - 4. Conformed Contract Documents
  - 5. Requirements for copies of the Contract Documents
  - 6. Coordination with the District, affected utility companies, municipal agencies, or other contractors

7. Contractor(s) responsibility for safety and first aid procedures and emergency contact personnel
8. Construction permits requirements and procedures
9. Traffic Control Plan
10. Use of premises
11. Access and rights-of-way to be furnished by the District
12. Private Property Coordination
13. Field Office
14. Security and housekeeping
15. Processing of Shop Drawings and Submittals
16. Processing of field decisions and Change Orders
17. Processing and Schedule of Payments
18. Record Drawings
19. Any other administrative or general matters as necessary

**PART 2 – PRODUCTS (NOT USED)**

**PART 3 – EXECUTION (NOT USED)**

**END OF SECTION**

## **SECTION 01300**

### **SHOP DRAWINGS AND SUBMITTALS**

#### **PART 1 - GENERAL**

##### **1.01 GENERAL**

- A. All Contractor submittals shall be submitted to the District in accordance with Section 00700, General Conditions and the requirements herein.
- B. Unless otherwise noted, within fifteen (15) days after the date of commencement as stated in the Notice to Proceed, the Contractor shall submit the following items to the District for review:
  - 1. A list of submittals with scheduled submission dates. This list shall include specification section number, description of the submittal, scheduled submission date, and anticipated approval date. The Contractor's schedule shall be based on a minimum of one resubmittal for each shop drawing and sample.
  - 2. A list of all permits and licenses the Contractor is required to obtain, indicating the agency required to grant the permit, the expected date of submittal for the permit, and required date for receipt of the permit.
- C. The Contractor is responsible for identifying and delivering all submittals and/or permits required by the Contract Documents.

##### **1.02 SUBMITTALS**

- A. Submit one electronic (PDF) copy of each submittal unless otherwise stated. Up to six hard copies of each submittal shall be submitted at DISTRICT's request. One electronic copy will be returned to the Contractor.
- B. Number submittals using numbering system as directed by the DISTRICT.
- C. Submittal Form. The form included at the end of this section shall be used unless otherwise directed by the DISTRICT. Submit a separate form for each submittal number. Submittals without completed Contractor's Submittal Form attached to each copy of each submittal listed in Schedule of Submittals will be returned without review and stamped "REJECTED".

- D. Exceptions and departures from Contract Documents shall be clearly noted, along with justification for each exception or departure. Otherwise, review or approval of submittals shall not constitute approval of exceptions or departures.
- E. Stock or standard drawings will not be accepted for review unless full identification and supplementary information is shown thereon in ink or typewritten form.
- F. Unless noted otherwise, the Engineer will return a PDF of each submittal to the Contractor with comments noted within twenty-one (21) calendar days following their receipt by the Engineer. The PDF copy of the comments will be emailed on request from the Contractor. It is considered reasonable that the Contractor shall make a complete and acceptable submittal by the second submission of a submittal item. Additional submittal reviews will be conducted at the Contractor's expense as outlined in the General Conditions (Section 00700) of these Specifications. Alternatively, the District reserves the right to withhold monies due the Contractor to cover additional costs of the Engineer's review beyond the second submittal. The Engineer's maximum review period for each submittal, will be twenty-one (21) days per submittal and the Contractor's resubmittal shall be made within twenty-one (21) days. Therefore, for a submittal that requires a second submittal before it is complete, the maximum period for that submittal could be sixty-three (63) days.
- G. Review of submittals shall proceed as follows:
1. Submit specified quantity of complete submittals together with Contractor's submittal forms to the DISTRICT for review.
  2. Submittals will be stamped "NO EXCEPTIONS TAKEN", "MAKE CORRECTIONS NOTED", "REVISE AND RESUBMIT", "REJECTED", "SUBMIT SPECIFIED ITEMS", or "FOR INFORMATION ONLY".
  3. If drawing or data is stamped "REVISE AND RESUBMIT" or "REJECTED", make necessary corrections and resubmit documents as required in Instruction 1. Contractor's submittal form transmitting revised documents shall show that documents comprise a resubmittal. Revisions and re-submittals shall be numbered as Revision #1, Revision #2, or as appropriate.
  4. If changes other than those noted by the DISTRICT are made on a submittal before resubmittal, note such changes on resubmittal.
  5. Revise and resubmit submittals as required, until confirmation of compliance is obtained.
  6. Costs incurred by the DISTRICT for third and subsequent re-submittals will be deducted from payment due Contractor.
  7. Do not begin work described in submittals until such submittals have been reviewed and returned by the DISTRICT stamped "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED". Fabrication or acceptance of delivery of products prior

to receipt of the DISTRICT's satisfactory return of applicable submittals shall be at Contractor's risk.

### **1.03 INITIAL SUBMITTAL**

- A. Letter addressed to the DISTRICT identifying Contractor's superintendent, safety officer, and traffic control coordinator, including emergency telephone numbers and signature authorization, and listing names, addresses and telephone numbers for subcontractors.

### **1.04 SUBMITTALS ON REQUEST FOR SUPPLEMENTAL INFORMATION**

- A. Detailed construction schedule updates shall be submitted, to describe scheduling of elements of construction requiring DISTRICT's or Contractor's coordination with public, or other private parties or public agencies.
- B. Supplemental information will be requested for "approved equals" and may be requested when there is a question that a manufacturer's product conforms to Contract Documents. DISTRICT reserves right to require submittal of supplemental information as described herein before approval of product.
- C. Certification of compliance with listed reference standards shall be submitted by manufacturers upon DISTRICT's request. Failure of DISTRICT to request certification of compliance shall not serve as waiver of Contractor's duty to comply with reference standards.
- D. Transcripts of results of acceptance tests performed at point of manufacture of products furnished shall be submitted by manufacturers on DISTRICT's request.
- E. Samples shall be submitted on DISTRICT's request.
- F. Names and addresses of nearest local service representatives that maintain technical service personnel and complete inventory of spare parts and accessories shall be submitted upon DISTRICT's request.
- G. List of three installations in which products comparable in size, capacity and rating with those required in Contract Documents are now in regular operation shall be submitted upon DISTRICT's request. Include listing of size capacity or rating of each installation. Include name and telephone number of at least one reference responsible for operations at each installation whom the DISTRICT may contact.

## 1.05 SHOP DRAWINGS AND PRODUCT DATA

- A. Wherever called for in the Contract Documents, the Contractor shall furnish two (2) hard-copies of each shop drawing submittal for review, along with a PDF (Portable Document Format) copy on electronic media. The term "Shop Drawings" as used herein shall be understood to include detail design calculations, shop drawings, fabrication and installation drawings, erection drawings, lists, graphs, catalog sheets, data sheets, and similar items. The Contractor shall submit, as applicable, the following for all materials and equipment to be procured and used in the Work:
1. Copy of the Section of these Specifications under which the submittal is being made, with the directly applicable paragraph(s) highlighted in yellow, and requested exceptions to the Contract Documents and/or any variations from the specified materials or equipment annotated.
  2. Complete manufacturer's specifications including descriptions of materials and protective coatings; parts lists; dimensions; and all options, features or accessories specified on the submittal as required by the Contract Documents or as is necessary for the Work.
  3. Requirements for storage and protection prior to installation.
  4. Installation procedures.
- B. All shop drawing submittals shall be accompanied by the District's standard submittal transmittal form. Any submittal not accompanied by such a form, or where all applicable items on the form are not completed, will be returned for resubmittal.
- C. Sequentially number the transmittal forms. Resubmittals shall have original number with an alphabetic suffix.
- D. Identify Contract, Contractor, Subcontractor and/or Supplier, pertinent drawing sheet and detail number(s), and specification section number, as appropriate. On standard drawings or data sheets, clearly indicate model and option being proposed and strike out all non-relevant data.
- E. Normally, a separate transmittal form shall be used for each specific item or class of material or equipment for which a submittal is required. Transmittal of a submittal of various items using a single transmittal form will be permitted only when the items taken together constitute a manufacturer's "package" or are so functionally related that expediency indicates review of the group or package as a whole. A multiple-page submittal shall be collated into sets, and each set shall be stapled or bound, as appropriate, prior to transmittal.



- F. Fabrication of an item shall be commenced only after the Engineer has reviewed the pertinent submittals and has responded with copies marked either "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED." Corrections indicated on submittals shall be considered as changes necessary to meet the requirements of the Contract Documents and shall not be taken as the basis for changes to the contract requirements.
- G. Shop drawings shall clearly show dimensions, clearances, slopes, floor space requirements, tolerances, conduit, anchor bolt sizes and embedment's, finishes, performance characteristics, and weight and type of products. Shop drawings shall indicate the location at which products are to be installed, how equipment will be mounted, how it relates to adjacent structures or products, and how connection will be made between Work under this contract and work under other contracts. Shop drawings shall show parts lists and details of appurtenances to be furnished with specified items, along with references to appropriate ASTM, and other reference standards and grades. Use of contract drawing reproductions for shop drawings is subject to rejection.
- H. Catalog data shall clearly indicate applicable items when several products are covered on one page. Using black ink, indicate on submitted catalog data, specification section or plan reference being satisfied.
- I. Installation or Application Instructions shall be manufacturer's printed instructions including warranty requirements, clearances required and proper field procedures to deliver, handle, install and prepare product for use. In the absence of manufacturer's published literature, ASTM, AWWA or trade standards for proper installation will be accepted.
- J. Operation and Maintenance Instructions shall be manufacturer's printed instructions for correct operation and maintenance procedures for product, along with data which must accompany manual as directed by current regulations of government agency. Include operating instructions for each piece of equipment. Describe equipment function, operating characteristics, limiting conditions, operating instructions, startup procedures, normal and emergency conditions, regulation and control, and shutdown. Include preventative maintenance instructions. List warranty requirements. Explain and illustrate preventative maintenance tasks. Include lubrication charts, lists of acceptable lubricants, troubleshooting instructions, and lists of required maintenance tools and equipment. List recommended spare parts, their costs, and ordering information for a manufacturer who can supply these parts. Index instructions for easy reference. Include information for installed equipment only.
- K. Manufacturer's Statement of Responsibility shall be copy of form attached, signed by authorized factory representative for manufacturer whose product is being furnished.

- L. Certification of Compliance shall certify materials have been sampled, tested and found to comply with applicable reference standards.
- M. Engineering Calculations shall be clearly legible, and shall demonstrate compliance with state and local codes, applicable standards, and contract requirements. Calculations shall be sealed by a licensed professional engineer registered in California.
- N. All Contractor shop drawing submittals shall be carefully reviewed by an authorized representative of the Contractor prior to submission. Each submittal shall be dated, signed, and certified by the Contractor as being correct and in strict conformance with the Contract Documents. In the case of shop drawings, each sheet shall be so dated, signed, and certified. No consideration for review by the Engineer of any Contractor submittals will be made for any items which have not been so certified by the Contractor. All non-certified submittals will be returned to the Contractor without action taken by the Engineer, and any delays caused thereby shall be the responsibility of the Contractor.

## **1.06 CONTRACTOR'S SCHEDULE**

- A. The Contractor's construction schedule and reports shall be prepared and submitted to the District in accordance with the General Provisions.

## **1.07 SAMPLES**

- A. Whenever, in the Specifications, samples are required, the Contractor shall submit not less than two (2) samples of each such item or material for review.
- B. Samples, as required herein, shall be submitted for acceptance a minimum of thirty (30) days prior to ordering such material for delivery to the job site, and shall be submitted in an orderly sequence so that dependent materials or equipment can be assembled and reviewed without causing delays in the Work.
- C. All samples shall be individually and indelibly labeled or tagged, indicating thereon all specified physical characteristics and the Manufacturer's name for identification. Upon receiving acceptance of the Engineer, two (2) sets of the samples will be returned to the Contractor. One set of samples will be retained by the District and one set of samples shall remain at the job site until completion of the Work.
- D. Unless indicated otherwise, all colors and textures of specified items presented in sample submittals shall be from the manufacturer's standard colors and standard materials, products, or equipment lines. If the samples represent non-standard colors, materials, products, or equipment lines and their selection will require an increase in contract time or price, the Contractor shall clearly indicate same on the transmittal page of the submittal.

**1.08 CONSTRUCTION PHOTOGRAPHS**

- A. Preconstruction photographs shall be submitted to the DISTRICT before any work is performed which has potential to disturb or modify public or private property, not owned by the DISTRICT and that owned by the DISTRICT but not considered to be affected by the proposed construction. Photographs shall be of sufficient quality and thoroughness to fully document pre-existing damage or wear to photographed property for which Contractor or DISTRICT might be asked to compensate property owner were it not for photographic evidence of pre-existing damage. Failure by Contractor to submit preconstruction photographs may be taken by DISTRICT as evidence that subsequent claims by property owners for damage to their property can be rightfully attributed to Contractor's actions.

**1.09 NOTIFICATION OF AFFECTED RESIDENCES AND BUSINESSES**

- A. When working in existing streets, written notification, with Contractor's 24-hour emergency phone number, shall be provided to residences and businesses fronting the project on either side of street. Notify these parties 72 hours in advance of construction which will affect these properties. Door-hangers or other means of notification shall be submitted and approved in advance by the DISTRICT.

**PART 2 - PRODUCTS (NOT USED)****PART 3 - EXECUTION****3.01 SCHEDULING FOR SUBMITTALS**

The Contractor is to recognize the time and sequence related to the submittals required by the Contract Documents. Therefore, the Contractor shall demonstrate competency in preparing and delivering submittals. The Contractor will not be allowed additional Contract time or compensation due to delays associated with submittals or their review. In addition, the costs associated with expedited review of a submittal or a submittal conference may be withheld from monies due the Contractor by the District to cover additional costs of the Engineer's or Design Engineer's review.

**END OF SECTION**

**SECTION 01310****CONSTRUCTION SCHEDULE****PART 1 – GENERAL****1.01 REQUIREMENTS OVERVIEW**

- A. The Contractor's planning, scheduling and execution of the contract work shall be presented to the District by submission of the progress schedule information and data as specified in the Contract Documents and including the additional requirements herein.
- B. The Work under this contract will be planned, scheduled, executed, and reported by the Contractor using a Critical Path Method (CPM) schedule within a Work Breakdown Structure approved by the District. The Contractor will adhere to established technical standards for CPM scheduling using a computerized precedence diagram method. The Contractor is required to provide baseline and status data using a hard copy and electronic formats approved by the District.
- C. All schedules shall be in accordance with the requirements of the Contract. The District's review or acceptance of any schedule shall not relieve the Contractor from responsibility for complying with the Contract requirements, adhering to those sequences of work indicated in or required by the contract documents, or from completing any work omitted from the schedule within the Contract Time. This review shall not extend to the Contractor's means, methods, or techniques, which shall remain the sole responsibility of the Contractor.

**1.02 SOFTWARE/INTERFACE REQUIREMENTS**

- A. The Contractor shall use CPM scheduling software to produce Contract schedules and reports as specified herein. This software shall run on PC compatible computers, be commercially available for lease or purchase, and be capable of processing and plotting schedule data as specified in this Section. The Contractor shall provide all schedules and schedule updates electronic format. The schedule files shall be compatible with Windows.

**1.03 QUALITY ASSURANCE**

- A. The Contractor shall perform the work covered by this Section with personnel having substantive experience in using computer based scheduling programs on construction projects. The responsible scheduling personnel will be evaluated by the District or its representative prior to the commencement of work. If the District has reasonable objection to the qualifications of the Contractor's nominated scheduling personnel, the Contractor shall, at no additional cost to the District, within two weeks, assign acceptable personnel or employ a full time qualified subcontractor, subject to the review of his/her qualifications by the District. Employment by the Contractor of a scheduling subcontractor shall not in any way alter or reduce the Contractor's obligations under this Section.

- B. In preparing all contract schedules, it is the responsibility of the Contractor to work with each subcontractor and supplier to obtain information pertinent to the planning and updating of their respective activities and schedules.

#### **1.04 USE OF FLOAT**

- A. Total Float is the number of days by which a part of the Work in the Construction Schedule may be delayed from its early dates without necessarily extending the Contract Time.
- B. Contract Float is the number of days between the Contractor's anticipated date for early completion of the Work, or specified part, and the corresponding Contract Time.
- C. Total float and contract float belong to the project and are not for the exclusive benefit of any party. They shall be available to the District or its representatives, consultants, or the Contractor to accommodate changes in the Work, or to mitigate the effect of events which may delay performance or completion. The District will monitor and optimize the use of float for the benefit of the Project.

#### **1.05 EARLY COMPLETION**

- A. An early completion schedule is one which anticipates completion of all or specified part of the work ahead of the corresponding Contract Time. Since Contract Float belongs to the project, the Contractor shall not be entitled to any extension in Contract Time, or recovery for any delay cost incurred because of extensions in an early completion date, until all Contract Float is used or consumed and performance or completion of the Work extends beyond the corresponding Contract Time.

#### **1.06 FLOAT SUPPRESSION**

- A. Float suppression techniques are prohibited. The Contractor shall remove any float suppression techniques, e.g., preferential sequencing (crew movements, equipment use, for reuse, etc.), extended durations, imposed dates, scheduling of non-critical work, artificial logic, and others, as a prerequisite to a request for an increase in Contract Price or Contract Time. Use of any type of schedule constraint requires prior approval by the District.

#### **1.07 NON-COMPLIANCE**

- A. The District may refuse the whole or part of any payment if, in the District's opinion, the Contractor's failure, refusal or neglect to provide the required schedule information precludes proper evaluation of the Contractor's progress. The District may withhold from any payment a set-off, if in the District's opinion, the Contractor's failure, refusal or neglect to provide the required schedule information precludes a proper evaluation of whether or not the Contractor is prosecuting the Work with the diligence that will ensure its completion within Contract Time.
- B. The Contractor agrees that the Contractor's failure, neglect, or refusal to comply with the requirements of this Section, or any portion thereof, constitute a material

breach of the Contractor's obligations under this Contract. The Contractor recognizes and agrees that such failure, neglect, or refusal prejudices the District's ability to recognize and mitigate delay, and such failure, neglect, or refusal prevent the timely issuance of extensions of Contract time, when such extension may be warranted. Therefore, the Contractor hereby waives all rights to additional costs or time extensions due to delays or accelerations that result from or occur during periods of time that Contractor fails, neglects, or refuses to fully comply with the requirements of this Section.

- C. These remedies for the Contractor's failure, neglect or refusal to comply with the requirements of this Section are in addition to, and not in limitation of, those provided under other sections of the Contract.

## **PART 2 - PRODUCTS**

### **2.02 CONTRACT SCHEDULES - GENERAL CRITERIA**

- A. All Contract Schedules shall be prepared by the Contractor and reflect the Contractor's plans for and status of the Work. The Contractor shall provide an electronic copy of all Contract Schedules.
- B. The Contract Schedules shall show the breakdown of work into activities and relationships only to the extent required to effectively manage the work. The Contract Schedules shall show the division of the Work into activities and specify the progression from the Notice to Proceed to the completion of the Work. The Contract Schedule shall include appropriate time allowances for submittals, items of interface with work performed by others, and specified Construction, Physical Checkout, Field Test, Functional Test, Start-up and Performance Test activities. All activity durations shall be in work days.
- C. The Contractor's Construction Schedule shall include all procurement related activities which lead to the delivery of permanent materials to the site. Procurement activities include but may not be limited to preparation of shop drawings, review and acceptance of shop drawings, materials fabrication, and materials delivery. Upon written approval by the District, these activities may be displayed or reported as a separate Off-Site Activities Schedule, properly correlated to the Contractor's Construction Schedule.
- D. The Contractor shall schedule those requisite duties and responsibilities of the District and others (performing work for the District) indicated in or required by the Contract Documents.

### **2.02 SCHEDULE UPDATE**

- A. Updating the Contractor's Construction Schedule and scheduling of changes and other events affecting the schedule is the responsibility of the Contractor. Contract Time (including all contracted milestones) shall not be changed without a formal Change Order approved by the District.
- B. The Contractor shall update the Contractor's Construction Schedule each month. Updating the schedule shall consist of the following:
  - 1. **Updating Activity Status:**

Each month the Contractor shall enter percent complete, remaining duration, actual start, and actual completion dates into the schedule and recalculate the schedule based on the payment cutoff date for that month. Percent complete shall be the percent agreed to by the District at the monthly schedule meeting. Remaining duration shall be the Contractor's best estimate of the time required to complete activities which have started but are not yet complete. Percent complete and remaining duration shall be arrived at independently for each activity. The remaining duration shall not be automatically calculated by the scheduling software based on the percent complete. The retained logic method of schedule calculation shall be used to calculate the schedule unless otherwise approved by the District.

## **2. Corrections to the Schedule:**

Each month, the Contractor shall make those corrections to the schedule which have been identified by the District since the last update. Generally, these corrections will include, but may not be limited to, correction of inaccurate actual dates, correction of logic for activities which did not start or finish as scheduled and are being driven by the data date, inaccurate representation of contract milestones, missing actual start or completion dates, incorrect budget or actual cost amounts, and out of sequence progress. The Contractor shall also correct any similar errors that he is aware of and shall inform the District of any such corrections.

## **3. Revisions to the Schedule:**

Schedule Revisions are defined as any change to schedule activities or logic other than the updating of actual start and completion dates, percent complete or remaining duration. All schedule revisions must be approved by the District in advance. Schedule revisions shall be based on the impact to the schedule of changes in the work or other delays as agreed to by the District during negotiations for the change or other impact in question. The specific activities added and their logical ties to existing schedule activities shall be explained in detail in the schedule narrative. After any schedule impact is negotiated and the specific activities and logic to be added have been approved, the Contractor shall promptly incorporate the revision into the schedule prior to the next update. Added activities shall be coded as directed by the District indicating which RFP they are associated with. Revisions shall be man-hour and resource loaded.

### **2.03 SCHEDULE IMPACT ANALYSIS**

- A. Whenever the Contractor requests an extension of the Contract Time or any Contract Milestone, the Contractor shall provide an analysis of the critical path as required by the General Conditions. At a minimum, the analysis must contain the following:
  1. The version of the Contractor's Construction Schedule on which the analysis is based.
  2. The contract milestones affected and the number of day's extension requested for each.
  3. A plot starting at the time line and showing the controlling path to each affected milestone before the change or delay in question.

4. A plot including the activities which were added to represent the change or delay starting at the time line and showing the controlling path to each affected milestone after the change or delay in question.
5. A listing of all activities and logic added, deleted or changed to represent the impact of the change or other delay being analyzed.
6. An electronic copy of both before and after schedules compatible with Windows.

### **PART 3 - EXECUTION**

#### **3.01 SCHEDULE DEVELOPMENT**

##### **A. Contractor's Construction Schedule**

1. The Contractor shall submit the Construction Schedule within the time frame specified in the General Conditions. This schedule shall reflect the entire scope of the Contract Work as awarded.
2. The Construction Schedule shall bear the Contractor's stamp of approval signed by the Contractor. The Contractor's stamp of approval shall constitute a representation to the District that the Contractor verified all data in the Construction Schedule and assumes full responsibility for doing so, and that the Contractor has reviewed and coordinated all activities and logic in the Construction Schedule with the requirements of the Work.
3. The District will review and return written comments on the Construction Schedule to the Contractor within fourteen (14) calendar days.
4. If revisions are required, the Contractor shall make appropriate adjustments or corrections and shall deliver the revised Construction Schedule to the District directing specific attention, in writing, to adjustments or corrections made other than those made in response to the District comments on the previous submittal. The District will review and return written comments on the revised Construction Schedule within seven (7) calendar days. This step shall be repeated until the schedule is accepted. Acceptance of the Construction Schedule by the District shall be a Condition Precedent to processing any Application for Payment, after the first full month.
5. The District's review and comments will be for conformance with the Contract Time and those sequences of work indicated in or required by the Contract Documents, to record dates for milestones, and for conformance with the requirements of this Section and other information given in the Contract Documents which may have a bearing on the schedule. The District's review shall not extend to the Contractor's means, methods, or techniques, the correctness of which shall remain the sole responsibility of the Contractor.

#### **3.02 MONTHLY UPDATE OF THE CONTRACTOR'S CONSTRUCTION SCHEDULE**

- ##### **A.**
- The cutoff date for the payment application and schedule update shall be determined by District.



**B. Schedule Status Submittals**

1. An update of the Construction Schedule is due monthly, with (attached to) each Application for Payment. Receipt by the District of the update of the Construction Schedule will be a Condition Precedent to processing each Application for Payment.
2. Neither the updating of the Construction Schedule nor the updating of any report or schedule submitted to the District by the Contractor under this Section shall have the effect of amending or modifying, in any way, the Contract Time, Contract Completion Date, or Contract Milestone Dates.

**C. Monthly Reviews**

1. Monthly review meetings between the District and the Contractor will be held within seven (7) calendar days prior to the payment cutoff date. The purpose of this meeting is to finalize the percent to be paid for activities completed or in progress, and to review and discuss any required corrections and proposed revisions to the schedule.
2. Prior to the monthly review meeting, the Contractor will update the status of each activity in progress or completed with actual or estimated actual start and finish dates, physical percent complete and remaining duration for activities started but not completed and calculate the CPM Network through payment cut off date. The Contractor shall provide an electronic copy of the updated schedule to the District three work-days prior to the schedule review meeting. Contractor will provide appropriate reports as defined by the District at the monthly review meeting.
3. After the meeting, the Contractor shall make revisions to the status of activities as directed by the District and submit the payment application along with the final update of the Construction Schedule within seven calendar days.

**3.03 SCHEDULE REVISIONS**

- A. The Construction Schedule must be revised when it is no longer useful as a status and control mechanism as determined by the District or when a change or delay impacts the Contractor's timing and sequence of the Work. Contract Time (including all contracted milestones) cannot be changed without a formal Change Order approved by the District.

**3.04 SCHEDULE RECOVERY**

- A. Within five days after a schedule problem is recognized and documented, the Contractor shall submit a recovery schedule to the District which shall consist of proposed revisions to the Contractor's Construction Schedule demonstrating how the Contractor intends to achieve all contractual milestones including contract completion within the allotted contract time. The accompanying narrative should describe the cause of the problems and the actions planned by the Contractor to recover the schedule. The Contractor shall promptly undertake appropriate action at no additional cost to the District to recover the schedule whenever the current schedule shows that the Contractor did not or will not achieve a milestone established in the Construction Schedule.

- B. Lack of Action: The Contractor's refusal, failure or neglect to take appropriate recovery action or to submit a recovery schedule shall constitute reasonable evidence that the Contractor is not prosecuting the Work, or separable part, with the diligence that will ensure its completion within the applicable Contract Time. Such lack of action shall constitute sufficient basis for the withholding of some or all of any payment due, and shall be considered grounds for termination by the District.

**END OF SECTION**

**SECTION 01354****HAZARDOUS MATERIAL PROCEDURES****PART 1 - GENERAL****1.01 SUMMARY**

- A. Section includes: Procedures required when encountering hazardous materials at the Work site.

**1.02 REFERENCES**

- A. California Code of Regulations (CCR):
  - 1. Title 8: Industrial Relations.
  - 2. Title 22: Social Security.
- B. California Occupational Safety and Health Administration (Cal-OSHA).
- C. Occupational Safety and Health Administration (OSHA).
- D. United States Code of Federal Regulation (CFR):
  - 1. Title 29 - Labor:
    - a. 1926.62 - Lead.
  - 2. Title 40 - Protection of Environment.
    - a. 261 - Identification and Listing of Hazardous Waste.

**1.03 SUBMITTALS**

- A. Submit laboratory reports, hazardous material removal plans, and certifications.
- B. Submit the following work plan:
  - 1. Removal and Legal Disposal of Asbestos Cement Pipe Plan.
    - a. Work plan shall include, but not be limited, to the following:
      - 1) Schedule of work.
      - 2) Security measures for work and disposal area.
      - 3) Staff training: Contractor shall provide at least one competent person who is capable of identifying asbestos hazards at the job site for the entire duration of the AC pipe removal and disposal operation.
      - 4) Trenching and removal of pipe procedure.

**1.04 DEFINITIONS**

- A. Adequately Wet: Penetration of the pipe wall with liquid to prevent release of particulates.
- B. Asbestos Cement Pipe: Also commonly referred to as AC Transite Pipe, AC pipe or ACP. Pipe that is generally composed of cement and asbestos fibers.

- C. Competent Person: A trained worker who is capable of identifying existing and predictable asbestos hazards, perform exposure assessment and monitoring, is qualified to train other workers, and has the authority to take immediate corrective action to eliminate a hazardous exposure.
- D. Non-friable Asbestos – Containing Material (NACM): Material containing more than 1 percent asbestos, that when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure.
- E. Regulated Asbestos – Containing Material (RACM): Category II non-friable ACM that has a high probability of becoming or has become crumbled, pulverized, or reduced to powder in the course of work.

## 1.05 HAZARDOUS MATERIALS PROCEDURES

- A. Hazardous materials are those defined by 40 CFR and State specific codes.
- B. When hazardous materials have been found:
  - 1. Prepare and initiate implementation of plan of action.
  - 2. Notify immediately District, Engineer, and other affected persons.
  - 3. Notify such agencies as are required to be notified by Laws and Regulations with the times stipulated by such Laws and Regulations.
  - 4. Designate a Certified Industrial Hygienist to issue pertinent instructions and recommendations for protection of workers and other affected persons' health and safety.
  - 5. Identify and contact subcontractors and licensed personnel qualified to undertake storage, removal, transportation, disposal, and other remedial work required by, and in accordance with, laws and regulations.
- C. When hazardous materials have been found that were identified by analysis:
  - 1. Prepare and initiate implementation of plan of action.
  - 2. Notify such agencies as are required to be notified by Laws and Regulations with the times stipulated by such Laws and Regulations.
  - 3. Designate a Certified Industrial Hygienist to issue pertinent instructions and recommendations for protection of workers and other affected persons' health and safety.
  - 4. Identify and contact subcontractors and licensed personnel qualified to undertake storage, removal, transportation, disposal, and other remedial work required by, and in accordance with, laws and regulations.
- D. Forward to Engineer, copies of reports, permits, receipts, and other documentation related to remedial work.
- E. Assume responsibility for worker health and safety, including health and safety of subcontractors and their workers.
  - 1. Instruct workers on recognition and reporting of materials that may be hazardous.
- F. File requests for adjustments to Contract Times and Contract Price due to the finding of Hazardous Materials in the Work site in accordance with Contract Documents.

1. Minimize delays by continuing performance of the Work in areas not affected by hazardous materials operations.

## **1.06 LEAD PAINT REMOVAL AND DISPOSAL**

- A. Existing paint on the interior and/or exterior surfaces that may contain lead in concentrations which will require implementation of hazardous material compliance procedures as legislated by the following:
  1. CFR, Title 29 and Title 40.
  2. CCR, Title 8 and Title 22.
- B. Remove samples of paint from the structures identified herein and have samples tested by a certified testing laboratory to determine lead content in samples.
  1. Ensure that sufficient numbers of paint samples are removed and tested to provide adequate information regarding lead content in paint.
  2. Ensure that samples contain the total thickness of the paint to the substrate where removed.
  3. Ensure that each sample contains a sufficient quantity of paint to facilitate proper and adequate analyses by testing laboratory.
  4. Ensure that samples are adequately identified with location from which it was removed.
- C. Laboratory testing of paint samples: In accordance with 40 CFR 261,
  1. Submit 10 copies of complete laboratory analyses of paint samples.
- D. Submit a plan for the removal, containment, and disposal of lead-based paint and associated debris.
  1. Submit 10 copies of plan.
- E. Prior to beginning work associated with the removal, containment, and disposal of lead-based paints, prepare and submit to the Engineer for his review 6 copies of the following:
  1. Listing of lead paint removal equipment to be used.
  2. Outline of procedures to be used to remove lead paint.
  3. Data and specifications describing chemical stripping materials to be used.
  4. Data and specifications describing abrasive blast materials and grit size to be used.
  5. Plan describing lead paint removal, hazardous waste debris containment, and hazardous waste disposal methods.
  6. Safety plan, consisting of a written plan of action covering operational requirements for safe removal of lead paint, safe handling and containment of waste and debris generated by the operation, and safe disposal of hazardous waste and non-hazardous waste materials, complying with the most stringent requirements of the following:
    - a. Equipment and material manufacturer's safety sheets.
    - b. 29 CFR 1926.62.
- F. Carry out lead paint removal, containment, and disposal work in accordance with the following SSPC guidelines:
  1. SSPC-Guide 6.
    - a. Open Abrasive Blast Cleaning with Expendable Abrasive.
    - b. Open Abrasive Blast Cleaning with Recyclable Abrasive.

- c. Closed Abrasive Blast Cleaning with Recyclable Abrasive.
  - d. Chemical Stripping.
- 2. SSPC-Guide 7.
- G. Assume responsibility for the proper utilization of the paint removal method selected. When abrasive blast cleaning is selected to remove lead-based paint, comply with all applicable federal, state, and local air quality, pollution, and environmental control regulations for blast cleaning. When chemical stripping is selected to remove the lead based paint, adhere to the chemical manufacturer's recommendations for the application of the product, the removal of the paint, and the containment of the debris.
- H. Lead paint removal work shall be performed by a Contractor having prior experience in the removal method selected and shall provide at least 5 references of similar projects completed, 3 of which must have been completed within the past 12 months, documenting his experience.
- I. Utilize a minimum of Class 3 containment and ventilation system as described in SSPC-Guide 6 during lead paint removal and containment procedures as required for the conditions.
- J. Do not leave spent abrasive blast material, chemical stripping material, or lead paint debris uncontained on the project site overnight.
- K. Test each container of paint debris, spent blast cleaning abrasive, chemical stripping debris, and other waste material generated by the operation to determine the waste material hazardous waste classification.
- L. Assume responsibility for the disposal of lead paint waste and associated waste generated by the removal of the lead paint and the preparation of the surfaces for recoating. Dispose in accordance with applicable federal, state, and local requirements and regulations.
- M. Accurately complete the Uniform Hazardous Waste Manifest included at the end of SSPC-Guide 7. Indicate on the Manifest that the District is the hazardous waste generator, and obtain the District's Environmental Protection Agency identification number for use in completing the Manifest.

## **1.07 ASBESTOS MATERIALS**

- A. Asbestos cement (AC) pipe that is to be removed shall not be cut but shall be separated at existing pipe joints for removal. If asbestos cement pipe (ACP) must be cut and handled in the field to accomplish the work, the Contractor shall be solely responsible for and shall take all appropriate precautions for protecting against threats to health and safety of the work force and general public arising out of construction involving asbestos. The Contractor shall comply with all applicable regulations for the handling, cutting, shaping, installation and disposal of asbestos. No separate payment shall be made for compliance with applicable regulations or for the removal of asbestos cement pipe unless such work is included in a separate bid item of work.
- B. Asbestos cement pipe to be disposed shall be properly handled, manifested, prepared for transport following criteria of County of San Diego Department of Public Works, Solid

Waste Division, and delivered to a landfill permitted for disposal of non-friable asbestos containing materials. Proper disposal shall be the sole responsibility of the Contractor. Contractor shall return the completed Generator copy (yellow) manifest to the District's Representative.

- C. Other hazardous materials, asbestos, polychlorinated biphenyl (PCB) or any other toxic wastes encountered by the Contractor during the Work except AC pipe shall require the Contractor to stop work in the affected area and report the condition to the District in writing. The work in the affected area shall not thereafter be resumed except by written agreement of the District and Contractor if in fact the material is asbestos or PCB and has not been rendered harmless. The work in the affected area shall resume in the absence of asbestos or PCB, or when it has been rendered harmless, by written agreement of the District and Contractor, or by arbitration per General Conditions. Unless otherwise specified in the Contract Documents, the District shall contract directly for the removal and/or abatement of any hazardous materials or toxic wastes except for AC pipe.
- D. It is the specific intent of these Contract Documents to exclude from the Work any and all products or materials containing asbestos. No products containing asbestos shall be incorporated in the Work.
- E. Removal of existing ACM shall be performed by a firm that is registered by Cal-OSHA and certified by the State Contractors Licensing Board and shall be a Licensed Abatement Contractor in the state where the project is located.
- F. Submit 2 copies of plan for the removal, containment, and disposal of ACM.
- G. Submit 2 copies of abatement license of ACM removal contractor.

## **PART 2 PRODUCTS**

### **2.01 ASBESTOS CEMENT PIPE (ACP)**

- A. The pipe to be removed from the ground has been in service for approximately 45 years.
  - 1. The manufacturer and exact composition of the pipe to be removed is unknown.
  - 2. ACP is generally manufactured using portland cement or pozzolan cement and asbestos fiber.
  - 3. Common pipe lengths: 3 feet 3 inches, 6 feet 6 inches, 9 feet 9 inches, and 13 feet 0 inches.
- B. Pipe fittings. Separate from pipe brass, galvanized pipe, copper, cast iron, galvanized pipe or steel fittings and dispose of separately.

## **PART 3 EXECUTION**

### **3.01 ASBESTOS MATERIALS**

- A. Notifications:
  - 1. Notify Cal-OSHA 24 hours prior to performing asbestos material removal operations.

2. Contractor shall notify District 3 working days in advance of commencing asbestos material removal operations.
- B. Work area:
1. Establish a regulated work area, using at a minimum, construction warning tape to establish limits of work area for the asbestos material removal.
  2. On site stockpiling or storage of asbestos material designated for disposal shall not be allowed.
- C. Safety:
1. Conduct an Initial Exposure Assessment (IEA).
  2. Provide a hand/face wash station.
- D. Worker qualifications:
1. Asbestos removal shall be performed by trained employees in conformance with Section (g) Methods of Compliance, of CCR, Title 8, § 1529, "Asbestos," mandating wet methods, vacuum cleaners with HEPA filters to collect debris and prompt cleanup.
- E. Legal disposal:
1. Legal disposal of asbestos material is the Contractor's responsibility.
  2. Contractor shall transport the asbestos material to the location designated by the District. Contractor to provide a tarp and cover to provide containment.

### **3.02 EXCAVATION OF AC PIPE**

- A. Machine excavates to expose asbestos cement pipe.
- B. Hand excavates areas under pipe where breaks are planned.
- C. Pipe shall be pre-wetted prior to any breaks being made.
- D. Pipe shall be snapped using mechanical snapping methods.

### **3.03 AC PIPE REMOVAL**

- A. All required pipe breaking operations shall require adequate pre-wetting with potable water.
- B. The Contractor shall make every effort to minimize the number of pipe breaks. Wherever possible, the pipe should be removed by pulling the pipe out of the pipe joint collars.
- C. Remove sections of AC pipe intact at joint collars by mechanical snapping methods between collars.
- D. Wet and containerize waste materials as removed from the trench. Use lifting straps and methods that do not further damage the pipe.
- E. Sections of AC pipe that become cut, have broken edges or have any friable surface shall be wet at exposed fractures and immediately wrapped.
  1. The pipe ends shall be sealed completely using a minimum 6-mil poly film wrap, which is securely fastened, taped to completely enclose the pipe and ACP



appurtenances and shall have conspicuous, legible labeling that has the following or equivalent labeling: CAUTION: CONTAINS ASBESTOS FIBERS. BREATHING ASBESTOS DUST MAY CAUSE SERIOUS BODILY HARM.

- F. AC Pipe sections shall not be left exposed in public view, either in trench or in disposal area.
- G. All connecting parts of pipe, rubber gaskets, and pipe couplings shall be discarded with pipe.
- H. AC pipe from this project only, shall be placed in the bin designated.

**END OF SECTION**

**SECTION 01370****SCHEDULE OF VALUES****PART 1 – GENERAL****1.1 DESCRIPTION**

- A. The Schedule of Values is an itemized list that establishes the value or cost of each part of the Work. It shall be used as the basis for preparing progress payments and may be used as a basis for negotiations concerning additional work or credits which may arise during construction. Quantities and unit prices may be included in the Schedule of Values when approved or required by the Engineer.

**1.2 PREPARATION**

- A. The Schedule of Values shall show the breakdown of labor, materials equipment and other costs used in preparation of the Contractor's Bid.
- B. Within 30 calendar days after the date of receipt of the Notice to Proceed, submit a Preliminary Schedule of Values for the major components of work. The Preliminary Schedule of Values shall be a detailed breakdown of each bid item with sufficient information for the Engineer to evaluate the work included and reasonable costs associated with each respective bid item. List sub-items of major products or systems as appropriate or when requested by District. Meet with the District or District Representative and jointly review the Preliminary Schedule of Values and make any adjustments in value allocations if, in the opinion of the Engineer, these are necessary to establish fair and reasonable allocation of values for the work components. The District may require reallocation of major work components from items in the above listing if, in the opinion of the District, such reallocation is necessary.
- C. Prepare and submit a detailed Schedule of Values to the District based on the accepted Preliminary Schedule of Values. The detailed Schedule of Values will be used to determine monthly progress payment amounts. The District will be the sole judge of acceptable numbers, details, and description of values established. If, in the opinion of the District, a revision in the number of items contained in the Schedule of Values is necessary, add or delete items so identified.
- D. The costs shall be in sufficient detail to indicate separate amounts for each Bid Item.
- E. Mobilization shall consist of preparatory work and operations including, but not limited to, those necessary for the movement of personnel, equipment, supplies and incidentals to the project site; for the establishment of all offices, buildings, temporary facilities and other facilities necessary for the Work; and for all other work and operations which must be performed or for costs incurred prior to the beginning of construction of the various Contract items. The Contractor shall list bonds, insurance, and permits separately on the Schedule of Values when such items are not identified separately on the Bid Schedule. When requested by Engineer, the Contractor shall provide substantiating data to support cost values.

- F. The sum of the individual values shown on the Schedule of Values must equal the total Contract Price.
- G. Each item shall include a directly proportional amount of the Contractor's overhead and profit.
- H. The Schedule of Values shall show purchase and delivery costs for materials and equipment for which the Contractor will submit a payment request prior to their installation. If this is not broken out in the Schedule of Values, the contractor will not be made until the item is installed, tested, and in operation.
- I. Coordinate the Schedule of Values with the Construction Schedule in accordance with Section 01310.
- J. Incorporate approved Change Orders into the Schedule of Values. Individual Change Order items shall be itemized by change order item number.

**1.3 SUBMITTAL**

- A. The Contractor shall submit the Schedule of Values prior to or at the pre-construction conference for District's review and approval.
- B. The Contractor shall submit three copies of the final Schedule of Values to the District for approval at least 20 days prior to submitting the first progress payment request. The Contractor shall revise and resubmit the Schedule of Values as required until final approval by the District.

**- END OF SECTION -**

**SECTION 01410****TESTING LABORATORY SERVICES****PART 1 – GENERAL****1.01 DESCRIPTION**

- A. The Contractor will employ and pay for an independent Approved Testing Laboratory to provide inspection, sampling and testing services as specified in the individual specification sections. Applicable sections include, but are not limited to:
1. Section 02223 – Trenching, Backfilling and Compaction
  2. Section 02510 – Asphaltic Concrete Paving
  3. Section 03200 – Steel Reinforcement
  4. Section 03300 – Cast-In-Place Concrete
  5. Section 03315 – Grout
  6. Section 15041 – Disinfection of Piping
  7. Tests or inspections required by any agency having jurisdiction of the public right-of-way
- B. The Contractor shall pay for:
1. Independent tests paid for by the District or performed by District forces, or any public agency, where such tests reveal nonconformity with the Contract Documents. This shall include repeat tests required because of the Contractor's failure to meet the requirements of the Contract Documents for any reason.
  2. Tests made for the Contractor's convenience.
- C. The testing laboratory is not authorized to approve or accept any portion of the Work; rescind, alter or augment the requirements of the Contract Documents; or perform any duties of the Contractor.

**1.02 QUALIFICATIONS OF LABORATORY**

- A. Where applicable, the testing laboratory will meet "Recommended Requirements for Independent Laboratory Qualification", latest edition, published by the American Council of Independent Laboratories and the basic requirements of ASTM E 329 "Standards of Recommended Practice for Inspection and Testing Agencies for Concrete and Steel as Used in Construction". Where applicable, the testing laboratory shall meet or exceed the requirements of ASTM C1077.

- B. Testing equipment used by the laboratory will be calibrated at maximum 12-month intervals by devices of accuracy traceable to either National Bureau of Standards or accepted values of natural physical constants.
- C. The Contractor shall submit a shop drawing in accordance with Section 01300 for the Testing Laboratory for approval demonstrating these qualifications for testing required in the individual specification sections noted above. Upon approval said laboratory will thereafter be referred to as the Approved Testing Laboratory.

### **1.03 LABORATORY DUTIES**

The testing laboratory will:

- 1. Cooperate with the Contractor to provide qualified personnel promptly on notice.
- 2. Perform the specified inspections, sampling and testing of materials; observe methods of construction; comply with applicable standards; ascertain compliance with requirements of Contract Documents.
- 3. Promptly notify the Contractor of irregularities or deficiencies in the Work which are observed during the performance of services.
- 4. Promptly submit 5 copies of reports of inspections and tests to the Contractor including:
  - a. Date issued.
  - b. Project title and number.
  - c. Testing laboratory name and address.
  - d. Date of inspection or sampling.
  - e. Record of temperature and weather.
  - f. Date of test.
  - g. Identification of product and specification section.
  - h. Location in the Project.
  - i. Type of inspection or test.
  - j. Results of tests and observations regarding compliance with the Contract Documents.

### **1.04 CONTRACTOR'S RESPONSIBILITIES**

The Contractor shall:

- A. Cooperate with laboratory personnel and the District. Provide access to Work and to manufacturer's operations.
- B. Provide preliminary representative samples of materials to be tested in required quantities to the laboratory.
- C. Furnish copies of product test reports to the District.
- D. Provide to the laboratory the preliminary design mix proposed for concrete and other material mixes that require testing by the testing laboratory.

- E. Furnish labor and facilities:
  - 1. To provide access to Work to be tested.
  - 2. To obtain and handle samples at the site.
  - 3. To facilitate inspections and tests.
  - 4. For laboratory's exclusive use for storage and curing of test samples.
  - 5. Forms for preparing concrete test beams and cylinders.
- F. Notify the laboratory and the District sufficiently in advance of operations to allow for assignment of personnel and scheduling or witnessing of tests.
- G. Arrange with laboratory and pay for additional samples and tests required for Contractor's convenience.
- H. Performing BacT testing by an independent qualified lab per Section 15041 – Disinfection of Piping.

**1.05 INDEPENDENT TESTS BY THE DISTRICT**

The District reserves the right to do, or not to do, additional independent testing at any time at the expense of the District to verify the results of the Contractor-retained Approved Testing Laboratory.

**PART 2 – PRODUCTS (NOT USED)**

**PART 3 – EXECUTION (NOT USED)**

**END OF SECTION**

## **SECTION 01505**

### **MOBILIZATION**

#### **PART 1 - GENERAL**

##### **1.01 GENERAL**

- A. Mobilization shall include the acquisition of all permits; moving onto the site of all equipment, and other construction facilities, all as required for the proper performance and completion of the Work. Mobilization shall include, but not be limited to, the following principal items:
  - 1. Installing temporary construction power, wiring, and lighting facilities.
  - 2. Developing construction water supply as required.
  - 3. Providing all on-site communication facilities, including telephones and radios for Contractor personnel.
  - 4. Providing on-site sanitary facilities and potable water facilities for Contractor personnel.
  - 5. Arranging for and establishing Contractor's storage yard as required.
  - 6. Obtaining all required permits.
  - 7. Posting all OSHA required notices and establishment of safety programs.
  - 8. Preparing and submitting product or equipment submittals and shop drawings.

##### **1.02 CONSTRUCTION FACILITIES PLAN**

- A. Prior to commencement of any field work, the Contractor shall submit a Construction Facilities Plan to the Engineer for approval. Said plan shall show the layout, equipment, materials and procedures that Contractor proposes for construction of temporary electrical, telephone, lighting, water, sanitation, field offices and sheds, and other similar site facilities.
- B. The Contractor's construction facilities shall be of a temporary nature. The Contractor shall be wholly responsible for the security of its lay down area, and for all its materials, equipment and tools at all times.

#### **PART 2 - PRODUCTS (NOT USED)**

#### **PART 3 - EXECUTION (NOT USED)**

**END OF SECTION**

## **SECTION 01510**

### **TEMPORARY UTILITIES**

#### **PART 1 - GENERAL**

##### **1.01 GENERAL REQUIREMENTS**

- A. The Contractor shall make arrangements with the appropriate utility agencies for temporary connections to the utilities. The Contractor is responsible for extending any utility services to the required point of use.
- B. Type of Services: The types of utility services that may be required for general temporary use at the project site may include, but are not limited to, the following:
  - 1. Sanitary Sewer
  - 2. Electrical Power
  - 3. Potable Water
  - 4. Telephone
- C. Scheduled Uses: The Contractor shall schedule the implementation and termination of service for each temporary utility or facility.

#### **PART 2 - PRODUCTS**

##### **2.01 MATERIALS**

- A. The Contractor shall provide either new or used materials and equipment, which are in substantially undamaged condition and without significant deterioration and which are recognized in the construction industry, by compliance with appropriate standards, as being suitable for intended use in each case. Where a portion of a temporary utility is provided for the Contractor by a utility company, the Contractor shall provide the remainder with matching and compatible materials and equipment and shall comply with recommendations of the utility company.

#### **PART 3 - EXECUTION**

##### **3.01 INSTALLATION OF TEMPORARY UTILITY SERVICES**

- A. General: Wherever feasible, the Contractor shall engage the utility company to install temporary service to the project, or as a minimum, to make connection to existing utility service; shall locate services where they will not interfere with total project construction work, including installation of permanent utility services; shall maintain temporary services as installed for required period of use; and shall relocate, modify or extend as necessary from time to time during that period as required to accommodate total project construction work.



**3.02 ELECTRICAL SERVICE**

- A. Contractor Operations: The Contractor shall pay all costs for electrical system installation and usage charges associated with its operations.
- B. Approval of Electrical Connections: All temporary connections for electricity shall be subject to approval of the Engineer and the power company, and shall be removed in like manner at the Contractor's expense prior to final acceptance of the Work.
- C. Separation of Circuits: Unless otherwise permitted by the Engineer, circuits separate from lighting circuits shall be used for all power purposes.
- D. Construction Wiring: All wiring for temporary electric light and power shall be properly installed and maintained and shall be securely fastened in place. All electrical facilities shall conform to the requirements of Title 8, Industrial Relations, Subchapter 5, Electrical Safety Orders, California Administrative Code; and Subpart K of the OSHA Safety and Health Standards for Construction.

**3.03 INSTALLATION OF POWER DISTRIBUTION SYSTEM**

- A. Power: The Contractor shall provide all necessary power required for its operations under the Contract at no additional cost to the District.
- B. Temporary Power Distribution: The Contractor shall provide a weatherproof, grounded, temporary power distribution system sufficient to accommodate performance of entire Work of the Contract, including but not necessarily limited to operation of test equipment and test operation of systems which cannot be delayed until permanent power connections are operable; temporary operation of other temporary facilities, including permanent equipment and systems which must be placed in operation prior to use of permanent power connections (pumps and similar equipment); and power for temporary operation of existing facilities (if any) at the site during change-over to new permanent power system. Provide circuits of adequate size and proper power characteristics for each use; run circuits wiring generally overhead, and rise vertically in locations where it will be least exposed to possible damage from construction operations, and result in least interference with performance of the Work; provide rigid steel conduit or equivalent raceways for wiring which must be exposed on grade, floors, decks, or other recognized exposures to damage or abuse.
- C. Provide power outlets for the Contractor's operations, with transformers, branch wiring and distribution boxes located safely and conveniently for the proposed construction activities. Provide flexible power cords as required.
- D. Maintain main service disconnect and overcurrent protection at source distribution equipment.

**3.04 INSTALLATION OF LIGHTING**

- A. Construction Lighting: All work conducted at night or under conditions of deficient daylight shall be suitably lighted to insure proper work and to afford adequate facilities for inspection and safe working conditions.
- B. Temporary Lighting: The Contractor shall provide a general, weatherproof, grounded temporary lighting system in every area of construction work, as soon as is practically feasible and provide

sufficient illumination for safe work and traffic conditions; and run circuit wiring generally overhead, and rise vertically in locations where it will be least exposed to possible damage from construction operations on grade, floors, decks, or other recognized areas of possible damage or abuse.

- C. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.
- D. Maintain lighting and provide routine repairs.

### **3.05 INSTALLATION OF SANITARY FACILITIES**

- A. Toilet Facilities: Fixed or portable chemical toilets shall be provided wherever needed for the use of Contractor's employees. Toilets at construction job site shall conform to the requirements of Subpart D, Section 1926.51 of the OSHA Standards for Construction.
- B. Sanitary and Other Organic Wastes: The Contractor shall establish a regular daily collection of all sanitary and organic wastes. All wastes and refuse from sanitary facilities provided by the Contractor or organic material wastes from any other source related to the Contractor's operations shall be disposed of away from the site in a manner satisfactory to the Engineer and in accordance with all laws and regulations pertaining thereto.

### **3.06 OPERATIONS AND TERMINATIONS**

- A. Inspections: Prior to placing temporary utility services into use, the Contractor shall inspect and test each service and arrange for governing authorities' required inspection and tests, and obtain required certifications and permits for use thereof.
- B. Protection: The Contractor shall maintain distinct markers for underground lines, and protect from damage during excavating operations.
- C. Termination and Removal: When need for a temporary utility service or a substantial portion thereof has ended, or when its service has been replaced by use of permanent services, or not later than time of substantial completion, the Contractor shall promptly remove installation unless requested by the Engineer to retain it for a longer period. The Contractor shall complete and restore the Work which may have been delayed or affected by installation and use of temporary utilities, including repairs to construction and grades and restoration and cleaning of exposed surfaces.

**END OF SECTION**

**SECTION 01530****PROTECTION OF WORK, PROPERTY AND EXISTING FACILITIES****PART 1 – GENERAL****1.01 DESCRIPTION**

- A. The Contractor shall be responsible for taking all precautions, providing all programs, and taking all actions necessary to protect the Work and all public and private property and facilities from damage as specified in the General Conditions and herein.
- B. In order to prevent damage, injury or loss to persons or property, the Contractor's actions shall include, but not be limited to, the following:
  - 1. Store materials, supplies and equipment in an orderly and safe manner that will not unduly interfere with the progress of the Work or the work of any other contractor or utility service company.
  - 2. Provide suitable storage facilities for all materials which are subject to theft or damage due to weather exposure, breakage or otherwise.
  - 3. Place upon the Work, or any part thereof, only such loads as are consistent with the safety of that portion of the Work.
  - 4. Frequently clean up all refuse, debris and scrap materials caused by operations to provide a safe, orderly and workmanlike appearance at all times at the site of the Work. Unless otherwise approved, the Contractor shall perform clean up on a daily basis.
  - 5. Provide barricades and guard rails around openings, for scaffolding, for temporary stairs and ramps, around excavations, elevated walkways and other hazardous areas.
- C. The Contractor shall not, except after written consent from proper parties, enter or occupy privately-owned land with workers, tools, materials or equipment except on District's easements therein.
- D. The Contractor shall assume full responsibility for the preservation of all public and private property or facility on or adjacent to the site. If any direct or indirect damage is done by or on account of any act, omission, neglect or misconduct in the execution of the Work by the Contractor, it shall be restored by the Contractor to original condition or better than existing prior to damage at the Contractor's expense.
- E. Payment for the Work of this Section shall be included as part of the lump sum or unit price bid amount for which such Work is appurtenant thereto.

**PART 2 – PRODUCTS****2.01 UNDERGROUND STRUCTURES**

- A. Underground structures are defined to include, but are not limited to, all sewer, water, gas, storm drains, manholes, chambers, electrical conduits, tunnels and other piping or subsurface work located within or adjacent to the limits of the Work.
- B. All underground structures known to the Engineer are shown to the extent of available information but are not guaranteed to be correct or complete.
- C. Water, sewer, electric, gas, telephone and cable television service connections, if shown, are considered approximate and their locations shall be determined by the Contractor and the utility owner prior to construction.
- D. The Contractor shall explore ahead of trenching or excavation work and shall uncover all proposed connection points on existing structures or pipes; obstructing; or adjacent underground structures sufficiently to determine their location, to prevent damage to them, and to prevent interruption of service which such structures provide. The Contractor shall immediately notify the District in the event that existing utilities differ from the locations shown on the Drawings. The Contractor shall restore any underground structures damaged by the Contractor's operations to original condition at no additional cost to the District.
- E. Necessary changes in the location of the Work may be made by the Engineer to avoid unanticipated underground structures.
- F. If permanent relocation of an underground structure is required and is not otherwise provided for in the Contract Documents, the Engineer will order the Contractor in writing to perform the work which shall be paid for under the provisions of the General Conditions.
- G. The Contractor shall notify U.S.A. Dig Alert at 811 a minimum of two working days prior to any excavation.

**2.02 SURFACE STRUCTURES**

Surface structures are defined as all existing buildings, tanks, walls, bridges, roads, dams, channels, open drainage, piping, poles, pedestals, transformers, wires, posts, signs, markers, curbs, walks and all other facilities that are visible above the ground surface and including their foundations or any extension below the surface.

**PART 3 – EXECUTION****3.01 GENERAL**

- A. Replace existing improvements such as curbs and gutters; fences; signs; paved surfaces; etc. that are cut, removed, damaged, or otherwise disturbed by the construction with new, in-kind improvements.

- B. Where utilities are parallel to or cross the pipeline trench but do not conflict with the permanent work to be constructed, follow the procedures given below and as indicated on the Drawings. For utility crossings not shown on the Drawings, follow the General Provisions and the instructions of the Engineer.
- C. Notification: Notify the utility owner 48 hours in advance of the crossing construction and coordinate the construction schedule with the utility owner's requirements.
- D. Exposing Utilities in Advance: It shall be the Contractor's responsibility to determine the true location and depth of utilities and service connections which may be affected by or affect the work. Determine the type, material, and condition of these utilities. In order to provide sufficient lead time to resolve unforeseen conflicts, order materials and take appropriate measures to ensure that there is no delay in work, the Contractor shall expose all utilities 1,300 linear feet in advance of the pipeline construction.
- E. Protect in Place: Protect utilities in place, unless abandoned, and maintain the utility in service, unless otherwise specified.
- F. Cut and Plug: Cut abandoned utility lines and plug the ends with a concrete plug in accordance with SSPWC Section 306-5. Dispose of the cut pipe as unsuitable material. Do not cut asbestos cement pipe; refer to Section 01170 for the procedure for the removal of asbestos cement pipe.
- G. Remove and Reconstruct: Where necessary or as required by the District's Representative, remove the utility and, after passage, reconstruct it with new materials. Provide temporary service for the disconnected utility.
- H. Cultivated or planted areas and other surface improvements which are damaged by actions of the Contractor shall be restored as nearly as possible to their original condition at the Contractor's expense. Existing guard posts, barricades, driveways and fences shall be protected and replaced if damaged.
- I. Vitrified Clay Sewer Pipe and Couplings: For sewer pipe eight inches in diameter or under, replacement shall consist of plain-end pipe conforming to ASTM C700. Compression coupling shall conform to ASTM C594; Band seal couplings or approved equal. At least two lengths of pipe shall be used in crossing the trench section.

### 3.02 PROTECTION OF EXISTING STRUCTURES

- A. Protection of Underground and Surface Structures:
  - 1. The Contractor shall sustain in their places and protect from direct or indirect damage all underground and surface structures located within or adjacent to the limits of the Work. Such sustaining and supporting shall be done carefully and as required by the party owning or controlling such structure. Before proceeding with the work of sustaining and supporting such structure, the Contractor shall satisfy the Engineer that the methods and procedures to be used have been approved by the party owning same.
  - 2. The Contractor shall assume all risks attending the presence or proximity of all underground and surface structures within or adjacent to the limits of the Work.

The Contractor shall be responsible for all damage and expense for direct or indirect damage caused to any structure. The Contractor shall immediately repair all damage to the satisfaction of the owner of the damaged structure.

- B. All other existing surface facilities, including but not limited to, guard rails, posts, guard cables, signs, poles, markers and curbs which are temporarily removed to facilitate installation of the Work shall be replaced and restored to their original condition at Contractor's expense.
- C. Adjacent Parallel Utilities: Protect existing parallel utilities from any disturbances and repair the lines and associated appurtenances if they are damaged in any way. All costs incurred for protection of utilities or any costs incurred due to the presence of the lines, whether or not they lie within the new construction, shall be borne in full by the Contractor.

### 3.03 PROTECTION OF INSTALLED PRODUCTS

- A. The Contractor shall provide protection of installed products to prevent damage from subsequent operations. Remove protection facilities when no longer needed prior to completion of the Work.
- B. The Contractor shall control traffic to prevent damage to equipment, materials and surfaces.

### 3.04 COMPACTION

- A. Utilities Protected in Place: Backfill and compact under and around the utility so that no voids are left. For existing utilities that are concrete encased, use cement-sand slurry conforming to this Section for backfill around the utility unless otherwise specified by the utility owner.
- B. Utilities Reconstructed: Prior to replacement of the utility, the trench shall be backfilled and compacted by approved means to an elevation one foot above the top of the ends of the utility. A cross trench of the proper width shall be excavated for the utility and it shall be laid, backfilled, and compacted as specified herein or as required by the Engineer.
- C. Cement-Sand Slurry: Slurry consisting of one sack (94 pounds) of portland cement per cubic yard of sand and sufficient moisture for workability may be required for backfill to aid in reducing compaction difficulties. Submit specific methods and procedures for the review of the District's Representative prior to construction.

### 3.05 PROTECTION OF SURVEY OR ROADWAY MARKERS

The Contractor shall not destroy, remove or otherwise disturb any existing survey markers or other existing street or roadway markers without proper authorization. No pavement breaking or excavation shall be started until all survey or other permanent marker points that will be disturbed by the construction operations have been properly referenced for accurate restoration. It shall be the Contractor's responsibility to notify the proper representatives of the District of the time and location that such work will be done. Such notification shall be in advance of construction to avoid delay due to referencing survey points for restoration. All survey markers or points

disturbed without proper authorization by the Engineer may be restored by the District at the Contractor's expense after all street or roadway resurfacing has been completed.

### **3.06 RESURFACING**

- A. The Contractor shall promptly place temporary surfacing on all areas where existing surfacing has been disturbed and shall maintain such surfacing for the duration required by the Engineer. Temporary resurfacing shall be constructed in accordance with the following requirements.
1. The subgrade shall be uniformly watered sufficiently to eliminate dust, but not to such extent as to form mud or pools of water. The street and surrounding area shall be cleared of rubbish and debris. The street shall be swept and the surrounding area shall be cleaned thoroughly.
  2. The temporary surfacing shall then be spread over the prepared subgrade and rolled with not less than an 8-ton tandem roller in such a manner that, after rolling, the temporary surfacing shall present a smooth surface for traffic, shall not be less than 2 inches in compacted thickness and shall be maintained free from bumps and depressions until permanent surfacing is placed. The finished surface of said temporary surfacing shall be flush with the adjoining pavement grade.
  3. The Contractor shall store sufficient temporary surfacing material at the job site for necessary repairs to the temporary surfacing already placed.
  4. The temporary surfacing shall be left in place until permanent surfacing is constructed.
  5. No separate payment shall be made for temporary surfacing and all costs shall be included with the associated items of the Work.
- B. Unless otherwise specified, roads in which the surface is removed, broken, or damaged, or in which the ground has caved or settled during the work under this contract, shall be resurfaced and brought to the original grade and section. Roadways used by the Contractor shall be cleaned and repaired on a weekly basis as directed by the Resident Engineer.
- C. Pavement surfaces which have been damaged due to the Contractor's operations shall be restored to their original condition at no additional cost to the District where such damage could have been reasonably expected, in the sole opinion of the Engineer, and the Contractor failed to implement measures to prevent the damage.

### **3.07 PROTECTION OF TREES AND LANDSCAPING**

- A. The Contractor shall exercise all necessary precautions so as not to damage or destroy any trees, shrubs or other existing landscaping including those lying within or beyond street right-of-way and project limits.
- B. The Contractor shall not trim or remove any vegetation unless approved for trimming or removal by the jurisdictional agency or District.

- C. All existing trees and landscaping which are damaged during construction shall be trimmed or replaced by the Contractor or a certified landscape company under permit from the jurisdictional agency or District and to the satisfaction of said agency and/or the District. All costs shall be borne by the Contractor.

**3.08 REPLACEMENT IN KIND WITH NEW**

Except as indicated or as specifically authorized by the District's Representative, reconstruct utilities or improvements with new material of the same size, type, and quality as that removed.

**END OF SECTION**



## **SECTION 01540**

### **SECURITY**

#### **PART 1 - GENERAL**

##### **1.01 DESCRIPTION**

- A. The Contractor(s) shall safely guard all work, materials, equipment and property from loss, theft, damage and vandalism. Contractors' duty to safely guard property shall include the District's property and other private property from injury or loss in connection with the performance of the Work.
- B. The Contractor shall employ watchmen as needed to provide the required security and prevent unauthorized entry.
- C. The Contractor may make no claim against the District for damage resulting from trespass.
- D. The party responsible for security shall make good all damage to property of District and other arising from failure to provide adequate security.
- E. If existing fencing or barriers are breached or removed for purposes of construction, the Contractor shall provide and maintain temporary security fencing equal to the existing in a manner satisfactory to the District's Representative.
- F. Security measures taken by the Contractor(s) shall be at least equal to those usually provided by the District to protect the existing facilities during normal operation.
- G. A security program shall be maintained throughout construction until final acceptance and occupancy precludes need for Contractor's security program.

##### **1.02 CONTRACTOR'S ACCESS TO THE SITE**

- A. Access to the site for Contractor's employees, material, tools, and equipment shall be as directed by the District's Representative.
- B. The Contractor shall ensure that each of its employees, representatives, material suppliers and others acting for the Contractor shall be subject to the following:
  - 1. No Contractor employee's personal vehicle shall be allowed to park anywhere other than the Contractor Employee's Parking Area. The Area shall be designated by the District's Representative. The Contractor shall prepare and maintain this area as required.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION (NOT USED)**

**END OF SECTION**

**SECTION 01560****TEMPORARY ENVIRONMENTAL CONTROLS****PART 1 - GENERAL****1.01 DESCRIPTION**

- A. The Contractor shall provide and maintain temporary methods, procedures, equipment and work as necessary to provide controls over environmental conditions at the site of the Work and adjacent areas. All physical evidence of temporary facilities shall be removed and areas restored to their original condition upon completion of the Work.

**1.02 RELATED WORK SPECIFIED ELSEWHERE**

- A. Section 02270 – Temporary Soil Erosion and Sediment Control

**PART 2 - PRODUCTS (NOT USED)****PART 3 - EXECUTION****3.01 LAYDOWN AREAS**

- A. Laydown areas shall be established as necessary in coordination with the District or its representative.

**3.02 NOISE CONTROL**

The Contractor shall comply with all local sound control and noise level rules, regulations and ordinances during the performance of the Work. Noise levels shall conform to the latest OSHA standards and in no case will noise levels which interfere with the District's work or operations, or the work of others, be permitted.

- A. Each internal combustion engine that is used for any purpose on the job or related to the job shall be equipped with a muffler of a type recommended by the manufacturer, and no internal combustion engine shall be operated at the site of the Work without said muffler.
- B. If the Contractor is allowed to work outside the normal work hours, the noise level generated by the Contractor's operations between the hours of 6:00 p.m. and 6:00 a.m. shall not exceed 70 dBA at a distance of fifty (50) feet. This requirement in no way relieves the Contractor from responsibility for complying with more stringent local ordinances regulating noise level. Said noise level requirements shall apply but not be limited to trucks, transmit mixers or transient equipment that may or may not be owned by the Contractor.

**3.03 DUST CONTROL**

The Contractor shall control the occurrence of objectionable dust during earthwork operations or any other activity. The Contractor shall apply water and calcium chloride, or use other methods

approved by the Engineer, to reduce the occurrence of airborne dust to the maximum extent practicable.

### **3.04 PEST AND RODENT CONTROL**

The Contractor shall provide rodent and pest control as necessary to prevent infestation of construction or storage areas. Employ methods and use materials which will not adversely affect conditions at the site or on adjoining properties.

### **3.05 WATER CONTROL**

- A. The Contractor shall provide, operate and maintain equipment and facilities of adequate size to control surface water and water from excavations and structures in order to prevent damage to the Work, the site, or adjoining properties.
  - 1. Control fill, grading and ditching to direct water away from excavations, pits, tunnels and other construction areas and to direct drainage to suitable drainage facilities to prevent erosion, nuisance flows or damage.
- B. The Contractor shall dispose of drainage water in a manner to prevent flooding, erosion or other damage to the Work, any portion of the site or to adjoining areas in conformance with all environmental requirements.
- C. The Contractor shall comply with the District's SWRCB Order WQ 2014-0194-DWQ, General Order No. CAG140001 as part of the Statewide National Pollutant Discharge Elimination System (NPDES) Permit for Drinking Water System Discharges to Waters of the United States.

### **3.06 POLLUTION CONTROL**

- A. The Contractor shall provide methods, means and facilities required to prevent contamination of soil, water or atmosphere by the discharge of noxious substances resulting from construction operations.
- B. The Contractor shall provide equipment and personnel and perform emergency measures required to contain any spillages, and to remove soils or liquids contaminated as a result of the Contractor's activities.
  - 1. Excavate and legally dispose off-site any contaminated soil or liquid and replace with suitable compacted fill and topsoil.
- C. The Contractor shall take special measures to prevent harmful substances from entering public waters.
  - 1. Prevent the disposal of wastes, effluents, chemicals or other such substances adjacent to or into streams or in sanitary or storm sewers.
- D. The Contractor shall provide systems for the control of atmospheric pollutants.
  - 1. Prevent toxic concentrations of chemicals.
  - 2. Prevent harmful dispersal of pollutants into the atmosphere.

**END OF SECTION**

**SECTION 01570****TRAFFIC REGULATIONS****PART 1 - GENERAL****1.01 GUIDANCE**

- A. Traffic Control permits, notifications, mobilization, temporary signs, barriers, lights, flagging personnel, striping, markings, and demobilization and removal.

**1.02 CONSTRUCTION IN PUBLIC ROADWAYS**

- A. CONTRACTOR shall prepare traffic control plans for any work impacting the public Right-of-Way (ROW) or adjacent to the public ROW. CONTRACTOR shall submit a Right-of-Way Permit (ROW Permit) to the City and/or County Jurisdiction for which the project is located supplemented with Traffic Control Plan(s) (TCPs) for each separate portion or phase of the project. The TCP is not valid until plans and a ROW Permit are approved and issued.
- B. Traffic Control Plans shall be per the latest editions of the California Manual on Uniform Traffic Control Devices (California MUTCD or CA MUTCD) Standards and Traffic Control Guidelines of the City and/or County jurisdiction for which the project is located. CONTRACTOR shall provide signs, signals, barricades, flares, lights and all other equipment, service and personnel required to regulate and protect all traffic and warn of hazards. All such work shall conform to requirements of the CITY and/or COUNTY. Remove temporary equipment and facilities when no longer required, restore grounds to original, or to specified conditions.
- C. Work hours on most streets shall be restricted between the hours of 7:00 AM and 5:00 PM, unless approved by the CITY and/or COUNTY and DISTRICT. Arterial streets may require night work. All night work will require written approval from the City and/or County. Lane closures, road closures, and traffic signal modifications associated with overnight construction activities will require warning signs to be placed at least one week in advance of starting construction.
- D. All open trenches shall be covered with a recessed, traffic bearing non-skid plates during nonworking hours according to this Specification.

**1.03 CONSTRUCTION PARKING CONTROL**

- A. Control vehicular parking to prevent interference with public traffic and parking, access by emergency vehicles, access to property, and DISTRICT AND CITY and/or COUNTY operations.
- B. Submit a plan for parking of construction personnel's vehicles to the DISTRICT for approval. No personal vehicles will be permitted beyond the approved designated construction parking area.
- C. Prevent parking on or adjacent to access roads or in non-designated areas.

**1.04 LAYDOWN AREAS**

- A. Laydown areas (construction staging areas) shall be established as needed in accordance with any requirements of the District Engineer.
- B. Laydown areas in the public right-of-way shall be approved by the agency having jurisdiction over the right-of-way.

**1.05 TRAFFIC CONTROL**

- A. **Vehicular and Pedestrian Access:** The Contractor's operations shall cause no unnecessary inconvenience to the public, including trash, mail, and other services provided to the public over the County rights-of-way and private streets. The access rights of the public shall be considered at all times, and vehicular and pedestrian traffic shall be permitted to pass on public rights of way or private streets through the work at all times, unless the Contractor receives prior written approval of a detour plan from the Engineer. The Contractor shall provide at least seventy-two (72) hours written notice to the Engineer requesting approval of a detour plan, prior to the performance of any work or the establishment of any detour or closure in the public right-of-way or private streets. The Contractor shall notify the occupants or owners of all affected properties at least forty-eight (48) hours prior to any temporary obstruction of access.
- B. Safe and adequate pedestrian and vehicular access shall be provided and maintained to fire hydrants, commercial and industrial establishments, churches, schools, parking lots, service stations, motels, fire and police stations, hospitals, and establishments of similar nature. Access to these facilities shall be continuous and unobstructed unless prior approval of a detour plan is received from the Engineer.
- C. Safe and adequate pedestrian zones and public transportation stops, as well as pedestrian crossings of the work at intervals not exceeding 300 feet (90 m), also shall be maintained unless prior approval of a detour plan is received from the Engineer.
- D. Vehicular access to residential driveways shall be maintained to the property line unless prior approval of a detour plan is received from the Engineer. This applies for both public right of ways and private roads.
- E. The Contractor shall cooperate with owners and occupants of affected properties as well as other parties involved in providing services to the public (trash collection, mail delivery, etc.), in order to maintain existing schedules for these services. This applies for both public right of ways and private roads.
- F. Grading operations, roadway excavation and fill construction shall be conducted by the Contractor in a manner to provide a reasonably satisfactory surface for traffic. When rough grading is completed, the roadbed surface shall be brought to a smooth, even condition satisfactory for traffic. This applies for both public right-of-ways and private roads.
- G. Unless otherwise authorized, work shall be performed in only one-half of the roadway at one time. One-half shall be kept open and unobstructed until the opposite side is ready for use. If one-half a street only is being improved, the other half shall be conditioned and maintained as a detour. This applies for both public right-of-ways and private roads.

- H. The Contractor shall provide barricades, flagmen, signs and other items required to ensure the safety of the public. The Contractor shall adhere to the traffic plans included in the Contract Documents, unless so otherwise directed by the Construction Manager.
- I. The Contractor shall maintain two-way traffic flow at all times, unless otherwise directed by the Inspector.
- J. Trenches shall be backfilled or trench-plated at the end of each workday. Trenches left open during non-working hours are allowed only at the stopping-starting point. Trench plates shall be recessed by grinding the pavement down on either side of the trench. The grinding depth shall be as deep as necessary to ensure the top of the trench plate is flush with the adjacent finish surface.
  - a. Trench plates shall be pinned using approved non-obtrusive material.
  - b. If more than one plate is used to cover a trench opening, the plates shall be welded together at abutting joints.
  - c. Warning signs reading "STEEL PLATES AHEAD" shall be placed for on-coming vehicular and pedestrian traffic as directed by the AGENCY.
  - d. In no case shall more than three (3) standard length plates be allowed in one location.
  - e. CONTRACTOR shall submit a drawing and written description of the method to completely install and remove the recessed trench plates per the Specifications. The recessed plate submittal will include, but not be limited to, plate size, thickness and load capacity, non-skid material, pinning mechanism, bracing system, including shoring system for trench walls, length of plate outside of trench line, typical warning signage and welding method, temporary hot mix AC upon removal, and grinding and final AC paving.

## 1.06 DETOUR PLANS

- A. The Contractor shall submit a detour plan for approval by the Agency having jurisdiction of the right-of-way which shall include, at a minimum, the following requirements unless specifically approved otherwise by the Agency:
  - 1. Unless authorized by the Agency, no less than a twelve foot (12') wide traffic lane shall be provided for each direction of travel on all streets at all times. The traffic lane shall be provided for each direction of travel on all streets at all times. The traffic lanes shall be maintained on pavement, and shall remain unobstructed. Lane transitions shall not be sharper than a taper of thirty to one (30:1).
  - 2. Unless authorized by the Agency, clearances from traffic lanes shall be no less than five feet (5') to the edge of any excavation and no less than two feet (2') to the face of any curb, pole, barricade, delineators, or other vertical obstruction.



3. Where applicable, one four foot (4') wide paved pedestrian walkway shall be maintained in the parkway area on each side of all streets. The clearance from the pedestrian walkway to any traffic lane shall be five feet (5').
4. Traffic control warning signs, lights, and devices shall conform to the least edition California Department of Transportation, Traffic Control Manual and supplemental revisions.
5. The Contractor shall provide barriers, guards, lights, signs, temporary bridges, flagpersons and watchpersons, advising the public of detours and construction hazards. The Contractor shall also be responsible for compliance with additional public safety requirements which may arise during construction. The Contractor shall furnish and install, and upon completion of the work, promptly remove all signs and warning devices.
6. At least forty-eight (48) hours in advance of closing, or partially closing, or of reopening, any street, alley, or other public or private thoroughfare, the Contractor shall notify the Police, Fire, Traffic and Engineering Departments of jurisdictional agencies involved, and comply with their requirements. Deviations must first be approved in writing by the Agency.
7. The Contractor shall secure approval, in advance, from authorities concerned, for the use of any bridges proposed by it for public use. Temporary bridges shall be clearly posted as to load limit, with signs and posting conforming to current requirements set forth in the Traffic Manual published by the California Department of Transportation, covering "signs". This manual shall also apply to the street closures, barricades, detours, lights, and other safety devices required.
8. Temporary traffic channelization shall be accomplished with barricades or delineators. Temporary striping will not be allowed unless specifically permitted by the Agency. The Contractor shall prepare any plans that may be required for temporary striping to the satisfaction of the Engineer. In no event will temporary striping on pavement surfaces be allowed to remain.

#### **1.07 TRAFFIC CONTROL DEVICE MAINTAINENCE**

- A. All traffic control devices shall be maintained 24 hours per day, 7 days a week, by the CONTRACTOR.

### **PART 2 - PRODUCTS**

#### **2.01 SIGNS, SIGNALS, AND DEVICES**

- A. Traffic control warning signs, lights, and devices shall conform to the most recent edition of the California Manual on Uniform Traffic Control Devices (California MUTCD).
- B. All signs and barricades shall be illuminated or reflectorized when they are used during hours of darkness. All delineators, cones, barricades or posts used in the diversion of traffic shall be provided with flashers or other satisfactory illumination if in place during darkness. Internally or externally illuminated signs shall be used where there is

significant interference from extraneous light sources and reflectorized signs will not be effective. External light sources shall be properly shielded to protect drivers from glare.

- C. The signing, barricading, and diverting of traffic shall be subject to the CONTRACTOR'S approved TCPs and ROW Permit. The CONTRACTOR shall maintain a 24-hour emergency service to remove, install, relocate and maintain warning devices and shall furnish to the CITY and/or COUNTY and DISTRICT names and telephone numbers of three persons responsible for this emergency service. In the event these persons do not promptly respond when notified by the CITY, COUNTY, AND/OR DISTRICT, the CITY, COUNTY, AND/OR DISTRICT reserves the right to call other forces to accomplish such required emergency service, and the CONTRACTOR will be held responsible for any and all costs incurred by the DISTRICT.

### **PART 3 - EXECUTION**

#### **3.01 FLAGPERSONS**

- A. Per CA MUTCD, provide trained and equipped flag persons to regulate traffic when construction operations or traffic encroach on public traffic lanes, or as required by local jurisdictions.

#### **3.02 FLARES AND LIGHTS**

- A. Use flares and lights during hours of low visibility to delineate traffic lanes and to guide traffic.

#### **3.03 HAUL ROUTES AND SITE ACCESS**

- A. Confine construction traffic to designated haul routes.
- B. Provide traffic control at critical areas of haul routes to regulate traffic and to minimize interference with public traffic.

#### **3.04 TRAFFIC SIGNS AND SIGNALS**

- A. Install traffic signs and signals at approaches to site and on site, at crossroads, detours, parking areas, and elsewhere as needed to direct construction and affected public traffic.
- B. Install and operate traffic control to direct and maintain orderly flow of traffic in areas under CONTRACTOR'S control, and areas affected by CONTRACTOR'S operations.
- C. Relocate as work progresses, to maintain effective traffic control.
- D. Work that disturbs normal traffic signal timing operations or detection shall be coordinated with the Agency 72 hours prior to commencing work.
- E. All traffic control devices shall be removed from view or covered when not in use.

#### **3.05 REMOVAL**

- A. Remove equipment and devices when no longer required.

- B. Repair damage caused by installation.
- C. The CONTRACTOR shall obtain verification from the Agency that the complete traffic control system has been satisfactorily removed and that all necessary repairs have been successfully completed.

**END OF SECTION**

**SECTION 01610****TRANSPORTING AND HANDLING MATERIALS AND EQUIPMENT****PART 1 - GENERAL****1.01 DESCRIPTION**

The Contractor shall make all arrangements for transportation, delivery and handling of equipment and materials required for the Work.

**1.02 DELIVERY**

- A. Shipments shall not be delivered to the District except where otherwise directed.
- B. Shipments shall be addressed and consigned to the proper party including the name of Project and complete.
- C. Shipments of materials to the Contractor or Subcontractors shall be delivered to the site only during regular working hours.
- D. Arrange deliveries of products according to construction schedules and with ample time to facilitate inspection prior to installation.
- E. Coordinate deliveries to avoid conflict with the Work and site conditions and to accommodate the following:
  - 1. The work of the District and the District's use of the premises.
  - 2. Limitations of storage space.
  - 3. Availability of equipment and personnel for product handling.
- F. Do not have products delivered to the project site until related Shop Drawings are approved by the Engineer and required storage facilities are available.
- G. Deliver products in manufacturer's original, unopened, labeled containers. Keep the Engineer informed of delivery of all equipment to be incorporated in the Work.
- H. Partial deliveries of component parts of equipment shall be clearly marked to identify the equipment and to facilitate storage and assembly.
- I. Immediately upon delivery, inspect shipments to assure:
  - 1. Product complies with the requirements of the Contract Documents and reviewed submittals.
  - 2. Quantities are correct.
  - 3. Containers and packages are intact and labels are legible.

4. Products are undamaged and properly protected.

**1.03 HANDLING**

- A. Provide equipment and personnel necessary to handle products including those provided by the District.
- B. Provide additional protection during handling as necessary to prevent soiling, scraping, marring or otherwise damaging products, packaging or surrounding surfaces.
- C. Handle products by methods to prevent bending or overstressing.
- D. Lift heavy components only at designated lifting points.
- E. Materials and equipment shall at all times be handled in a safe manner and as recommended by the manufacturer or supplier to prevent damage. Do not drop, roll or skid products off delivery vehicles. Hand carry or use suitable handling equipment.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION (NOT USED)**

**END OF SECTION**

**SECTION 01620****STORAGE OF MATERIAL****PART 1 - GENERAL****1.01 DESCRIPTION**

The Contractor shall make all arrangements and provisions necessary for the storage and protection of materials and equipment in accordance with the manufacturer's recommendations and the requirements of the Contract Documents.

**1.02 STORAGE LOCATIONS AND ACCESS**

- A. Areas available for storage of material and equipment on the construction site shall be as shown on the Drawings or approved by the Engineer. The Contractor shall not store products in the structures being constructed unless approved in writing by the Engineer.
- B. Lawns or private property shall not be used for storage purposes without written permission of the District or other person in possession or control of such premises.
- C. Materials and equipment which are to become the property of the District shall be stored to facilitate their inspection and for preservation of the quality and fitness of the Work including proper protection against damage by freezing and moisture. They shall be placed in enclosed storage areas unless otherwise approved by the District.
- D. All excavated materials, construction equipment, and materials and equipment to be incorporated into the Work shall be stored to prevent damage to any part of the Work or existing facilities, and to allow access at all times to all parts of the Work and to all public utility installations in the vicinity of the Work. Materials and equipment shall be kept neatly and compactly stored in locations that will cause a minimum of inconvenience to other contractors, public travel, and adjoining owners and/or occupants.
- E. The Contractor shall not open manufacturer's containers until time of installation unless recommended by the manufacturer or otherwise specified.
- F. The Contractor shall be fully responsible for loss or damage to stored materials and equipment.

**1.03 UNCOVERED STORAGE**

- A. The following types of materials may be stored outdoors without cover:
  - 1. Masonry units
  - 2. Reinforcing and structural steel
  - 3. Metal piping
  - 4. Castings

5. Chemical storage containers

- B. Store the above materials on wood blocking to prevent contact with the ground.

**1.04 COVERED STORAGE**

- A. The following types of materials may be stored outdoors if covered with material impervious to water:

1. Pumps and valves
2. Plastic Piping
3. Plastic Pipe Fittings

- B. The Contractor shall tie down and slope covers to prevent the accumulation of water on covers.

- C. The Contractor shall store materials on wood blocking.

**1.05 FULLY PROTECTED STORAGE**

- A. The Contractor shall protect mechanical and electrical equipment from being contaminated by dust, dirt and moisture.

- B. The Contractor shall maintain humidity at levels recommended by manufacturers for electrical and electronic equipment.

**1.06 MAINTENANCE OF STORAGE**

- A. The Contractor shall periodically inspect stored products on a regular basis to assure that:

1. The condition of the storage facility is adequate to provide the required conditions.
2. The required environmental conditions are maintained on a continuing basis.
3. The products which are exposed to elements are not adversely affected.

- B. If necessary to move stored materials and equipment during construction, the Contractor shall move or cause to be moved materials and equipment without additional compensation from the District.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION (NOT USED)**

**END OF SECTION**



## SECTION 01700

### PROJECT CLOSEOUT

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

- A. Contract Closeout is the process that commences as the Work nears Substantial Completion. It continues through Substantial Completion, and Final Acceptance of the Work.
- B. This specification section defines the overall changeover process from construction (by the Contractor) to operations (by the District). This section defines the terms in this process, and outlines the responsibilities of the Contractor, the Engineer, and the District.

##### 1.02 CONTRACT CLOSEOUT SEQUENCE OF EVENTS

- A. The sequence of events and their description listed below represent the suggested order of activities as the Contract proceeds from construction, through checkout, testing, Substantial Completion, and the Notice of Completion. Not all work will proceed in this exact order. Adjustments may be made, after approval by the Engineer, for the mutual benefit of the Contractor and the District, if the situation so warrants. Any adjustment made in the sequence of events, to accommodate the Contractor, shall be at no additional cost to the District.
- B. Closeout Sequence of Events and Description:
  - 1. Work Nears Completion - Signifies the start of testing. The Contractor shall indicate when work is ready for testing on a facility and/or system basis.
  - 2. Contract Closeout Deliverables - The Contractor shall provide the following:
    - a. Final as built Redline Drawings.
    - b. All Unconditional Waivers and Release Upon Final Payment to Subcontractor submitted to the District.
    - b. Written guarantees, where required.
    - c. Maintenance stock items; spare parts; special tools.
    - d. Certificates of inspection and acceptance by local governing agencies having jurisdiction.
  - 3. Pre-Final Inspection and Discrepancy List - The Engineer will conduct a pre- final inspection of the Work prior to substantial completion. The Engineer will prepare a discrepancy list (punchlist). The discrepancy list includes items of work which do not conform to the Contract Documents, plus any additional items found to be missing, incomplete, damaged, incorrect, or constructed in an unworkmanlike manner. The Contractor shall correct all items on the discrepancy list.

4. Substantial Completion - Following correction of items on the discrepancy list and successful completion of the operational demonstration, the Contractor shall notify the Engineer that the Work is substantially complete.
5. Final Inspection - Following written notice from the Contractor that the entire Work is complete the Engineer, the District, the Contractor will conduct a final inspection to verify that the Work is complete. The Engineer will prepare a final punchlist of all outstanding items.
6. Final Payment - After the Contractor has completed all final punchlist items, and completed all other requirements, the Contractor shall submit a final application for payment to the Engineer. The final payment application will include all necessary documentation, in addition to waivers or releases of all liens filed in connection with the Work. The Contractor shall specifically release the District from any claims not specifically renewed on the final application for payment. After acceptance by the Engineer and the District, the District will make final payment to the Contractor after deducting all amounts to be retained under the provisions of the Contract Documents.
7. Notice of Completion - The District will file a Notice of Completion with the County Recorder to begin the thirty-day (30-day) stop notice-filing period.
8. Release of Retention - Not more than thirty-five (35) days after filing the Notice of Completion, the District will release to the Contractor all retained funds, less any deductions to cover pending third party claims against the District.

### **1.03 SUBSTANTIAL COMPLETION:**

- A. Substantial Completion includes compliance with the following requirements:
  1. The Contractor has, substantially completed the construction and erection of the Work in conformance with the Contract Documents.
  2. The Contractor has installed, adjusted, and successfully tested Products, equipment, and systems. The facilities are constructed as indicated by the erection, installation, and operations and maintenance instructions of the Suppliers.
  3. The Contractor has provided and completed the following items as approved by the Engineer:
    - a. Contract Closeout Deliverables.
    - b. Special Supplier's Warranties.

### **1.04 PRE-FINAL AND FINAL INSPECTIONS**

- A. Pre-final and final inspections are surveys of the Contractor's work by the Engineer, the District, and the Design Engineer to create a list of incomplete or unsatisfactory items of Work.
- B. Prior to the pre-final and final inspections, the Contractor must complete the following:
  1. Clean site; sweep paved areas, rake clean unpaved surfaces.

2. Remove waste and surplus materials, rubbish, fencing, equipment, temporary utilities, and construction facilities from the site.
- C. The discrepancy list(s) and punchlist will include all items of work found to be unsatisfactory, missing, incomplete, damaged, incorrect, or improperly installed or constructed. Prior to Final Acceptance, the Contractor shall correct the punchlist items by re-work, modification, or replacement, at the option of the Engineer and at no additional cost to the District. The Engineer will re-inspect punchlist items upon notice by the Contractor that they are complete.

## **PART 2 - PRODUCTS (NOT USED)**

## **PART 3 - EXECUTION**

### **3.01 FINAL CLEANUP**

- A. The Contractor shall promptly remove from the vicinity of the completed work, all rubbish, unused materials, concrete forms, construction equipment, and temporary structures and facilities used during construction. Final acceptance of the Work by the District will be withheld until the Contractor has satisfactorily complied with the foregoing requirements for final cleanup of the project site.

### **3.02 MAINTENANCE AND GUARANTEE**

- A. The Contractor shall comply with the maintenance and guarantee requirements contained in the General Conditions.
- B. Replacement of earth fill or backfill, where it has settled below the required finish elevations, shall be considered as a part of such required repair work, and any repair or resurfacing which becomes necessary by reason of such settlement shall likewise be considered as a part of such required repair work unless the Contractor shall have obtained a statement in writing from the affected private owner or public agency releasing the District from further responsibility in connection with such repair or resurfacing.
- C. The Contractor shall make all repairs and replacements promptly upon receipt of written order from the District. If the Contractor fails to make such repairs or replacements promptly, the District reserves the right to do the Work and the Contractor and his surety shall be liable to the District for the cost thereof.

### **3.03 BOND**

- A. The Contractor shall provide a bond to guarantee performance of the provisions contained in the General Conditions.

**END OF SECTION**

**SECTION 01720****RECORD DOCUMENTS****PART 1 – GENERAL****1.01 DESCRIPTION**

The Contractor shall maintain and provide record documents to the Engineer in accordance with this Section except where otherwise specified or approved in writing by the District.

**1.02 MAINTENANCE OF DOCUMENTS**

- A. A bond copy of the Contract Drawings shall be furnished to the Contractor by the District. This copy shall be updated with record information and a “redline” copy of the updated record drawings shall be submitted to the Engineer every three months. The red line copy shall be up-to-date and its completeness shall be a pre-condition of the next month’s partial payment request approval.
- B. The Contractor shall maintain complete sets of the following record documents in the Contractor’s field office and in a clean, dry and legible condition: Contract Drawings, Specifications, Addenda, approved Shop Drawings, Samples, photographs, Change Orders, Field Orders, test records, survey data, and all other modifications or data that are pertinent to the Work.
- C. The Contractor shall provide files and racks for organization, storage and access. The filing format shall conform to Construction Specification Institute (CSI) format unless otherwise approved by the Engineer.
- D. The Contractor shall make documents available at all times for inspection by the Engineer and the District.
- E. The Contractor shall not use record documents for any other purpose or remove them from the Contractor’s office without the Engineer’s approval.

**1.03 MARKING SYSTEM**

- A. The Contractor shall provide red pencils or felt tip pens for marking changes, revisions, or additions and deletions to the record documents.

**1.04 RECORDING**

- A. The Contractor shall label each document "PROJECT RECORD" in 2-inch high printed letters.
- B. The Contractor shall keep record documents current. Marking of the record documents shall be done at the time the material and equipment are installed.

- C. The Contractor shall not permanently conceal any Work until the required information has been recorded. The Engineer may direct the Contractor to expose concealed Work if Work was not recorded on the record drawings.
- D. Drawings: The Contractor shall legibly mark to record actual construction of the following items:
1. The Contractor shall label each document "RECORD DRAWINGS" in 2-inch high printed letters.
  2. Record drawings shall incorporate addenda, supplementary drawings, working drawings, change orders and clarifications. As-built drawings shall incorporate survey notes, field notes and system demonstration logs.
  3. Depths of various elements of foundation in relation to datum.
  4. Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvements.
  5. The locations of internal utilities and appurtenances concealed in construction with reference to visible and accessible features or structures.
  6. Field changes of dimensions and details.
  7. Changes made by Change Order or Field Order.
  8. Details not shown on original Drawings.
- E. Specifications and Addenda: The Contractor shall legibly mark up each Section or document to record:
1. Manufacturer, trade name, catalog number and supplier of each product and item of equipment actually installed.
  2. Changes made by Change Order or Field Order.
  3. Other matters not originally specified.

#### **1.05 SUBMITTAL**

- A. The Contractor shall deliver record documents to the Engineer upon Substantial Completion of the Work. Final payment will not be made until record documents are deemed satisfactory by the Engineer.
- B. The transmittal for record documents shall contain the following:
1. Date, project title and District's project number.
  2. The title and number of each record document.
  3. The Contractor's name, address, signature of authorized representative and certification that each document is complete and accurate as submitted.

- C. The Contractor may submit additional 24" x 36" sheets detailing record work as approved by the Engineer.

**PART 2 – PRODUCTS (NOT USED)**

**PART 3 – EXECUTION (NOT USED)**

**END OF SECTION**

**SECTION 02050****DEMOLITION AND REMOVALS****PART 1 - GENERAL****1.01 DESCRIPTION**

The work of this Section describes requirements for the demolition, abandonment, removal, salvage and disposal of existing facilities or improvements as necessary for the performance of the Work in accordance with the Contract Documents. Demolition and removal work shall conform to the applicable Sections of these Specifications.

**1.02 RELATED SECTIONS**

- A. Section 01354 – Hazardous Material Procedure
- B. Section 01610 – Transporting and Handling Materials and Equipment
- C. Section 01560 – Temporary Environmental Controls

**1.03 REFERENCE STANDARDS**

- A. Except as otherwise indicated in this Section, the Contractor shall comply with the latest edition of the Standard Specifications for Public Works Construction.

**1.04 SUBMITTALS**

- A. Affidavit of Compliance: Prior to commencing with demolition work, the Contractor shall submit an affidavit of compliance to the District detailing the final disposition for items and materials to be removed from the site. Said affidavit shall list the locations of all disposal sites utilized, and shall include the Contractor's certification that those sites are legal for the disposal of the subject items or materials. The affidavit shall include a similar list of recyclers and Contractor's certification, if utilized.
- B. Receipts: The Contractor shall submit receipts from all disposal sites and recyclers utilized for the disposal of materials removed from the site. Said receipts shall account for the entire quantities of all materials removed from the site.

**PART 2 - PRODUCTS (NOT USED)****PART 3 - EXECUTION****3.01 RECORD DOCUMENTS**

The Contractor shall obtain copies of available record drawings at Contractor's expense and review the documents in order to familiarize himself with the existing conditions and facility operations prior to commencing with the work of this Section or this Contract, and to schedule and complete the required demolition and construction operations necessary within the specified number of working days.

**3.02 ISOLATION OF PIPELINES**

The District will operate all valves required for isolation of any facilities to be demolished or removed, or for new pipeline connections. Some water flow-by may occur through closed valves and the Contractor will be required to manage the water during the Work. The Contractor shall provide 14-calendar days advance notice to the District for isolation of facilities which must include an approved plan at that time. See Section 01043 for coordination with District Operations.

**3.03 PROTECTION OF ITEMS TO REMAIN**

- A. The Contractor shall be responsible to protect from damage any items not noted for removal including, but not limited to, existing vegetation and landscaping, electrical and mechanical equipment, above- or below-grade structures, or piping.
- B. The Contractor shall repair or replace items that are not noted for removal and that are damaged by the Contractor's operations during any phase of the Work to the satisfaction of the District and at Contractor's expense.

**3.04 SALVAGE BY DISTRICT**

- A. The District may wish to salvage certain items of existing equipment and may perform its salvage operations with its own forces prior to the Contractor's initiation of demolition work.
- B. The following shall not entitle the Contractor to any additional compensation:
  - 1. The District's election to perform its salvage operations after the date and time of bid opening.
  - 2. The District's election to salvage items after the Contractor has initiated demolition work.
  - 3. The District's election to not salvage items that are noted for salvage in the Contract Documents or are otherwise implied as being subject to salvage.
  - 4. Salvage of items by the District that are not shown on the Drawings.

**3.05 SALVAGE BY CONTRACTOR**

- A. The Contractor shall obtain written notification from the District that salvage operations are complete prior to proceeding with demolition or salvage work.
- B. All equipment remaining after the District's salvage operations are completed shall be salvaged or removed and disposed of by the Contractor at the Contractor's expense.
- C. Items to be salvaged shall be removed and handled with care to prevent damage and transported to a storage area designated by the District. Damage to salvaged items resulting from the Contractor's operations shall be repaired or replaced to the satisfaction of the District and at the Contractor's expense.
- D. The list of items to be salvaged by the Contractor for the District is as follows:



1. \_\_\_\_\_

### **3.06 DEMOLITION, REMOVAL, AND ABANDONMENT**

- A. The Contractor shall comply with all pertinent regulations of OSHA and local codes and practices.
- B. Conduits or structures shall not be abandoned until their use is no longer required. The Contractor shall notify the District in advance of the intended culvert or pipe abandonment.
- C. The Contractor shall demolish or dismantle and remove all items that are noted for demolition and removal in the Contract Documents and that will interfere with the planned construction, or as otherwise ordered by the District.
- D. The Contractor shall demolish, or dismantle and remove, all abandoned conduits or structures that are encountered during the prosecution of the work and which interfere with the construction of the work upon the approval of the District. The voids or openings resulting from the removal of a portion of a conduit or structure shall be plugged with concrete at least 6 inches thick in accordance with SSPWC Section 306-5.
- E. Conduits that are proposed to be abandoned in place shall be cut at the limits of the abandonment and shall be plugged with concrete at least 6 inches thick in accordance with SSPWC Section 306-5.
- F. When slurry filling of conduits is specified on the plans or ordered by the District, the conduits shall be abandoned by injecting cement-aggregate slurry conforming to SWPWC Class 100-E-100 concrete or a 2-sack, cement-sand slurry to completely fill the conduit. The slurry shall be placed by the tremie method through openings in the conduit that are spaced at least every 200 feet along the conduit or as approved by the District to allow for complete filling of the conduit. The Contractor shall verify that the volume of slurry injected into the conduit is sufficient to fill the conduit within the limits of abandonment.
- G. If an existing water line that was previously connected to the cut-and-plugged line will be re-pressurized, the open end of the line to remain active shall receive a plug, cap or blind flanged and a thrust block shall be cast behind the plug, cap or blind flange in accordance with the District's standard drawings or as approved by the Engineer.
- H. Where valves, blow-offs, or other appurtenances are to be abandoned or are connected to conduits that are to be abandoned, all surface and above-ground components shall be removed to a depth of one foot below grade. All below-grade piping shall be plugged or capped at the cut end. Valve well covers shall be removed and salvaged to the District and valve wells shall be slurry filled with a 2-sack, cement-sand slurry to allow for paving after the slurry has attained sufficient strength. Paving is to be repaired in like kind to the satisfaction of the agency having jurisdiction over the street or the District, and the paving thickness shall exceed the thickness of the existing pavement by one inch.
- I. The site shall be kept neat and orderly during the demolition to the maximum extent practical. Public right-of-way and private property shall be kept free of debris at all times. Stockpiles of demolished items or materials shall be removed from the site on a

daily basis or stored in waste containers which shall be emptied on a weekly basis or as conditions require in order to manage the accumulation of waste. Accumulations of flammable materials shall not be permitted.

- J. Unless otherwise indicated in the bid schedule, payment for demolition and removal shall be included in the contract price for the item of work for which such demolition or removal is appurtenant thereto and no separate payment shall be made.

### **3.07 DISPOSAL AND RECYCLING**

- A. All items removed from the site shall be transported to and disposed of in a legal manner. All disposal sites and recycling facilities shall be approved by the District prior to initiation of the Work.
1. Concrete or asphalt concrete debris shall be transported to a recycler of such materials.
  2. Hazardous materials shall be handled and disposed of in accordance with all applicable laws, codes, and regulations. Contractor shall refer to Section 01354 Hazardous Material Procedure.

**END OF SECTION**

**SECTION 02130****REMOVAL AND RESURFACING OF PAVEMENT SURFACES****PART 1 – GENERAL****1.01 DESCRIPTION**

- A. Street pavement and surfaces shall be removed and replaced in conformance with details shown on the Plans and as specified herein. Resurfacing of existing pavement and surfaces damaged or removed in connection with the construction of project improvements, including all appurtenances, shall conform to the provisions of permits issued by the local governing body, agency or association having jurisdiction of public and private streets for Work performed within the rights-of-way of the respective governing body, agency or association (i.e., County of San Diego).

**1.02 RELATED WORK DESCRIBED ELSEWHERE**

The Contractor shall refer to the following Specification Section(s) for additional requirements:

- A. Section 01570 – Traffic Regulations
- B. Section 02200 - Earthwork
- C. Section 02223 – Trenching, Backfilling and Compaction
- D. Section 02510 - Asphalt Concrete Pavement
- E. Section 03300 - Cast-in Place Concrete

**1.03 SUBMITTALS**

- A. Submittals shall be provided as required in the related section(s) of the Specifications for the appropriate material.

**PART 2 – MATERIALS AND EXECUTION****2.01 EARTHWORK**

- A. Earthwork shall conform to the provisions of the standard specifications.

**2.02 PAVEMENT REMOVAL**

- A. General: Pavement or existing road surfacing shall be removed as noted on the plans and as specified herein prior to proceeding with excavation operations. Surplus material shall be removed and disposed of at Contractor's expense as specified. Prior to removal of existing surfacing, pavement cuts for pipelines shall be made as shown on the Plans and/or specified herein. All pavement cuts for pipelines shall be neat and straight along both sides of the trench and parallel to the alignment of the pipe to provide an unfractured and level pavement joint for bonding existing surfacing with pavement replacement.

Where saw cut edges are damaged subsequent to saw cutting, the edges shall again be saw cut to neat, straight lines prior to resurfacing operations. All cut edges shall provide clean, solid vertical faces free from all loose material. Where large irregular surfaces are removed, such trimming or cutting as hereinafter provided shall be parallel to the roadway centerline or at right angles to same. All cut edges shall provide clean, solid vertical faces free from all loose material.

- B. Portland Cement Concrete Surfaces: Concrete pavement, including cross gutters, curbs and gutters, sidewalks, driveways, and concrete surfaces of whatever nature, shall be saw cut to a minimum depth of two inches (2") prior to removal in accordance with details shown on the Plans or as specified herein. Said saw cut shall be made at the edge of the trench and/or excavation. If a saw cut falls within 3 feet of a construction joint, cold joint, expansion joint, or edge, the concrete shall be removed to the joint or edge. With the written permission of the Engineer, pneumatic tools or other approved equipment may be used to cut concrete pavement within the limits of the excavation. In such an event, saw cuts as provided herein, shall be made after backfilling and the additional (remnant) concrete pavement shall be removed and disposed of by the Contractor at his expense prior to resurfacing.
- C. Plant Mix Surfacing (Asphalt Concrete Pavement): Areas surfaced with asphalt concrete pavement shall be initially saw cut at the limits of the trench and/or excavation prior to removal of surfacing. Pavement saw cutting within the right-of-way of the roads will be as required by local governing bodies.
- D. Road-Mixed Surfacing: Areas surfaced with road-mixed surfacing shall be cut at the limits of the trench and/or excavation prior to removal of existing surfacing. Cuts may be made with pneumatic tools or other approved equipment. Additional trimming of pavement edges prior to resurfacing may be required by the agency having jurisdiction over the roadway.

### 2.03 ASPHALT CONCRETE RESURFACING

- A. In all areas in which the surface is removed, broken or damaged by equipment, or in which the ground has caved in or settled due to the installation of the improvements, the surface shall be restored to the original grade and crown section by the CONTRACTOR at its own expense. In the absence of specific designation on the Plans, and where the street has been improved with roadway surface, base course, curb, sidewalk or gutter, trenches, or damaged sections shall be restored with the type of improvement conforming to that which existed at the time the CONTRACTOR entered upon the work. Prior to resurfacing, the existing surface shall be removed as provided above. All work shall match the appearance of the existing improvements and finished pavement shall not deviate from existing grade by more than 1/8-inch in 10-feet and shall be free from ruts, depressions and irregularities. Where large irregular surfaces are to be resurfaced, existing surfacing shall be cut and removed as provided herein. Asphaltic emulsion per the standard specifications shall be applied to the vertical faces of all asphaltic concrete pavements against which the pavement replacement materials are to be placed. The completed surface, when ready for acceptance, shall be thoroughly compacted, true to grade and cross section, and shall be free from ruts, depressions and irregularities.

- B. Resurfacing of asphalt concrete shall be per San Diego Regional Standard Drawings or City of Escondido Standard Drawings G-2-E, G-3-E, G-4-E, G-5-E and/or G-6-E as applicable.
- C. Prior to resurfacing, the existing surfacing shall be removed as provided above. All Work shall match the appearance of the existing improvements.
- D. Asphalt concrete construction shall conform to Section 02510.
- E. Trench paving shall overlap at least twelve inches (12") on each side of the trench and shall be hand raked prior to compaction so that the overlapped section will join smooth and neat with the existing pavement. The resulting contact edge between the new and existing pavement on each side of the trench shall parallel the existing trench centerline and result in a straight and neat join line.

#### **2.04 RESURFACING OF CONCRETE SURFACES**

- A. Unless otherwise specified, portland cement concrete pavement surfaces shall be replaced in kind with 560-C-3250 concrete to a thickness equal to that removed, or as specified on the plans. Aggregate base, if it exists beneath the existing portland cement concrete paving, shall be replaced to a thickness equal to the existing or as specified on the plans.
- B. Portland Cement concrete sidewalks and driveways shall be replaced to the nearest score line or over a sufficient width to replace any portions of the sidewalk or driveway damaged, fragmented, cracked or otherwise made unusable as a result of construction operations. Minimum thickness of concrete shall be 4-inches in walkways, 6-inches in residential driveways, and 8-inches in commercial driveways.

#### **2.05 PORTLAND CEMENT CONCRETE**

- A. Portland cement concrete for the reconstruction of existing surface improvements in accordance with San Diego Regional Standards and shall conform to the concrete class specified for the type of construction in accordance with Section 201-1.1.2 of the Standard Specifications for Public Works Construction (SSPWC or Greenbook), latest edition..
- B. Portland cement concrete shall be placed to the limits of pavement removal applicable to portland cement concrete surfaces as specified in this Section.

#### **2.06 TEMPORARY PAVING (HOT MIX) AND DETOURS**

- A. All pavement removal for trenching operations shall be replaced with a minimum of 4-inches of compacted temporary asphalt concrete as specified above after aggregate base compaction is approved by the geotechnical engineer. Cold mix will not be allowed under any circumstances.
- B. Cross streets and all accesses shall be paved with temporary pavement on the same day that excavation is made. Temporary pavement shall be maintained so that a smooth traversable surface is available at all times for vehicular traffic, free from ruts, depressions, holes, and loose gravel. Cost for detours and temporary paving shall be at the CONTRACTORS expense.

## **PART 3 – EXECUTION**

### **3.01 GRINDING**

- A. All grinding for recessed trench plating and asphalt concrete overlay shall be accomplished per the standard specifications.

### **3.02 TEMPORARY SURFACING**

- A. The CONTRACTOR shall promptly place temporary surfacing on all areas where existing surfacing has been disturbed and shall maintain such surfacing for the period of time required by the DISTRICT. Temporary resurfacing shall be constructed in accordance with the following requirements.
  - 1. The subgrade shall be uniformly watered sufficiently to eliminate all dust, but not to such extent as to form mud or pools of water. The street and surrounding area shall be cleared of rubbish and debris. The street shall be swept with a power sweeper with spray nozzle and the surrounding area shall be cleaned thoroughly, at least weekly, or more frequent as conditions dictate.
  - 2. The temporary resurfacing shall then be spread over the prepared foundation material and rolled with an 8-ton tandem roller in such a manner that after rolling, the temporary resurfacing shall present a smooth surface for traffic, shall not be less than 4-inches in compacted thickness and shall be maintained free from bumps and depressions until permanent resurfacing is placed. The finished surface of said temporary resurfacing shall be flush with the adjoining pavement grade.
  - 3. The temporary resurfacing shall be left in place until permanent resurfacing is constructed.

### **3.03 PERMANENT RESURFACING**

- A. In order to obtain a satisfactory junction with adjacent surfaces, the CONTRACTOR shall grind 12-inches beyond the saw cut edges to a depth of 1-1/2 inches so as to provide a clean, sound, vertical joint before permanent replacement of an excavated or damaged portion of pavement. Damaged edges of pavement along excavations and elsewhere shall be trimmed back by saw cutting in straight lines. All pavement restoration and other facilities restoration shall be constructed to finish grades compatible with adjacent undisturbed pavement. CONTRACTOR is responsible for the replacement of traffic detector loops damaged or removed during construction which are associated with existing traffic controls.

### **3.04 RESTORATION OF SIDEWALKS OR PRIVATE DRIVEWAYS**

- A. Wherever sidewalks or private roads have been removed for purposes of construction, the CONTRACTOR shall place suitable temporary sidewalks or roadways promptly after backfilling and shall maintain them in satisfactory condition and the CONTRACTOR shall maintain said temporary sidewalks or roadways until the final restoration thereof has been completed. The sidewalks or driveways shall be removed and replaced in kind to the nearest joint.

**END OF SECTION**

**SECTION 02140****DEWATERING****PART 1 - GENERAL****1.01 DESCRIPTION**

- A. This Section includes materials, installation, maintenance, operation, and removal of temporary dewatering systems. The Contractor shall perform site dewatering necessary to lower and control groundwater levels and hydrostatic pressures to allow excavation and construction to be performed properly under drained and stable conditions.
- B. Dewatering operations shall be adequate to provide worker protection and the protection of the work. The responsibility for conducting the dewatering operation in a manner which will protect the Work and adjacent structures and facilities rests solely with the Contractor. The cost of repairing any damage to adjacent structures and restoration of facilities shall be the responsibility of the Contractor.

**1.02 RELATED WORK SPECIFIED ELSEWHERE**

- A. Section 02223 – Trenching, Backfilling and Compaction
- B. Section 02270 – Temporary Soil Erosion and Sediment Control

**1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS**

- A. For projects that create more than one acre of ground disturbance area, the Contractor shall develop and implement a site-specific Storm Water Pollution Prevention Plan (SWPPP) and comply with all aspects of the Storm Water General Permit in accordance with Section 02270.
- B. For projects that create one acre or less of ground disturbance area, the Contractor shall prepare a Water Pollution Control Plan or other stormwater management plan meeting the requirements of the County of San Diego stormwater ordinances, as applicable, in accordance with Section 02270.
- C. The Contractor shall obtain all required permits and approvals and comply with California Regional Water Quality Control Board General Waste Discharge Requirements for Groundwater Remediation and Dewatering Waste Discharges.
- D. Prior to pipeline flushing and/or dewatering operations, the Contractor shall file a Notice of Intent with the California Regional Water Quality Control Board under applicable conditional waivers for the discharge of water from pipelines.
- E. The Contractor shall obtain all required permits and approvals and comply with the California Regional Water Quality Control Board General Waste Discharge Requirements for Groundwater Remediation and Dewatering Waste Discharges.



**1.04 CONTRACTOR SUBMITTALS**

- A. The Contractor shall submit the following in accordance with Section 01300:
1. Before starting excavation in areas of known or anticipated groundwater, the Contractor shall submit Shop Drawings including a detailed plan, schedule, and description of the dewatering of excavations. The Shop Drawings shall include: the proposed type of dewatering system; the arrangement, location, and depths of system components; a complete description of the equipment and instrumentation to be used with installation, operation and maintenance procedures; a description of the Contractor's means and methods for measuring groundwater levels and piezometric water levels; and the methods for disposal of dewatering effluent.
  2. Before starting excavations below groundwater, the Contractor shall submit copies of well installation permits.
  3. Before starting excavations below groundwater, the Contractor shall submit copies of its permit for dewatering discharges to the local sewer agency or Regional Water Quality Control Board permit for dewatering discharges to the environment, whichever is applicable.
  4. The Contractor shall submit copies of well destruction permits, as applicable.
- B. The Contractor shall submit a daily report that includes the following information:
1. Groundwater levels and piezometric water levels in observation wells (if any).
  2. Changes in elevation of settlement monitoring points to detect settlement in adjacent structures.
  3. The average dewatering flow rate.
  4. Water quality test results as required by the Regional Water Quality Control Board or local sewer agency, as applicable.

**1.05 QUALITY ASSURANCE**

- A. These provisions shall apply continuously during the construction of the work.
- B. The Contractor shall conduct a demonstration of the proposed dewatering system and shall provide verification that adequate personnel, materials and equipment are available.
- C. The Contractor shall maintain adequate control to ensure that the stability of excavated or constructed slopes is not adversely affected by water, that erosion is controlled, and that flooding of excavations or damage to structures does not occur.
- D. Where critical structures or facilities exist immediately adjacent to areas of proposed dewatering, the Contractor shall establish points for settlement monitoring and shall observe these points at frequent intervals to detect any settlement which may occur. The monitoring frequency shall be determined based on recommendations of the soils engineer or District, the nature of the critical structure or facility, and the distance from

the excavation. The minimum frequency shall be twice per working day (once at the beginning of the work day and once at the conclusion of the work day).

- E. The Contractor shall comply with Regional Water Quality Control Board or local sewer agency requirements for any discharge of groundwater to the environment or sanitary sewer, whichever is applicable. The Contractor shall comply with Regional Water Quality Control Board Waste Discharge requirements under the latest applicable Board Orders. Before starting dewatering operations, the Contractor shall obtain authorization, as required, for the disposal of groundwater. The Contractor shall comply with all applicable sampling, testing, monitoring, and reporting requirements.

## **1.06 DESIGN CRITERIA**

- A. Dewatering, treatment, and disposal of water shall be performed in conformance with all applicable local, state, and Federal laws and permits issued by Jurisdictional Regulatory Agencies.
  - 1. A permit is required from the Regional Water Quality Control Board for discharge of groundwater to storm drains or surface waters.
  - 2. Sewer systems shall not be used as drains for dewatering trenches or excavations, nor for disposal of collected or accumulated groundwater, without the approval of the Agency of Jurisdiction.
  - 3. Groundwater shall not be applied to land without the approval of the landowner or the Agency of Jurisdiction.

## **PART 2 - PRODUCTS**

### **2.01 MATERIALS AND EQUIPMENT**

- A. Dewatering, where indicated, includes well points, sump pumps, temporary pipelines for water disposal, rock or gravel placement, observation wells and other means including standby pumping equipment maintained on the jobsite continuously.
- B. The Contractor shall provide piezometers for monitoring groundwater levels. The Contractor shall provide other instruments and measuring devices as required.

## **PART 3 - EXECUTION**

### **3.01 GENERAL REQUIREMENTS**

- A. The site shall be graded to facilitate drainage and runoff shall be diverted from the excavation. Surface runoff shall be collected in shallow ditches around the perimeter of the excavation, drained to sumps, and pumped or drained by gravity away from the excavation.
- B. The Contractor shall install and maintain an adequate system to lower and control the groundwater to permit excavation, construction of structures, and placement of fill or backfill materials to be performed under drained and stable conditions.

- C. Sufficient dewatering equipment shall be installed to pre-drain the water-bearing strata below the bottom of foundations, drains, sewers and other subsurface structures or excavations.
- D. The hydrostatic head in water-bearing strata below foundations, drains, sewers, pipelines and other subsurface structures or excavations shall be reduced to below the structure or excavation subgrade at all times.
- E. The system shall be placed into operation before excavation below groundwater level is started. The system shall be operated continuously 24 hours a day, 7 days a week until drains, sewers and structures have been constructed, fill or backfill materials have been placed, and dewatering is no longer required.
- F. Dewatering shall at all times be conducted to preserve the undisturbed bearing capacity of the subgrade soils at proposed bottom of excavation. Provide and maintain means and devices to remove and dispose of all water entering the excavation during pipe laying, until cement mortar of pipe joints has set hard, during concrete placement and initial curing, and during backfill placement.
- G. Do not drain trench water through the pipeline under construction.
- H. Flotation of structures and facilities shall be prevented by maintaining a positive and continuous removal of water from locations which will not create an adverse hydraulic gradient beneath or adjacent to the structures.
- I. If foundation soils are disturbed or loosened by the upward seepage of water or an uncontrolled flow of water, the affected areas shall be excavated and replaced with drain rock at no additional cost to the District.
- J. If well points or wells are used, they shall be adequately spaced to provide the necessary dewatering and shall be sandpacked and/or other means shall be used to prevent pumping of fine sands or silts from the subsurface. The Contractor shall continuously monitor the dewatering operation for indications of subsurface soil migration and shall make necessary adjustments as warranted with notice to the Engineer.
- K. Water and debris shall be disposed of in a legal manner in compliance with permit requirements and SSPWC Subsection 306-3.3 without damage to adjacent property. No water shall be drained into Work built or under construction. Before disposal, water shall be filtered to remove sand and fine soil particles and treated in accordance with permit requirements.
- L. The release of groundwater to its original level shall be performed in a manner that avoids disturbance of foundation soils, prevents disturbance of compacted backfill, and prevents flotation or movement of structures.
- M. Provide and maintain means and devices to remove and dispose of all water entering the trench excavation during the time the trench is being prepared for the pipe laying, during the laying of the pipe, until cement mortar of exterior joints has set hard, when concrete is being deposited and during the hydration process, and until the backfill at the pipe zone and trench zone has been completed.

**END OF SECTION**

**SECTION 02200****EARTHWORK****PART 1 - GENERAL****1.01 WORK OF THIS SECTION**

- A. The CONTRACTOR shall provide all labor, equipment, materials and incidentals to perform all earthwork required for construction of the work as shown on the approved plans and as specified herein. Work includes the loosening, removing, loading, transporting, depositing, and compacting all soil, rock, and other earth materials, wet and dry. The CONTRACTOR shall comply with all local, state, and federal safety and health standards, laws and regulations.
- B. The CONTRACTOR shall refer to the related Section for excavations for pipelines and structures.

**1.02 DEFINITIONS**

- A. Fill material is defined as material used to raise the level of a portion of the site to the line and grade indicated.
- B. Backfill material is defined as material used to refill an excavation. Backfill material is defined as starting 1 foot above the top of the pipe or conduit, or at the subgrade for cast-in-place structures such as vaults and valve boxes.

**1.03 RELATED SECTIONS**

- A. The Work of the following Sections applies to the Work of this Section. Other Sections, not referenced below, shall also apply to the extent required for proper performance of this Work:
  - 1. Section 01300 - Shop Drawings and Submittals
  - 2. Section 02140 - Dewatering
  - 3. Section 02222 - Protecting Existing Underground Utilities
  - 4. Section 02223 - Trenching, Backfilling, and Compacting

**1.04 REFERENCE SPECIFICATIONS, CODES AND STANDARDS**

- A. Except as otherwise indicated in this Section, the CONTRACTOR shall comply with the latest adopted edition of the Standard Specifications for Public Works Construction (SSPWC) together with the latest adopted editions of the Regional and Supplement Amendments. Pipe zone and base material will conform in all respects to the latest edition of the DISTRICT Standards.

- B. The Work of this Section shall comply with current versions, with revisions, of the following:
1. California Building Code.
  2. Construction Safety Orders, Division of Industrial Safety, State of California.
  3. California Department of Transportation Traffic Manual.

#### 1.05 CONTRACTOR SUBMITTALS

- A. The CONTRACTOR shall submit the following in compliance with the related Sections:
1. A copy of this specification section, with addendum updates included, and all referenced and applicable sections, with addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements. Check marks shall denote full compliance with a paragraph as a whole. If deviations from the specifications are indicated, and therefore requested by the CONTRACTOR, each deviation shall be underlined and denoted by a number in the margin to the right of the identified paragraph, referenced to a detailed written explanation of the reasons for requesting the deviation. The remaining portions of the paragraph not underlined will signify compliance on the part of the CONTRACTOR with the specifications. The DISTRICT shall be the final authority for determining acceptability of requested deviations. Failure to include a copy of the marked-up specification sections, along with justification(s) for any requested deviations to the specification requirements, with the submittal shall be sufficient cause for rejection of the entire submittal with no further consideration.
  2. The CONTRACTOR's detailed plan showing the design and calculations for all shoring, bracing, sloping of the sides of excavation, or other provisions for worker protection against the hazard of caving ground during the excavation of trenches or structure excavation. The CONTRACTOR's detailed plan shall include a description of the methods, schedule and equipment, including trench shields, to be used for earthwork operations. The CONTRACTOR'S plan shall identify the locations of temporary soil stockpiles. The CONTRACTOR's detailed plan shall be submitted before starting any trench or structure excavation 5-feet deep or over. The CONTRACTOR shall be in possession of the DISTRICT's written acceptance of the detailed plan before starting any trench or structure excavation 5-feet deep or over. If the CONTRACTOR's detailed plan varies from the shoring system established in the Construction Safety Orders of the State of California, the CONTRACTOR's detailed plan shall be prepared and signed by a civil or structural engineer licensed in the State of California.

3. A copy of the excavation permit issued by the California Department of Industrial Safety.
4. Samples of imported material in accordance with SSPWC Subsection 306-1.3.5.
5. Such other samples of materials as the DISTRICT may require.
6. An agricultural soil evaluation about the suitability of proposed topsoil.

## **PART 2 - PRODUCTS**

### **2.01 FILL AND BACKFILL MATERIALS**

- A. General: Fill and backfill material shall consist of select material obtained from the excavation, imported material, bedding material, or unclassified material. The CONTRACTOR shall import, at his own expense, materials in excess of the approved material obtained from excavation as required to complete the fill, backfill, and grading work as indicated.
- B. Select Material: Select material shall consist of primarily granular material obtained from the excavation which is free of vegetation, organic matter, rubbish, debris, rocks larger than 4-inches in diameter and other unsuitable material, has an expansion index less than 30 (less than 20 for footings and floor slabs), has a plasticity index of 10 or less, has a liquid limit of 30 or less, and is approved as select material by the DISTRICT.
- C. Imported Material: Imported material shall conform to the same specifications as select material defined above. In addition, the imported materials shall comply with SSPWC subsection 306-1.3.5. Imported material placed in areas to be planted shall be able to support normal plant growth. The CONTRACTOR shall obtain approval by the DISTRICT before transporting imported material.
- D. Unclassified Material: Unclassified material shall conform to SSPWC Subsection 300-4.

### **2.02 ROCK PRODUCTS**

- A. Rock products, consisting of crushed rock, rock dust, gravel, sand, and stone for riprap shall be clean, hard, sound, durable, uniform in quality and free of disintegrated material, organic matter, oil, alkali, or other deleterious substance, and shall unless otherwise specified conform to the requirements of SSPWC Subsection 200-1, including the Regional and Supplement Amendments.

### **2.03 UNTREATED BASE MATERIALS**

- A. Untreated base materials shall conform to the requirements of SSPWC Subsection 200-2.
- B. Materials for use as untreated base or subbase shall be:
  1. Crushed Aggregate Base.

**2.04 TOPSOIL**

- A. Topsoil shall be designated as Class A (imported) and shall conform to the requirements of SSPWC Subsection 212-1.1. The CONTRACTOR shall submit an agricultural soil evaluation regarding the suitability of the proposed topsoil.

**PART 3 - EXECUTION****3.01 GENERAL**

- A. The CONTRACTOR shall perform earthwork as necessary to complete the work as shown on the Contract Drawings and specified herein. The CONTRACTOR shall take the necessary precautionary measures to prevent dust or other nuisances which might be created by reason of its activities.
- B. All types of earthwork, including trench, structural and general excavation, fill, backfill and compaction, shall conform to applicable requirements of the SSPWC Section 300 and to the requirements of the Contract Documents.
- C. Pursuant to California Code of Regulations, Title 8, Section 1541, the CONTRACTOR shall notify the Regional Notification Center and known owners of underground facilities in the area who are not members of the Regional Notification Center of the proposed excavation at least two working days before the start of excavation.

**3.02 SITE PREPARATION**

- A. Areas to be excavated, filled, graded, or to be occupied by permanent construction or embankments shall be prepared by clearing, grubbing, and stripping. Clearing, grubbing, and stripping shall conform to the applicable requirements of SSPWC Subsection 300-1. The CONTRACTOR shall provide for a Storm Water Pollution Prevention Plan in accordance with the requirements of the related Section.

**3.03 EXCAVATION**

- A. General: Except when specifically provided to the contrary, excavation shall include the removal of all materials of whatever nature encountered, including all obstructions of any nature that would interfere with the proper execution and completion of the work. Unless otherwise directed, the removal of said materials shall conform to the lines and grades shown. Unless otherwise provided, the entire construction site shall be stripped of all vegetation and debris, and such material shall be removed from the site prior to performing any excavation or placing any fill. The CONTRACTOR shall furnish, place, and maintain all supports and shoring that may be required for the sides of the excavations, and all pumping, ditching, or other measures for the removal or exclusion of water as required by the standard specifications, Dewatering. Excavations shall be sloped or otherwise supported in a safe manner in accordance with the rules, orders, and regulations of the Division of Industrial Safety of the State of California.
- B. Unclassified Excavation: Unclassified excavation shall consist of all excavation, including roadways, unless separately designated.



1. Unsuitable material shall be excavated and disposed of in accordance with the requirements of SSPWC Subsection 300-2.2.
  2. Wet material, if unsatisfactory for the specified use on the project solely because of high moisture content, may be processed to reduce the moisture content, or may be required to be removed and replaced with suitable material in accordance with the requirements of SSPWC Subsection 300- 2.2.2.
  3. The removal and disposal of slide and slipout material shall be in accordance with SSPWC Subsection 300-2.4.
  4. Excavation slopes shall be finished in conformance with the lines and grades shown, and in accordance with SSPWC Subsection 300-2.5.
  5. Surplus material shall be legally disposed of off-site, and in accordance with SSPWC Subsection 300-2.6.
- C. Pipeline and Utility Excavation: See the standard specifications.
- D. Excavation in Lawn Areas:
1. Where excavation occurs in lawn areas, the sod shall be carefully removed and stockpiled to preserve it for replacement. Excavated material may be placed on the lawn; provided, that a drop cloth or other suitable method is employed to protect the lawn from damage. The lawn shall not remain covered for more than 72 hours. Immediately after completion of backfilling, the sod shall be replaced in a manner so as to restore the lawn as near as possible to its original condition. CONTRACTOR shall provide new sod if removed sod has remained stockpiled for more than 72 hours.
  2. The CONTRACTOR shall restore the lawn irrigation system removed or damaged due to excavation operations to a condition equal to the previous condition.
- E. Excavation in Vicinity of Trees: Except where trees are shown to be removed, trees shall be protected from injury during construction operations. No tree roots over 2- inches in diameter shall be cut without written permission of the DISTRICT. Trees shall be supported during excavation by means previously reviewed and accepted by the DISTRICT.
- F. Rock Excavation:
1. Rock excavation shall include removal and disposal of the following: (1) all boulders measuring 1/3 of a cubic yard or more in volume; (2) all rock material in ledges, bedding deposits, and unstratified masses which cannot be removed without systematic drilling and blasting; (3) concrete or masonry structures which have been abandoned; and (4) conglomerate deposits which are so firmly cemented that they possess the characteristics of solid rock and which cannot be removed without systematic drilling and blasting.
  2. Rock excavation shall be performed by the CONTRACTOR, however, should the quantity of rock excavation be affected by any change in the scope of the work, an appropriate adjustment of the contract price will be made.

### 3.04 FILL AND BACKFILL

#### A. General:

1. Backfill shall be placed in accordance with the DISTRICT Design Standards.
2. Backfill shall not be dropped directly upon any structure or pipe. Backfill shall not be placed around or upon any concrete structure until the concrete has cured and has attained sufficient strength to withstand the loads imposed. Backfill around water retaining structures shall not be placed until the structures have been tested, and the structures shall be full of water while backfill is being placed.

#### B. Placing and Spreading of Materials:

1. Materials shall be placed and spread evenly in layers. When compaction is achieved using hand operated mechanical equipment the layers shall be evenly spread so that when compacted, each layer shall not exceed 4 inches in thickness. When compaction is performed with larger ride-on compaction equipment, the layers shall be spread so that when compacted, each layer shall not exceed 9 inches in thickness. Compaction by using flooding and jetting methods shall not be performed.
2. During spreading, each layer shall be thoroughly mixed as necessary to promote uniformity of material in each layer. Bedding materials shall be brought up evenly around the pipe so that when compacted, the material will provide uniform bearing and side support.
3. Where the material moisture content is below the optimum moisture content water shall be added before or during spreading until the proper moisture content is achieved.
4. Where the material moisture content is too high to permit the specified degree of compaction the material shall be dried until the moisture content is satisfactory.

#### C. Compaction Requirements

1. The relative compaction of fill, backfill, and base material shall be in accordance with SSPWC Section 300, with the following exceptions:
  - a. Subgrade where trench has been over-excavated: 90%
  - b. Fill beneath structures, including water-containing structures: 95%
  - c. All trench backfill: Minimum 90%. Refer to Contract Drawings and Standard Details.
2. The CONTRACTOR shall be responsible for all costs associated with testing and shall be performed by an approved third party testing laboratory.
3. In case the tests of the fill or backfill show non-compliance with the specified compaction or density requirements, the CONTRACTOR shall accomplish such remedy as may be necessary to assure compliance. The CONTRACTOR will be responsible for all Subsequent testing to show compliance with the specifications, and the CONTRACTOR shall pay all costs for retesting of fill or backfill caused by non-compliance with these specifications, and at no cost to the DISTRICT.

**3.05 PREPARATION OF SUBGRADE**

- A. The preparation of subgrade for pavement, curbs and gutters, driveways, sidewalks and other roadway structures shall be in accordance with SSPWC Subsection 301.

**3.06 UNTREATED BASE**

- A. Aggregate base material shall be spread and compacted in accordance with SSPWC Subsection 301-2.

**3.07 TEMPORARY STOCKPILES**

- A. Locations of temporary stockpiles shall be approved by the DISTRICT.
- B. Temporary stockpiles shall not be allowed to surcharge buried pipe, conduits, or other structures.

**END OF SECTION**

## **SECTION 02222**

### **PROTECTING EXISTING UNDERGROUND UTILITIES**

#### **PART 1 - GENERAL**

##### **1.01 DESCRIPTION**

- A. This section includes materials and procedures for protecting existing underground utilities.

##### **1.02 RELATED WORK SPECIFIED ELSEWHERE**

- A. Section 02223 – Trenching, Backfilling, and Compacting

#### **PART 2 - MATERIALS**

##### **2.01 REPLACEMENT IN KIND**

- A. Except as indicated or as specifically authorized by the DISTRICT, reconstruct utilities with new material in accordance with DISTRICT Standards of the same size and type. Where materials are not specifically addressed in DISTRICT Standards, reconstruct utilities with new material of the same size, type, and quality as those being replaced.

#### **PART 3 - EXECUTION**

##### **3.01 GENERAL**

- A. Replace in kind street improvements, such as curbs and gutters; fences; signs; paved surfaces; etc, that are cut, removed, damaged, or otherwise disturbed by the construction.
- B. Where utilities are parallel to or cross the pipeline trench but do not conflict with the permanent work to be constructed, follow the procedures given below and as indicated on the Drawings. Notify the utility AGENCY a minimum of 72 hours in advance of the crossing construction and coordinate the construction schedule with the utility AGENCY's requirements. For utility crossings not shown on the Drawings, CONTRACTOR shall immediately notify the DISTRICT who will promptly investigate the conditions.
- C. Determine the true location and depth of utilities and service connections which may be affected by or affect the work. Determine the type, material, size (outside diameter), and condition of these utilities. This pothole work shall take place prior to construction of the water or sewer utility in order to provide sufficient lead time to resolve unforeseen conflicts, order materials and take appropriate measures to ensure that there is no delay in work. Expose utilities in advance of the pipeline construction as required by the General Provisions.

**3.02 PROCEDURES**

- A. Protect in Place: Protect existing utilities in place, unless abandoned, and maintain the utility in service, unless otherwise specified.
- B. Cut and Plug Ends: Cut abandoned utility lines, fill with concrete two feet into line and plug the ends with brick and mortar or concrete plug. Dispose of the cut pipe as unsuitable material.
- C. Remove and Reconstruct: Preservation of all laterals and utilities in their existing location shall govern. However, if the CONTRACTOR encounters an existing lateral or utility, which would otherwise cause the new or existing utility to not perform as it is or was intended, then the CONTRACTOR shall remove the utility and, after passage, reconstruct it with new materials. The DISTRICT shall decide at its sole discretion the applicability to which relocation is warranted.
- D. Provide temporary service for the disconnected utility, prior to permanent repair.

**3.03 COMPACTION**

- A. Utilities Protected in Place: Backfill and compact under and around the utility so that no voids are left. Where utilities are concrete encased, use the alternative construction method (2-sack cement sand slurry) for backfill around the utility.

**3.04 ADJACENT PARALLEL UTILITIES**

- A. Protect existing parallel utilities from any disturbances and repair the lines and associated appurtenances if they are damaged in any way. All costs incurred for protection of utilities or any costs incurred due to the presence of the lines, whether or not they lie within the new construction, shall be borne in full by the CONTRACTOR.

**END OF SECTION**

**SECTION 02223****TRENCHING, BACKFILLING AND COMPACTION****PART 1 – GENERAL****1.01 DESCRIPTION**

- A. This Section includes all labor, materials, equipment, testing, and incidentals for trench excavation, backfilling, and compacting. The work performed under this Section shall be constructed to the lines, grades and cross sections indicated on the Drawings, specified herein, or ordered by the Engineer in writing.

**1.02 RELATED WORK SPECIFIED ELSEWHERE**

- A. Section 00700 – General Conditions
- B. Section 00800 – Supplementary Conditions
- C. Section 01300 – Record Drawings and Submittals
- D. Section 01410 – Testing Laboratory Services
- E. Section 01530 – Protection of Work, Property and Existing Utilities
- F. Section 02140 – Dewatering
- G. Section 02350 – Excavation Support Systems

**1.03 REFERENCE STANDARDS**

- A. The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.
  - 1. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
  - 2. ASTM D2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
  - 3. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
  - 4. ASTM D1557 - Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup>(2,700 kN-m/m<sup>3</sup>))
  - 5. ASTM D4253 - Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table

6. ASTM D4254 - Standard Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density
7. ASTM D75 - Standard Practice for Sampling Aggregates
8. ASTM C90 - Standard Specification for Load bearing Concrete Masonry Units
9. ASTM A82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement

#### **1.04 GENERAL REQUIREMENTS**

- A. Requirements of the Standard Specifications for Public Works Construction (SSPWC) apply to this Section. In the event of conflicting requirements between the SSPWC and the County of San Diego Standards, the County of San Diego Standards shall take precedence. In the event of conflicting requirements for the Pipe Zone between either the SSPWC or the County of San Diego Standards and the District's Standards, the District Standards shall take precedence.
- B. Conform to the requirements and provisions of the permits issued by jurisdictional agencies in addition to the requirements of these Specifications. If a permit is not required, the work shall conform to the standards of the agency in whose right of way the work is performed in addition to the requirements of these Specifications.
- C. The Contractor shall be responsible for all measures necessary during the performance of the work to protect the project area and adjacent properties which would be affected by this work from storm damage, flood hazard, caving of trenches and embankments, and sloughing of material until final acceptance of the work. The Contractor shall be responsible for maintaining completed work until the entire project, or portions thereof, are accepted by the District.
- D. Whenever imported borrow for pipe zone or trench backfill is required, the Contractor shall furnish imported material and shall include the cost of this work in the bid. The Contractor shall be responsible for the excavation and disposition of unsuitable or surplus material by approved means of conveyance away from the working area. Conform to applicable requirements for disposition as specified in the SSPWC.
- E. The cost of materials that are rejected by the Engineer for nonconformance with this Section and their removal from the site shall be borne by the Contractor.
- F. All equipment used for pavement removal, trench excavation and backfill compaction shall be of the size and type approved by the Engineer. The approval of specific equipment or pavement removal methods shall not relieve the Contractor of any damage to adjacent ground, existing improvements, or improvements installed under the Contract. The Contractor shall make his own determination in this regard.
- G. In the event that obstructions are encountered during the progress of the work and are not generally shown on the Drawings and which will require Drawing revisions, the Engineer shall have the authority to order the deviation from line or grade. The Contractor shall not make any such deviation without the approval of the Engineer. Should any deviations in line and grade be permitted by the Engineer in order to reduce the amount

of rock excavation or for other similar convenience to the Contractor, any additional costs for thrust blocks, valves, extra pipe, concrete, or other costs shall be per the unit prices listed in the Contractor's bid or such other prices approved by the District. Changes to line or grade necessitated by the Contractor's inadequate potholing prior to trenching shall be made at the sole expense of the Contractor.

### **1.05 SAFETY PRECAUTIONS**

- A. The Contractor shall observe safety precautions in all phases of the Work including trench shoring, bracing, lighting, and barricades as dictated by reason and by the Safety Orders of the Division of Industrial Safety, State of California (CAL/OSHA). The Contractor shall obtain an exemption letter or trenching permit from the California Division of Industrial Safety (CAL/OSHA) and comply with Labor Code Section 6705, Excavation Plans for Worker Protection, and shall submit a copy of the exemption letter or trenching permit with excavation drawings to the District prior to excavation work.
- B. Nothing in this Section is intended to relieve the Contractor of the responsibility to carefully examine the Contract Documents and the site where the Work is to be performed; to familiarize himself with all the local conditions and federal, state, and, local laws, ordinances, rules, and regulations that may affect the performance of any Work; to study all surveys and investigations regarding subsurface and latent physical conditions pertaining to the site; to perform additional surveys and investigations as the Contractor deems necessary to complete the Work for the Contractor's bid price; and to correlate the results of all such data with the requirements of the Contract Documents.

### **1.06 SUBMITTALS**

- A. Submit shop drawings in accordance with Section 01300.
- B. Submit testing laboratory report(s) verifying that imported material is asbestos-free and conforms to the specified gradations or characteristics, and laboratory test reports for physical properties of backfill materials as identified in this Section.
- C. Submit plans for excavation support systems in accordance with Section 02350.

### **1.07 OBSTRUCTIONS**

- A. The Contractor's attention is directed to the possible existence of pipe and other underground improvements which may or may not be shown on the Plans. The Contractor shall preserve and protect any such improvements whether shown on the Plans or not and expose such improvements in advance of the pipeline construction to allow for changes in the alignment as necessary. Where it is necessary to remove and replace or to relocate such improvements in order to prosecute the work, they shall be removed, maintained, and permanently replaced by the Contractor at his expense. Existing underground utilities shall be protected in place.

### **1.08 COMPACTION TESTING**

- A. The Contractor shall engage a qualified representative to perform inspection of the removal and replacement of unsuitable materials, and the placement and compaction of all fill and backfill within the limits of earthwork for the project. All work shall be done



in accordance with these Specifications and as ordered and approved by the Engineer or permit conditions. The costs of all such inspections and tests will be paid for by the Contractor.

- B. Materials sampling and testing shall conform to the following:
1. The in-place soil dry unit weight shall be determined by the sand cone method, ASTM D1556 or by nuclear methods, ASTM D2922 and D3017. The testing frequency will be determined by the Engineer and shall not be less than one test per 100 linear feet of trench for each foot of backfill thickness exclusive of pavement subgrade soil testing.
  2. The laboratory moisture-dry unit weight relationship of soils shall be determined by ASTM D1557-91. The testing frequency will be determined by the Engineer and shall not be less than one test for each soil type used or encountered in the backfill operations.
  3. The relative density of cohesionless soils shall be determined by ASTM D4253 and D4254. The testing frequency will be determined by the Engineer and shall not be less than one test for each soil type used or encountered in the backfill operations.
  4. Samples of backfill materials shall be obtained in accordance with ASTM D75.
- C. "Relative compaction" is the ratio, expressed as a percentage, of the in-place dry density to the laboratory maximum dry density.
- D. The Contractor shall make excavations for compaction tests at the locations and to the depths designated by the qualified representative and shall backfill and compact the excavations upon completion of testing. When tests indicate that the compaction is less than the specified relative compaction, the Contractor shall rework those areas until tests indicate that the specified relative compaction has been obtained.

## **1.09 UTILITY PROTECTION**

The Contractor's attention is directed to the possible existence of pipe and other underground improvements which may or may not be shown on the Drawings. Preserve and protect any such improvements whether shown on the Drawings or not. Expose such improvements in advance of the pipeline construction to allow for changes in the alignment as necessary and report any unknown condition to the District before proceeding with the work. Where it is necessary to remove and replace or to relocate such improvements in order to prosecute the work, they shall be removed, maintained, and permanently replaced by the Contractor at his expense. The cost of repair or replacement of utilities or structures damaged by the Contractor's operations shall be borne by the contractor. Protect existing underground utilities in accordance with Section 01530.

## **1.10 WATER FOR CONSTRUCTION**

Water supplied by the District, for whatever needs and uses, shall be paid for in accordance with the rates and rules of the District or the water purveyor unless otherwise agreed to in writing by the District.

## 1.11 DEFINITIONS

### A. PIPE BASE

The pipe base shall be defined as a layer of material immediately below the bottom of the pipe and extending over the full trench width in which the pipe is bedded. Thickness of pipe base shall be a minimum of 6 inches.

### B. PIPE ZONE

The pipe zone shall include the full width of trench from the bottom of the pipe to a horizontal level 12 inches above the top of the pipe. Where multiple pipes are placed in the same trench, the pipe zone shall extend from the bottom of the lowest pipe to a horizontal level above the top of the highest or topmost pipe. Thickness of pipe zone above the highest top of pipe shall be a minimum of 12 inches.

### C. TRENCH ZONE

The trench zone includes the portion of the trench from the top of the pipe zone to the bottom of the pavement zone or to the existing surface in unpaved areas.

### D. PAVEMENT ZONE

The pavement zone includes the asphalt concrete or portland cement concrete, aggregate base and the upper 12 inches of soil subgrade over the trench zone.

### E. TRENCH ROCK

For the purposes of trench excavation, trench rock shall be defined as follows:

- a) Limestone, sandstone, granite, or similar rocks in solid beds or masses in either original or stratified position which can be removed only by breaking using drilling and blasting, hydraulic fracturing, or pneumatic tools, and all boulders of 1 cubic yard in volume or larger.
- b) Massive rock or concretions encountered in the excavation that cannot be excavated without blasting by the equivalent of a Caterpillar 320E track-type hydraulic excavator rated at not less than 150-horsepower flywheel power (nominal) and in good working order and equipped with a 24-inch wide heavy duty rock bucket with a bucket digging force of not less than 28,000 pounds and a stick digging force of not less than 19,700 pounds.

Trench rock shall not include materials such as individual rocks or boulders, concrete, hardpan, or other materials that can be removed by conventional excavation with the equipment specified herein and with additional effort.

**PART 2 – PRODUCTS****2.01 SOIL BACKFILL - TRENCH ZONE**

- A. Soil backfill used above the pipe zone shall be excavated soil free of asbestos, organic matter, rocks greater than 2 inches in maximum dimension, clods, clay balls, broken pavement and other deleterious materials. The coarser materials shall be well distributed throughout the finer material. Backfill materials that are obtained from trench excavated materials to the extent such material is available, shall be screened during the trenching operation. Hand selecting of rocks from earth as it is placed into the trench will not be permitted in lieu of the specified screening. Under no circumstances will native earth backfill be allowed or used in the pipe base or pipe zone areas.

**2.02 IMPORTED MATERIAL FOR BACKFILL - TRENCH ZONE**

Imported material shall conform to that specified in this Section for soil backfill or imported sand.

**2.03 IMPORTED SAND - PIPE BASE AND PIPE ZONE**

Imported sand used in the pipe base and pipe zone shall consist of natural or manufactured granular material or a combination thereof with a Sand Equivalent of not less than 30 and free of organic material, mica, loam, clay and other deleterious substances. Imported sand shall be free of sharp, angular fragments that may, in the sole opinion of the Engineer, damage protective polyethylene encasement and shall have the following gradation or approved similar:

U.S. Standard Sieve Size	Percent Passing By Weight
3/8-inch	100
No.4	95-100
No.30	30-50
No.100	2-20
No.200	0-5

**2.04 ROCK BACKFILL FOR FOUNDATION STABILIZATION**

Rock backfill shall be used in areas where trench subgrade, as determined by the Engineer, is unsuitable for placement of pipe due to loose, soft, or otherwise deleterious materials. Rock backfill shall consist of crushed or natural rock having ASTM C131 test grading of A and the following gradation:

U.S. Standard Sieve Size	Percent Passing By Weight
3 inches	100
1-1/2 inch	70-100
3/4-inch	60-100
No. 4	25 – 60
No. 30	0 – 10
No. 200	0 – 5

**2.05 GRANULAR MATERIAL FOR STRUCTURAL BACKFILL**

- A. Granular material for structural backfill shall be free of asbestos, organic materials, clay balls, and shall have the following gradation:

U.S. Standard Sieve Size	Percent Passing By Weight
1-inch	100
3/4-inch	90 - 100
1/2-inch	40-70
3/8-inch	20 - 50
No. 4	0-10
No. 8	0 – 5

- B. Whenever the phrase “structural backfill material” is used in these Specifications, it shall mean granular material for structural backfill as described above in 2.05 A and shall be referenced as No.67.
- C. Excavated material may be used for structural backfill provided it conforms to the Specifications for structural backfill material.

**2.06 SLURRY BACKFILL**

Slurry backfill for trenches shall consist of cement-sand slurry conforming to Class 100-E-100 per the SSPWC, Table 201-1.1.2 (A).

**2.07 CONCRETE FOR BELOW GROUND INSTALLATIONS**

- A. Concrete for anchors, collars, encasements, supports, and thrust blocks shall be Class A for reinforced items and Class C for un-reinforced items per Specification Section 03300, except use rapid set concrete mix where indicated. Concrete slurry backfill, when required, shall be in accordance with Table 201-1.1.2 (A), 100-E-100 of the Standard Specifications for Public Works Construction (Green Book), latest edition.
- B. Provide anchor blocks at valves in pipe having rubber gasket bell and spigot or unrestrained mechanical joints.
- C. Provide support blocks at all valves, depending on Geotechnical Investigation results. Typical support of valves shall be accomplished by compacted Class 2 aggregate base, unless geotechnical conditions dictate otherwise.
- D. Provide thrust blocks at fittings in pipe having rubber gasket bell and spigot or unrestrained mechanical joints.
- E. Items B, C, and D shall be in accordance with the Standard Drawings.

**2.08 TRENCH CUT OFF WALLS**

- A. Provide ASTM C 90, Grade N I, hollow load bearing concrete masonry units, medium weight, moisture controlled, average compressive strength over gross area of 1,000 psi. Nominal face dimensions: 8 inches by 8 inches by 16 inches.

- B. Provide ladder conforming to ASTM A 82.
- C. Mortar and grout shall be a mixture of cement, sand, and water. Mortar shall consist of not more than one part cement to two and one half parts sand by damp loose volume. The quantity of mixing water shall be not more than necessary for handling and placing.

## **2.09 WATER FOR COMPACTION**

Water used in compaction shall have a maximum chloride concentration of 500 mg/l, a maximum sulfate concentration of 500 mg/l, and shall have a pH of 7.0 to 9.0. Water shall be free of acid, alkali, or organic materials injurious to the pipe or coatings. Salt water will not be allowed.

## **2.10 WOVEN GEOTEXTILE**

Woven geotextile fabric shall conform to the requirements for Geosynthetics Type 270WS in accordance with the requirements of SSPWC Section 213-2.

# **PART 3 – EXECUTION**

## **3.01 COMPACTION REQUIREMENTS**

- A. Unless otherwise shown on the Drawings, otherwise described in the Specifications or required by the agency having jurisdiction over the area of the work, relative compaction in pipe trenches shall be a minimum as follows:
  - 1. Pipe base: 95% relative compaction.
  - 2. Pipe zone: 95% relative compaction.
  - 3. Backfill above pipe zone not beneath paving: 90% relative compaction.
  - 4. Backfill above pipe zone in paved areas: 95% relative compaction.
  - 5. Rock backfill for foundation stabilization: 80% relative density.
  - 6. Imported sand backfill for overexcavation: 90% relative compaction.

## **3.02 SIDEWALK, PAVEMENT, AND CURB REMOVAL**

- A. Cut and remove bituminous and concrete pavements regardless of the thickness, and curbs and sidewalks prior to excavation of the trenches with a pavement saw, hydrohammer, or pneumatic pavement cutter. Impact type pavement breakers will not be permitted within 5 feet of existing utilities.
- B. The pavement cut width shall be at least equal to the required width of the trench at ground surface.
- C. Haul pavement and concrete materials from the site. Do not reuse in trench backfill.

**3.03 SHEETING, SHORING, AND BRACING OF TRENCHES**

- A. Trenches shall have sheeting, shoring, and bracing conforming with 29CFR 1926, Subpart P Excavations, CAL/OSHA requirements, and the DISTRICT's requirements.

**3.04 DEWATERING**

- A. Refer to Section 02140.

**3.05 BLASTING**

- A. No blasting is anticipated to be required for this project. No blasting will be allowed without prior approval.

**3.06 TRENCH WIDTH**

- A. Pipe trench widths in the pipe zone will be limited as follows:

<u>Pipe Diameter</u>	<u>Minimum Trench Width</u>	<u>Maximum Trench Width</u>
4" through 12"	O.D. + 12"	O.D. + 16"
14" through 48"	O.D. + 16"	O.D. + 24"

- B. Trench width at the top of the trench will not be limited except where width of excavation would undercut the structural support of adjacent structures and footings. Where shoring or encasement is required, trench widths shall be increased accordingly.

**3.07 LENGTH OF OPEN TRENCH**

- A. Limit the length of open trench to the lessor of 300 feet in advance of pipe laying, or the length of pipe to be installed in one working day considering excavation, pipe laying, appurtenant construction, and backfill.
- B. Complete backfilling and temporary or first layer paving not more than 150 feet in the rear of pipe laying.
- C. Where pipelines are located beneath or adjacent to existing paved roads, backfill all trenches at the end of each workday and place temporary or first layer of paving. Clean all new and adjacent existing paved surfaces of residual excavated and backfill materials. Perform dust control operations in these areas with a brush or vacuum type mobile street sweeper. No open trenches will be allowed in these areas.
- D. Where open trenches are not required to be backfilled at the end of the day per these Specifications but in the opinion of the Engineer pose a hazard to the public, the trench shall be surrounded with temporary chain link fence panels or be backfilled.
- E. Provide ingress and egress to buildings and property at all times. Provide steel covering for vehicular access.

### **3.08 DISPOSAL OF EXCESS EXCAVATED MATERIAL**

Dispose of excess excavated material offsite. Contractor shall make his own arrangements for the disposal of the excess material and bear all costs incidental to such disposal. In open terrain, excess material may be disposed of within the right of way by spreading, provided that rocks or lumps which cannot be readily covered by spreading are removed.

### **3.09 TRENCH EXCAVATION**

- A. Perform all excavation in accordance with the safety requirements of this Section and applicable regulations regardless of the type, nature, or condition of the material encountered. Do not commence excavation prior to acceptance of the Contractor's plans for the excavation support system.
- B. During trench excavation, place the excavated material only within the working area or within the areas shown on the Drawings. Do not obstruct any roadways or streets. Conform to federal, state, and local codes governing the safe loading of trenches with excavated material.
- C. Remove loose cobble or boulders from the sidewalls of trenches before allowing workers into the excavation, or protect with sheathing or other methods
- D. Do not operate excavation equipment within 5 feet of existing structures or utilities or newly completed construction. Excavate with hand tools in these areas.
- E. Excavate the trench to the lines and grades shown on the Drawings with allowance for pipe thickness, sheeting and shoring if used, and for pipe base. Trench depth shall accommodate the pipe and the pipe base at the elevations shown in the profile on the Drawings. In the absence of such profile, the top of pipe shall have adequate cover to resist construction loads and have at least 4 feet of cover for pipe greater than 12 inches in diameter or 3 feet for pipe 12 inches in diameter or less.
- F. If the trench is excavated below the required subgrade, refill any part of the trench excavated below the subgrade at no additional cost to the District with imported sand or crushed rock backfill. Place the refilling material over the full width of trench in compacted layers not exceeding 6 inches deep to the established grade with allowance for the pipe base.
- G. Construct trenches in rock by removing rock to a minimum of 6 inches below bottom of pipe and pipe bells and backfilling with imported sand.
- H. Prior to lowering pipe in place, the trench bottom shall be prepared to provide firm and uniform bearing over the entire length of the pipe barrel and a bearing width at least equal to one-half the outside diameter of the pipe. Adjustments to line and grade shall be made by scraping or by filling and tamping the subgrade. Wedging or blocking beneath the pipe will not be permitted.

### **3.10 TRENCH EXCAVATION IN BACKFILL OR EMBANKMENT AREAS**

- A. Excavate trenches for pipe in backfill or embankment areas in accordance with one of the following procedures:

1. Construct and compact the embankment to an elevation of 1-foot minimum over the top of the largest pipe to be installed. Excavate trench in the compacted embankment. Place pipe base material, install pipe, and backfill with pipe zone material. Construct embankment as specified in the Section 02200.
2. Excavate trench in the completed backfill or embankment. Place pipe base material, install pipe, and backfill with pipe zone material. Place and compact backfill above the pipe zone to the same relative compaction as the adjacent embankment as specified in the Section 02200.

### **3.11 FOUNDATION STABILIZATION**

- A. After the required excavation has been completed, the Engineer will inspect the exposed subgrade to determine the need for any additional excavation. It is the intent that additional excavation be conducted in all areas within the influence of the pipeline where unacceptable materials such as soft, spongy or deleterious materials exist at the exposed grade. Overexcavation shall include the removal of all such unacceptable material that exists directly beneath the pipeline to the trench width and to a depth sufficient to remove the deleterious materials, or 2 feet, whichever is less.
- B. Backfill the trench to the design subgrade of the pipe base with rock backfill material for foundation stabilization. Line the trench with woven geotextile fabric, and then place the rock backfill over the full width of the trench and compact in layers not exceeding 8 inches deep to the required grade. Woven geotextile fabric is to line the trench bottom and sides, and shall fully encase the rock backfill. The woven geotextile fabric is to overlap at seams a minimum of 2-feet.

### **3.12 CONCRETE FOR BELOW GROUND INSTALLATIONS**

- A. Encase pipe with concrete to the line and dimensions indicated or place concrete between the undisturbed ground and the pipe or fittings to be restrained or supported. Quantity or bearing area of the concrete against undisturbed ground shall be as shown on the Standard Drawings, Drawings, or as directed by the Engineer. Provide temporary support of pipe, fittings, or valves and place concrete such that the pipe joints, fittings, or valves are accessible for repairs. Consolidate the concrete during placement to eliminate voids. Do not backfill adjacent to the concrete or subject the concrete to pipeline pressure until the concrete has achieved the design strength per Section 03300.
- B. Provide concrete anchor blocks at all valves in pipe having rubber gasket bell and spigot or unrestrained mechanical joints.
- C. Provide concrete support blocks at isolation valves.
- D. Provide thrust blocks at fittings in pipe having unrestrained, rubber gasket bell and spigot or mechanical joints. Do not provide thrust blocks for ductile iron pipe with restrained joints or steel pipe having welded, flanged, or butt strap joints unless detailed on the Drawings or otherwise required.



### 3.13 TRENCH CUT-OFF WALLS

- A. Install trench cut-off walls at the locations shown on the Drawings, and at 50 feet on center on slopes 30 percent and steeper. Hand cut trench walls neat to the dimensions required by the Standard Drawings and to accomplish compaction of backfill adjacent to the wall. Reinforced masonry cutoff walls shall be reinforced with ladder steel as the wall is laid and with blocks fully bedded in mortar and fill all block cells with mortar. Cut blocks to fit around the pipe and mortar in place. Provide weep holes in the wall to relieve hydrostatic pressure. Provide one 1/2-inch diameter weep hole for each 1.5 square foot of wall in the trench pipe zone. Place backfill in layers being evenly brought up on each side of the cut-off wall. Compact the backfill with hand operating compaction equipment. Give special attention to placing backfill in slot in trench walls.

### 3.14 PIPE INSTALLATION AND TRENCH BACKFILLING

- A. Pipe zone and trench zone backfill materials shall, to the extent practical, be moisture conditioned prior to placement into the trench. However, in no event shall backfill materials be compacted at less than the moisture content specified herein. All materials shall be within 2 percent of optimum moisture content at the time of compaction.
- B. Place the specified thickness of pipe base material (imported sand) over the full width of trench and compact to the specified relative compaction. Grade the top of the pipe base ahead of the pipe laying to provide firm, continuous, uniform support along the full length of the trench for the pipe, fittings, and valves. The requirement for closely fitting the pipe to the bedding material as specified in this Section will be strictly enforced.
- C. Excavate bell holes at each joint to permit proper assembly and inspection of the entire joint. Fill and compact the area excavated for the joints with the pipe base material.
- D. Pipe shall normally be laid up grade. Any pipe which is not in true alignment, both vertical and horizontal, or shows any undue settlement after laying shall be replaced when so ordered by the Engineer. No pipe shall be laid which is damaged including cracks, checks, or spalls or any other defect deemed by the Engineer to render the pipe unacceptable and all such sections shall be permanently removed from the work.
- E. At all times when the work of installing pipe is not in progress, the ends of the pipeline shall be kept tightly closed with suitable plywood or sheet metal bulkheads to prevent the entrance of animals, unauthorized persons, water, or foreign materials from entering the pipe.
- F. After the pipeline has been bedded and cement mortar on exterior joints has set hard (as applicable), place pipe zone material (imported sand) simultaneously on both sides of the pipe, fittings, and valves, keeping the level of backfill the same on each side. Carefully place the material around the pipe so that the pipe barrel is completely supported and that no voids or uncompacted areas are left beneath the pipe. Use particular care in placing material on the underside of the pipe to prevent lateral movement during subsequent backfilling. Do not drop sharp, heavy pieces of material directly onto the pipe or the tamped material around the pipe.
- G. Backfill imported sand in the pipe zone by hand and compact by mechanical means and in layers not to exceed 8 inches in compacted thickness. Jetting or ponding for

compaction will not be permitted. Care shall be exercised in backfilling to avoid damage to pipe coatings and polyethylene encasement. Damage to polyethylene wrap (i.e., abraded, torn, or overly stretched) will be repaired or replaced at the expense of the Contractor.

- H. After backfilling in the pipe zone is completed, inspected and approved, place detectable warning tape prior to commencing trench zone backfill. Place and compact native earth backfill or imported backfill material in layers not to exceed 8 inches in compacted thickness. Compact each layer to the specified relative compaction for the trench zone by mechanical means; jetting or ponding will not be permitted. Do not permit free fall of the material until at least 2 feet of cover is provided over the top of the pipe.

### **3.15 MECHANICAL COMPACTION OR HAND TAMPING**

- A. Place imported sand and backfill materials in uniform layers of the indicated thickness. Compact each layer to the required minimum relative compaction at the optimum moisture content. Do not use heavy compaction equipment with an overall weight in excess of 125 pounds until backfill has been completed to a depth of 2 feet over the top of pipe.

### **3.16 SLURRY BACKFILL**

- A. Use a cement-sand slurry trench backfill where it is specified on the Drawings, where required by the requirements of regulatory or utility agencies, or where soil compaction is rendered infeasible by the Engineer. Slurry backfill shall not be used where, in the opinion of the Engineer, it will impede subsurface drainage.
- B. Slurry shall be thoroughly consolidated with tampers or vibrators. Allow slurry to cure for a minimum of 48 hours before pavement resurfacing unless otherwise approved by the Engineer.
- C. A tack coat shall be applied to the surface of the slurry prior to placing asphalt concrete paving.

### **3.17 SLOPE PROTECTION**

- A. Install erosion and sediment control best management practices to all disturbed soil areas and along the boundary of the work site. Refer to Section 02270.
- B. Upon the completion of ground disturbing activities and after final clean-up, cultivate areas to be seeded to break up compaction of the soil surface resulting from earthwork operations. Apply a mixture of wood or cellulose fiber mulch, tackifier, and seed to all soil areas disturbed by construction or as ordered by the Engineer in accordance with Section 02270. Use fertilizers or soil amendments where so specified or required for the success of revegetation to at least 70% vegetative cover.

### **3.18 FINAL CLEAN-UP**

- A. After backfilling, grade the ground surface to the contours of the original ground and match the adjacent undisturbed ground. Clear surfaces free of all disturbed vegetation,

rubbish and other construction waste. Dispose offsite of all excavated surplus soil or surface rocks which cannot be readily covered by spreading.

- B. Replace in kind street improvements, such as curbs and gutters, barricades, traffic islands, signalization, fences, signs, mail boxes, etcetera that are cut, removed, damaged, or otherwise disturbed by the construction.

**END OF SECTION**

**SECTION 02270****TEMPORARY SOIL EROSION AND SEDIMENT CONTROL****PART 1 - GENERAL****1.01 DESCRIPTION**

- A. The Contractor shall implement a temporary soil erosion and sediment control program for all earthwork and demolition activities including clearing and grubbing; trenching; grading; and pavement grinding, cutting, or removal. Such program shall conform to all applicable federal, state and local laws and regulations including National Pollution Discharge Elimination System (NPDES) requirements.
- B. In compliance with the local, State and Federal regulations regarding storm water management during construction, the CONTRACTOR shall not allow any debris, waste materials or pollutants, originating from the CONTRACTOR's operations, to enter the storm drainage system. The CONTRACTOR shall be fully responsible for developing and implementing a Storm Water Pollution Prevention Plan (SWPPP).
- C. In the event that a project-specific Storm Water Pollution Prevention Plan (SWPPP) is not required, the CONTRACTOR is responsible providing supporting documentation provided by a Qualified SWPPP Developer (QSD) in accordance with the General Permit for developing, and shall submit a Water Pollution Control Plan (WPCP), as required by applicable jurisdictional agency requirements including those of NPDES general permit(s) governed by the Regional Water Quality Control Board.
- D. In the absence of a project-specific Storm Water Pollution Prevention Plan (SWPPP), Water Pollution Control Plan (WPCP), or other stormwater management plan prepared by or on behalf of the District for storm water and non-storm water management purposes, the Contractor shall prepare its own project-specific storm water and non-storm water management plan and furnish all required Permit Registration Documents that shall meet the minimum requirements of applicable local, state and federal laws and regulations:
  - 1. County of San Diego, Stormwater Standards Manual, Appendix A to the Watershed Protection, Stormwater Management and Discharge Control Ordinance No. 9424 (An Excerpt from the San Diego County Code of Regulatory Ordinances)
  - 2. Order WQ 2014-0194-DWQ, General Order No. CAG140001, Statewide National Pollutant Discharge Elimination System (NPDES) Permit for Drinking Water System Discharges To Waters of The United States
  - 3. Order No. R9-2007-0001, National Pollutant Discharge Elimination System ("NPDES") Permit No. CA0108758, as amended
  - 4. Order No. 2009-0009-DWQ (as amended), National Pollutant Discharge Elimination System ("NPDES") General Permit for Storm Water Discharges

Associated with Construction and Land Disturbance Activities, NPDES No. CAS000002

## **1.02 RELATED WORK SPECIFIED ELSEWHERE**

- A. Section 02140 – Dewatering
- B. Section 02223 – Trenching, Backfilling, and Compaction
- C. Section 02510 – Asphalt Concrete Paving

## **1.03 STORM WATER POLLUTION PREVENTION MEASURES**

- A. The CONTRACTOR shall contain and remove any and all waste or pollutants generated by the CONTRACTOR's construction operations using the appropriate Best Management Practices (BMPs) by preparing a SWPPP. The SWPPP shall be submitted for approval to the DISTRICT and the appropriate regulatory agencies in accordance with the standard specifications. The SWPPP shall be written, amended, and certified by a Qualified SWPPP Developer (QSD) in accordance with the General Permit.
- B. The CONTRACTOR shall be responsible throughout the duration of the construction period for installing and maintaining the applicable BMPs and for removing and legally disposing of temporary control measures, wastes and pollutants at an off-site location. The CONTRACTOR shall ensure all BMPs and temporary control measures required by the General Permit and the SWPPP are implemented by a Qualified SWPPP Practitioner (QSP) in accordance with the General Permit. Unless otherwise directed by the DISTRICT or specified elsewhere in these specifications, the CONTRACTOR's responsibility for BMP implementation shall continue throughout any temporary suspension of work.
- C. The CONTRACTOR is responsible for all treatment necessary to ensure water is disposed of in a legal manner.
- D. In accordance with the General Permit and the SWPPP, the CONTRACTOR shall develop a Rain Event Action Plan (REAP) within 48 hours prior to any likely precipitation event.

## **1.04 RESPONSIBILITIES, CONSEQUENCES, AND REMEDIES**

- A. Conformance with the provisions of this section shall not relieve the CONTRACTOR from the CONTRACTOR's responsibilities of the Contract Documents.
- B. For purposes of this section, costs and liabilities include, but are not limited to, fines, penalties and damages whether assessed against the DISTRICT or the CONTRACTOR, including those levied under the Federal Clean Water Act and the State Porter-Cologne Water Act.
- C. If solid or liquid materials or waste, hazardous or otherwise, or pollutants originating from the CONTRACTOR's operation enter the storm drain system or water courses, the CONTRACTOR will be required to thoroughly clean up the affected storm drain

facilities and water courses to the satisfaction of the DISTRICT. If the CONTRACTOR fails to clean up the affected facilities as required, the DISTRICT will issue a stop-work order and take necessary actions to ensure the cleanup of the affected facilities.

- D. The CONTRACTOR shall be responsible for all costs, including fines, the DISTRICT's cost of defense, the cost of cleanup by others ordered by the DISTRICT, and liabilities imposed by law as a result of the CONTRACTOR's failure or negligence in complying with the requirements specified herein.

## 1.05 SUBMITTALS

### A. General

1. SWPPP, WPCP or other stormwater management plan approved by the agency of jurisdiction.
2. Manufacturers' catalog data and samples of materials used for erosion and sediment control purposes including physical properties, application, and installation instructions:
  - a. Fiber rolls
  - b. Silt fence fabrics
  - c. Fabric for gravel-filled bags
  - d. Erosion control mats
3. Submit records for hydraulically applied erosion control materials that indicate
  - a. Compliance with the specified application rates,
  - b. Areas treated and quantity of materials applied,
  - c. Application date and time.

### B. Seed

1. At least 60 days before seed application, submit proof that the order for seed required for the Contract has been placed and accepted by the seed vendor. Include the seed's botanical names, quantity ordered, and the anticipated date of delivery.
2. Submit a copy of the analysis report for each seed species before application. Submit seed labels. Seed labels must show:
  - a. Seed variety including botanical name and common name
  - b. Lot number or other lot identification

- c. Origin
- d. Net weight
- e. Percent pure live seed
- f. Percent total viability
- g. Percent by weight inert matter
- h. Percent by weight other crop seed
- i. Percent by weight weed seed
- j. Name of restricted noxious weed seed by number per pound of seed
- k. Name and address of the supplier or grower responsible for the analysis

C. Tackifier

- 1. Submit a certificate of compliance for tackifier and bonded fiber matrix in accordance with Section 01300 before application. Certificates of compliance must include:
  - a. SDS
  - b. Product label
  - c. Report of acute and chronic toxicity tests on aquatic organisms complying with EPA methods
  - d. List of ingredients, including chemical formulation
  - e. Properties of polyacrylamide in tackifier including:
    - 1) Percent purity by weight
    - 2) Percent active content
    - 3) Average molecular weight
    - 4) Charge density

## 1.06 QUALITY CONTROL

A. Seed

- 1. Seed must be tested for purity and germination by a seed laboratory certified by the Association of Official Seed Analysts or by a seed technologist certified by the Society of Commercial Seed Technologists.

2. Tests must be performed within 12 months before application.

## PART 2 - PRODUCTS

### 2.01 GENERAL

Materials used for temporary erosion and sediment control purposes including, but not limited to, gravel bags, fiber rolls, erosion control blankets, silt fences, etc. shall be of commercial grade and intended for use in achieving compliance with applicable water pollution control regulations and standards.

### 2.02 FIBER ROLLS

- A. Fiber roll shall have a minimum functional longevity of one year and comply with the following requirements:
  1. Prefabricated roll filled with rice or wheat straw, wood excelsior, or coconut fiber.
  2. Rolls shall be covered with biodegradable jute, sisal, or coir fiber netting secured tightly on each end.
  3. Rolls shall comply with one of the following:
    - a. 8 to 10 inches in diameter, 10 to 20 feet long, and at least 1.1 pounds per foot.
    - b. 10 to 12 inches in diameter, at least 10 feet long, and at least 3 pounds per foot.
- B. Rope shall be biodegradable, such as sisal or manila, with a minimum diameter of 1/4 inch.
- C. Wood stakes for anchoring fiber rolls shall be 3/4 -inch-square and 24 inches long.

### 2.03 SILT FENCE

- A. Silt fence fabric shall comply with the following or as approved by the Engineer.

Property	Test method	Requirement	
		Woven	Nonwoven
Grab breaking load, 1-inch grip in each direction (min, lb)	ASTM D4632	120	120
Apparent elongation, in each direction (min, percent)	ASTM D4632	15	50
Water flow rate, average roll value, (min and max, gal per minute/sq ft)	ASTM D4491	10-100	100-150



Permittivity (min, sec <sup>-1</sup> )	ASTM D4491	0.05	1.1
Apparent opening size, average roll value (max, inches)	ASTM D4751	0.023	0.012
UV resistance, retained grab breaking load, 500 hours (min, percent)	ASTM D4355	70	70

## 2.04 GRAVEL FILLED BAG

- A. A gravel-filled bag must:
1. Be a geosynthetic bag;
  2. Have inside dimensions from 24 to 32 inches long and from 16 to 20 inches wide;
  3. Have a bound opening sewn with yarn, bound with wire, or secured with a closure device;
  4. Weigh from 30 to 50 pounds when filled with gravel.
- B. Gravel for a gravel-filled bag must be from 3/8- to 3/4-inch in diameter and must be clean and free of clay balls, organic matter, and other deleterious materials.

## 2.05 FIBER

- A. Fiber must be wood fiber, cellulose fiber, alternate fiber, or a combination of these fibers.
- B. Wood fiber must be a long-strand, whole-wood fiber thermo mechanically processed from clean whole wood chips.
- C. Cellulose fiber must be made from natural or recycled pulp fiber, such as wood chips, sawdust, newsprint, chipboard, corrugated cardboard, or a combination of these materials.
- D. Alternate fiber must be a long strand, whole natural fiber made from clean straw, cotton, corn, or other natural feed stock.
- E. Fiber must:
1. Disperse into a uniform slurry when mixed with water.
  2. Contain 3/8-inch fiber strands for at least 25 percent by total volume.
  3. Have at least 40 percent retained when passed through a no. 25 sieve.
  4. Have an initial moisture content of no more than 15 percent of its dry weight when tested under California Test 226. The moisture content must be marked on the packaging.

5. Have a water holding capacity, by weight, of at least 1,200 percent when tested under ASTM D7367.
6. Be nontoxic to plants and animal life.
7. Be free of synthetic or plastic materials, lead paint, printing ink, varnish, petroleum products, seed germination inhibitors, and chlorine bleach.
8. Contain less than 250 ppm of boron.
9. Be colored to contrast with the area where it is to be applied. The coloring agent must be biodegradable, nontoxic, and free from copper, mercury, and arsenic, and must not stain concrete or painted surfaces.

## 2.06 TACKIFIER

- A. Tackifier must be:
  1. free from growth or germination inhibiting factors,
  2. nonflammable,
  3. nontoxic to aquatic organisms,
  4. functional for a minimum of 180 days.
- B. Tackifier must be one of the following:
  1. Plant based natural high-molecular-weight polysaccharide. Plant-based tackifier must be a high viscosity hydrocolloid that is miscible in water, and labeled as either guar, psyllium, or starch, as follows:
    - a. Guar gum based tackifier must be derived from the ground endosperm of the guar plant, *Cyanmopsis tetragonolobus*. It must be treated with dispersing agents for easy mixing. It must be able to be diluted at the rate of 1 to 5 pounds per 100 gallons of water.
    - b. Psyllium based tackifier must be manufactured from the finely ground, mucilloid coating of *Plantago ovata* or *Plantago ispaghula* seeds and able to dry and form a firm but rewettable membrane.
    - c. Starch based tackifier must be a nonionic, water-soluble, granular material derived from corn, potato, or other plant-based source.
- C. Prepackaged liquid or dry powder polymeric emulsion blend. Prepackaged tackifier must be an anionic formulation with a residual monomer content not exceeding 0.05 percent by weight. The tackifier must contain and be labeled with one of the following as the primary active ingredients:
  1. Acrylic copolymers and polymers.

2. Polymers of methacrylates and acrylates.
3. Copolymers of sodium acrylates and acrylamides.
4. Polyacrylamide and copolymer of acrylamide.
5. Hydrocolloid polymers.

## **2.07 BONDED FIBER MATRIX**

- A. Bonded fiber matrix must be a hydraulically-applied material composed of fiber and tackifier and may also include seed and fertilizer.
- B. Fiber for bonded fiber matrix must be 100 percent wood fiber and comply with the specifications for Fiber in this Specification Section, except that at least 50 percent is retained when passed through a No. 25 sieve.
- C. Tackifier for bonded fiber matrix must:
  1. Be bonded to the fiber or prepackaged with the fiber by the manufacturer;
  2. Contain a minimum of 10 percent of the combined weight of the dry fiber, activating agents, and additives;
  3. Be an organic, high viscosity colloidal polysaccharide with activating agents or a blended hydrocolloid-based binder.

## **2.08 SOIL AMENDMENTS**

- A. Soil conditioner shall be Life by Wil-Gro or Humic Compost, 3/8-inch screened by AgriService, Oceanside, CA or approved equal.
- B. Agricultural gypsum shall be commercially processed agricultural grade and packaged gypsum with a minimum 80 percent grade containing a minimum of 14 percent sulphur. Gypsum shall be in pelletized form to minimize dust.

## **2.09 SEED**

- A. Seed shall consist of a mixture of annual native California species formulated for rapid growth.
- B. Shall be 95-percent pure and have a minimum of 85 percent germination. Seed with a germination rate lower than the minimum rate shown may be used if authorized. Deliver seed to the job site in unopened, separate containers with the seed tag attached.
- C. Seed mix shall contain:
  1. Bromus carinatus "Cucamonga" (cucamonga brome)
  2. Festuca microstachys (small fescue)

3. Trifolium ciliolatum (tree clover)
- D. Seed mix must not contain:
1. Prohibited noxious weed seed,
  2. More than 1.0 percent total weed seed by weight.
- E. Seeding rate: 32 lbs per acre.
- F. Height range: 30-36 inches.

## **PART 3 - EXECUTION**

### **3.01 GENERAL**

- A. The Contractor shall develop erosion control or pollution prevention plans and reports required by the governing agency, as applicable.
- B. The Contractor shall take all precautionary actions and implement and maintain all necessary BMPs to prevent discharges to any portion of the storm drain conveyance system, streams, or water bodies including the discharge of pollutants from activities such as paving operations, soil stockpiles, concrete waste washouts, cold-milling, vehicle and equipment fueling. Handle, store, or legally dispose of all construction materials or excavated soils properly.
- C. Avoid excavation, grading, and paving activities during wet weather. Sweep the streets on which construction activity occurs on a daily basis. Avoid washing soil, aggregate, concrete, or any other debris or pollutant (visible or non-visible) without proper containment or onto a street. Use vacuum with all concrete sawing operations.
- D. Keep the amount of exposed soil areas to a minimum during the rainy season. Cover material and excavated soil stockpiles with secured tarps or plastic sheeting.
- E. Grade disturbed surfaces to provide positive drainage and to prevent ponding of water. Surface water shall be controlled to prevent water damage or deposition of sediment to all adjoining and downstream properties. Construct diversion dikes and drainage swales around work sites. Cover and seal catch basins if work in their vicinity may allow debris or deleterious liquids to enter.
- F. Install silt fences, desilting basins, erosion control blankets, gravel bags, drainage inlet protection, stabilized construction entrances and any other erosion or sediment control measures to reduce sediment escape from the construction site to the maximum extent practical in compliance with manufacturer's recommendations and applicable regulations.
- G. At a minimum, provide erosion and sediment control measures prior to or immediately following clearing, grubbing, grading, or backfilling operations in the following locations:

1. At the lowest end and at the perimeter of disturbed soil areas where storm water runoff will be discharged from the site.
  2. At additional locations for sediment control as required by the Contract Documents and NPDES requirements.
- H. Check and repair leaking equipment away from construction sites. Keep equipment in proper working order and free of oil, grease, or fuel leaks and immediately contain any leaks with drip pans or absorbent material. Designate a location away from storm drains for equipment refueling. Clean up all spills using dry methods.

### **3.02 SWPPP PREPARATION AND IMPLEMENTATION**

- A. The CONTRACTOR, as a registered QSD/QSP or under the direction of a registered QSD/QSP, shall develop and implement a project specific SWPPP based on the CONTRACTOR's construction activities to ensure compliance with the State Water Resources Control Board (SWRCB) General Permit for Storm Water Discharges Associated with Construction Activity in accordance with the standard specifications. The SWPPP shall be kept on file with any amendments and made available upon request of the DISTRICT or representative from the Regional Water Quality Control Board or the SWRCB.
- B. Amendments or changes to the SWPPP shall be performed by the CONTRACTOR and QSD and are a requirement. All costs for implementing and maintaining the General Permit conditions and SWPPP and BMP requirements shall be borne by the CONTRACTOR.

### **3.03 SELECTIVE BMPS FOR STORM WATER POLLUTION PREVENTION**

- A. The CONTRACTOR shall incorporate some or all of the following BMPS, as applicable, into the CONTRACTOR's site-specific SWPPP for this project.
1. Material Handling and Storage
    - a. Non-hazardous Materials
      - (1) Designated Delivery and Storage Area: The CONTRACTOR shall propose, within the CONTRACTOR's staging site, an area that is suitable for material delivery and storage. To the maximum extent practicable, these areas shall be away from gutters, catch basins, drainage courses or creeks. The CONTRACTOR shall submit the proposed areas to and shall obtain approval from the DISTRICT in writing prior to bringing in materials.
      - (2) Storage of Granular Material: The CONTRACTOR shall store granular material at least ten feet (10') away from any inlet or curb return and shall prevent the granular materials from entering the storm system, drainage courses or creeks. During wet weather or when rain is forecast within 24 hours, the CONTRACTOR shall cover granular materials with

a tarpaulin and surround the material with sandbags or other approved heavy objects.

b. Hazardous Materials

- (1) Hazardous materials include, but are not limited to, petroleum products, friable products containing asbestos, antifreeze, paints, thinners, solvents, pesticides, herbicides and various other toxic chemicals.
- (2) The CONTRACTOR shall propose, within the CONTRACTOR's staging site, an area that is suitable for hazardous material delivery and storage. To the maximum extent practicable, the area shall be away from inlets, gutters, drainage courses or creeks. The CONTRACTOR shall submit the proposed area to and shall obtain the approval from the DISTRICT in writing prior to bringing in hazardous materials.
- (3) The CONTRACTOR shall label and store all hazardous materials and hazardous wastes in accordance with applicable regulation.
- (4) The CONTRACTOR shall keep all hazardous materials or waste in containers and fully covered to avoid contamination of storm runoff.
- (5) The CONTRACTOR shall keep an accurate, up-to-date inventory, including Materials Safety Data Sheets (MSDSs), of hazardous materials and hazardous wastes stored on-site to assist emergency response personnel in the event of a hazardous material incident.

2. Hazardous Material Usage

- a. The CONTRACTOR shall follow all local, State and Federal policies, laws and regulations governing the use of hazardous materials.

3. Vehicle and Equipment Cleaning, Maintenance and Fueling

- a. Cleaning: The CONTRACTOR shall not clean or wash vehicles or equipment on-site or in the streets. If allowed by the DISTRICT in writing, cleaning and washing shall be performed in a designated and bermed area approved by the DISTRICT using water only. No soaps, solvents, degreasers, steam cleaning equipment or similar methods are permitted. The CONTRACTOR shall not allow wash water to flow into streets, gutters, storm drain system, drainage courses or creeks.
- b. Maintenance and Fueling: The CONTRACTOR shall perform maintenance and fueling of vehicles or equipment in a designated, bermed area or over a drip pan that will prevent waste, leaks or spills from entering streets, gutters, storm drain system, drainage courses or creeks. The CONTRACTOR shall inspect all vehicles and equipment arriving on-site for leaking fluids and shall promptly repair leaking vehicles and equipment. Drip pans shall be used to catch leaks until

repairs can be made. Shut-off valves on equipment must be working properly.

4. Spill Prevention and Control

- a. If hazardous materials are used on the project, the CONTRACTOR shall keep a stockpile of spill clean-up materials, such as rags or absorbents, readily accessible on-site.
- b. Above-ground storage tanks and their installations shall comply with all local, State and Federal requirements.
- c. The CONTRACTOR shall immediately contain and prevent spills or leaks from entering the storm drain system, drainage courses or creeks and shall properly clean up and dispose of the spills or leaks. The CONTRACTOR shall not wash the spills or leaks into streets, gutters, storm drain system, drainage courses or creeks and shall not bury the spills or leaks.

5. Disposal of Hazardous Waste

- a. Unless the CONTRACTOR is a licensed hazardous waste handler, the CONTRACTOR shall contract with a licensed hazardous waste handler to remove and dispose of hazardous waste materials unless the waste quantities to be transported are below threshold limits for transportation as specified in the State and Federal regulations.
- b. The CONTRACTOR shall arrange for regular hazardous waste collection to comply with limits for storage of hazardous waste.
- c. The CONTRACTOR may dispose of dry, empty paint cans, buckets, paintbrushes, rollers, rags and drop cloths in the trash.
- d. The CONTRACTOR shall dispose of hazardous waste at facilities authorized for treatment, storage and disposal of hazardous waste only.

6. Street Sweeping

- a. At the end of each day or as directed by the DISTRICT, the CONTRACTOR shall sweep roadways of all debris and excess materials attributed to the CONTRACTOR's operations.

7. Water Usage

- a. The CONTRACTOR shall use the least amount of water necessary for dust control and street sweeping operations.
- b. The CONTRACTOR shall not use water to flush dust and debris down the street in place of street sweeping.

8. Dumpsters and Portable Sanitary Facilities

- a. If dumpsters or portable sanitary facilities are used, they shall be stationed at least ten feet (10') away from storm drain facilities.
- b. The CONTRACTOR shall arrange for regular waste collection to keep dumpsters and portable sanitary facilities from overflowing and shall regularly inspect these facilities for leaks. If a leak is discovered, the CONTRACTOR shall arrange for the repair or replacement of facilities that leak. The CONTRACTOR shall not wash the dumpsters or portable sanitary facilities on-site.

9. Earthwork

- a. The CONTRACTOR shall maximize the control of erosion and sediment by using the Best Management Practices for erosion and sedimentation control described in the California Stormwater Quality Association (CASQA) Stormwater Best Management Practice Handbook or ABAG Manual of Standards for Erosion and Sediment Control Measures.

10. Dewatering

- a. The CONTRACTOR shall route water through a control device, such as a sediment trap, sediment basin or Baker tank, to remove settleable solids prior to discharging the water into the storm drain system. Refer to the CASQA Stormwater Best Management Practice Handbook for these sediment control measures.
- b. Approval of the control device shall be obtained in advance from the DISTRICT and the Regional Water Quality Control Board (RWQCB).
- c. Filtration of the water following the control device may be required on a case-by-case basis.
- d. If the RWQCB and DISTRICT determine that the dewatering operation would not generate an appreciable amount of settleable solids, the control device may be waived.

11. Saw Cutting

- a. During saw cutting or grinding operation, use as little water as possible.
- b. During saw cutting, the CONTRACTOR shall cover or barricade catch basins using filter fabric, straw bales, sandbags or fine gravel dams to keep slurry out of the storm drain system. When protecting a catch basin, the CONTRACTOR shall ensure that the entire opening of the catch basin is covered. Refer to CASQA Stormwater Best Management Practice Handbook for these control measures.
- c. The CONTRACTOR shall shovel, absorb or vacuum saw cut slurry and pick up the waste as the work progresses prior to moving to the next



location, as specified elsewhere in these specifications or as directed by the DISTRICT.

- d. If saw cut slurry enters catch basins, the CONTRACTOR shall, at the CONTRACTOR's cost, clean up the storm drain system immediately.

12. Concrete, Grout and Mortar Related Work

a. Material Handling

- (1) The CONTRACTOR shall avoid mixing excess amounts of fresh concrete or cement mortar on-site.
- (2) The CONTRACTOR shall store concrete, grout and mortar away from storm drain facilities or drainage courses and shall ensure that these materials do not enter the storm drain system.

b. Washing of Concrete Truck and Tools

- (1) The CONTRACTOR shall not wash out concrete trucks or equipment into streets, gutters, storm drain system, drainage courses or creeks.
- (2) The CONTRACTOR shall perform washing of concrete trucks and tools off-site.

### **3.04 CONTRACTOR TRAINING AND AWARENESS**

- A. The CONTRACTOR shall train all employees and subcontractors on the storm water pollution prevention requirements contained in these specifications.
- B. The CONTRACTOR shall inform subcontractor of the storm water pollution prevention contract requirements and include appropriate subcontract provisions to ensure that these requirements are met.
- C. The CONTRACTOR shall post warning signs in areas treated with chemicals.

### **3.05 BMP MAINTENANCE**

- A. To ensure proper implementation and effectiveness of the BMPs, the CONTRACTOR shall regularly inspect, maintain, repair and/or replace the deployed BMPs throughout the construction site. The CONTRACTOR shall identify corrective actions and the time needed to address any deficient BMPs or reinstate any BMPs that have been discontinued. The CONTRACTOR shall keep written records of all BMP inspections, maintenance and corrective actions.
- B. The frequency of the BMP inspection shall be as follows:
  - 1. Prior to a forecast storm
  - 2. After any precipitation that causes runoff

3. At 24-hour intervals during extended rain events
  4. Routinely, at a minimum of once every week
- C. If the CONTRACTOR or the DISTRICT identifies a deficiency in the deployment or functioning of a BMP, the deficiency shall be corrected immediately. If requested by the CONTRACTOR and approved by the DISTRICT in writing, the deficiency may be corrected at a later time or date but the corrective action shall not be later than the onset of the subsequent rain event. The correction of deficient BMPs shall be at no additional cost to the DISTRICT.

### **3.06 EROSION CONTROL**

- A. During all phases of construction, the CONTRACTOR shall perform the work in a manner which will minimize soil erosion and prevent water pollution from site runoff by utilizing the following:
1. Proper scheduling of work and careful construction practices.
  2. Grading disturbed surfaces to provide positive drainage and prevent ponding of water.
  3. Installing desilting basins, gravel bag dikes, silt fences and other erosion control measures to prevent sediment escape from the construction site and to maintain runoff quality.

### **3.07 FIBER ROLLS**

- A. Before installing fiber roll remove obstructions from the ground, including rocks, clods, and debris greater than 1 inch in diameter.
- B. Install fiber roll approximately parallel to the slope contour. For any 20-foot section of fiber roll, prevent the fiber roll from varying more than 5 percent from level. Install fiber roll on slopes at the following spacing unless shown otherwise:
1. 10 feet apart for slopes steeper than 2:1 (horizontal:vertical)
  2. 15 feet apart for slopes from 2:1 to 4:1 (horizontal:vertical)
  3. 20 feet apart for slopes from 4:1 to 10:1 (horizontal:vertical)
  4. 50 feet apart for slopes flatter than 10:1 (horizontal:vertical)
- C. Type 1 fiber roll installation consists of placing and fastening as follows:
1. Place in a furrow that is from 2 to 4 inches deep.
  2. Fasten with wood stakes every 4 feet along the length of the fiber roll.
  3. Fasten the ends of the fiber roll by placing a stake 6 inches from the end of the roll.

4. Drive the stakes into the soil so the top of the stake is less than 2 inches above the top of the fiber roll.
- D. Type 2 fiber roll installation consists of placing and fastening as follows:
1. Fasten with notched wood stakes and rope.
  2. Drive stakes into the soil until the notch is even with the top of the fiber roll.
  3. Lace the rope between stakes and over the fiber roll. Knot the rope at each stake.
  4. Tighten the fiber roll to the surface of the slope by driving the stakes further into the soil.
- E. If soil conditions do not allow driving stakes into the soil, drill pilot holes to facilitate driving of the stakes.
- F. Maintain fiber roll in a way that provides sediment holding capacity and reduces runoff velocities as follows:
1. Remove sediment from behind the fiber roll if sediment is  $\frac{1}{3}$  of fiber roll height above ground.
  2. Repair or adjust the fiber roll if rills or other evidence of concentrated runoff occur beneath the fiber roll.
  3. Repair or replace the fiber roll if they become split, torn, or unraveled.
  4. Add stakes if the fiber roll slumps or sags.
  5. Replace broken or split wood stakes.
  6. Remove sediment deposits, trash, and debris from fiber roll as needed. If removed sediment is deposited within project limits, it must be stabilized and not exposed to erosion by wind or water.

### **3.08 TEMPORARY SILT FENCE**

- A. Construct a temporary silt fence with silt fence fabric, posts, and fasteners assembled at the job site or with prefabricated silt fence.
- B. If prefabricated silt fence is used, attach the fabric to the posts by inserting the posts into the sewn pockets. If the fence is assembled at the job site:
1. Fasten the fabric to the posts with staples or nails if wood posts are used
  2. Fasten the fabric to the posts with tie wires or locking plastic fasteners if steel posts are used
  3. Space the fasteners no more than 8 inches apart

- C. Place a temporary silt fence parallel with the slope contour. For any 50-foot section of temporary silt fence, do not allow the base elevation of the fence to vary by more than 1/3 of the height of the fence above the ground.
  - 1. Place the bottom of the fabric in a 6-inch-deep trench.
  - 2. Secure it with the posts placed on the downhill side of the fabric.
  - 3. Backfill the trench with soil and compact by hand or mechanical methods to secure the fabric in the trench.
  - 4. Join separate sections to form reaches not more than 500 feet without openings.
  - 5. Secure the end posts of each section by wrapping the tops of the posts with at least 2 wraps of 16-gauge tie wire.

### **3.09 HYDROMULCH AND HYDROSEED**

- A. Apply hydromulch to all disturbed soil areas with hydraulic spray equipment that mixes fiber, tackifier, fertilizer, and other erosion control materials specified. If applying hydroseed, add seed to hydromulch. Seed may be dry applied to small areas not accessible by hydroseeding equipment if authorized.
- B. Add water to hydromulch and hydroseed materials as recommended by the manufacturer and mix sufficiently to ensure an even application. A dispersing agent may be added to the mixture if authorized.
- C. Equipment must have a built-in continuous agitation and discharge system capable of producing a homogeneous mixture and a uniform application rate.
- D. Apply materials in locations, rates, and number of applications shown and as follows:
  - 1. Start application within 60 minutes after adding seed to the tank.
  - 2. Apply in successive passes as necessary to achieve the specified application rate.
  - 3. Apply all hydromulch or hydroseed materials shown for a single area within 72 hours.
- E. After the final application, do not allow pedestrians or equipment on the treated areas.

### **3.10 DRY SEED**

- A. Apply dry seed and fertilizer at the rates shown after job site preparation. Scarify areas to a minimum depth of 1 inch. Apply and incorporate materials into the soil to a maximum depth of 1/4-inch by dragging or raking.

### 3.11 BONDED FIBER MATRIX

- A. Apply bonded fiber matrix materials in the locations, rates, and number of applications shown and as follows:
  - 1. Apply in successive passes as necessary to achieve the specified application rate.
  - 2. Form a continuous uniform mat with no gaps between the mat and the soil surface as follows:
    - a. Apply in 2 or more directions if necessary.
    - b. Apply in layers as necessary to avoid slumping and aid drying.

### 3.12 MAINTENANCE

- A. The Contractor shall maintain erosion and sediment control measures for proper functioning before, during, and after storm events and until such time that the site of Work is prepared for permanent drainage and erosion control measures.
- B. The Contractor shall conduct site inspections of the erosion and sediment control measures prior to forecasted storm events and after the actual storm to evaluate the adequacy and effectiveness of such measures. The Contractor shall implement modifications as necessary for compliance with NPDES regulations.
- C. The Contractor shall submit inspection reports (pre- and post-rain, quarterly, annual, as required) to the Engineer in accordance with applicable regulations. The inspection reports shall include, at a minimum, the date of the inspection, the individual(s) who performed the inspection, the observations, and any modifications implemented. The Contractor shall post inspection schedules and reports within the field office or with the District, as applicable.
- D. The Contractor shall remove sediment from desilting basins as required for proper operation.
- E. The Contractor shall repair all damaged erosion and sediment controls and any erosion damage within the construction area for the duration of the Contract.
- F. The Contractor shall annually certify in writing that the construction activity complies with applicable NPDES permit(s). The certification shall be based upon the site inspections required by permits or in this Section. The Contractor shall submit the written certification to the Engineer.
- G. The Contractor shall immediately notify the Engineer in writing if construction activity is not or has not been in compliance with any of the NPDES permit requirements. The notification shall identify the nature of noncompliance and include a time schedule to achieve compliance.

- H. Additional site inspections and/or sampling and analysis may be required at the request of the applicable Regional office of the California Regional Water Quality Control Board or the Engineer.
- I. Materials installed for erosion and sediment control purposes shall remain in place and in proper working order at the time of acceptance by the District unless otherwise specified for removal by the Contractor in the Contract Documents.

**END OF SECTION**

**SECTION 02350****EXCAVATION SUPPORT SYSTEMS****PART 1 - GENERAL****1.01 DESCRIPTION**

This Section provides specifications for sheeting, shoring, bracing, or other excavation support systems for worker protection from the hazard of caving ground during the excavation of trenches.

**1.02 SAFETY AND HEALTH REGULATIONS**

- A. The Contractor shall comply with Safety and Health Regulations for Construction, promulgated by the Secretary Standards Act, as set forth in Title 9 C.F.R. Copies of these regulations may be obtained from Labor Building, 14th and Constitution Avenue NW, Washington, DC 20013.
- B. The Contractor shall also comply with the provisions of the Federal Occupational Safety and Health Act (OSHA), as amended, and with all applicable State of California, Department of Industrial Relations, Construction Safety Orders (Cal-OSHA) requirements.

**1.03 QUALITY ASSURANCE**

- A. The Contractor's attention is directed to Section 6705 of the California Labor Code which requires plans showing the design of all shoring, bracing, sloping of excavation side slopes, or other provisions for worker protection against the hazard of caving ground during excavation of trenches 5 feet or greater in depth.
- B. Sheeting, shoring, bracing or alternative excavation support systems shall comply in all respects to with the requirements of Article 6 of the Construction Safety Orders of the Division of Industrial Safety. The Contractor's attention is directed to the provisions of Section 1541.1, Requirements for Protective Systems. It shall be the Contractor's responsibility to provide the additional strength required to support the sides of the excavations against loads which may exceed those employed to derive the criteria set forth in the Construction Safety Orders.
- C. The Contractor shall observe safety precautions in all phases of the Work including trench shoring, bracing, lighting, and barricades as dictated by reason and by the Safety Orders of the Division of Industrial Safety, State of California (CAL/OSHA). Nothing in this Section is intended to relieve the Contractor of the responsibility to carefully examine the Contract Documents and the site where the Work is to be performed; to familiarize himself with all the local conditions and federal, state, and, local laws, ordinances, rules, and regulations that may affect the performance of any Work; to study all surveys and investigations regarding subsurface and latent physical conditions pertaining to the site; to perform additional surveys and investigations as the Contractor deems necessary to complete the Work for the Contractor's bid price; and to correlate the results of all such data with the requirements of the Contract Documents.

- D. The requirements of this Section and applicable regulations are to be considered the minimum to be provided by the Contractor. The Contractor shall be solely responsible for any and all liabilities which may arise from his failure to provide an adequate excavation support system as necessary to support the excavation under any or all of the loading conditions which may exist or arise during construction of the project.

#### **1.04 SPECIFICATIONS AND STANDARDS**

- A. Except as otherwise indicated, the current editions of the following apply to the Work of this Section:
1. ASTM A 36 Structural Steel
  2. ASTM A 328 Steel Sheet Piling
  3. AWS D1.1 Structural Welding Code-Steel
  4. UBC Chapter 25, Wood
  5. WCLIB Grading Rules
  6. WWPA Grading Rules
  7. AISC Manual of Steel Construction
  8. AASHTO, Section on Steel Tunnel Liner Plate

#### **1.05 SUBMITTALS**

- A. The following shall be submitted in accordance with Section 01300:
- B. Trenching support drawings:
1. Pursuant to Section 6705 of the California Labor Code, prior to commencing trench or structure excavations that are 5 feet deep or greater, the Contractor shall submit to the District and shall be in receipt of the District's written acceptance of the Contractor's detailed plan showing the design of all shoring, bracing, sloping of excavation side slopes, or other provisions for worker protection against the hazard of caving ground during excavation of trenches 5 feet or greater in depth. The plan shall be prepared by a civil or structural engineer licensed in the State of California and regularly engaged in the preparation of such plans.
  2. The registered civil or structural engineer shall certify that the plan complies with the CAL/OSHA Construction Safety Orders. If, however, the plan does not comply with the Safety Orders, the registered civil or structural engineer shall certify that the plan is not less effective than the shoring, bracing, sloping or other provisions of the Safety Orders. Each copy of the plan shall have an original seal and "wet" signature of the civil or structural engineer registered in the State of California.



3. If the Contractor's trench protection system includes the use of a shield, the shield design shall be approved by the Division of Industrial Safety. Structural details shall indicate the maximum pressure the shield can safely withstand and the trench configuration and supporting calculations indicating the maximum pressure against the shield. The Contractor shall use braced sheeting as required by the Engineer in lieu of a shield in cases where the trench is located near critical existing facilities or is excavated in zones of dry, cohesionless soils.
  4. Subsurface investigations may have been conducted on behalf of the District at the project site. If so, these investigations are identified in the Contract Documents and the records of such investigations are available for inspection at the District's business office. The detailed plan showing the design of the shoring, bracing, etc. which the Contractor is required to submit to the Engineer in advance of excavation will not be accepted by the Engineer if the plan is based on subsurface conditions which are more favorable than those revealed by the investigations conducted on behalf of the District; nor will the plan be accepted if it is not based on design soil parameters and criteria set forth in the subsurface investigations conducted on behalf of the District.
  5. The detailed plan showing the design of shoring, bracing, etc. shall include surcharge loads for adjacent embankments, structures, stockpiles, vehicle traffic, construction equipment and other loadings which are reasonably expected to occur. The plan shall indicate the minimum horizontal distances from the top of the excavation to the near side of the surcharge loads for all trench conditions.
  6. Nothing contained in this Section shall be construed as relieving the Contractor of the full responsibility for providing shoring, bracing, sloping or other provisions which are adequate for worker protection. The District's review of the Contractor's drawings prepared and submitted pursuant to this Section will not relieve the Contractor of its responsibilities for worker protection under this or any other Section.
  7. The Contractor shall obtain an exemption letter or trenching permit from the California Division of Industrial Safety (CAL/OSHA) and comply with Labor Code Section 6705, Excavation Plans for Worker Protection, and shall submit a copy of the exemption letter or trenching permit with excavation drawings to the District prior to excavation work.
- C. Drawings for the proposed excavation support system for each construction component where excavation support systems will be used shall include the following, as applicable:
1. Arrangement and details for each excavation support system, supporting design calculations, and construction methods to be used for the installation of each system.
  2. Soldier pile installation methods, connection details, bracing preloading, and jacking procedures.
  3. Depths below the excavation bottom elevation to which the support system will be installed.

4. Elevations of ground surface, struts, and shores, as applicable.
  5. Permissible depth to which excavation may be carried before supports must be installed and preloaded.
  6. The full excavation depth load to be carried by various support system members.
  7. Bracing loads for various stages of excavation, bracing removal, and concrete placement.
  8. Preloads as required.
  9. Proposed sequence of strut and shore removal as applicable and as related to concrete placement and backfilling operations.
- D. The above Shop Drawings shall be coordinated with other shop drawing submittals for work specified elsewhere in which support of excavation is required.
- E. The proposed method of installing sheet piling shall include sequence of installation, template, and equipment description.
- F. The Contractor shall submit a contingency plan for alternative procedures to be implemented if the excavation support system is found to perform unfavorably.

#### **1.06 DESIGN CRITERIA**

- A. Shop Drawings with supporting calculations for the various excavation support systems shall be prepared in accordance with the following criteria:
1. Design the excavation support system and all components to support the earth pressures, unrelieved hydrostatic pressures, utility loads, equipment, traffic, and construction loads including impact, and other surcharge loads in such manner as will allow the safe and expeditious construction of the permanent structures; to maintain the undisturbed state of the soils adjacent to the trench and at and below the excavation bottom; and to prevent settlement, lateral movement, or damage to adjacent ground, buildings, structures, roadways and utilities.
- B. The design, planning, installation and removal of all lagging, sheeting, shoring, sheet piling, or bracing shall be accomplished in such a manner as.
1. Design support members to resist the maximum loads expected to occur during the excavation and support removal stages.
  2. Maximum vertical center-to-center spacing of supports shall be 16 feet between top 2 support levels and 12 feet below second support level unless specifically designed for alternate support conditions. If decking beams are not required, install the uppermost bracing tier at a vertical distance of not more than 6 feet below the top of the excavation.
  3. Where water flows from the face of excavation, the maximum height of unsupported excavation shall not exceed 15 inches.

4. In running sand and silt, provide positive means for securing timber lagging to the soldier piles to avoid shifting or falling off of the lagging, and positive means for containing such material behind lagging.
  5. No portion of the excavation support system's vertical face will be permitted to penetrate the design lines as indicated on the Drawings for the permanent structure to be constructed within the excavation.
  6. Vertical support capacity shall be provided for wall systems and internal bracing elements, for loads due to vertical force components of tieback anchors, the weight of the structural systems themselves, and live load on any portion of the system.
  7. Support system members shall not be spliced.
  8. The use of horizontal strutting below the barrel of a pipe or the use of a pipe as a support will not be permitted.
  9. The support system design shall allow for eccentricities resulting from field fabrication and assembly.
- C. Timber Support Systems and Members:
1. Basis for determination of minimum allowable working stress: UBC Chapter 25.
  2. The minimum thickness of timber lagging between soldier piles spaced 5 to 7 feet center-to-center shall be 3 inches for excavations up to 25 feet in depth, and 4 inches for excavations deeper than 25 feet. Contractor's shop drawings, design, and calculations shall indicate thickness required for actual site conditions and system used.
  3. For other conditions and types of lagging, design calculations shall be submitted.

## 1.07 PROJECT CONDITIONS

- A. Utility agencies shall be notified and caution exercised while exposing utility facilities by hand or other methods approved by utility owner.
- B. If existing utility facilities interfere with the proposed method of support, the method shall be modified in a manner that will protect the facility and accommodate the proposed Work. Shop Drawings shall be revised and resubmitted along with design calculations required to account for the modified support method and to show the actual location of the existing utilities.
- C. Provisions shall be made for contingencies as follows:
1. Monitor performance of support system components, for both vertical and horizontal movement, at regular intervals not to exceed 3 days.
  2. Provide contingency plan for alternative procedures to be implemented if unfavorable performance is evidenced.

3. Keep materials and equipment on hand as necessary to implement contingency plan.

## **PART 2 - PRODUCTS**

### **2.01 MATERIALS**

- A. Steel sheet piling shall be continuous interlocking type ASTM A328 of appropriate shape and provided with at least one 2-1/2-inch-diameter handling hole on the centerline of the web located at least 6 inches from each end of the sheet pile.
- B. Fabricated connections and accessories, steel H-piles, WF shapes, and other structural steel shall conform to the requirements of ASTM A36, unless otherwise approved.
- C. Concrete:
  1. For encasement of steel soldier piles below the final level of excavation, 2,500 psi shall be used.
  2. For encasement of soldier piles above the final level of excavation, lean concrete shall be used, the strength of which shall be adequate to support the excavated faces of the augured hole.
- D. Wood lagging shall be dimension lumber with minimum allowable stress of 1,100 psi.
  1. The stress grade of the lagging shall be in conformance with the allowable stresses of the UBC, Chapter 25.
  2. Lumber shall be grade marked by WWPA or WCLIB with species and grade conforming to those shown on approved Shop Drawings.

## **PART 3 - EXECUTION**

### **3.01 GENERAL**

- A. Furnish, install, maintain, and remove, as applicable, excavation support systems as required by Federal, State or local safety requirements.
- B. The support system shall extend from the excavation bottom to an elevation which is adequate to prevent lateral movement and to support applied vertical loads. In areas where additional excavation is required below the design excavation subgrade, provisions shall be made to prevent movement of excavation supports.
- C. Damage to existing utilities during installation of excavation support system shall be avoided.
- D. Water control measures shall be provided in accordance with dewatering requirements specified elsewhere.

- E. If, in the opinion of the District, sufficient or proper supports have not been provided, the District may order additional supports to be placed at the expense of the Contractor. Compliance with such order shall not relieve the Contractor from the responsibility for the sufficiency of such supports.

### **3.02 SOLDIER PILES**

- A. Soldier piles shall be installed by pre-boring or other approved pre-excavation methods to the design tip elevation shown on approved Shop Drawings. Prevent pre-bored or other pre-excavated holes from collapsing.
- B. Pre-bored holes shall be filled with structural concrete from the bottom of the hole to the design excavation subgrade. The remaining pile length shall be filled with lean concrete completely encasing the pile.
- C. Concrete shall be placed from the bottom of the hole upwards by means of a tremie pipe connected to a hopper.

### **3.03 SHEETING AND LAGGING**

- A. Sheeting and lagging shall be installed with no gaps exceeding 1/2-inch. As installation progresses, the voids between the excavation face and the lagging or sheeting shall be backfilled with sand or soil and rammed into place. Materials such as burlap or geosynthetic drainage panels shall be used where necessary to allow drainage of groundwater without loss of soil or packing material.
- B. If unstable material is encountered, suitable measures shall be taken to retain it in place or to otherwise prevent soil displacement.
- C. Extend the lagging or sheeting down to final subgrade.
- D. A sufficient quantity of material shall be on hand for sheeting, shoring, bracing, and other operations for protection of work and for use in case of accident or emergency.

### **3.04 STEEL SHEET PILING**

- A. Steel sheet piling may be used only where existing subsurface conditions are suitable for installation of sheet piling to the full depth of penetration required and to proper alignment and plumb as specified herein without damage to the sheet piling or rupture of its interlocks. The use of steel sheet piling will not be permitted where boulders, rock or other materials or subsurface obstructions may prevent the proper installation of sheet piling.
- B. Steel sheet piling shall be installed plumb with each pile interlocked with adjoining piles for its entire length so as to form a continuous diaphragm and bearing tightly against original ground. Install sheeting to the depth(s) required by the approved Drawings. Exercise care during installation so that interlocking members can be extracted, if required, without damage to adjacent ground or structures. The installation equipment shall be suitable for the type and nature of the subsurface materials anticipated and adjacent structures to be encountered. The equipment and methods of installation, cutting, and splicing shall conform to the approved Shop Drawings.

- C. Liner plate shall be installed to proper line, grade and dimensions which will enable final liner to be placed in accordance with tolerances specified by the Engineer. Annular voids shall be filled with grout where ordered by the Engineer.

### **3.05 INTERNAL BRACING SUPPORT SYSTEM**

- A. All bracing and support members shall be installed and maintained in tight contact with each other and with the surface being supported.
- B. Bracing members shall be preloaded by jacking the struts and shores in accordance with the loads, procedures, and sequence shown or specified on the approved Shop Drawings. Coordinate excavation work with bracing installation and preloading. Use steel shims and steel wedges welded or bolted in place to maintain the preloading force in the bracing after release of the jacking pressure. Use procedures that will produce uniform loading without appreciable eccentricities, overstressing, or support member distortion.
- C. Struts shall be provided with intermediate bracing to prevent distortion or buckling under the maximum design loads. Provide diagonal bracing as necessary to maintain the stability of the system. Web stiffeners, plates, or angles shall be provided as needed to prevent rotation, crippling, or buckling of connectors at points of bearing between structural steel members.
- D. Excavations shall not extend more than 2 feet below the elevation of the support member about to be placed. The support member shall be installed and preloaded immediately after installation and prior to continuing excavation.

### **3.06 REMOVAL OF SUPPORT SYSTEMS**

- A. Where removal is required wholly or in part, such removal shall be performed in a manner that will not disturb or damage adjacent new or existing construction, utilities, or structures. Fill all voids immediately with lean concrete or other approved means.
- B. All elements of support systems shall be removed to a minimum depth of 6 feet below final ground surface. However, when a structure that is cast against the sheeting or shoring system extends above the 6-foot limit, removal of the system shall be to the top of the structure.
- C. All damage to property resulting from removal of the support system shall be promptly repaired at no cost to the District. The Construction Manager shall be the sole judge as to the extent and determination of the materials and methods for repair.

**END OF SECTION**

**SECTION 02510****ASPHALT CONCRETE PAVEMENT****PART 1 – GENERAL****1.01 DESCRIPTION**

This Section describes requirements for asphalt concrete pavement construction and sealing for roads, parking areas, and other paved areas as shown on the Drawings, as required by permit conditions from the agency having jurisdiction of the street in which the Work will occur, and as specified herein.

**1.02 RELATED WORK DESCRIBED ELSEWHERE**

The Contractor shall refer to the following Specification section(s) for additional requirements:

- A. Section 01015 – General Requirements
- B. Section 01300 – Submittals
- C. Section 01410 – Testing Laboratory Services
- D. Section 02223 – Trenching, Backfilling, and Compaction
- E. Section 02530 – Adjusting Utility Access Covers
- F. Standard Specifications for Public Works Construction (SSPWC), “Greenbook”, latest edition
- G. Regional Supplement to the Standard Specifications for Public Works Construction (Regional Supplement), latest edition adopted by the San Diego Regional Standards Committee
- H. State of California, Department of Transportation, Standard Specifications (State Standard Specifications), latest edition.

**1.03 SUBMITTALS**

Contractor shall furnish submittals in accordance with the requirements of Section 01300. The following submittals are required:

- A. Submit copies testing laboratory reports certifying that aggregate base material is asbestos-free and conforms to the specified gradations or characteristics.
- B. Submit copies testing laboratory reports certifying that asphalt concrete materials conform to the physical requirements of the governing jurisdiction.

- C. Submit copies testing laboratory reports certifying that the mix design for slurries and sealers, including emulsion-aggregate slurry, conforms to the physical requirements of the governing jurisdiction and/or the Greenbook.
- D. Any other submittals required by permit conditions or by the agency having jurisdiction of the street in which the Work will occur.

#### **1.04 PAVING LIMITS**

The following work area limits shall apply to pavement construction or sealing; however, the limits specified by the agency having roadway jurisdiction shall govern.

- A. Reconstruction of existing asphalt concrete pavements including aggregate base along the trenches for the pipeline alignments shown on the Drawings.
- B. Construction of asphalt concrete overlays (and related cold milling) where specified on the Drawings.

#### **1.05 MEASUREMENT AND PAYMENT**

- A. Unless specifically included in a separate bid item of work, payment for the work in this Section shall include, but is not limited to, the protection of existing pavements adjacent to the Work and the removal and off-site, legal disposal of existing pavement or base materials where required for the Work and shall be included as part of the lump-sum or unit-price bid amount for which such work is appurtenant thereto unless a separate item of work is included in the bid schedule for the items defined in this Section.
- B. Refer to Section 01410 for the payment of testing or inspection services.

#### **1.06 TESTING FOR COMPACTION**

- A. The CONTRACTOR will be responsible for all costs associated with compaction testing of asphalt concrete pavement and shall provide test results to the DISTRICT as described herein and in the standard specifications.
- B. Determine the density of existing soil in place by the Sand Cone Method, ASTM D1556.
- C. Determine laboratory moisture-density relations of soils by ASTM D1557.
- D. Determine relative density of cohesionless soils by ASTM D4253 and D4254.
- E. Sample backfill materials by ASTM D75.
- F. "Relative compaction" is the ratio, expressed as a percentage of the in-place dry density to the laboratory maximum dry density.
- G. Compaction shall be deemed to comply with the specifications when no more than one test of any three consecutive tests falls below the specified relative compaction. The one test shall be no more than three percentage points below the specified compaction. The CONTRACTOR shall pay the costs of any testing and retesting of work not conforming to the Specifications.



**1.07 TEST STANDARDS****A. ASTM**

1. ASTM D75 – Standard Practice for Sampling Aggregates
2. ASTM D979 – Standard Practice for Sampling Bituminous Paving Mixtures
3. ASTM D1556 – Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method
4. ASTM D1557 – Standard Test Methods for Laboratory Compaction of Soil Modified Effort
5. ASTM D1561 – Standard Practice for Preparation of Bituminous Mixture Test Specimens by Means of California Kneading Compactor
6. ASTM D2041 – Standard Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
7. ASTM D2216 – Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
8. ASTM D2950 – Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods
9. ASTM D4253 – Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table
10. ASTM D4254 – Standard Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density
11. ASTM D4829 – Standard Test Method for Expansion Index of Soils
12. ASTM D6938 – Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

**B. Caltrans**

1. California Test 111 – Developing Density and Moisture Calibration Tables for Nuclear Gages
2. California Test 125 – Sampling Highway Materials and Products Used in the Roadway Structural Sections
3. California Test 304 – Preparation of Bituminous Mixtures for Testing
4. California Test 308 – Bulk Specific Gravity and Weight per Cubic Foot of Bituminous Mixture
5. California Test 375 – Determining the In-Place Density and Relative Compaction of Hot Mix Asphalt Pavement Using Nuclear Gages

6. California Test 384 – Method of Test to Determine Combined Gradations for Hot Mix Asphalt (HMA) using up to 25% Reclaimed Asphalt Pavement (RAP)
- C. "Relative compaction" for soils is the ratio, expressed as a percentage, of the in-place dry unit weight to the laboratory maximum dry unit weight. For asphalt concrete, it shall be the percentage of the in-place total density to the laboratory maximum density.
- D. Compaction shall be deemed to comply with the Specifications when no more than one test of any three consecutive tests falls below the specified relative compaction. The one test shall be no more than two percentage points below the specified compaction. The Contractor shall pay the costs of any re-testing of work not conforming to the Specifications.

## **PART 2 – MATERIALS**

### **2.01 GENERAL**

- A. Materials for pavement construction, reconstruction, or sealing shall conform to the requirements of the SSPWC as amended by the Regional Supplement. In the event of conflicting requirements between the SSPWC and the City of Escondido or County of San Diego standards or permit conditions, the standards of the agency having jurisdiction of the street in which the Work will occur shall supersede.
- B. The requirements for rubberized asphalt, if allowed by the agency of jurisdiction, shall be as specified in the local agency standards.

### **2.02 SOIL STERILANT**

Sterilant shall be Oust as manufactured by DuPont, Polybor Chromate as manufactured by U.S. Borax, or approved equal.

### **2.03 AGGREGATE BASE COURSE**

- A. Unless otherwise specified, aggregate base materials shall conform to crushed aggregate base per SSPWC Section 200-2.2. The Contractor may elect to use materials conforming to Section 200-2.5, Processed Miscellaneous Base of the SSPWC with the approval of the governing agency.
- B. Class 2 aggregate base shall conform to Section 26-1.02B, 3/4-inch maximum size, of the State Standard Specifications.

### **2.04 PRIME COAT**

Prime coat shall be liquid asphalt, Grade SC-250 or MC-70 as specified in Section 203-2 of the SSPWC.

### **2.05 TACK COAT**

- A. If paving over existing pavement, a tack coat shall be applied and shall conform to SS-1h emulsified asphalt in accordance with 203-3 of the SSPWC.

- B. Tack coat conforming to Caltrans requirements shall be PG 64-10 or PG 64-16 per Section 92 of the State Standard Specifications.

## **2.06 ASPHALT CONCRETE - GREENBOOK**

Materials for asphalt concrete shall conform to the applicable provisions of Section 203-6.4 of the SSPWC and the following provisions.

- A. Composition and grading of aggregate and asphalt binder shall conform to Class C2 (Dense, Medium) per Table 203-6.4.3 (A) or as specified by the agency having jurisdiction of the street on which the materials are to be placed.
- B. If separate base and finish courses of asphalt concrete are to be placed, composition and grading of aggregate and asphalt binder for the paving base course may conform to Class B (Dense, Medium Coarse) per Table 203-6.4.3 (A) upon the approval of the agency having jurisdiction of the street on which the materials are to be placed.
- C. In private streets, driveways, and parking areas, composition and grading of aggregate and asphalt binder shall conform to Class D2 (Dense, Fine) per Table 203-6.4.3 (A)
- D. Asphalt binder shall be Performance Grade PG 64-10 paving asphalt conforming to Section 203-1.

## **2.07 ASPHALT CONCRETE - CALTRANS**

Materials for asphalt concrete shall conform to the applicable provisions of Section 39 of the State Standard Specifications and the following:

- A. Asphalt concrete shall be Type A HMA per Section 39-2.02.
- B. Aggregate gradation shall conform to 3/4-inch maximum size per Section 39-2.02B(4)(b). For finish course or overlay paving, aggregate gradation shall conform to 1/2-inch maximum size.
- C. Asphalt binder content shall be based on a Job Mix Formula per Section 39-2.02A.
- D. Asphalt binder shall conform to PG 64-10 per Section 92 of the State Standard Specifications.

## **2.08 EMULSION-AGGREGATE SLURRY**

Emulsion-aggregate slurry shall conform to SSPWC Section 203-5 with tests and certifications in accordance with Section 203-1.3.

- A. Emulsified asphalt shall consist of SS-1h or CSS-1h per SSPWC Section 203-3.2. The use of quick-set asphalt emulsion shall be subject to the approval of the agency having jurisdiction of the street to receive slurry seal.
- B. Composition and grading of the aggregate and asphalt emulsion shall conform to Type II per Section 203-5.3 in public streets and Type I elsewhere.

**2.09 SEAL COAT**

Seal coat for asphalt concrete pavements shall conform to Section 302-5.10 of the Regional Supplement.

**2.10 PAVEMENT STRIPING AND MARKINGS**

- A. Traffic striping and markings shall conform to SSPWC Section 210-1.6 and shall be similar in type and color to the existing striping and markings.
- B. Materials for traffic stripes and pavement markings conforming to Caltrans requirements shall conform to Section 84-2 of the State Standard Specifications.

**2.11 PAVEMENT MARKERS**

Pavement markers and adhesives shall conform to SSPWC Section 214. Markers shall be similar in kind and color to the existing markers.

**PART 3 – EXECUTION****3.01 GENERAL**

- A. Existing pavements of whatever nature that are adjacent to the Work area shall be protected from damage by the Contractor's operations by the use of trench plates, protective mats, rubber-tired equipment (excavation or otherwise), and/or limiting the maximum payloads for materials exported or imported to the site. The Contractor shall document the distressed pavement areas that exist prior to mobilization and submit the documentation for review in accordance with Section 01300, submit the proposed method for the protection of pavements prior to mobilization onto the site, and shall not commence excavation activities until the method of pavement protection is accepted, in writing, by the Engineer. Acceptance by the Engineer does not relieve the Contractor from the responsibility to implement measures to protect existing pavements from damage, and pavements that are damaged because of the Contractor's failure to implement reasonable measures for their protection, in the sole opinion of the Engineer, shall be replaced by the Contractor at no additional expense to the District.

**3.02 SUBGRADE PREPARATION**

- A. Compaction of trench backfill below the pavement subgrade soils shall conform to the requirements of Section 02223 or governing agency requirements, whichever is more stringent.
- B. Scarify the upper 6 inches of the pavement subgrade soils; bring to within 2 percentage points of optimum moisture content; and compact to a relative compaction of 95 percent.

**3.03 SOIL STERILANT**

- A. Unless required by the governing road jurisdiction, soil sterilant will not be required in areas of existing pavement removal and replacement.

- B. Soil sterilant shall be spread uniformly upon the prepared subgrade at the manufacturer's recommended rate. For new roadway construction, apply from outside of curb to opposite outside of curb for the full width of roadway or parking area to be paved or surfaced.

### **3.04 AGGREGATE BASE COURSE**

- A. Base material shall be furnished, placed and compacted for asphalt concrete pavements or portland cement concrete pavements where ordered or as shown on the drawings and specified herein.
- B. Spreading and compacting shall conform to Section 301-2 of the SSPWC. The requirements for compacted lift thickness will be strictly enforced.
- C. Placement and compaction of Class 2 aggregate base shall conform to Section 26-1.03 of the State Standard Specifications.

### **3.05 COLD MILLING OF EXISTING PAVEMENT**

Cold milling of existing pavement shall conform to SSPWC Section 302-1 and the following:

- A. Unless otherwise specified on the Contract Documents or by the agency having jurisdiction of the street, the nominal depth of profile milling shall be 1-1/2 inches minimum below the existing pavement surface.
- B. The nominal depth of profile milling in areas outside of public right-of-way that are to receive Class D or Class E paving shall be 1 inch minimum below existing pavement surface.

### **3.06 PRIME COAT**

After completion of the subgrade, a prime coat of liquid asphalt as specified in this Section shall be pressure-spray applied at a rate of approximately 0.25 gallons per square yard. If aggregate base is specified, the prime coat shall be applied after completion of the base course. Liquid asphalt shall be prevented from spraying on adjacent ground, structures, curbing and fencing.

### **3.07 TACK COAT**

- A. Apply tack coat to existing pavement, between pavement lifts, and to vertical surfaces of curbs, gutters and pavement joints in accordance with Section 302-5.4 of the SSPWC.
- B. For Caltrans requirements, apply tack coat per Section 39-2.01C(3)(f).

### **3.08 ASPHALT CONCRETE PAVEMENT**

Asphalt concrete construction shall conform to Section 302-5 of the SSPWC.

- A. Asphalt concrete pavement shall be spread in one or more courses as required for lift thickness requirements of Table 302-5.5 (A) of the SSPWC by means of an asphalt paving machine. It shall be spread to a depth to achieve a compacted thickness as shown on the Plans. If the thickness of new asphalt concrete pavement is not specified, place to

a total thickness of 4 inches minimum, or 1 inch thicker than the existing pavement section, whichever is greater or to the standards of the agency having jurisdiction over the work.

- B. The completed surface shall be thoroughly compacted, smooth and true to grade and cross-section, and free from ruts, humps, depressions and irregularities. When a straight edge is laid on the finished surface and parallel to the centerline, the surface shall not vary more than one-eighth (1/8) of an inch in 10 feet.
- C. Compaction shall achieve a density of 95 percent of the density obtained using California Test 304.

### **3.09 EMULSION-AGGREGATE SLURRY**

Emulsion-aggregate slurry shall be applied to asphalt concrete pavements as specified on the Drawings or in this Section, or as required by permit conditions or governing agency requirements. Slurry shall be applied in accordance with SSPWC Section 302-4 and the mix design shall be approved by the Engineer.

- A. The Contractor shall provide the District with unlimited access at all times.
- B. All pavement cracks greater than 1/4-inch wide that are in areas to receive slurry seal shall be sealed with liquid asphalt conforming to Greenbook Section 203.2 prior to the application of the slurry seal.
- C. If approved by the governing authority, the Contractor shall have the following options:
  - 1. Close the paved area to traffic until the slurry has achieved sufficient set, in the opinion of the Engineer, to be opened to traffic without tracking or damage.
  - 2. Apply sand or rock dust at the rate of at least 6 pounds per square yard to eliminate tracking or damage to the slurry. Apply sand or rock dust at least four (4) hours after the application of the slurry, and open the paved area to vehicle traffic as soon as cover sand is placed. The Contractor shall remove and dispose of excess sand per Section 302-5.10 of the Regional Supplement but not more than seven (7) days after its application.

### **3.10 SEAL COAT**

The application of seal coat shall conform to the requirements of Section 302-5.10 of the Regional Supplement.

### **3.11 APPLYING PAVEMENT STRIPING AND MARKINGS**

- A. Apply traffic striping, markings, and all other directional information to new paved surfaces and existing surfaces that were damaged by the construction
- B. Use traffic paint that matches the color of the existing traffic striping and markings.
- C. Apply per Section 310-5.6 of the SSPWC. Wait a minimum of 10 days prior to the placement of permanent traffic striping and markings and the placement of pavement,

slurry, or seal coat. Apply a second coat of paint to all areas where the first coat of paint bled, curled, or discolored.

- D. Application of pavement stripes and markings conforming to Caltrans requirements shall conform to Section 84-2 of the State Standard Specifications.

### **3.12 INSTALLING REFLECTIVE PAVEMENT MARKERS**

- A. After the application of all pavement striping and markings, install markers on new paved surfaces and existing surfaces that were damaged by the construction.
- B. Use markers that are reflective and match the color or combination of colors of the existing markers within the area of work. Install markers along the alignment and match spacing of the existing, as directed by the Engineer, and in accordance with Section 312 of the SSPWC.

### **3.13 INSTALLING FIRE HYDRANT MARKERS**

- A. Install a blue reflective marker opposite each new or relocated fire hydrant. Place the marker on the pavement and locate 6 inches off the centerline of the traffic striping or reflective pavement markers towards the hydrant. Install markers in accordance with Section 85 of the State Standard Specifications. Where existing fire hydrants have been relocated or removed from service, dislodge the existing blue marker from the pavement and dispose.

### **3.14 ADJUSTING UTILITY ACCESS COVERS**

- A. See Section 02530.

**END OF SECTION**

## **SECTION 02530**

### **ADJUSTING UTILITY ACCESS COVERS**

#### **PART 1 - GENERAL**

##### **1.01 SECTION INCLUDES**

- A. Adjusting Manhole Covers
- B. Adjusting Valve Covers
- C. Adjusting Survey Monument Covers

##### **1.02 RELATED SECTIONS**

- A. Section 02510 - Asphalt Concrete Pavement

##### **1.03 REFERENCES**

- A. State of California Standard Specifications, Current Edition.
- B. Standard Specifications for Public Works Construction (SSPWC), Current Edition.
- C. San Diego Regional Standard Drawings, Current Edition.

##### **1.04 SUBMITTALS**

- A. Manhole Extension Ring. Contractor shall supply manufacturer information including materials, dimensional data and installation instructions.

#### **PART 2 - PRODUCTS**

##### **2.01 MATERIALS**

- A. Concrete. Class 560-C-3250, per Section 201-1 of the SSPWC.
- B. Manhole Extension Ring. As manufactured by Southbay Foundry or an approved equivalent product.

#### **PART 3 - EXECUTION**

##### **3.01 GENERAL**

- A. All existing utility access frames and covers and frames and grates, including sewer manholes, valve covers, and survey monument covers, shall be adjusted to grade by the Contractor, upon completion of asphalt concrete resurfacing in accordance with the provisions of Section 301-1.6 of the SSPWC and in accordance with the Contract Documents.



- B. Existing survey monuments that are disturbed during construction shall be reconstructed in accordance with San Diego Regional Standards and a corner record filed with the County of San Diego.
- C. Prior to placing new asphalt, the Contractor shall make locations measurements to each utility cover and monument. During paving operations, the Contractor shall mark, in the newly placed surfacing, the locations of each utility access cover. The method of marking shall be subject to the approval of the Engineer.
- D. The covers shall not be raised to final grade until the resurfacing has been completed.
- E. At the option of the Contractor, manhole extension rings may be used and shall be installed per manufacturers' specifications.

**3.02 INSTALLATION OF NEW SURVEY MONUMENT COVERS**

- A. Prior to resurfacing, new covers and frames shall be installed for all existing survey monuments which are damaged by the prosecution of the work. Covers and frames shall be installed in accordance with San Diego Regional Standard Drawing M-10. Covers and frames shall be installed at an elevation suitable for flush finish following resurfacing.

**END OF SECTION**

**SECTION 02950****HIGHLINING FOR WATERMAINS****PART 1 - GENERAL****1.01 WORK OF THIS SECTION**

- A. The CONTRACTOR shall provide, furnish and install all materials, equipment, and labor necessary to bypass sections of the existing water main line with a temporary above-ground supply line (highline) in phases as indicated in the Contract Documents. Some portions of the highline system will be trenched and buried as shown or specified to avoid interference with roadways and walkways. All materials shall be NSF 61 approved.
- B. All costs related to procure highline materials and components, and to install, test, disinfect, connect, operate, maintain, and dismantle the highline system, as specified, shall be the at the CONTRACTOR's expense.
- C. The highline piping shall be installed along both sides of streets to supply water service connections to consumer's water meters. In no case shall a meter service connection be routed across a roadway, driveway, or other area subject to vehicular traffic.
- D. The highline system shall provide continuous full service to connected water services until the new water main line is installed, tested and accepted by the DISTRICT. The work shall be organized, scheduled, and performed to provide minimum disruption of water services during installation and dismantling of the highline system.
- E. The CONTRACTOR shall properly flush, disinfect, and leak test the highline prior to placing it in service according to AWWA C-650-16 to maintain public health and safety. Bacteriological sampling and testing shall be performed by the DISTRICT's Laboratory at the CONTRACTOR's expense.
- F. The CONTRACTOR shall continually maintain the highline system as specified.
- G. The CONTRACTOR shall be aware that improper installation, pressure control, or operation of the highline may result in direct and/or subsequent damage, including but not limited to: burst pipes, damaged domestic water heaters, water and erosion damage to water users' property, and related public health and safety issues. In this regard, maintenance and monitoring of the highline system is of the utmost importance for a safe and reliable potable water supply.
- H. On completion of the new water main line, the CONTRACTOR shall reconnect services to normal supply from the new water main, dismantle the highline system and appurtenances, and restore streets, curbs and gutters, cross gutters, landscape, irrigation, and other disturbed facilities within ten working days of acceptance of the new complete water main line, services, and appurtenances.

## 1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. The work of the following Specifications, Divisions, or Sections apply to the work of this Section. Work of other Sections of the Specification, not referenced below, shall also apply to the extent required for proper performance of this work.
1. Section 01300 – Shop Drawings and Submittals
  2. Section 02960 – Temporary Sewer Bypass Pumping

## 1.03 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. All reference specifications, codes, and standards shall be the latest edition, including all approved DISTRICT supplements and amendments, unless a specific code issue date, edition, or adoption date is specified. The order of precedence shall be as defined in the Contract Documents.
- B. Codes and Safety Regulations: All equipment, products, materials, and their installation shall be as specified and shall be in accordance with the applicable parts of the following codes and safety regulations.
1. Uniform Fire Code.
  2. Uniform Mechanical Code.
  3. Uniform Plumbing Code.
  4. DISTRICT Approved Materials List
  5. State of California, Water Resources Control Board, Division of Drinking Water publication titled, “Approved for Service Isolation in California Public Water Systems.”
  6. DISTRICT Standard Drawings.
  7. Applicable City, local, state, and federal codes and regulations.
- C. Commercial and Industrial Standards: All equipment, products, materials, and their installation shall be as specified and shall be in accordance with the following commercial and industrial standards.
1. ANSI/AWWA C 606 Grooved and Shouldered Pipe Joints.
  2. ASTM A 53 Specification for Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.
  3. ASTM A 123 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
  4. ASTM A 153 Standard Specification for Zinc Coating (Hot-Dipped) on Iron and Steel Hardware
  5. ASTM A 307 Specification for Carbon Steel Bolts and Studs, 6,000 PSI Tensile Strength.
  6. ASTM A D1784 Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds

7. AWWA C 511 Standard for Reduced Pressure Principal Backflow Prevention Assembly
  8. AWWA C 651 Disinfecting Water Mains
- D. Testing Laboratories: All water sampling and bacteriological testing shall be performed by the following testing laboratory:
1. DISTRICT approved third party certified laboratory

#### **1.04 CONTRACTOR SUBMITTALS**

- A. Submittals shall be made in conformance with standard specifications.
- B. Submit catalog data for all highline materials and components.
- C. Temporary fire hydrants shall be required on all bypass pipe and shall be serviceable at all times.
- D. Submit highline system installation including temporary fire hydrant locations and detail drawings prior to the start of fabrication or assembly of each phase of the highline system to the DISTRICT. This plan must include the detailed locations of each fire hydrant, service connection, location of highline, etc. The plan must be drawn in on the DISTRICT's Atlas books. This plan must include phase numbers which correspond to a written plan. The plan must also include an Emergency Contact Plan for disturbance and monitoring of the highline.
- E. Submit a highlining schedule prior to the start of fabrication or assembly of any part of the highline system to the DISTRICT.
- F. Submit traffic control drawings and an approved Traffic Control Plan prior to the start of fabrication or assembly of each phase of the highline system to the DISTRICT.

#### **1.05 QUALITY ASSURANCE**

- A. Flushing, disinfecting, and testing requirements are specified in Paragraph 3.3.
- B. The highline system shall be flushed, hydrostatic tested for leaks, and disinfected, and shall pass the specified bacteriological tests prior to connection to user systems as described herein.

### **PART 2 - PRODUCTS**

#### **2.01 GENERAL**

- A. The CONTRACTOR shall provide all stocks of pipe, fittings, adapters, materials, and components required for a complete and operable highline system installation.
  1. The CONTRACTOR shall provide only products and materials which meet the specified requirements.
  2. At the CONTRACTOR's option, highlining products and materials shall be either:

- a. New products and materials purchased specifically for this project.
  - b. Previously used products and materials provided that these products and materials shall have been used only in potable water service. These products and materials shall perform as new or have been refurbished to perform as new.
  - c. Certification as to the material use for potable water service shall be submitted by the CONTRACTOR to the DISTRICT.
3. Products and materials provided for this project shall be of current manufacture and shall be products of manufacturers specializing in the manufacture of such products and materials.
  4. Products and materials shall be suitable for the intended purpose, free of defects, and recommended by the manufacturer for the application intended.
  5. Products and materials provided for this project shall be selected from the DISTRICT's Approved Materials List, wherever applicable.
- B. The highline system shall NSF 61 certified and be sized to meet the water demands of the system.
1. Hoses shall be used only at corners and curves and for connections to user's service meters.
  2. PVC piping shall be used only for service connections. In no case shall PVC piping be used in driveways, roadways, or other locations subject to being driven over by vehicular traffic.

## **2.02 PIPE**

- A. Galvanized steel pipe.
1. Pipe fabrication shall conform to ASTM A 53 or other equal ASTM galvanized pipe standard.
  2. Minimum wall thickness shall be Schedule 40 (0.154 inches) and entire system shall be H20 traffic rated.
  3. Pipe ends shall be machine cut or rolled for grooved couplings and fittings in compliance with ANSI/AWWA C 606.
- B. PVC pipe.
1. PVC pipe shall not be run on streets, driveways, roadways, or any other location being driven over by vehicular traffic.
  2. Pipe fabrication shall conform to ASTM D 1784.
  3. The PVC pipe material shall contain ultraviolet (UV) light inhibitors and shall be rated for outdoor use when exposed to direct sunlight.
  4. Minimum wall thickness shall be Schedule 80 (0.218 inches).
  5. Minimum pressure and temperature rating shall be 350 PSIG at 73 degrees Fahrenheit.

6. Pipe ends shall be machine cut for grooved couplings and fittings in compliance with ANSI/AWWA C 606 or shall be solvent weld PVC ends with adapters to grooved couplings.

## 2.03 FITTINGS AND COUPLINGS

- A. Fittings and couplings, including tees, reducing tees, laterals, wyes, elbows, pipe couplings, reducers, caps, plugs, and adapters, shall have standard flexible grooved joint connections in compliance with ANSI/AWWA C 606. Minimum pressure rating shall be 350 PSIG.
  1. Housing material shall be ductile iron coated with the manufacturer's standard painting system. Coupling gasket material shall be standard EPDM (ethylene-polypropylene diene monomer) rubber.
  2. Couplings shall be Victaulic Style 75 or equal.
  3. Victaulic Style 791 or equal tamper-resistant boltless couplings with locking pins may be used in lieu of bolted couplings.
  4. The branch outlet of reducing tees shall be 1-inch male pipe thread. All connections of standard tees shall be grooved.
  5. Victaulic Style 72 or equal Outlet Couplings with 1-inch female threaded outlets may be used in lieu of reducing tees and couplings.
  6. Grooved elbows with 113, 222, 45 and 90-degree bend angles will be required to configure the highline piping system to existing bends and contours at the work site.
- B. Meter connections.
  1. For meters up to 1-inch size, the connections shall be 90-degree, long radius, brass elbow couplings with a swivel meter nut on one end and male pipe threads on the other.
    - a. The swivel meter nut shall be sized to fit the specific meter. The male pipe thread end shall be fitted with a galvanized steel "Chicago" 2-lug, quarter-turn, quick disconnect hose fitting-to-female pipe thread fitting.
  2. For meters larger than 1-inch, the connections shall be elbows with a 2-bolt Class 125 flange on one end and female pipe threads on the other.
    - a. The flange shall be sized to fit the specific meter. The female pipe thread end shall be fitted with a short pipe thread to grooved connection adapter nipple.
    - b. Alternatively, the assembly can be a 2-bolt Class 125 flange-to-male pipe thread fitting, a threaded pipe elbow, and a short pipe thread-to-grooved connection adapter nipple.
- C. Bushings, reducers, and adapters.
  1. The CONTRACTOR shall be responsible for all fit-up and connections in the system and shall provide all bushings, reducers, and adapters required to connect the highline system to the existing fire hydrants, meters, and other facilities at the project site. All bushings, reducers, and adapters shall be provided at no additional cost to the DISTRICT.

- D. Pipe-to-hose adapters.
  - 1. For 1-inch hoses, the adapter shall be a 1-inch, galvanized steel, “Chicago” 2-lug, quarter-turn, quick disconnect hose-to-female pipe thread fitting.
- E. Fire hydrant-to-pipe connectors.
  - 1. Shall be a brass or bronze 2-inch female fire hydrant thread to 2-inch male pipe thread fitting.

## **2.04 BOLTS AND FASTENERS**

- A. Bolts and fasteners, including bolts, nuts, and washers, shall meet the minimum requirements of ASTM A 307, and shall be hot dipped galvanized according to ASTM A 153.

## **2.05 VALVES**

- A. Pipe shutoff valves shall be 2-inch, lever handle, two-position, manual ball valves with grooved mechanical connections in compliance with ASTM C 606. Minimum pressure rating shall be 200 PSIG.
  - 1. Housing material shall be ductile iron coated with the manufacturer’s standard painting system. Seal material shall be standard EPDM rubber.
- B. Curb stop valves shall be bronze full-port ball valves without handles.
  - 1. Seats shall be molded Buna-N rubber or other approved material. The ball shall be Teflon-coated brass or bronze. Approved plastic ball materials will be considered as substitutes.
  - 2. Size shall be 1-inch with female pipe thread connections. Other sizes and end connections may be required to accommodate specific user connections.

## **2.06 HOSES**

- A. User connection.
  - 1. For meters up to 1-inch, the hose shall be a 1-inch standard general service air compressor hose with EPDM cover and 300 WP rating. End connections shall be galvanized steel, “Chicago” 2-lug, quarter-turn, quick disconnect fittings banded to the hose.
- B. Curves and curbs.
  - 1. Hose shall be 2-inch standard general service air compressor hose with EPDM cover and 300 WP rating. End connections shall be galvanized steel grooved mechanical end fittings in compliance with ASTM C 606 banded to the hose.

## **2.07 CHECK VALVES**

- A. Check valves shall be swing check type with grooved mechanical connections in compliance with ASTM C 606. Minimum pressure rating shall be 200 PSIG.

- B. Housing material shall be ductile iron coated with the manufacturer's standard painting system. Seal material shall be standard EPDM rubber.

## **2.08 BACKFLOW PREVENTERS**

- A. Shall meet the requirements within the DISTRICT Standard Drawings.
- B. Shall meet the requirements of AWWA C 511.

## **2.09 PRESSURE REGULATORS**

- A. Shall be 2-inch pipe size and bronze or ductile iron construction. Materials, coatings, seals, diaphragms, and trim shall be approved for potable water service. Connections shall be pipe threaded union couplings.
- B. Pressure ratings and regulation ranges shall be approved for the pressure zones involved.

## **2.10 TEMPORARY ASPHALT (COLD MIX)**

- A. Temporary asphalt (cold mix) shall conform to SSPWC 306-1.5.1, Temporary Resurfacing.
- B. The cost of the temporary asphalt (cold mix) used in conjunction with the highline installation shall be included in the price bid for the water highline.

## **2.11 PIPE SUPPORTS**

- A. Shall be adjustable type and fabricated from galvanized carbon steel.

## **2.12 SAFETY BARRICADES AND TRAFFIC CONE MARKERS**

- A. Traffic cone markers and fold-up safety barricades shall conform to the latest editions of the California Manual on Uniform Traffic Control Devices (California MUTCD or CA MUTCD) Standards.
- B. Materials shall be polyvinyl chloride (PVC), high molecular weight polyethylene (HMWPE), or equal industrial plastic materials. Cones and barricades shall be weighted to prevent blowing over in high winds.
- C. Safety barricades shall be provided with durable, weatherproof, and removable labels.
  - 1. Labels shall be imprinted with the following in letters not less than 12-inches high: "24- Hour Emergency Phone: (760) 745-5522". Below this, imprint the following in letters not less than 1-inch in height: "RINCON DEL DIABLO MUNICIPAL WATER DISTRICT".
  - 2. Emergency telephone information shall be attached to the lower barricade crossbar, shall not interfere with the reflective striping on the upper crossbar, and shall be attached to both sides of the barricade.
  - 3. The label attaching method shall be durable and labels shall remain in place for the duration of the project. The CONTRACTOR shall replace any labels which become separated from the barricade at no additional cost to the DISTRICT.



4. Letters shall be black on white background.
5. Labels shall be removed from barricades at the completion of the project. Barricades so labeled shall be used only for Water Utilities Department projects.

## **PART 3 - EXECUTION**

### **3.01 GENERAL**

- A. Authorization.
  1. The CONTRACTOR shall not start fabrication or assembly of any part of the highline system without review of submittals and written authorization by the DISTRICT.
- B. Workmanship.
  1. CONTRACTOR workmanship shall meet the accepted standards of the trades involved.
  2. Highline piping systems shall be installed and maintained such that they are neat, orderly, and leak-free, and shall be arranged to minimize interference with, or present a hazard to, normal usage of streets, sidewalks, driveways, and other affected facilities.
  3. Highline piping systems shall be installed in such a manner that they do not interfere with normal storm water drainage.
  4. Excess materials and debris shall be removed from the project site by the end of the working day on which they are generated.
- C. User Notification.
  1. In addition to the written notification required elsewhere in the Contract Documents, the CONTRACTOR shall prepare and distribute a second written notification within twenty-four hours prior to starting work on any highline phase. This notification shall be delivered door-to-door to water users in the affected area. A copy shall be delivered to the DISTRICT on the date of user notification. The notification shall include information on fire protection service outages/fire watch requirements.
  2. The CONTRACTOR shall also notify affected users whenever the water service must be shut off for short periods of time.
    - a. This includes times when an individual user service is switched from the main line to the highline (and vice-versa) and when portions of the highline must be isolated to repair leaks or damage.
    - b. This notice shall be oral and shall be made by CONTRACTOR personnel knocking on user's doors immediately prior to shutting off the water service.
    - c. The CONTRACTOR shall coordinate the work to minimize the duration of shutdowns and outages.
- D. Emergency Telephone.

1. The 24-hour Emergency Services telephone number which shall be listed in user notifications, imprinted on safety barricades, and posted in the work area is (xxx) xxx-xxxx.
  2. On receipt of notification of a problem in the work area, the 24-hour Emergency Services telephone dispatcher shall notify the DISTRICT, CONTRACTOR, or Emergency Services as appropriate.
- E. Repair and Maintenance.
1. The CONTRACTOR shall maintain the temporary asphalt (cold mix) protective ramps for the duration of the highline installation. All cold mix damage discovered or reported during working hours shall be repaired that same day before CONTRACTOR personnel leave the site.
  2. During working hours the CONTRACTOR shall repair and maintain the highline system. This shall include damage or plugging of the user meters and service lines which occurs as a result of highlining activities.
    - a. All leaks or damage shall be repaired within two hours of discovery or reporting. All leaks or damage discovered or reported during working hours shall be repaired that same day before CONTRACTOR personnel leave the site. This repair criterion shall apply to leaks or damage arising for any reason, including vandalism and damage by CONTRACTOR personnel, equipment, or work activities.
    - b. When the repair involves any disassembly of the system, disinfect and flush the affected components according to AWWA C651.
    - c. Repair work shall be inspected and approved by the DISTRICT. At the sole discretion of the DISTRICT, the CONTRACTOR shall be back-charged for non-responsive or otherwise unacceptable repair and maintenance work.
- F. Problem Reporting.
1. All highline system problems discovered or reported and corrective actions taken shall be documented in the CONTRACTOR's Daily Log and reported to the DISTRICT.
- G. Fire Department and Utility Coordination.
1. The CONTRACTOR shall submit a copy of the project written user notification to the local Fire Department office not less than five days prior to commencing work on the water system.
  2. The CONTRACTOR shall submit a copy of the highline written user notification to the local Fire Department office within twenty-four hours prior to commencing work on any phase of the highlining system.
  3. The CONTRACTOR shall submit written notification to the local Fire Department office on the date that each phase of the highline is activated and deactivated.
  4. On the date of transmittal, copies of all Fire Department correspondence shall be delivered to the DISTRICT.
- H. Traffic Control.

1. The CONTRACTOR shall provide traffic control during highline installation and dismantling activities as required by the project approved Traffic Control Plan, as shown on the Contract Drawings, or as directed by the DISTRICT.
- I. Schedules and Timing.
1. The CONTRACTOR shall coordinate highlining operations such that the overall water main replacement project schedule is not affected or delayed.

### **3.02 INSTALLATION**

- A. Highline Piping System.
1. The highline piping system shall be installed in phases as shown on Contract Drawings and/or as directed by the DISTRICT.
  2. Piping phases shall be installed in loop systems as shown on the Contract Drawings with a fire hydrant connection to the water supply at each end.
  3. The highline piping system shall be inspected and approved in writing by the DISTRICT prior to charging the system with potable water or connecting to any user service line.
  4. Shutoff valves shall be installed at each fire hydrant connection, along the piping runs at the middle of each block, on either side of highline tee fittings for user connections to meters larger than 1-inch, and at the ends of cul-de-sac blind runs to permit flushing. The lever handles shall be removed from the valves to prevent unauthorized operation.
  5. The two-bolt grooved couplings or swing clamp devices shall be installed with the bolts oriented downward. This orientation permits the pipe to be laid closer to the curb and is less susceptible to damage by auto traffic. Also, to prevent damage to auto tires, coupling bolts shall not extend beyond the thickness of the nut when installed and tightened.
- B. Fire Hydrant Connection.
1. The fire hydrant connection shall be as shown on the approved drawings.
  2. Elbows of different bend angles shall be used as required to align the connection fittings parallel to the sidewalk or curb.
  3. Pressure regulators shall be installed where shown on Approved Drawings, when the fire hydrant is located in a pressure zone higher than all or part of the affected service area, or in any situation where pressures in the affected service area may exceed safe ratings.
  4. In situations where the fire hydrant is located such that piping must cross a sidewalk, piping shall be routed under the sidewalk surface in a 12-inch wide by 12-inch minimum deep (approximate dimensions) saw cut trench. The trench backfill and temporary asphalt surface shall be tamped and compacted to provide a smooth, safe surface for the duration of the highlining installation. Routing the pipe above the sidewalk shall not be permitted.
  5. Provide barricades and cones as required by the approved Traffic Control Plan and to ensure public safety.

- C. User Connection.
1. Connection to meters sized up to 1-inch shall be as shown on the Approved Drawings. Adapters may be required to connect to specific meters.
  2. Connection to meters 1-1/2-inch and larger shall be submitted to and reviewed by the DISTRICT on a case-by case basis.
    - a. A shutoff valve in the user connection line shall be provided at the highline tee fitting.
    - b. Meters 1-1/2-inch and larger typically have 2-bolt flanged connections. Provide adapters as required to connect to specific meters.
    - c. Sidewalk crossings may be routed above ground and ramped with temporary asphalt (cold mix). and as required elsewhere in this Section.
    - d. Field cut, groove, and fit 2-inch galvanized steel pipe as required to make user connections. Sections of the highline piping shall be cut such that service tees are as close as possible to the user meters and service connection hose or piping length is minimized.
  3. Provide barricades and cones as required by the approved Traffic Control Plan, at service tees and meters, and as required to ensure public safety.
- D. Roadway Crossing and Trenching.
1. Wherever piping is required to cross a roadway, piping shall be routed below the roadway surface in a 12-inch wide by 12-inch minimum deep (approximate dimensions) saw cut trench. Routing the pipe above the roadway shall not be permitted.
  2. The trench backfill and temporary asphalt surface shall be tamped and compacted to provide a smooth, safe surface for the duration of the highlining installation.
- E. Driveway or Handicapped Access Crossing.
1. Wherever the highline piping crosses an auto driveway or handicapped access ramp, the piping shall be provided with temporary asphalt (cold mix) crossing ramps which shall be H20 traffic rated.
  2. The temporary asphalt (cold mix) crossing ramps shall be tamped and compacted to provide a smooth, safe surface for the duration of the highlining installation. Slopes shall not exceed those shown.
  3. The temporary asphalt (cold mix) crossing ramps shall be constructed such that they do not interfere with normal storm water or other drainage flows. They shall not divert drainage flows either into the street or onto adjacent properties. Where required to achieve proper drainage, sections of galvanized steel piping shall be installed in the crossing ramp parallel to the highline piping to allow for drainage past the crossing ramp. All crossing ramp installations shall be inspected and approved by the DISTRICT.
- F. Corners and Curves.
1. Routing the highlining system around corners and curves shall typically be accomplished by use of hose.

2. A shutoff valve shall be installed at each end of the curve.
3. Portions of corners and curves with driveways or handicapped access ramps shall be crossed with galvanized steel pipe as described elsewhere. Use of hose shall not be permitted at these crossings.
4. Corners and curves with bend radii too short to be accommodated by hose shall be routed with short sections of galvanized steel pipe and grooved elbows of different bend angles. Pipe shall be cut, grooved, and fitted in the field as required.
5. Portions of the piping and fittings extending 12 inches or more from the curb shall be protected with an asphalt cold mix covering of not less than 2-inch thickness above the pipe and fittings. The cold mix shall be sloped over the pipe and tamped in place to provide a durable surface.

### **3.03 START-UP PROCEDURES**

- A. System leak test. The CONTRACTOR shall:
  1. Charge the system with available water pressure, bleed the system of air, and verify that the entire system is filled.
  2. Visually inspect the system for leaks and repair any leaks discovered. The system will not be accepted by the DISTRICT until all leaks are repaired.
- B. User Hook-up and Service Change. The CONTRACTOR shall:
  1. Coordinate work such that user service downtime is minimized. Any single service downtime shall not exceed thirty minutes.
  2. Notify the user as specified prior to connection of the user to the highline system.
  3. Disinfect hoses, fittings, and other highline user connections according to AWWA C651 prior to connection to user meters.
  4. Flush the highline connection, including the meter adaptor on the hose, with potable water until the effluent is clear and free of debris.
  5. Shut off and disconnect the user water meter from the existing water main service line. Ensure that no dirt or debris enters to meter or meter connection. Remove any dirt or debris which may enter and plug the meter.
  6. Move or bend aside the existing water main service line to provide room for the highline service line. Ensure that the water main service line is not damaged. Some soil may need to be removed from the bottom of the meter box to allow bending of the line.
  7. Connect the user water meter to the highline water service line. Use approved adaptors as required to make the connection. Open the shutoff valve to activate the connection.
  8. Flush each user system from the hose bibb closest downstream to the water meter - until the effluent is clear and free of debris.
  9. Verify proper flow and operation of the system. Clean plugged meters or regulators as required. Reset regulators as required after disturbance of the system to achieve proper service pressures.

- C. Shutdown of Water Main.
  - 1. The CONTRACTOR shall notify the DISTRICT after all highline user water meter connections are made and activated. The DISTRICT will inspect the system and issue a written approval to cut and plug the main line.
  - 2. The CONTRACTOR shall coordinate the shutdown of the water main with the DISTRICT after receiving approval from the DISTRICT.
  - 3. As stated elsewhere in the Contract Documents the shutdown of the water main line shall be performed by DISTRICT personnel only. Notification in accordance with the Water Utilities Manual must be given to DISTRICT personnel before shutdown of waterline. Cutting and plugging operations shall be complete within ten working days of CONTRACTOR notification to the DISTRICT.

### **3.04 RESTORATION OF NORMAL SERVICE**

- A. Flushing of the New Water Main.
  - 1. The CONTRACTOR shall not flush the new water main with water from the highline system without written approval of the DISTRICT.
- B. User Hook-up to the New Main Line.
  - 1. Restoration of user service to the new water main shall be in accordance with Specification Section 15041.
- C. Shutdown of Highline System.
  - 1. The CONTRACTOR shall shut down the highline system by closing the fire hydrant valves only after all water user services have been transferred to the new water main line.

### **3.05 DISASSEMBLY OF HIGHLINE SYSTEM**

- A. Disassembly.
  - 1. After restoration of normal service to water users, the CONTRACTOR shall fully disassemble the highline system and remove all highline construction materials and debris from the area by the end of the working day.
- B. Restoration of Streets and Other Facilities.
  - 1. The CONTRACTOR shall repair or replace all disturbed facilities to a condition equal to or better than the existing condition.

**END OF SECTION**

**SECTION 02960****TEMPORARY SEWER BYPASS PUMPING****PART 1 - GENERAL****1.01 DESCRIPTION**

- A. The CONTRACTOR shall provide a complete sewer bypassing system including, but not limited to, the following:
1. Developing a sewer bypassing plan.
  2. Developing a spill prevention and emergency response plan.
  3. Submitting and obtaining approval from the DISTRICT for the sewer bypassing plan and the spill prevention and emergency response plan.
  4. Implementing the bypassing and spill prevention and emergency response plan.
  5. Providing bypassing in accordance with the approved plans throughout the duration of the Work.

**1.02 RELATED WORK SPECIFIED ELSEWHERE**

- A. The Work of the following Sections applies to the Work of this Section. Work of other Sections of the Specification, not referenced below, shall also apply to the extent required for proper performance of this Work.
1. Section 01000 – General Requirements
  2. Section 01300 – Shop Drawings and Submittals
  3. Section 01570 – Traffic Regulations
  4. Section 02950 – Highlining for Watermains
  5. Section 15000 – General Piping Systems and Appurtenances

**1.03 SUBMITTALS**

- A. All submittals required by this Specification shall be provided to the DISTRICT for approval within 10-days of receiving the Notice to Proceed. No construction activities related to bypassing shall begin prior to the approval of the required submittals by the DISTRICT. Approval of the CONTRACTOR'S Bypassing and Spill Prevention and Emergency Response Plan in no way relieves the CONTRACTOR of his responsibility to maintain sewage service or provide sewer bypassing at all times during construction and to prevent any spills.
- B. Bypassing Plan
1. The CONTRACTOR shall design the bypass system to handle the flows of the system. Contractor shall assume the sewer lines are flowing half full at the slopes indicated on the Contract Drawings for the purposes of estimating the flow rate.

2. The CONTRACTOR shall develop and submit to the DISTRICT, for review and approval, a written Bypassing plan including sequence of work outlining how sewage flows will be maintained and bypassed during construction. The bypassing plan shall include, but not be limited to:
    - a. A primary and 100% redundant backup pumping system, each capable of handling the peak flow of the system, which shall be onsite and available 24 hours a day.
    - b. A flow monitoring plan describing the method of monitoring and showing the location of upstream and downstream monitoring units for all of the construction locations.
    - c. Bypassing of service laterals as necessary to ensure the maximum amount of time a connection is out of service is 8-hours in accordance with the standard specifications.
  3. The bypassing plan shall be developed in conjunction with the traffic control plans in order to minimize the impact to the community. See the standard specifications.
- C. Spill Prevention and Emergency Response Plan
1. The CONTRACTOR shall develop and submit to the DISTRICT, for review and approval, a written Spill Prevention and Emergency Response Plan. The Spill Prevention and Emergency Response Plan shall be developed to prevent and respond to any construction related sewage spills. The plan shall include, but not be limited to:
    - a. Identification of all nearby waterways, channels, catch basins and entrances to underground storm drains
    - b. Furnishing of all the necessary materials, supplies, tools equipment, labor and other services to prevent sewage from coming into contact with these areas.
    - c. Arrangements for an emergency response unit comprised of emergency response equipment and trained personnel to be immediately dispatched to the Site in the event of sewage spill(s).
    - d. An emergency notification procedure, which includes an emergency response roster with telephone numbers and arrangements for backup personnel and equipment and an emergency notification roster of designated DISTRICT representatives.
    - e. Direct phone numbers (no voicemail) for 3 CONTRACTOR representatives who shall be accessible and available at all times to respond immediately to any construction related emergency.

#### **1.04 RESPONSIBILITIES OF CONTRACTOR**

- A. The CONTRACTOR shall observe and comply with all Federal, State, and local laws, ordinances, codes, orders, and regulations which in any manner affect the conduct of the work, specifically as it relates to sewage and prevention of sewage spills. The



CONTRACTOR shall be fully responsible for preventing sewage spills, containing any sewage spills, recovery and legal disposal of any spilled sewage, paying any and all fines, incurring and handling any penalties, claims, or liability arising from negligently causing or allowing a sewage spill, failure to prevent a sewage spill, or any violation of any law, ordinance, code, order, or regulation as a result of the spillage.

## **PART 2 - MATERIALS**

### **2.01 GENERAL**

- A. All equipment and tools used for sewer bypassing shall be designed to prevent any and all sewage leaks or spills.
- B. All equipment used as part of the bypassing system shall not cause a significant noise impact to the community in accordance with local noise ordinances. If noise complaints from residents occur due to the CONTRACTORS activities, the CONTRACTOR shall immediately replace the noise generating equipment or reduce the noise generated with mitigating devices to the satisfaction of the DISTRICT.
- C. Sewage shall be conveyed/pumped in closed conduits and disposed of in a sanitary sewer system. Sewage shall not be permitted to flow in trenches or be covered by backfill.
- D. Suction and discharge manholes shall be sealed to prevent odors.
- E. Access to driveways may not be blocked by the bypass pipe. Lay flat pipe, a raised platform above bypass pipe or a shallow trench may be used to provide access to residents.
- F. If bypass piping must cross any major arterial streets/roads, piping must be installed in a shallow trench. Lay flat piping or raised traffic platforms across these streets will not be allowed. Trench shall be backfilled or covered with recessed, secured trench plating.
- G. All shallow trenching shall be backfilled and paved in accordance with the standard specifications following demobilization of sewer bypass. All costs to install, maintain, backfill, and pave temporary shallow trenching shall be included in Contractor's bid item for sewer bypassing and no additional compensation shall be made therefor.
- H. If deemed necessary due to lack of preparedness on the Contractor's part, the DISTRICT has the option to clean up the sewage spill caused by the Contractor. Clean up costs incurred by the DISTRICT shall be recoverable in addition to the penalties from the Contractor's progress payments.

### **2.02 PUMPING EQUIPMENT**

- A. All pumps used for sewer bypassing shall be the submersible type and shall only be operated below ground in the sewer manhole or other sewer facility. The use of above ground pumps or pumps not specifically designed for submersible service are not allowed.
- B. The pumps shall be sized to fit in manholes or other confined areas necessary to successfully complete the sewer bypassing. The CONTRACTOR shall ensure all equipment used for bypassing will operate under the conditions required and the

CONTRACTOR will be responsible for all costs associated with changes to the bypassing system due to inappropriate equipment or non-conformance with the Contract Documents.

- C. Electric or fuel/generator driven pumps shall be used. The CONTRACTOR shall provide an emergency standby power generator, sized to operate the bypass system at a minimum, to be used to operate the submersible pumps if electrical power is lost during the progress of the Work and a sewage spill will occur. The generator shall meet all requirements per the standard specifications.
- D. The pumps shall be specifically intended for use with raw sewage and shall be capable of passing a 3-inch diameter solid.
- E. Regardless of power used the total noise of any equipment used by the CONTRACTOR as part of the bypassing system shall be under 68 dba as measured standing thirty (30) feet from the equipment.

## **PART 3 - EXECUTION**

### **3.01 GENERAL**

- A. The CONTRACTOR shall observe and comply with the DISTRICT policy of “ZERO SPILLS”.
- B. The CONTRACTOR shall exercise care not to damage existing public and private improvements, interrupt existing services and/or facility operations which may cause a sewage spill. Any reasonably anticipated utility and/or improvement which is damaged by the CONTRACTOR shall be immediately repaired at the CONTRACTOR’S expense. In the event that the CONTRACTOR damages an existing utility or interrupts an existing service which causes a sewage spill, the CONTRACTOR shall immediately notify the DISTRICT representatives. The CONTRACTOR shall request and obtain from the DISTRICT an emergency roster of the designated DISTRICT representatives with their respective telephone numbers including cellular phone numbers. The CONTRACTOR shall take all measures necessary to prevent further damage or service interruption, and to control, contain and clean up the resultant impacts of the damage, service interruption and any resulting sewage spill(s).
- C. The CONTRACTOR shall continuously monitor the flow levels downstream and upstream of the construction location to detect any possible failure that may cause a sewage backup and spill. The CONTRACTOR shall include the means and methods of monitoring the flow in their Sewer Bypassing Plan.

### **3.02 SEWAGE SPILLS**

- A. In case of sewage spill, the CONTRACTOR shall act immediately, within fifteen minutes – without instructions from the DISTRICT – to control the spill and take all appropriate steps to contain it in accordance with their Spill Response Plan.
- B. The CONTRACTOR shall immediately notify the DISTRICT representatives of the sewage spill(s) and all remedial actions taken.

- C. The CONTRACTOR shall, within 24 hours from the occurrence of the spill, submit to the DISTRICT a draft written report describing the following information related to the spill: the location on a current Thomas Bros. guide map; the nature and volume; the date and time; the duration; the cause; the type of remedial and/or preventive actions taken; and the water body impacted and results of any necessary monitoring. The DISTRICT will review the draft report, and if revisions are required, the CONTRACTOR shall make those revisions and submit the final report to the DISTRICT within 24 hours of the receipt of comments. Requests for additional compensation for the handling of the spill shall be submitted to the Engineer as a construction claim. The CONTRACTOR shall assure the validity, accuracy, and correctness of the claim under penalty of perjury. The Engineer may institute further corrective actions, as deemed necessary, to fully comply with existing law, ordinance, code, order or regulation. The CONTRACTOR shall be responsible for all costs incurred for the corrective actions.
- D. It shall be the CONTRACTOR's responsibility to assure that all field forces, including Subcontractors, know and obey all safety and emergency procedures, including the Spill Response Plan, to be maintained and followed at the Site.

### **3.03 SEWER BYPASSING**

- A. The CONTRACTOR shall provide temporary means to maintain and handle the sewage flow in the existing system as required to complete the necessary construction.
- B. The CONTRACTOR shall size the bypass system to handle the peak flow of the system. The CONTRACTOR shall provide a redundant, identically sized, one- hundred percent (100%) backup bypass system. The CONTRACTOR shall utilize the backup system to mitigate any additional wet weather flows, perform the necessary maintenance and repairs on the primary bypass system, and exercise and ensure the operability of the backup system. Each pump, including the backup pumps, shall be a complete unit with its own suction and discharge piping. The CONTRACTOR shall operate the backup bypass system for a minimum of twenty- five percent (25%) of the time on a weekly basis. The backup bypass system shall be fully installed and operationally ready at all times.
- C. Prior to the full operation of the bypass system, the CONTRACTOR shall demonstrate, to the satisfaction of the DISTRICT, that both the primary and backup bypass systems are fully functional and adequate, and shall certify the same, in writing, in a manner acceptable to the DISTRICT.
- D. The CONTRACTOR shall provide all equipment necessary to minimize the noise generated by the bypassing operations. Noise levels from the complete bypassing system shall not exceed the levels allowable under the local jurisdictional codes and requirements.
- E. The CONTRACTOR shall continuously (while in use) monitor the operation of the bypass system and all impacted facilities. The CONTRACTOR shall submit, as part of their bypass plan, their system monitoring procedure and frequency. The CONTRACTOR shall maintain a log of the monitoring in a manner acceptable to the Engineer.
- F. The CONTRACTOR shall continuously monitor the flow levels downstream and upstream of the bypass to detect any possible failure that may cause a sewage backup and/or spill. The CONTRACTOR shall include the means and methods of monitoring the flow in their

Bypassing Plan. The CONTRACTOR shall provide flow monitoring data to the DISTRICT on a weekly basis in a format acceptable to the DISTRICT.

- G. The CONTRACTOR shall routinely inspect and maintain the bypass system, including the backup system. The CONTRACTOR shall submit as part of their Bypassing Plan their maintenance procedures and frequency. The CONTRACTOR shall maintain a log of all pertinent inspection, maintenance and repair records in a manner acceptable to the Engineer.
- H. At the end of each day's work, the CONTRACTOR shall re-establish sewer flows in the gravity sewer system. Work undertaken each day shall only include work that can be completed during that working day.
- I. See the standard specifications for requirements of property owner notification due to bypassing operations.

**END OF SECTION**

**SECTION 03200****STEEL REINFORCEMENT****PART 1 - GENERAL****1.01 DESCRIPTION**

The Contractor shall furnish, fabricate, and place all concrete reinforcement steel, welded wire fabric, couplers, and concrete inserts for use in reinforced concrete construction and shall perform all appurtenant work, including all the wires, clips, supports, chairs, spacers, and other accessories, all in accordance with the Contract Documents. The Contract Documents shall take precedence over these specifications.

**1.02 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS**

The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.

A. Codes: All codes, as referenced herein and specified in Section 01015.

B. Commercial Standards:

ACI 301	Structural Concrete for Buildings
ACI 315	Details and Detailing of Concrete Reinforcement
ACI 318	Building Code Requirements for Reinforced Concrete
CRSI MSP-1	Concrete Reinforcing Steel Institute Manual of Standard Practice
WRI	Manual of Standard Practice for Welded Wire Fabric
AWA D1.4	Structural Welding Code – Reinforcing Steel
ASTM A82	Specification for Welded Steel Wire, Plain, for Concrete Reinforcement
ASTM A185	Specification for Welded Steel Wire Fabric, Plain, for Concrete Reinforcement
ASTM A615	Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM A706	Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement
ASTM A775	Specification for Epoxy-Coated Reinforcing Steel Bars

AWS D1.4

Structural Welding Code for Reinforcing Steel

**1.03 RELATED WORK SPECIFIED ELSEWHERE**

- A. Section 01300 – Shop Drawings and Submittals
- B. Section 01410 – Testing Laboratory Services
- C. Section 03300 – Cast-In-Place Concrete
- D. Section 03315 – Grout

**1.04 CONTRACTOR SUBMITTALS**

- A. The Contractor shall furnish reinforcement placing drawings, shop bending diagrams, placing lists, and drawings of all reinforcement steel prior to fabrication in accordance with the requirements of Section 01300.
- B. Details of the concrete reinforcement steel and concrete inserts shall be submitted by the Contractor at the earliest possible date after receipt by the Contractor of the Notice to Proceed. Said details of reinforcement steel for fabrication and erection shall conform to ACI 315 and the requirements specified and shown. The shop bending diagrams shall show the actual lengths of bars, to the nearest inch measured to the intersection of the extensions (tangents for bars of circular cross section) of the outside surface. The shop drawings shall include bar placement diagrams that clearly indicate the dimensions of each bar splice.
- C. Contractor shall submit mill tests reports for each heat of reinforcement steel.
- D. Where mechanical couplers are required or permitted to be used to splice reinforcement steel, the Contractor shall submit manufacturer's literature which contains instructions and recommendations for installation for each type of coupler used; certified test reports which verify the load capacity of each type and size of coupler used; and shop drawings which show the location of each coupler with details of how they are to be installed in the formwork.
- E. If reinforcement steel is spliced by welding at any location, the Contractor shall submit mill test reports which shall contain the information necessary for the determination of the carbon equivalent as specified in AWS D1.4. The Contractor shall submit a written welding procedure for each type of weld for each size of bar which is to be spliced by welding; merely a statement that AWS procedures will be followed is not acceptable. Welding of reinforcing bars shall be done only where specifically detailed on the plans or when permitted by the Engineer.
- F. Contractor shall submit all reinforcing for a given structure in a single submittal at one time. Partial reinforcing submittals may be returned to the Contractor rejected for incompleteness.

## 1.05 QUALITY ASSURANCE

- A. If requested by the Engineer, the Contractor shall provide samples from each heat of reinforcement steel delivered in a quality adequate for testing. Costs of tests will be paid by the Contractor.
- B. If reinforcement steel is spliced by welding at any location, the Contractor shall submit certifications of procedure qualifications for each welding procedure used and certification of welder qualifications, for each welding procedure, and for each welder performing the work. Such qualifications shall be as specified in AWS D1.4.
- C. If requested by the Engineer, the Contractor shall provide samples of each type of welded splice used in the work in a quantity and of dimensions adequate for testing. At the discretion of the Engineer, radiographic testing of direct butt welded splices will be performed. The Contractor shall provide assistance necessary to facilitate testing. The Contractor shall repair any weld which fails to meet the requirements of AWS D1.4. The costs of testing will be paid by the Contractor.
- D. Inspection: All work hereunder shall be subject to continuous inspection by a Special Inspector approved by the District and approved by the local Building Official having jurisdiction. Special Inspection shall be performed in accordance with the latest edition of the Uniform Building Code. The Special Inspector shall work under the direct supervision of the Contractor. All costs of such inspection shall be borne by the Contractor and shall be included in the price bid for completion of the work.
- E. The Special Inspector shall observe the following work for conformance with the design drawings and specifications:
  - 1. Placing of all reinforcing steel in concrete requiring special inspection
  - 2. Welding of all reinforcing steel

## PART 2 - PRODUCTS

### 2.01 MATERIAL REQUIREMENTS

Materials specified in this Section which may remain or leave residues on or within the concrete shall be classified as acceptable for potable water use within 30 days of application or use by the Environmental Protection Agency.

### 2.02 REINFORCEMENT STEEL

- A. Reinforcement steel for all cast-in-place reinforced concrete construction shall conform to the following requirements:
  - 1. Bar reinforcement shall conform to the requirements of ASTM A615 for Grade 60 Billet Steel Reinforcement or as otherwise shown.
  - 2. Welded wire fabric reinforcement shall conform to the requirements of ASTM A185 and the details shown; provided, that welded wire fabric with longitudinal wire of WR size wire and smaller shall be either furnished in flat sheets or in

rolls with a core diameter of not less than 10 inches; and provided further, that welded wire fabric with longitudinal wires larger than W4 size shall be furnished in flat sheets only.

3. Spiral reinforcement shall be cold-drawn steel wire conforming to the requirements of ASTM A82.
4. Bar reinforcement used in welded connections shall conform to the requirements of ASTM A706.

B. Accessories

1. Accessories shall include all necessary chairs, slab bolsters, concrete blocks, tie wires, dips, supports, spacers, and other devices to position reinforcement during concrete placement. All bar supports shall meet the requirements of the CRSI Manual Standard Practice including special requirements for supporting epoxy coated reinforcing bars. Wire bar supports shall be CRSI Class 1 for maximum protection with a 1/8-inch minimum thickness of plastic coating which extends at least 1/2-inch from the concrete surface. Plastic shall be gray in color.
2. Concrete blocks (dobies), used to support and position reinforcement steel, shall have the same or higher compressive strength as specified for the concrete in which it is located. Wire ties shall be embedded in concrete block bar supports.

- C. Epoxy coating for reinforcing and accessories, where specified or shown, shall conform to ASTM A775.
- D. Drilling of reinforcing bars in place of cast-in-place hooks and anchors will not be permitted unless previously approved by the Engineer in writing.

### 2.03 MECHANICAL COUPLERS

- A. Mechanical couplers shall be provided where shown and where approved by the Engineer. The couplers shall develop a tensile strength which exceeds 125 percent of the yield strength of the reinforcement bars being spliced at each splice.
- B. Where the type of coupler used is composed of more than one component, all components required for a complete splice shall be supplied. This shall apply to all mechanical splices including those splices intended for future connections.
- C. The reinforcement steel and coupler used shall be compatible for obtaining the required strength of the connection. Straight threaded type couplers shall require the use of the next larger size reinforcing bar or shall be used with reinforcing bars with specially forged ends which provide upset threads which do not decrease the basic cross section of the bar.
- D. Couplers shall be Lenton Form Saver as manufactured by Erico Products; Dowel Bar Splicer System as manufactured by Richmond Screw Anchor Company; or equal.



## 2.04 WELDED SPLICES

- A. Welded splices shall be provided where shown and where approved by the Engineer. All welded splices of reinforcement steel shall develop a tensile strength which exceeds 125 percent of the yield strength of the reinforcement bars which are connected.
- B. All materials required to conform the welded splices to the requirements of AWS D1.4 shall be provided.

## 2.05 EPOXY GROUT

Epoxy for grouting reinforcing bars shall be specifically formulated for such application, for the moisture condition, application temperature, and orientation of the hole to be filled. Epoxy grout shall meet the requirements of Section 03315.

## PART 3 - EXECUTION

### 3.01 GENERAL

All reinforcement steel, welded wire fabric, couplers, and other appurtenances shall be fabricated, and placed in accordance with the requirements of the Building Code and the supplementary requirements specified herein.

### 3.02 FABRICATION

- A. General
  - 1. Reinforcement steel shall be accurately formed to the dimensions and shapes shown, and the fabricating details shall be prepared in accordance with ACI 315 and ACI 318, except as modified by the Drawings. Stirrups and tie bars shall be bent around a pin having diameter not less than 1-1/2-inch for No. 3 bars, 2-inch for No. 4 bars, and 2-1/2-inch for No. 5 bars. Bends for other bars shall be made around a pin having a diameter not less than 6 times the bar diameter, except for bars larger than 1 inch, in which case the bends shall be made around a pin of 8 bar diameters. Bar bends shall be made cold.
  - 2. The Contractor shall fabricate reinforcement bars for structures in accordance with bending diagrams, placing lists, and placing drawings. Said drawings, diagrams, and lists shall be prepared by the Contractor as specified under Section 01300.
- B. Fabricating Tolerances: Bars used for concrete reinforcement shall meet the following requirements for fabricating tolerances:
  - 1. Sheared length:  $\pm 1$ -inch
  - 2. Depth of truss bars:  $+ 0, -1/2$ -inch
  - 3. Stirrups, ties, and spirals:  $\pm 1/2$ -inch
  - 4. All other bends:  $\pm 1$ -inch

### 3.03 PLACING

- A. Reinforcement steel shall be accurately positioned as shown, and shall be supported and wired together to prevent displacement, using annealed iron wire ties or suitable clips at intersections. All reinforcement steel shall be supported by concrete, plastic or metal supports, spacers or metal hangers which are strong and rigid enough to prevent any displacement of the reinforcement steel. Where concrete is to be placed on the ground, supporting concrete blocks (or dobies) shall be used, in sufficient numbers to support the bars without settlement, but in no case shall such support be continuous. All concrete blocks used to support reinforcement steel shall be tied to the steel with wire ties which are embedded in the blocks. For concrete over formwork, the Contractor shall furnish concrete, metal, plastic, or other acceptable bar chairs and spacers.
- B. Reinforcing shall be accurately positioned around pipe opening to conform to the required tolerances. Placement of reinforcing mats without required pipe openings followed by field cutting of mat to clear pipe flange shall not be permitted.
- C. Limitations on the use of bar support materials shall be as follows:
  - 1. Concrete Dobies: permitted at all locations except where architectural finish is required.
  - 2. Wire Bar Supports: permitted only at slabs over dry areas, interior dry wall surfaces, and exterior wall surfaces.
  - 3. Plastic Bar Supports: permitted at all locations except on grade.
- D. Tie wires shall be bent away from the forms in order to provide the specified concrete coverage.
- E. Bars additional to those shown which may be found necessary or desirable by the Contractor for the purpose of securing reinforcement in position shall be provided by the Contractor at his own expense.
- F. Unless otherwise specified, reinforcement placing tolerances shall be within the limits specified in Section 7.5 of ACI 318 except where in conflict with the requirements of the Building Code.
- G. Bars may be moved as necessary to avoid interference with other reinforcement steel, conduits, or embedded items. If bars are moved more than one bar diameter, or enough to exceed the above tolerances, the resulting arrangement of bars shall be as acceptable to the Engineer.
- H. Welded wire fabric reinforcement placed over horizontal forms shall be supported on slab bolsters. Slab bolsters shall be spaced not more than 30 inches on centers, shall extend continuously across the entire width of the reinforcement mat, and shall support the reinforcement mat in the plane shown.
- I. Welded wire fabric placed over the ground shall be supported on wired concrete blocks (dobies) spaced not more than 3 feet on centers in any direction. The construction

practice of placing welded wire fabric on the ground and hooking into place in the freshly placed concrete shall not be used.

- J. Epoxy coated reinforcing bars shall be stored, transported, and placed in such a manner as to avoid chipping of the epoxy coating. Non-abrasive slings made of nylon and similar materials shall be used. Specially coated bar supports shall be used. All chips or cracks in the epoxy coating shall be repaired with a compatible epoxy repair material prior to placing concrete.
- K. Accessories supporting reinforcing bars shall be spaced such that there is no deflection of the accessory from the weight of the supported bars. When used to space the reinforcing bars from wall forms, the forms and bars shall be located so that there is no deflection of the accessory when the forms are tightened into position.

### **3.04 SPACING OF BARS**

- A. The clear distance between parallel bars (except in columns and between multiple layers of bars in beams) shall be not less than the nominal diameter of the bars nor less than 1-1/3 times the maximum size of the coarse aggregate, nor less than one inch.
- B. Where reinforcement in beams or girders is placed in 2 or more layers, the clear distance between layers shall be not less than one inch.
- C. In columns, the clear distance between longitudinal bars shall be not less than 1-1/2 times the bar diameter, nor less than 1-1/2 times the maximum size of the coarse aggregate, nor less than 1-1/2 inches.
- D. The clear distance between bars shall also apply to the distance between a contact splice and adjacent splices or bars.

### **3.05 SPLICES**

- A. General:
  - 1. Reinforcement bar splices shall only be used at locations shown. When it is necessary to splice reinforcement at points other than where shown, the character of the splice shall be as acceptable to the Engineer.
  - 2. Unless otherwise indicates, dowels shall match the size and spacing of the spliced bar.
- B. Splices of Reinforcement
  - 1. Unless otherwise shown, the length of lap for reinforcement bars shall be in accordance with ACI 318-95, Section 12.15.1 for a Class B, category 3 splice.
  - 2. Laps of welded wire fabric shall be in accordance with the ACI 318. Adjoining sheets shall be securely tied together with No. 14 tie wire, one tie for each 2 running feet. Wires shall be staggered and tied in such a manner that they cannot slip.

3. Splices in column spiral reinforcement, when necessary, shall be made by welding or by a lap of 1-1/2 turns.
- C. Bending or Straightening
1. Reinforcement shall not be straightened or rebent in a manner which will injure the material. Bars with kinks or bends not shown shall not be used. All bar bends shall be made cold, unless otherwise permitted by the Engineer. No bars partially embedded in concrete shall be field-bent except as shown or specifically permitted by the Engineer.
- D. Couplers which are located at a joint face shall be a type which can be set either flush or recessed from the face as shown. The couplers shall be sealed during concrete placement to completely eliminate concrete or cement paste from entering. Couplers intended for future connections shall be recessed a minimum of 1/2-inch from the concrete surface. After the concrete is placed, the coupler shall be plugged with plastic plugs which have an O-ring seal and the recess filled with sealant to prevent any contact with water or other corrosive materials. Threaded couplers shall be plugged.
- E. Unless noted otherwise, mechanical coupler spacing and capacity shall match the spacing and capacity of the reinforcing shown for the adjacent section.

### **3.06 CLEANING AND PROTECTION**

- A. Reinforcement steel shall at all times be protected from conditions conducive to corrosion until concrete is placed around it.
- B. The surfaces of all reinforcement steel and other metalwork to be in contact with concrete shall be thoroughly cleaned of all dirt, grease, loose scale and rust, grout, mortar and other foreign substances immediately before the concrete is placed. Where there is delay in depositing concrete, reinforcement shall be re-inspected and, if necessary re-cleaned.

### **3.07 EMBEDMENT OF DRILLED REINFORCING STEEL DOWELS**

- A. Hole Preparation
1. The hole diameter shall be as recommended by the epoxy manufacturer, but shall be no larger than 0.25 inch greater than the diameter of the outer surface of the reinforcing bar deformations.
  2. The depth of the hole shall be as recommended by the epoxy manufacturer to fully develop the bar but shall not be less than 12 bar diameters, unless noted otherwise.
  3. The hole shall be drilled by methods which do not interfere with the proper bonding of epoxy.
  4. Existing reinforcing steel in the vicinity of proposed holes shall be located prior to drilling. The location of holes to be drilled shall be adjusted to avoid drilling through or nicking any existing reinforcing bars.

5. The hole shall be blown clean with clean, dry compressed air to remove all dust and loose particles.
6. Epoxy shall be injected into the hole through a tube placed to the bottom of the hole. The tube shall be withdrawn as epoxy is placed but kept immersed to prevent formation of air pockets. The hole shall be filled to a depth that insures that excess material will be expelled from the hole during dowel placement.
7. Dowels shall be twisted during insertion into the partially filled hole so as to guarantee full wetting of the bar surface with epoxy. The bar shall be inserted slowly enough to avoid developing air pockets.
8. Drilled reinforcing dowels shall only be used where specifically detailed on the Drawings or when permitted by the Engineer in writing.

**END OF SECTION**

**SECTION 03300****CAST-IN-PLACE CONCRETE****PART 1 - GENERAL****1.01 DESCRIPTION**

- A. The Contractor shall furnish all materials for concrete in accordance with the provisions of this Section and shall form, mix, place, cure, repair, finish, and do all other Work as required to produce finished concrete, in accordance with the requirements of the Contract Documents.
- B. The following types of concrete shall be covered in this Section:
1. Structural Concrete: Concrete to be used in all cases except where noted otherwise in the Contract Documents. Concrete to be used for curbs, gutters, catch basins, sidewalks, pavements, thrust blocks, valve anchor blocks, fence and guard post footings, and all other concrete unless otherwise shown.
  2. Lean Concrete: Concrete to be used for underground duct bank encasement, pipe trench cut-off walls, non-structural pipe encasement or cradles where the preceding items are detailed on the Drawings as unreinforced. Concrete to be used as protective cover for dowels intended for future connection. Concrete backfill around soldier piles placed above the bottom of the excavation.
- C. The term “hydraulic structure” used in these specifications shall refer to environmental engineering concrete structures for the containment, treatment, or transmission of water, wastewater, or other fluids.

**1.02 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS**

The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.

- A. Federal Specifications:
- |                   |   |
|-------------------|---|
| UU-B-790A (1) (2) | Building Paper, Vegetable Fiber (Kraft, Waterproofed, Water Repellant and Fire Resistant) |
|-------------------|---|
- B. Commercial Standards:
- |         |  |
|---------|--|
| ACI 117 | Standard Tolerances for Concrete Construction and Materials              |
| ACI 214 | Recommended Practice for Evaluation of Strength Test Results of Concrete |
| ACI 301 | Specifications for Structural Concrete for Buildings                     |

ACI 309	Consolidation of Concrete
ACI 315	Details and Detailing of Concrete Reinforcement
ACI 318	Building Code Requirements for Reinforced Concrete
ASTM C31	Practices for Making and Curing Concrete Test Specimens in the Field
ASTM C33	Specification for Concrete Aggregates
ASTM C39	Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C94	Specification for Ready-Mixed Concrete
ASTM C136	Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM C143	Test Method for Slump of Hydraulic Cement Concrete
ASTM C150	Specification for Portland Cement
ASTM C156	Test Methods for Water Retention by Concrete Curing Materials
ASTM C157	Test Method for Length Change of Hardened Hydraulic Cement Mortar and Concrete
ASTM C192	Method of Making and Curing Concrete Test Specimens in the Laboratory
ASTM C260	Specification for Air-Entraining Admixtures for Concrete
ASTM C309	Specifications for Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C494	Specification for Chemical Admixtures for Concrete
ASTM C920	Specifications for Elastomeric Joint Sealant
ASTM C1077	Practice for Laboratories Testing Concrete and Concrete Aggregates for use in Construction & Criteria for Laboratory Evaluation
ASTM D175	Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non- Extruding and Resilient Bituminous Types)
ASTM D2419	Test Method for Sand Equivalent Value of Soils and Fine Aggregate
ASTM E119	Method for Fire Tests of Building Construction and Materials

**1.03 RELATED WORK SPECIFIED ELSEWHERE**

- A. Section 01300 – Contractor Submittals
- B. Section 01410 – Testing Laboratory Services
- C. Section 03200 – Steel Reinforcement

**1.04 SUBMITTALS**

- A. **Mix Designs:** Prior to beginning the Work and within 14 days of the notice to proceed, the Contractor shall submit concrete mix designs in accordance with Section 01300 which shall show the proportions and gradations of all materials proposed for each class and type of concrete specified herein.

The Contractor shall submit mix designs from a minimum of two qualified batch plants for review.

The mix designs shall be checked by an independent testing laboratory acceptable to the District. All costs related to such checking shall be borne by the Contractor. Since laboratory trial batches require 35 calendar days to complete, the Contractor may consider testing more than one mix design for each class of concrete.

- B. **Delivery Tickets:** The Contractor shall furnish delivery tickets at the time of delivery for each load of concrete. Each ticket shall show the state certified equipment used for measuring and the total quantities, by weight, of cement, sand, each class of aggregate, admixtures, and the amounts of water in the aggregate added at the batching plant, and the amount allowed to be added at the site for the specific design mix. In addition, each ticket shall state the mix number, total yield in cubic yards, and the time of day, to the nearest minute, corresponding to the times when the batch was dispatched, when it left the plant, when it arrived at the site, when unloading began, and when unloading was finished.
- C. Provide the following submittals in accordance with ACI 301:
  - 1. Mill tests for cement
  - 2. Admixture certification. Chloride ion content must be included.
  - 3. Aggregate gradation and certification
  - 4. Materials and methods for curing
  - 5. Results of 7, 14, and 28-day compressive tests done on trial batches
  - 6. Results of shrinkage drying tests

**1.05 QUALITY ASSURANCE**

- A. General:



1. Tests on component materials and for compressive strength and shrinkage of concrete will be performed as specified herein. Tests for determining slump will be in accordance with the requirements of ASTM C143.
2. The cost of all laboratory tests on cement, aggregates, and concrete will be borne by Contractor. However, the Contractor shall be charged for the cost of any additional tests and investigation on Work performed which does not meet the specifications. The laboratory must meet or exceed the requirements of ASTM C1077.
3. Concrete for testing shall be supplied by the Contractor at no cost to the testing laboratory and the Contractor shall provide assistance in obtaining samples, and disposal and cleanup of excess material.

B. Compression Tests:

1. Compression test specimens will be taken during construction from the first placement of each class of concrete and at intervals in accordance with ACI 301 to insure continued compliance with these specifications. Each set of test specimens will be a minimum of 5 cylinders.
2. Compression test specimens for concrete shall be made in accordance with Section 9.2 of ASTM C31. Specimens shall be 6-inch diameter by 12-inch high cylinders.
3. Compression tests shall be performed in accordance with ASTM C39. One test cylinder will be tested at 7 days, one test cylinder will be tested at 14 days and one test cylinder will be tested at 28 days. The remaining 2 cylinders will be held to verify test results, if needed.

C. Evaluation and Acceptance of Concrete:

1. Evaluation and acceptance of the compressive strength of concrete shall be according to the requirements of ACI 318, Chapter 5 "Concrete Quality," and as specified herein.
2. A statistical analysis of compression test results will be performed according to the requirements of ACI 214. The standard deviation of the test results shall not exceed 640 psi, when ordered at equivalent water content as estimated by slump.
3. If any concrete fails to meet these requirements, immediate corrective action shall be taken to increase the compressive strength for all subsequent batches of the type of concrete affected.
4. When the standard deviation of the test results exceeds 640 psi, the average strength for which the mix is designed shall be increased by an amount necessary to satisfy the statistical requirement that the probability of any test being more than 500 psi below or the average of any 3 consecutive tests being below the specified compressive strength is 1 in 100. The required average strength shall be calculated by Criterion No. 3 of ACI 214 using the actual standard of deviation.

5. All concrete which fails to meet the ACI requirements and these specifications, is subject to removal and replacement at the cost of the Contractor.

D. Shrinkage Tests:

1. Drying shrinkage tests will be made for the trial batch specified in the Paragraph in Part 2 entitled, "Trial Batch and Laboratory Tests," the first placement of each class of concrete, and during construction to insure continued compliance with these Specifications.
2. Drying shrinkage specimens shall be 4-inch by 4-inch by 11-inch prisms with an effective gage length of 10 inches, fabricated, cured, dried and measured in accordance with ASTM C157 modified as follows: specimens shall be removed from molds at an age of  $23 \pm 1$  hours after trial batching, shall be placed immediately in water at  $70 \text{ degrees F} \pm 3 \text{ degrees F}$  for at least 30 minutes, and shall be measured within 30 minutes thereafter to determine original length and then submerged in saturated lime water at  $73 \text{ degrees F} \pm 3 \text{ degrees F}$ . Measurement to determine expansion expressed as a percentage of original length shall be made at age 7 days. This length at age 7 days shall be the base length for drying shrinkage calculations ("0" days drying age). Specimens then shall be stored immediately in a humidity control room maintained at  $73 \text{ degrees F} \pm 3 \text{ degrees F}$  and 50 percent  $\pm 4$  percent relative humidity for the remainder of the test. Measurements to determine shrinkage expressed as percentage of base length shall be made and reported separately for 7, 14, 21, and 28 days of drying after 7 days of moist curing.
3. The drying shrinkage deformation of each specimen shall be computed as the difference between the base length (at "0" days drying age) and the length after at each test age. The average drying shrinkage deformation of the specimens shall be computed to the nearest 0.0001 inch at each test age. If the drying shrinkage of any specimen departs from the average of the test age by more than 0.0004-inch, the results obtained from the specimen shall be disregarded. Results of the shrinkage test shall be reported to the nearest 0.001 percent of shrinkage. Compression test specimens shall be taken in each case from the same concrete used for preparing drying shrinkage specimens. These tests shall be considered a part of the normal compression tests for the projects. Allowable shrinkage limitations shall be as specified in Part 2, herein.

E. Construction Tolerances: The Contractor shall set and maintain concrete forms and perform finishing operations so as to ensure that the completed Work is within the tolerances specified herein. Surface defects and irregularities are defined as finishes and are to be distinguished from tolerances. Tolerance is the specified permissible variation from lines, grades, or dimensions shown. Where tolerances are not stated in the specifications, permissible deviations will be in accordance with ACI 117.

1. The following construction tolerances are hereby established and apply to finished walls and slab unless otherwise shown:

Item	Tolerance

Item	Tolerance
Variation of the constructed linear outline from the established position in plan.	In 10 feet: ¼-inch In 20 feet or more: ½-inch
Variation from the level or from the grades shown.	In 10 feet: ¼-inch In 20 feet or more: ½-inch
Variation from the plumb.	In 10 feet: ¼-inch In 20 feet or more: ½-inch
Variation in thickness of slabs and walls.	Minus ¼-inch Plus ½-inch
Variation in the locations and sizes of slabs and wall openings.	Plus or minus ¼-inch

## **PART 2 - MATERIALS**

### **2.01 CONCRETE MATERIALS**

- A. General:
1. All materials specified herein shall be classified as acceptable for potable water use within 30 days of application by the Environmental Protection Agency.
  2. Materials shall be delivered, stored, and handled so as to prevent damage by water or breakage. Only one brand of cement shall be used. Cement reclaimed from cleaning bags or leaking containers shall not be used. All cement shall be used in the sequence of receipt of shipments.
- B. All materials furnished for the Work shall comply with the requirements of Sections 201, 203, and 204 of ACI 301, as applicable.
- C. Storage of materials shall conform to the requirements of Section 205 of ACI 301.
- D. Materials for concrete shall conform to the following requirements:
1. Cement shall be standard brand portland cement conforming to ASTM C150 for Type II/V, including Table 2 optional requirements. A minimum of 85 percent of cement by weight shall pass a 325 screen. A single brand of cement shall be

used throughout the Work, and prior to its use, the brand shall be acceptable to the Engineer. The cement shall be suitably protected from exposure to moisture until used. Cement that has become lumpy shall not be used. Sacked cement shall be stored in such a manner so as to permit access for inspection and sampling. Certified mill test reports, including fineness, for each shipment of cement to be used shall be submitted to the Engineer if requested regarding compliance with these Specifications.

2. Flyash is not permitted.
3. Water for mixing and curing shall be potable, clean, and free from objectionable quantities for silty organic matter, alkali, salts, and other impurities. The water shall be considered potable, for the purpose of this Section only, if it meets the requirements the local governmental agencies. Agricultural water with high total dissolved solids (over 1,000 mg/l TDS) shall not be used.
4. Aggregates shall be obtained from pits acceptable to the Engineer, shall be non-reactive, and shall conform to ASTM C33. Maximum size of coarse aggregate shall be as specified herein. Lightweight sand for fine aggregate will not be permitted.
  - a. Coarse aggregates shall consist of clean, hard, durable gravel, crushed gravel, crushed rock or a combination thereof. The coarse aggregates shall be prepared and handled in two or more size groups for combined aggregates with a maximum size greater than  $\frac{3}{4}$ -inch. When the aggregates are proportioned for each batch of concrete the two size groups shall be combined. See the Paragraph in Part 2 entitled, "Trial Batch and Laboratory Tests" for the use of the size groups.
  - b. Fine aggregates shall be natural sand or a combination of natural and manufactured sand that are hard and durable. When tested in accordance with ASTM D2419, the sand equivalency shall not be less than 75 percent for an average of three samples and no less than 70 percent for an individual test. Gradation of fine aggregates shall conform to ASTM C33. The fineness modulus of sand used shall not be over 3.00.
  - c. Combined aggregates shall be well graded from coarse to fine and shall be uniformly graded between screen sizes to produce concrete that has optimum workability and consolidation characteristics. Where a trial batch is required for a mix design, the final combined aggregate gradations will be established during the trial batch process.
  - d. When tested in accordance with ASTM C33, the ratio of silica released to reduction in alkalinity shall not exceed 1.0.
  - e. When tested in accordance with ASTM C33, the fine aggregate shall produce a color in the supernatant liquid no darker than the reference standard color solution.

- f. When tested in accordance with ASTM C33, the loss of weight of coarse aggregate shall not exceed 10 percent after 100 revolutions or 45 percent after 500 revolutions.
  - g. When tested in accordance with ASTM C33, the loss resulting after five cycles shall not exceed 10 percent for fine or coarse aggregate when using sodium sulfate.
5. Admixtures: All admixtures shall be compatible and by a single manufacturer capable of providing qualified field service representation. Admixtures shall be used in accordance with manufacturer's recommendations. If the use of an admixture is producing an inferior end result, the Contractor shall discontinue use of the admixture. Admixtures shall not contain thiocyanates nor more than 0.05 percent chloride ion, and shall be non-toxic after 30 days.
- a. Air-entraining agent shall meet the requirements of ASTM C260. Sufficient air-entraining agent shall be used to provide a total air content of 2 to 4 percent. The Engineer reserves the right, at any time, to sample and test the air-entraining agency received on the job by the Contractor. The air-entraining agent shall be added to the batch in a portion of the mixing water. The solution shall be batched by means of a mechanical batcher capable of accurate measurement. Air content shall be tested at the point of placement. Air-entraining agency shall be Micro-Air by Master Builders; Daravair by W.R. Grace; Sika AEA-15 by Sika Corporation; or equal.
  - b. Set controlling and water reducing admixtures: Admixtures may be added to the Contractor's option to control the set, effect water reduction, and increase workability. The addition of an admixture shall be at the Contractor's expense. The use of an admixture shall be subject to acceptance by the Engineer. Concrete containing an admixture shall be first placed at a location determined by the Engineer. Admixtures specified herein shall conform to the requirements of ASTM C494. The required quantity of cement shall be used in the mix regardless of whether or not an admixture is used.
    - 1) Concrete shall contain more than one water reducing admixture. Concrete containing an admixture shall be first placed at a location determined by the Engineer.
    - 2) Set controlling admixture shall be either with or without water-reducing properties. Where the air temperature at the time of placement is expected to be consistently over 80 degrees F, a set retarding admixture such as Plastocrete by Sika Corporation; Pozzolite 300R by Master Builders; Daratard by W.R. Grace; or equal shall be used. Where the air temperature at the time of placement is expected to be consistently under 40 degrees F, a non-corrosive set accelerating admixture such as Plastocrete 161FL by Sika Corporation; Pozzutec 20 by Master Builders; Daraset by W.R. Grace; or equal shall be used.

- 3) Normal range water reducer shall conform to ASTM C494, Type A. WRDA 79 by W.R. Grace; Pozzoloth 322-N by Master Builders; Plastocrete 161 by Sika Corporation; or equal. The quantity of admixture used and the method of mixing shall be in accordance with the Manufacturer's instructions and recommendations.
- 4) High range water reducer shall conform to ASTM C494, Type F or G. Duracem 100 or WDRA 19 by W.R. Grace; Sikament FF or Sikament 86 by Sika Corporation; Rheobuild 1000 or Rheobuild 716 by Master Builders; or equal. High range water reducer shall be added to the concrete after all other ingredients have been mixed and initial slump has been verified. No more than 14 ounces of water reducer per sack of cement shall be used. Water reducer shall be considered as part of the mixing water when calculating water cement ratio.
- 5) If the high range water reducer is added to the concrete at the job site, it may be used in conjunction with the same water reducer added at the batch plant. Concrete shall have a slump of 3 inches  $\pm$  1/2-inch prior to adding the high range water reducing admixture at the job site. The high range water reducing admixture shall be accurately measured and pressure injected into the mixer as a single dose by an experienced technician. A standby system shall be provided and tested prior to each day's operation of the job site system.
- 6) Concrete shall be mixed at mixing speed for a minimum of 30 mixer revolutions after the addition of the high range water reducer.

## 2.02 CURING MATERIALS

- A. Materials for curing concrete as specified herein shall conform to the following requirements and ASTM C309:
  1. All curing compounds shall be white pigmented and resin based. Sodium silicate compounds shall not be allowed. Concrete curing compound shall be Kurez by Euclid Chemical Company; MB-429 as manufactured by Master Builders; L&M Cure R; or equal. Water based resin curing compounds shall be used only where local air quality regulations prohibit the use of a solvent based compound. Water based curing compounds shall be Aqua-Cure by Euclid Chemical Company; Masterkure-W by Master Builders; L&M Cure R-2; or equal.
  2. Polyethylene sheet for use as concrete curing blanket shall be white, and shall have a nominal thickness of 6 mils. The loss of moisture when determined in accordance with the requirements of ASTM C156 shall not exceed 0.055 grams per square centimeter of surface.
  3. Polyethylene-coated waterproof paper sheeting for use as concrete curing blanket shall consist of white polyethylene sheeting free of visible defects, uniform in

appearance, having a nominal thickness of 2 mils and permanently bonded to waterproof paper conforming to the requirements of Federal Specification UU-B-790A (1) (2). The loss of moisture, when determined in accordance with the requirements of ASTM C156, shall not exceed 0.055 gram per square centimeter of surface.

4. Polyethylene-coated burlap for use as concrete curing blanket shall be 4-mil thick, white opaque polyethylene film impregnated or extruded into one side of the burlap. Burlap shall weigh not less than 9 ounces per square yard. The loss of moisture, when determined in accordance with the requirements of ASTM C156, shall not exceed 0.055 grams per square centimeter of surface.
5. Curing mats for use in Curing Method 6 as specified herein, shall be heavy shag rugs or carpets or cotton mats quilted at 4 inches on center. Curing mats shall weigh a minimum of 12 ounces per square yard when dry.
6. Evaporation retardant shall be a material such as Colifilm as manufactured by Master Builders; Eucobar as manufactured by Euclid Chemical Company; E-CON as manufactured by L&M Consturction Chemicals, Inc.; or equal.

### **2.03 NON-WATERSTOP JOINT MATERIAL**

- A. Materials for non-waterstop joints in concrete shall conform to the following requirements:
  1. Preformed joint filler shall be a non-extruding, resilient, bituminous type conforming to the requirements of ASTM D1751.
  2. Elastomeric joint sealer shall conform to ASTM C920, Type S, Grade NSA, Class 25, and shall be polyurethane-based. The sealant shall be formulated for exterior use and exposure to ultra-violet rays.
  3. Mastic joint sealer shall be a material that does not contain evaporating solvents; that will tenaciously adhere to concrete surfaces; that will remain permanently resilient and pliable; that will not be affected by continuous presence of water and will not in any water contaminate potable water; and that will effectively seal the joints against moisture infiltration even when the joints are subject to movement due to expansion and contraction. The sealer shall be composed of special asphalts or similar materials blended with lubricating and plasticizing agents to form a tough, durable mastic substance containing no volatile oils or lubricants and shall be capable of meeting the test requirements set forth hereinafter, if testing is required by the Engineer.

### **2.04 MISCELLANEOUS MATERIALS**

- A. Damp-proofing agent shall be an asphalt emulsion, such as Hydrocide 600 by Sonneborn; Damp-proofing Asphalt Coating by Euclid Chemical Company; Sealmastic by W.R. Meadows, Inc., or equal.
- B. Bonding agents shall be epoxy adhesives conforming to the following products for the application specified:

1. For bonding freshly-mixed, plastic concrete to hardened concrete, Sikadur 32 Hi-Mod Epoxy Adhesive, as manufactured by Sika Corporation; Concrecive Liquid (LPL), as manufactured by Master Builders; BurkEpoxy MV as manufactured by The Burke Company; or equal.
2. For bonding hardened concrete or masonry to steel, Sikadur 31 Hi-Mod Gel as manufactured by Sika Corporation; BurkEpoxy NS as manufactured by The Burke Company; Concrecive Paste (LPL) as manufactured by Master Builders; or equal.
3. Crystalline waterproofing material shall be packaged in powder form and mixed with water for application as a cementitious slurry coating on concrete surfaces. The material shall chemically control and permanently fix non-soluble crystalline growth throughout the capillary voids in concrete. XYPEX CONCENTRATE as manufactured by Xypex Chemical Corporation, Richmomd, B.C. Canada [phone: (310) 643-5191], or VANDEX SUPER as manufactured by Vandex, Columbia, MD [phone: (800) 394-1410]

Alternate crystalline waterproofing product will be accepted if it is in a powder form, requires only the addition of clean water, provides waterproofing by forming crystalline formations in the capillary voids in the concrete and is shown to be equivalent to the above-named products.

## 2.05 CONCRETE DESIGN REQUIREMENTS

- A. General: Concrete shall be composed of cement, admixtures, aggregates and water. These materials shall be of the qualities specified. The exact proportions in which these materials are to be used for different parts of the Work will be determined during the trial batch. In general, the mix shall be designed to produce a concrete capable of being deposited so as to obtain maximum density and minimum shrinkage and, where deposited in forms, to have good consolidation properties and minimum shrinkage and maximum smoothness of surface. The aggregate gradations shall be formulated to provide fresh concrete that will not promote rock pockets around reinforcing steel or embedded items. The proportions shall be changed whenever necessary or desirable to meet the required results at no additional cost to the District. All changes shall be subject to review by the Engineer.
- B. Fine Aggregate Composition: In mix designs for structural concrete, the percentage of fine aggregate in total aggregate by weight shall be as indicated in the following table.

Fine Aggregate	
<u>Fineness Modulus</u>	<u>Maximum Percent</u>
2.7 or less	41
2.7 to 2.8	42
2.8 to 2.9	43
2.9 to 3.0	44



For other concrete, the maximum percentage of fine aggregate of total aggregate, by weight, shall not exceed 50.

- C. **Water-Cement Ratio and Compressive Strength:** The minimum compressive strength and cement content of concrete shall be not less than that specified in the following tabulation.

<u>Type of Work</u>	<u>Min. 28-Day Compressive Strength (psi)</u>	<u>Max. Aggregate Size (in)</u>	<u>Min. Cement Content per cu. yd. (lbs)</u>	<u>Max. W/C Ratio (by weight)</u>
Structural concrete: foundation, walls, floor slabs, vaults, catch basins, equipment bases, manholes, piers, pre-cast components, and other reinforced structures or slabs.	3,250	1	560	.45
Sitework concrete: pavement; curb, gutter, walks; steel reinforced anchor/thrust blocks, encasements, cradles, cutoff walls.	2,500	1	520	0.50
Unreinforced concrete: thrust blocks, pipe bedding, pipe encasement, tunnel backfill.	2,000	1	376	0.62

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NOTE: The Contractor is cautioned that the limiting parameters specified above are not a mix design. Additional cement or water reducing agent may be required to achieve workability demanded by the Contractor’s construction methods and aggregates. The Contractor is responsible for any costs associated with furnishing concrete with the required workability.

- D. **Adjustments to Mix Design:** The mixes used shall be changed whenever such change is necessary or desirable to secure the required strength, density, workability, and surface finish. The Contractor shall not be entitled to additional compensation because of such changes.

**2.06 CONSISTENCY**

The quantity of water entering into a batch of concrete shall be just sufficient, with a normal mixing period, to produce a concrete which can be worked properly into place without segregation, and which can be compacted by the vibratory methods herein specified to give the desired density, impermeability and smoothness of surface. The quantity of water shall be changed as necessary, with variations in the nature of moisture content of the aggregates, to maintain uniform production of a designed consistency. The consistency of the concrete in successive batches shall be determined by slump tests in accordance with ASTM C143. The slumps shall be as follows:

<u>Part of Work</u>	<u>Slump (in)</u>
Structural and site work concrete	4 inches, maximum

With high range water reducer added	6 inches $\pm$ 2 inches
Duct banks	5 inches $\pm$ inch

## 2.07 TRIAL BATCH AND LABORATORY TESTS

- A. Before placing any concrete, a testing laboratory approved by the District shall prepare a trial batch of each class of structural concrete, based on the preliminary concrete mixes submitted by the Contractor. During the trial batch the aggregate proportions may be adjusted by the testing laboratory using the two coarse aggregate size ranges to obtain the required properties. If one size range produces an acceptable mix, a second mix size range need not be used. Such adjustments shall be considered refinements to the mix design and shall not be the basis for extra compensation to the Contractor. All concrete shall conform to the requirements of this Section, whether the aggregate proportions are from the Contractor's preliminary mix design, or whether the proportions have been adjusted during the trial batch process. The trial batch shall be prepared using the aggregates, cement and admixtures from the same source or manufacturer as proposed for the project. The trial batch materials shall be of a quantity such that the testing laboratory can obtain 3 drying shrinkage, and 6 compression test specimens from each batch. Trial batch testing required shall be performed at the expense of the Contractor.
- B. The determination of compressive strength will be made by testing 6-inch diameter by 12-inch high cylinders; made, cured and tested in accordance with ASTM C192 and ASTM C39. Three compression test cylinders will be tested at 7 days and 3 at 28 days. The average compressive strength for the 3 cylinders tested at 28 days for any given trial batch shall not be less than 125 percent of the specified compressive strength.
- C. A sieve analysis of the combined aggregate for each trial batch shall be performed according to the requirements of ASTM C136. Values shall be given for percent passing each sieve.

## 2.08 SHRINKAGE LIMITATION

- A. The maximum concrete shrinkage for specimens cast in the laboratory from the trial batch, as measured at 21-day drying age or at 28-day drying age shall be 0.040 percent or 0.046 percent respectively. The Contractor shall only use a mix design for construction that has first met the trial batch shrinkage requirements. Shrinkage limitations apply only to structural concrete used as part of a hydraulic structure.
- B. The maximum concrete shrinkage for specimens cast in the field shall not exceed the trial batch maximum shrinkage requirement by more than 20 percent.
- C. If the required shrinkage limitation is not met during construction, the Contractor shall take any or all of the following actions, at no additional cost to the Engineer, for securing the specified shrinkage requirements. These actions may include changing the source or aggregates, cement and/or admixtures; reducing water content; washing of aggregate to reduce fines; increasing the number of construction joints; modifying the curing requirements; or other actions designed to minimize shrinkage or the effects of shrinkage.

**2.09 MEASUREMENT OF CEMENT AND AGGREGATE**

- A. The amount of cement and of each separate size of aggregate entering into each batch of concrete shall be determined by direct weighing equipment furnished by the Contractor and acceptable to the Engineer.
- B. Weighing tolerances:

<u>Material</u>	<u>Percent of Total Weight</u>
Cement	1
Aggregates	3
Admixtures	3

**2.10 MEASUREMENT OF WATER**

- A. The quantity of water entering the mixer shall be measured by a suitable water meter or other measuring device of a type acceptable to the Engineer and capable of measuring the water in variable amounts within a tolerance of one percent. The water feed control mechanism shall be capable of being locked in position so as to deliver constantly any specified amount of water to each batch of concrete. A positive quick-acting valve shall be used for a cut-off in the water line to the mixer. The operating mechanism must be such that leakage will not occur when the valves are closed.

**2.11 READY-MIXED CONCRETE**

- A. At the Contractor's option, ready-mixed concrete may be used meeting the requirements as to materials, batching, mixing, transporting, and placing as specified herein and in accordance with ASTM C94, including the following supplementary requirements.
- B. Ready-mixed concrete shall be delivered to the site of the Work, and discharge shall be completed within one hour after the addition of the cement to the aggregates or before the drum has been revolved 250 revolutions, whichever is first.
- C. Truck mixers shall be equipped with electrically-actuated counters by which the number of revolutions of the drum or blades may be readily verified. The counter shall be of the resettable, recording type, and shall be mounted in the driver's cab. The counters shall be actuated at the time of starting mixers at mixing speeds.
- D. Each batch of concrete shall be mixed in a truck mixer for not less than 70 revolutions of the drum or blades at the rate of rotation designated by the manufacturer of the equipment. Additional mixing, if any, shall be at the speed designated by the manufacturer of the equipment as agitating speed. All materials including mixing water shall be in the mixer drum before actuating the revolution counter for determining the number of revolution of mixing.
- E. Truck mixers and their operation shall be such that the concrete throughout the mixed batch as discharged is within acceptable limits of uniformity with respect to consistency, mix, and grading. If slump tests taken at approximately the  $\frac{1}{4}$  and  $\frac{3}{4}$  points of the load

during discharge give slumps differing by more than one inch when the specified slump is 3 inches or less, or if they differ by more than 2 inches when the specified slump is more than 3 inches, the mixer shall not be used on the Work unless the causing condition is corrected and satisfactory performance is verified by additional slump tests. All mechanical details of the mixer, such as water measuring and discharge apparatus, condition of the blades, speed of rotation, general mechanical condition of the unit, and clearance of the drum, shall be checked before a further attempt to use the unit will be permitted.

- F. Each batch of ready-mixed concrete delivered at the job site shall be accompanied by a delivery ticket furnished to the Engineer in accordance with the Paragraph in Part 1 entitled, "Delivery Tickets."
- G. The use of non-agitating equipment for transporting ready-mixed concrete will not be permitted. Combination truck and trailer equipment for transporting ready-mixed concrete will not be permitted. The quality and quantity of materials used in ready-mixed concrete and in batch aggregates shall be subject to continuous inspection at the batching plant by the Engineer.

### **PART 3 - EXECUTION**

#### **3.01 PROPORTIONING AND MIXING**

- A. Proportioning: Proportioning of the concrete mix shall conform to the requirements of Chapter 3, "Proportioning" of ACI 301.
- B. Mixing: Mixing of concrete shall conform to the requirements of Chapter 7 of ACI 301.
- C. Slump: Maximum slumps shall be as specified herein.
- D. Retempering: Retempering of concrete or mortar, which has partially hardened, shall not be permitted.

#### **3.02 PREPARATION OF SURFACES FOR CONCRETING**

- A. General: Earth surfaces shall be thoroughly wetted by sprinkling, prior to the placing of any concrete, and these surfaces shall be kept moist by frequent sprinkling up to the time of placing concrete thereon. The surface shall be free from standing water, mud, and debris at the time of placing concrete.
- B. Joints in Concrete: Refer to SSPWC Section 302-6.5, SSPWC Section 303-1.8.6, and SSPWC Section 303-5.4 for joint requirements. Construction joints are defined as concrete surfaces upon or against which concrete is to be placed where the placement of the concrete has been stopped or interrupted so that, as determined by the Engineer, the new concrete cannot be incorporated integrally with that previously placed. The surfaces of horizontal joints shall be given a compacted, roughened surface for good bond. Except where the Drawings call for joint surfaces to be coated, the joint surfaces shall be cleaned of all laitance, loose or defective concrete, and foreign material and roughened to a minimum ¼-inch amplitude. Such cleaning and roughening shall be accomplished by hydroblasting or abrasive blasting (exposing aggregate) followed by thorough washing.

All pools of water shall be removed from the surface of construction joints before the new concrete is placed.

- C. The surface between the reservoir floor and column joint shall be screeded with a steel brush after the initial set of concrete. Screeding shall be postponed until the laitance of the concrete can be fully removed. Heavy abrasive blasting may be done in lieu of the above and with the approval of the District. Curing compounds, if used, that have been deposited in the keys shall be removed by abrasive blasting prior to pouring the footing concrete.
- D. **Placing Interruptions:** When placing of concrete is to be interrupted long enough for the concrete to take a set, the working face shall be given a shape by the use of forms or other means that will secure proper union with subsequent Work provided that construction joints shall be made only where acceptable to the Engineer.
- E. **Embedded Items:** No concrete shall be placed until all formwork, installation of parts to be embedded, reinforcement steel, and preparation of surfaces involved in the placing have been completed and accepted by the Engineer at least 4 hours before placement of concrete. All surfaces of forms and embedded items that have become encrusted with dried grout from concrete previously placed shall be cleaned of all such grout before the surrounding or adjacent concrete is placed.
- F. All inserts or other embedded items shall conform to the requirements herein.
- G. All reinforcement, anchor bolts, sleeves, inserts, and similar items shall be set and secured in the forms where shown or by shop drawings and shall be acceptable to the Engineer before any concrete is placed. Accuracy of placement is the responsibility of the Contractor.
- H. **Casting New Concrete Against Old:** Where concrete is to be cast against old concrete (any concrete which is greater than 60 days of age), the surface of the old concrete shall be thoroughly cleaned and roughened by hydro-blasting or abrasive blasting (exposing aggregate). The joint surface shall be coated with a bonding agent unless indicated otherwise by the Engineer.
- I. No concrete shall be placed in any structure until all water entering the space to be filled with concrete has been properly cut off or has been diverted by pipes, or other means, and carried out of the forms, clear of the Work. No concrete shall be deposited underwater nor shall the Contractor allow still water to rise on any concrete until the concrete has attained its initial set. Water shall not be permitted to flow over the surface of any concrete in such manner and at such velocity as will injure the surface finish of the concrete. Pumping or other necessary dewatering operations for removing groundwater, if required, will be subject to the review of the Engineer.
- J. **Corrosion Protection:** Pipe, conduit, dowels, and other ferrous items required to be embedded in concrete construction shall be so positioned and supported prior to placement of concrete that there will be a minimum of 2 inches clearance between said items and any part of the concrete reinforcement. Securing such items in position by wiring or welding them to the reinforcement will not be permitted.

- K. Openings for pipes, inserts for pipe hangers and brackets, and the setting of anchors shall, where practicable, be provided for during the placing of concrete.
- L. Anchor bolts shall be accurately set, and shall be maintained in position by templates while being embedded in concrete.
- M. Cleaning: The surfaces of all metalwork to be in contact with concrete shall be thoroughly cleaned of all dirt, grease, loose scale and rust, grout, mortar, and other foreign substances immediately before the concrete is placed.

### **3.03 HANDLING, TRANSPORTING, AND PLACING**

- A. General: Placing of concrete shall conform to the applicable requirements of Chapter 8 of ACI 301 and the requirements of this Section. No aluminum materials shall be used in conveying any concrete. Do not place concrete during rainstorms. Protect concrete placed immediately before rain to prevent rainwater from coming in contact with it. Keep sufficient protective covering on hand at all times for this purpose.
- B. Non-Conforming Work or Materials: Concrete which upon or before placing is found not to conform to the requirements specified herein shall be rejected and immediately removed from the Work. Concrete which is not placed in accordance with these Specifications or which is of inferior quality shall be removed and replaced by and at the expense of the Contractor.
- C. Unauthorized Placement: No concrete shall be placed except in the presence of duly authorized representative of the Engineer. The Contractor shall notify the Engineer in writing at least 24 hours in advance of placement of any concrete.
- D. Placement in Wall Forms: Concrete shall not be dropped through reinforcement steel or into any deep form, nor shall concrete be placed in any form in such a manner as to leave accumulation of mortar on the form surfaces above the placed concrete. In such cases, some means such as the use of hoppers and, if necessary, vertical ducts of canvas, rubber, or metal shall be used for placing concrete in the forms in a manner that it may reach the place of final deposit without separation. In no case shall the free fall of concrete exceed 8 feet below the ends of ducts, chutes, or buggies. Concrete shall be uniformly distributed during the process of depositing and in no case after depositing shall any portion be displaced in the forms more than 6 feet in horizontal direction. Concrete in forms shall be deposited in uniform horizontal layers not deeper than 2 feet; and care shall be taken to avoid inclined layers or inclined construction joints except where such are required for sloping members. Each layer shall be placed while the previous layer is still soft. The rate of placing concrete in forms shall not exceed the design rate of vertical rise. Sufficient illumination shall be provided in the interior of all forms so that the concrete at the places of deposit is visible from the deck or runway.

A wall section may be cast against an adjacent wall section after a minimum of 24 hours has elapsed after the completion of the previous wall section.

- E. Casting New Concrete Against Old: An epoxy adhesive bonding agent shall be applied to the old surfaces according to the manufacturer's written recommendations. This provision shall not apply to joints where waterstop is installed. No horizontal joints will be permitted in reservoir corewall sections.

- F. Conveyor Belts and Chutes: All ends of chutes, hopper gates, and all other points of concrete discharge throughout the Contractor's conveying, hoisting and placing system shall be so designed and arranged that concrete passing from them will not fall separated into whatever receptacle immediately receives it. Conveyor belts, if used, shall be of a type acceptable to the Engineer. Chutes longer than 50 feet will not be permitted. Minimum slopes of chutes shall be such that concrete of the specified consistency will readily flow in them. If a conveyor belt is used, it shall be wiped clean by a device operated in such a manner that none of the mortar adhering to the belt will be wasted. All conveyor belts and chutes shall be covered.
- G. Placement in Columns: Concrete in circular spirally-tied columns, having no horizontal reinforcement crossing into the region bounded by the vertical reinforcement, may be deposited from the top of the column form, at Contractor's option such that no separation of the coarse aggregate from the mortar takes place. All concrete shall be vibrated as required herein. The final quality of the poured concrete column shall be the responsibility of the Contractor. If the quality of the column is found to be unacceptable, the District, at the Contractor's expense, may require the complete removal of the column and may require that an alternate placement method be used.
- H. Placement in Reservoir Wall and Column Sections: Wall and column pours shall immediately be preceded with a cement rich concrete layer of 1-inch average thickness at walls and columns consisting of water, and 8 sacks of cement per cubic yard. Sand and fine aggregate shall be added equally to the mix with a maximum slump of 8 inches. Compressive strength of cement-rich concrete shall be the equal to that required for the remainder of the pour.
- I. Placement in Slabs: Concrete placed in sloping slabs shall proceed uniformly from the bottom of the slab to the top, for the full width of the placement. As the Work progresses, the concrete shall be vibrated and carefully worked around the slab reinforcement, and the surface of the slab shall be screeded in an up-slope direction.
- J. Temperature of Concrete: The temperature of concrete when it is being placed shall be not more than 90 degrees F nor less than 55 degrees F for sections less than 12 inches thick nor less than 50 degrees F for all other sections. Concrete ingredients shall not be heated to a temperature higher than that necessary to keep the temperature of the mixed concrete, as placed, from falling below the specified minimum temperature. When the temperature of the concrete is 85 degrees F or above, the time between the introduction of the cement to the aggregates and discharge shall not exceed 45 minutes. If concrete is placed when the weather is such that the temperature of the concrete would exceed 90 degrees F, the Contractor shall employ effective means, such as precooling of aggregates and mixing water using ice or placing at night, as necessary to maintain the temperature of the concrete, as it is placed, below 90 degrees F. The Contractor shall be entitled to no additional compensation on account of the foregoing requirements.
- K. Hot Weather Placement:
1. Hot weather is defined as any combination of high air temperature, low relative humidity and wind velocity tending to impair the quality of fresh or hardened concrete or otherwise result in abnormal concrete properties. During hot weather, any or all of the methods specified herein for temperature control of

concrete shall be used as required to maintain the concrete temperature below the limits specified.

2. Aggregate piles, cement bins and batch plant bins shall be shaded from direct rays of the sun. Aggregate piles shall be cooled by wetting with water and evaporation. Aggregate wetting shall be performed in such a manner that it will not cause wide variation in moisture content impairing slump uniformity.
3. Concrete water shall be refrigerated or ice shall be added to the mix, up to 100 percent of the water requirement. Ice shall be in such a form that it will be completely melted and dispersed throughout the mix at the completion of the mixing time. The mix time shall be held to the minimum practicable consistent with producing concrete meeting the specified requirements.
4. Elevated forms, reinforcing steel and similar members shall be cooled by fog spray and evaporation immediately prior to placing of concrete. Forms shall be free of standing water when concrete is placed.
5. Concrete shall be deposited in the Construction within 60 minutes after completion of mixing.
6. The Contractor shall provide a fog spray of water on the exposed surface of concrete prior to its initial set when site conditions produce a rate of evaporation of 0.2 lbs./sq. ft./hr. as determined by Figure 2.1.5 of ACI 305R, to prevent plastic shrinkage cracks in the concrete.
7. Fog spray shall be used after finishing and before the specified curing is commenced to avoid surface drying.
8. There shall be no additional reimbursement to the Contractor for costs incurred for placing concrete in hot weather.

L. Cold Weather Placement:

1. Placement of concrete shall conform to ACI 306.1 – Standard Specification for Code Weather Concreting, and the following.
2. Remove all snow, ice and frost from the surfaces, including reinforcement, against which concrete is to be placed. Before beginning concrete placement, thaw the subgrade to a minimum depth of 6 inches. All reinforcement and embedded items shall be warmed to above 32 degrees F prior to concrete placement.
3. Maintain the concrete temperature above 50 degrees F for at least 3 days after placement.

M. Crystalline Waterproofing Application

1. The waterproofing material shall be mixed, applied and cured as recommended by the manufacturer.



2. The surface to receive the waterproofing shall be prepared as recommended by the manufacturer. The waterproofing shall be mixed to a slurry consistency and brushed onto the surfaces specified where the waterproofing is required at a cold joint. When brushing the slurry into the substrate, it should be worked into all holes and crevices in the surface.
3. Where the waterproofing is required in a continuous groove, a slurry coat of waterproofing shall be applied to the groove surface. The prepared groove shall then be packed with a "dry pack" consistency mix flush with the surrounding surface.

### **3.04 PUMPING OF CONCRETE**

- A. General: If the pumped concrete does not produce satisfactory end results, the Contractor shall discontinue the pumping operation and proceed with the placing of concrete using conventional methods.
- B. Pumping Equipment: The pumping equipment must have 2 cylinders and be designed to operate with one cylinder only in case the other one is not functioning. In lieu of this requirement, the Contractor may have a standby pump on the site during pumping.
- C. The minimum diameter of the hose (conduits) shall be in accordance with ACI 304.2R.
- D. Pumping equipment and hoses (conduits) that are not properly functioning shall be replaced.
- E. Aluminum conduits for conveying the concrete shall not be permitted.
- F. Field Control: Concrete samples for slump, air content, and test cylinders will be taken at the placement (discharge) end of the line.
- G. Before pumping is started, prime the delivery pipe or hose by pumping mortar through the line using 5 gallons of mortar for each 50 feet of delivery line. Do not deposit mortar in forms.

### **3.05 ORDER OF PLACING CONCRETE**

- A. The order of placing concrete in all parts of the Work shall be acceptable to the Engineer. In order to minimize the effects of shrinkage, the concrete shall be placed in units as bounded by construction joints shown. The placing of units in slabs shall be done by placing alternate units in a manner such that each unit placed shall have cured at least 3 days for hydraulic structures and 2 days for all other structures before the contiguous unit or units are placed. Corner sections of vertical walls shall not be placed until the 2 adjacent wall panels have cured at least 7 days for hydraulic structures and 4 days for all other structures.
- B. The surface of the concrete shall be level whenever a run of concrete is stopped. To insure a level, straight joint on the exposed surface of walls, a wood strip at least ¾-inch thick shall be tacked to the forms on these surfaces. The concrete shall be carried about ½-inch above the underside of the strip. About one hour after the concrete is placed, the

strip shall be removed and any irregularities in the edge formed by the strip shall be leveled with a trowel and all laitance shall be removed.

### **3.06 TAMPING AND VIBRATING**

- A. As concrete is placed in the forms or in excavations, it shall be thoroughly settled and compacted, throughout the entire depth of the layer which is being consolidated, into a dense, homogenous mass, filling all corners and angles, thoroughly embedding the reinforcement, eliminating rock pockets, and bringing only a slight excess of water to the exposed surface of concrete during placement. Vibrators shall be Group 3 (per ACI 309) high speed power vibrators (8,000 to 12,000 rpm) of an immersion type in sufficient number and with (at least one) standby units as required. Group 2 vibrators may be used only at specific locations when accepted by the Engineer.
- B. Care shall be used in placing concrete around waterstops. The concrete shall be carefully worked by rodding and vibrating to make sure that all air and rock pockets have been eliminated. Where flat-strip type waterstops are placed horizontally, the concrete shall be worked under the waterstops by hand, making sure that all air and rock pockets have been eliminated. Concrete surrounding the waterstops shall be given additional vibration, over and above that used for adjacent concrete placement to assure complete embedment of the waterstops in the concrete.
- C. Concrete in walls and columns shall be internally vibrated and at the same time rammed, stirred, or worked with suitable appliances, tamping bars, shovels, or forked tools until it completely fills the forms or excavations and closes snugly against all surfaces. Subsequent layers of concrete shall not be placed until the layers previously placed have been worked thoroughly as specified. Vibrators shall be provided in sufficient numbers, with standby units as required, to accomplish the results herein specified within 15 minutes after concrete of the prescribed consistency is placed in the forms. Each layer of concrete in walls and columns shall be vibrated thoroughly before the next layer may be placed thereon. Vibrators shall be taken through the top layer down through the full layer thickness below to insure proper integration of the concrete and to avoid the development of cold joints and honeycomb between the layers. In other words, each layer of concrete shall be vibrated at least twice. The vibrating head shall be kept from contact with the surfaces of the forms. Care shall be taken not to vibrate concrete excessively or to work it in any manner that causes segregation of its constituents.
- D. Vibration shall be performed at each required pour window opening in the form wall for the reservoir and elsewhere, where occurs.

### **3.07 FINISHING CONCRETE SURFACES**

- A. General: Surfaces shall be free from fins, bulges, ridges, offsets, honeycombing, or roughness of any kind, and shall present a finished, smooth, continuous hard surface. Allowable deviations from plumb or level and from the alignment, profiles, and dimensions shown are defined as tolerances and are specified in Part 1, herein. These tolerances are to be distinguished from irregularities in finish as described herein. Aluminum finishing tools shall not be used.

- B. Formed Surfaces: No treatment is required after form removal except for curing, repair of defective concrete, and treatment of surface defects. Where architectural finish is required, it shall be as specified or shown.
  - 1. Surface holes larger than 1/2-inch in diameter or deeper than 1/4-inch are defined as surface defects in basins and exposed walls.
  
- C. Unformed Surfaces: After proper and adequate vibration and tamping, all unformed top or permanently exposed surfaces of slabs, floors, walls, and curbs shall be brought to a uniform surface with suitable tools. Immediately after the concrete has been screeded, it shall be treated with a liquid evaporation retardant. The retardant shall be used again after each work operation as necessary to prevent drying shrinkage cracks. The classes of finish specified for unformed concrete surfaces are designated and defined as follows:
  - 1. Finish U1 – Sufficient leveling and screeding to produce an even, uniform surface with surface irregularities not to exceed 3/8-inch. No further special finish is required.
  - 2. Finish U2 – After sufficient stiffening of the screeded concrete, surfaces shall be float finished with wood or metal floats or with a finishing machine using float blades. Excessive floating of surfaces while the concrete is plastic and dusting of dry cement and sand on the concrete surface to absorb excess moisture will not be permitted. Floating shall be the minimum necessary to produce a surface that is free from screed marks and is uniform in texture. Surface irregularities shall not exceed 1/4-inch. Joints and edges shall be tooled where shown or as determined by the Engineer. Floating shall be performed as soon as possible to prevent premature drying of the surface prior to applying the required curing membrane.
  - 3. Finish U3 – After the floated surface (as specified for Finish U2) has hardened sufficiently to prevent excess of fine material from being drawn to the surface, steel troweling shall be performed with firm pressure such as will flatten the sandy texture of the floated surface and produce a dense, uniform surface free from blemishes, ripples, and trowel marks. The finish shall be smooth and free of all irregularities.
  - 4. Finish U4 – Steel trowel finish (as specified for Finish U3) without local depressions or high points. In addition, the surface shall be given a medium-broom finish with brooming perpendicular to drainage unless otherwise shown. The resulting surface shall be rough enough to provide a non-skid finish.
  
- D. Unformed surfaces shall be finished according to the following schedule:

UNFORMED SURFACE FINISH SCHEDULE

Area	Finish
Grade slabs and foundations to be covered with concrete or fill material	U1
Floors to be covered with grouted tile or topping grout	U2

Slabs or footings which are water bearing with slopes 10 percent or less	U3
Sloping slabs which are water bearing with slopes greater than 10 percent	U4
Slabs not water bearing	U4
Slabs to be covered with built-up roofing	U2

## UNFORMED SURFACE FINISH SCHEDULE

Area	Finish
Interior slabs and floors to receive architectural finish	U3
Top surface of walls	U3

**3.08 CURING**

- A. General: All concrete shall be cured for not less than 7 days after placing, in accordance with the methods specified herein for the different parts of the Work, and described in detail in the following paragraphs:

Surface to be Cured	Method
Unstripped forms	1
Wall sections and columns with forms removed	3
Construction joints between floor and walls, and between floor slab and columns	3
Easement concrete and thrust blocks	2
All concrete surfaces not specifically provided for elsewhere in this Paragraph	4
Floor slabs on grade in hydraulic structures, wall and column footings	5
Slabs not on grade	5

- B. Method 1: Wooden forms shall be wetted immediately after concrete has been placed and shall be kept wet with water until removed. If steel forms are used the exposed concrete surfaces shall be kept continuously wet until the forms are removed. If forms are removed within 7 days of placing the concrete, curing shall be continued in accordance with Method 5, herein.
- C. Method 2: The surface shall be covered with moist earth not less than 4 hours, nor more than 24 hours, after the concrete is placed. Earthwork operations that may damage the concrete shall not begin until at least 7 days after placement of concrete.
- D. Method 3: The surface shall be sprayed with a liquid curing compound.

1. It shall be applied in accordance with the manufacturer's printed instructions at a maximum coverage rate of 200 square feet per gallon and in such a manner as to cover the surface with a uniform film which will seal thoroughly.
2. Where the curing compound method is used, care should be exercised to avoid damage to the seal during the 7-day curing period. Should the seal be damaged or broken before the expiration of the curing period, the break shall be repaired immediately by the application of additional curing compound over the damaged portion.
3. Wherever curing compound may have been applied by mistake to surfaces against which concrete subsequently is to be placed and to which it is to adhere, said compound shall be entirely removed by wet sandblasting just prior to the placing of new concrete.
4. Where curing compound is specified, it shall be applied as soon as the concrete has hardened enough to prevent marring or unformed surfaces, and within 2 hours after removal of forms from formed surfaces. Repairs required to be made to formed surfaces shall be made within the said 2-hour period; provided, however, that any such repairs which cannot be made within the said 2-hour period shall be delayed until after the curing compound has been applied. When repairs are to be made to an area on which curing compound has been applied, the area involved shall first be wet-sandblasted to remove the curing compound, prior to the repairs shall be made as specified herein.
5. At all locations where concrete is placed adjacent to a panel which has been coated with curing compound, the previously coated panel shall have curing compound reapplied to an area within 6 feet of the joint and to any other location where the curing membrane has been disturbed.
6. Prior to final acceptance of the Work, all visible traces of curing compound shall be removed from all surfaces in such a manner that does not damage surface finish.

E. Method 4:

1. Until the concrete surface is covered with curing compound, the entire surface shall be kept damp by applying water, using nozzles that atomize the flow so that the surface is not marred or washed. The concrete shall be given a coat of curing compound in accordance with Method 3, herein. Not less than one hour nor more than 4 hours after the coat of curing compound has been applied, the surface shall be wetted with water delivered through a fog nozzle, and concrete-curing blankets shall be placed on the slabs. The curing blankets shall be polyethylene sheet, polyethylene-coated waterproof paper sheeting or polyethylene-coated burlap. The blankets shall be laid with the edges butted together and the joints between strips sealed with 2-inch wide strips of sealing tape or with edges lapped not less than 3 inches and fastened together with a waterproof cement to form a continuous watertight joint.
2. The curing blankets shall be left in place during the 7-day curing period and shall not be removed until after concrete for adjacent Work has been placed. Should

the curing blankets become torn or otherwise ineffective, the Contractor shall replace damaged sections. During the first 3 days of the curing period, no traffic of any nature and no depositing, temporary or otherwise, of any materials shall be permitted on the curing blankets. During the remainder of the curing period, foot traffic and temporary depositing of materials that impose light pressure will be permitted only on top of plywood sheets 5/8-inch minimum thickness, laid over the curing blanket. The Contractor shall add water under the curing blanket as often as necessary to maintain damp concrete surfaces at all times.

- F. Method 5: This method applies to both walls and slabs.
1. The concrete shall be kept continuously wet by the application of water for a minimum period of at least 7 consecutive days beginning immediately after the concrete has reached final set or forms have been removed.
  2. Until the concrete surface is covered with the curing medium, the entire surface shall be kept damp by applying water, using nozzles that atomize the flow so that the surface is not marred or washed.
  3. Heavy curing mats shall be used as a curing medium to retain the moisture during the curing period. The curing medium shall be weighted or otherwise held in place to prevent being dislodged by wind or any other causes and to be substantially in contact with the concrete surface. All edges shall be continuously held in place.
  4. The curing blankets and concrete shall be kept continuously wet by the use of sprinklers or other means both during and after normal working hours.
  5. Immediately after the application of water has terminated at the end of the curing period, the curing medium shall be removed, any dry spots shall be rewetted, and curing compound shall be immediately applied in accordance with Method 4 herein.
  6. The Contractor shall dispose of excess water from the curing operation to avoid damaged to the Work.

### **3.09 PROTECTION**

- A. The Contractor shall protect all concrete against injury until final acceptance by the Engineer.
- B. Fresh concrete shall be protected from damage due to rain, hail, sleet, or snow. The Contractor shall provide such protection while the concrete is still plastic and whenever such precipitation is imminent or occurring.

### **3.10 CURING IN COLD WEATHER**

- A. Water curing of concrete may be reduced to 6 days during periods when the mean daily temperature in the vicinity of the worksite is less than 40 degrees F; provided that, during

the prescribed period of water curing, when temperatures are such that concrete surfaces may freeze, water curing shall be temporarily discontinued.

- B. Concrete cured by an application of curing compound will require no additional protection from freezing if the protection at 50 degrees F for 72 hours is obtained by means of approved insulation in contact with the forms of concrete surfaces; otherwise the concrete shall be protected against freezing temperatures for 72 hours immediately following 72 hours protection at 50 degrees F. Concrete cured by water curing shall be protected against freezing temperatures for 3 days immediately following the 72 hours of protection at 50 degrees F.
- C. Discontinuance of protection against freezing temperatures shall be such that the drop in temperature of any portion of the concrete will be gradual and will not exceed 40 degrees F in 24 hours. In the spring, when the mean daily temperature rises above 40 degrees F for more than 3 successive days, the specified 72-hour protection at a temperature not lower than 50 degrees F may be discontinued for as long as the mean daily temperature remains above 40 degrees F; provided, that the concrete shall be protected against freezing temperatures for not less than 48 hours after placement.
- D. Where artificial heat is employed, special care shall be taken to prevent the concrete from drying. Use of unvented heaters will be permitted only when unformed surfaces of concrete adjacent to the heaters are protected for the first 24 hours from an excessive carbon dioxide atmosphere by application of curing compound; provided, that the use of curing compound for such surfaces is otherwise permitted by these specifications.

### 3.11 TREATMENT OF SURFACE DEFECTS

- A. As soon as forms are removed, all exposed surfaces shall be carefully examined and any irregularities shall be immediately rubbed or ground in a satisfactory manner in order to secure a smooth, uniform, and continuous surface. Plastering or coating of surfaces to be smoothed will not be permitted. No repairs shall be made until after inspection by the Engineer. In no case will extensive patching of honeycombed concrete be permitted. Concrete containing minor voids, holes, honeycombing, or similar depression defects shall have them repaired as specified herein. Concrete containing extensive voids, holes, honeycombing, or similar depression defects, shall be completely removed and replaced. The Contractor, at its own expense, shall promptly execute all repairs and replacements herein specified after inspection by the Engineer.
- B. Defective surfaces to be repaired shall be cut back from trueline a minimum depth of ½ inch over the entire area. Feathered edges will not be permitted. Where chipping or cutting tools are not required in order to deepen the area properly, the surface shall be prepared for bonding by the removal of laitance or soft material, and not less than 1/32 inch depth of the surface film from all hard portions, by means of an efficient sandblast. After cutting and sandblasting, the surface shall be wetted sufficiently in advance of shooting with shotcrete or with cement mortar so that while the repair material is being applied, the surfaces under repair will remain moist, but not so wet as to overcome the suction upon which a good bond depends. The material used for repair proposed shall consist of a mixture of one sack of cement to 3 cubic feet of sand. For exposed walls, the cement shall contain such a proportion of Atlas white portland cement as is required to make the color of the patch match the color of surrounding concrete.

- C. Holes left by tie-rod cones shall be reamed with suitable toothed reamers so as to leave the surfaces of the holes clean and rough. These holes then shall be repaired in an approved manner with dry-packed cement grout. Holes left by form-tying devices having a rectangular cross-section, and other imperfections having a depth greater than their last surface dimension, shall not be reamed but shall be repaired in an approved manner with dry-packed cement grout.
- D. All repairs shall be built up and shaped in such a manner that the completed Work will conform to the requirements of this Section, as applicable, using approved methods which will not disturb the bond, cause sagging, or cause horizontal fractures. Surfaces of said repairs shall receive the same kind and amount of curing treatment as required for the concrete in the repaired section.
- E. Prior to filling any structure with water, all cracks that may have developed shall be "vee'd" and filled with sealant conforming to the requirements of SSPWC Section 302-6.5, SSPWC Section 303-1.8.6, and SSPWC Section 303-5.4 for joint requirements. This repair method shall be done on the water bearing face of members. Prior to backfilling, faces of members in contact with fill, which are not covered with a waterproofing membrane, shall also have cracks repaired as specified herein.

### **3.12 PATCHING HOLES IN CONCRETE**

- A. Patching Small Holes:
  - 1. Holes which are less than 12 inches in their least dimension and extend completely through concrete members shall be filled as specified herein.
  - 2. Small holes in members which are water-bearing or in contact with soil or other fill material shall be filled with non-shrink grout. Where a face of the member is exposed to view, the non-shrink grout shall be held back 2 inches from the finished surface. The remaining 2 inches shall then be patched according to the Paragraph in Part 3 entitled "Treatment of Surface Defects".
  - 3. Small holes through all other concrete members shall be filled with non-shrink grout, with exposed faces treated as above.
- B. Patching Large Holes:
  - 1. Holes which are larger than 12 inches in their least dimension, shall have a keyway chipped into the edge of the opening all around, unless a formed keyway exists. The holes shall then be filled with concrete as specified herein.
  - 2. Holes which are larger than 24 inches in their least dimension and which do not have reinforcing steel extending from the existing concrete, shall have reinforcing steel set in grout in drilled holes. The reinforcing added shall match the reinforcing in the existing section unless ordered otherwise.

### **3.13 CARE AND REPAIR OF CONCRETE**

The Contractor shall protect all concrete against injury or damage from excessive heat, lack of moisture, overstress, or any other cause until final acceptance by the Engineer. Particular care



shall be taken to prevent the drying of concrete and to avoid roughening or otherwise damaging the surface. Any concrete found to be damaged, or which may have been originally defective, or which becomes defective at any time prior to the final acceptance of the completed Work, or which departs from the established line or grade, or which, for any other reason, does not conform to the requirements of the Contract Documents, shall be satisfactorily repaired or removed and replaced with acceptable concrete at the Contractor's expense.

**END OF SECTION**

**SECTION 03315****GROUT****PART 1 - GENERAL****1.01 DESCRIPTION**

- A. The Contractor shall furnish all materials for grout in accordance with the provisions of this Section and shall form, mix, place, cure, repair, finish, and do all other Work as required to produce finished grout, in accordance with the requirements of the Contract Documents. The Contract Documents shall take precedence over these specifications.
- B. The following type of grout shall be covered in this Section:
  - 1. Non-Shrink Grout: This type of grout is to be used wherever grout is shown in the Contract Documents, unless another type is specifically referenced.
  - 2. Cement Grout
  - 3. Epoxy Grout

**1.02 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS**

The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.

CRD-C 621	Corps of Engineers Specification for Non-Shrink Grout
ASTM C 109	Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in or 50-mm Cube Specimens)
ASTM C 531	Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical- Resistant Mortars, Grouts, and Monolithic Surfaces
ASTM C 579	Test Methods for Compressive Strength of Chemical-Resistant Mortars and Monolithic Surfaces
ASTM C 827	Test Method for Early Volume Change of Cementitious Mixtures
ASTM D 696	Test Method for Coefficient of Linear Thermal Expansion of Plastics

**1.03 RELATED WORK SPECIFIED ELSEWHERE**

- A. Section 01300 – Contractor Submittals
- B. Section 01410 – Testing Laboratory Services
- C. Section 03300 – Cast-In-Place Concrete

## **1.04 CONTRACTOR SUBMITTALS**

The Contractor shall submit certified test results verifying the compressive strength, shrinkage, and expansion requirements specified herein; and manufacturer's literature containing instructions and recommendations on the mixing, handling, placement and appropriate uses for each type of non-shrink and epoxy grout used in the Work.

## **1.05 QUALITY ASSURANCE**

### **A. Field Tests:**

1. Compression test specimens will be taken during construction from the first placement of each type of grout, and at intervals thereafter as selected by the Engineer to insure continued compliance with these specifications.
2. Compression tests and fabrication of specimens for cement grout and non-shrink grout will be performed as specified in ASTM C109 at intervals during construction as selected by the Engineer. A set of three specimens will be made for testing at 7 days, 28 days, and each additional time period as appropriate.
3. Compression tests and fabrication of specimens for epoxy grout will be performed as specified in ASTM C579, Method B, at intervals during construction as selected by the Engineer. A set of three specimens will be made for testing at 7 days, and each earlier time period as appropriate.
4. All grout, already placed, which fails to meet the requirements of these specifications, is subject to removal and replacement at the cost of the Contractor.
5. The cost of all laboratory tests on grout will be borne by the Contractor. The Contractor shall supply all materials necessary for fabricating the test specimens.

**B. Construction Tolerances:** Construction tolerances shall be as specified in the Section 03300 except as modified herein and elsewhere in the Contract Documents.

## **PART 2 - PRODUCTS**

### **2.01 CEMENT GROUT**

- A. Cement Grout:** Cement grout shall be composed of one part cement, three parts sand, and the minimum amount of water necessary to obtain the desired consistency. Where needed to match the color of adjacent concrete, white portland cement shall be blended with regular cement as needed. The minimum compressive strength at 28 days shall be 4000 psi.
- B. Cement grout materials shall be as specified in Section 03300.**

### **2.02 PREPACKAGED GROUTS**

- A. Non-Shrink Grout:**

1. Non-shrink grout shall be prepackaged, inorganic, non-gas-liberating, non-metallic, cement-based grout requiring only the addition of water. Manufacturer's instructions shall be printed on each bag or other container in which the materials are packaged. The specific formulation for each class of non-shrink grout specified herein shall be that recommended by the manufacturer for the particular application.
  2. Class A non-shrink grouts shall have a minimum 28-day compressive strength of 5000 psi; shall have no shrinkage (0.0 percent) and a maximum 4.0 percent expansion in the plastic state when tested in accordance with ASTM C-827; and shall have no shrinkage (0.0 percent) and a maximum of 0.2 percent expansion in the hardened state when tested in accordance with CRD C 621.
  3. Class B non-shrink grouts shall have a minimum 28-day compressive strength of 5000 psi and shall meet the requirements of CRD C 621.
  4. Application:
    - a. Class A non-shrink grout shall be used for the repair of all holes and defects in concrete members which are water bearing or in contact with soil or other fill material, grouting under all equipment base plates, and at locations where grout is specified in the contract documents; except, for those applications for Class B non-shrink grout and epoxy grout specified herein. Class A non-shrink grout may be used in place of Class B non-shrink grout for all applications.
    - b. Class B non-shrink grout shall be used for the repair of all holes and defects in concrete members which are not water-bearing and not in contact with soil or other fill material, and grouting under all base plates for structural steel members.
- B. Epoxy Grout:
1. Application: Epoxy grout shall be used to embed all anchor bolts and reinforcing steel required to be set in grout, and for all other applications required in the Contract Documents.
  2. Epoxy grout shall be a pourable, non-shrink, 100 percent solids system. The epoxy grout system shall have three components: resin, hardener, and especially blended aggregate, all premeasured and prepackaged. The resin component shall not contain any non-reactive diluents. Resins containing butyl glycidyl ether (BGE) or other highly volatile and hazardous reactive diluents are not acceptable. Variation of component ratios is not permitted unless specifically recommended by the manufacturer. Manufacturer's instructions shall be printed on each container in which the materials are packaged.
  3. The chemical formulation of the epoxy grout shall be that recommended by the manufacturer for the particular application.
  4. The mixed epoxy grout system shall have a minimum working life of 45 minutes at 75 degrees F.

5. The epoxy grout shall develop a compressive strength of 5,000 psi in 24 hours and 10,000 psi in seven days when tested in accordance with ASTM C579, Method B. There shall be no shrinkage (0.0 percent) and a maximum 4.0 percent expansion when tested in accordance with ASTM C827.
6. Epoxy grout shall be BurkEpoxy Anchoring Grout by the Burke Company, Hilti HY-150, Simpson SET or I.C.B.O. approved equal.

### **2.03 CURING MATERIALS**

Curing materials shall be as specified in Section 03300 for cement grout and as recommended by the manufacturer of prepackaged grouts.

### **2.04 CONSISTENCY**

- A. The consistency of grouts shall be that necessary to completely fill the space to be grouted for the particular application. Dry pack consistency is such that the grout is plastic and moldable, but will not flow. Where "dry pack" is called for in the Contract Documents, it shall mean a grout of that consistency; the type of grout to be used shall be as specified herein for the particular application.
- B. The slump for topping grout and concrete fill shall be adjusted to match placement and finishing conditions, but shall not exceed 4 inches.

### **2.05 MEASUREMENT OF INGREDIENTS**

- A. Measurements for cement grout shall be made accurately by volume using containers. Shovel measurement shall not be allowed.
- B. Prepackaged grouts shall have ingredients measured by means recommended by the manufacturer.

## **PART 3 - EXECUTION**

### **3.01 GENERAL**

- A. All surface preparation, curing, and protection of cement grout shall be as specified in Section 03300. The finish of the grout surface shall match that of the adjacent concrete.
- B. The manufacturer of Class A non-shrink grout and epoxy shall provide on-site technical assistance upon request.
- C. Base concrete must have attained its design strength before grout is placed, unless authorized by the Engineer.

### **3.02 GROUTING PROCEDURES**

- A. Prepackaged Grouts: All mixing, surface preparation, handling, placing, consolidation, curing, and other means of execution for prepackaged grouts shall be done according to the instructions and recommendations of the manufacturer.

**B. Base Plate Grouting:**

1. For base plates, the original concrete shall be blocked out or finished off a sufficient distance below the plate to provide for a one-inch thickness of grout or a thickness as shown on the Drawings.
2. After the base plate has been set in position at the proper elevation by steel wedges or double nuts on the anchor bolts, the space between the bottom of the plate and original pour of concrete shall be filled with non-shrink-type grout. The mixture shall be a trowelable consistency and tamped or rodded solidly into the space between the plate and the base concrete. A backing board or stop shall be provided at the back side of the space to be filled with grout. Where this method of placement is not practical or where required by the Engineer, alternate grouting methods shall be submitted for acceptance by the Engineer.

**3.03 CONSOLIDATION**

Grout shall be placed in such a manner, for the consistency necessary for each application, so as to assure that the space to be grouted is completely filled.

**END OF SECTION**

**SECTION 03460****PRECAST CONCRETE SEWER MANHOLES****PART 1 - GENERAL****1.01 DESCRIPTION**

- A. The CONTRACTOR shall provide precast concrete sewer manholes, also referred to as access holes, complete and in place, in accordance with the DISTRICT standard drawings.

**1.02 RELATED SECTIONS**

- A. The Work of the following Sections applies to the Work of this Section. Other Sections, not referenced below, shall also apply to the extent required for proper performance of this Work.
1. Section 01300 – Shop Drawings and Submittals
  2. Section 02350 – Excavation Support Systems
  3. Section 03300 – Cast-in-Place Concrete
  4. Section 09801 – Manhole Lining

**1.03 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS**

- A. The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.
1. ASTM A48 – Standard Specification for Gray Iron Castings
  2. ASTM C478 – Standard Specification for Circular Precast Reinforced Concrete Manhole Sections
  3. ASTM C923 – Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals
  4. ASTM C1244 – Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill
  5. Standard Specifications for Public Works Construction (SSPWC), “Greenbook”

**1.04 SUBMITTALS**

- A. All submittals shall be submitted in accordance with Section 01300, “Shop Drawings and Submittals”.
- B. Submit manufacturer’s catalog data on precast concrete manholes, frames, and covers. Show dimensions, reinforcing, concrete mix design and materials of construction by ASTM reference and grade. Show lettering on manhole covers.

- C. Design calculations showing design for concrete member thicknesses and reinforcement.
- D. Shop drawings shall show dimensions, locations, lifting inserts, reinforcement, and joints.
- E. Submit manufacturer's data sheets on ductile iron pipe, joints, and fittings including dimensions, wall thickness, weight, coating, lining, and deflections at push-on and mechanical joints.

## 1.05 QUALITY ASSURANCE

- A. After installation, the CONTRACTOR shall demonstrate that manholes have been properly installed, level, with tight joints, at the correct elevations and orientations, and that the backfilling has been carried out in accordance with the Contract Documents.

## PART 2 - MATERIALS

### 2.01 MANHOLES

- A. The CONTRACTOR shall provide precast manhole sections and conical sections conforming to ASTM C478 and the requirements of this Section. Adjusting rings shall be standard items from the manufacturer of the manhole sections. Minimum wall thickness of rings shall be 1/8 of the internal diameter of the riser or largest cone diameter.
- B. Axial length of sections shall be selected to provide the correct total height with the fewest joints and shall be in accordance with the Standard Drawings.
- C. Conical sections shall be designed to support cast iron frames and covers under an AASHTO HS-20 vehicle loading, unless indicated otherwise.
- D. Sewer manhole sections shall be cast without ladder rungs.
- E. Design Criteria: Manhole walls, transitions, conical sections, and base shall be designed per ASTM C478 for the depths indicated and the following:
  - 1. AASHTO HS-20 vehicle loading applied to the cover.
  - 2. Unit weight of soil of 120 pcf located above all buried portions of the manhole.
  - 3. Lateral soil pressure based on saturated soil producing 100 pcf acting on an empty manhole.
  - 4. Lateral soil pressure due to surcharge loading based on AASHTO HS-20 loading applied adjacent to the manhole.
  - 5. Internal fluid pressure based on weight of 63 pcf with manhole filled from invert to cover with no balancing external soil pressure.
  - 6. Dead load of manhole sections fully supported by the base and transition.
  - 7. The minimum allowable steel shall be hoops of No. 4 wire. Add reinforcing steel in walls to transfer stresses at openings.



8. The minimum clear distance between the edges of any 2 wall penetrations shall be 12-inches or one-half of the diameter of the smaller penetration, whichever is greater.
  9. All manholes on sewer pipelines, all drop manholes, regardless of size and all force main terminal manholes shall be coated with a lining system per specification section 09801, "Manhole Lining".
- F. Joint sealing compound shall be a butyl rubber sealant material in a flexible rope or rolled form with removable wrapper sized to fit into the key manhole sections.
1. Concrete for base and channel formation and precast concrete sections shall be concrete conforming to the Standard Specifications and shall meet the following minimum mix design requirements of SSPWC Section 201-1: All applications shall use a minimum of Class 560-C-3250 concrete, unless otherwise shown on the Drawings or as directed by the DISTRICT.
    - a. Mix design requirements for 560-C-3250 concrete shall be in conformance with SSPWC Section 201-1.1.2.
    - b. The maximum slump shall be 4" to 5".
    - c. The maximum water/cement ratio shall be 0.50 by weight.
  2. All applications where concrete is anticipated to experience moderate or severe exposure to sulfates shall use the special exposure mixes of SSPWC Table 201-1.1.3.
    - a. Moderate exposure applications shall conform to Special Exposure 658-CME-4500P.
    - b. Severe exposure applications shall conform to Special Exposure 658-CSE-5000P.
    - c. The maximum water/cement ratio for Special Exposure conditions shall be in conformance with SSPWC Table 201-1.1.3.
- G. Refer to Standard Specification Section 03300 for additional concrete and reinforcing material requirements.
- H. Repair mortar and an epoxy bonding agent shall be used to repair minor surface damage to precast sections or cast-in-place manhole bases at the discretion of the DISTRICT. Repair products shall be in accordance with Standard Specifications Section 03740.
- I. Barrel section to sewer pipe connections shall be sealed with manhole stop rings complying with ASTM C923, not extruded, as manufactured Newby Rubber Inc., or approved equal.
- J. Drop manholes, if approved by the DISTRICT, shall conform to the applicable provisions for precast manholes as specified herein.
- K. An approved seal or waterstop shall be placed over the plastic sewer main at the manholes per DISTRICT standard drawings.
- L. Manhole Manufacturers per the Approved Materials List.

## 2.02 MANHOLE FRAMES AND COVERS

- A. Manhole frames shall be 36 inches in diameter with two concentric covers, made of cast-iron in accordance with ASTM A48 Class 30 and the Standard Drawings. Covers shall incorporate a “pic-hole” for lifting purposes.
  - 1. Locking frames and covers may be required in areas located outside the public right of way, in remote areas or when determined by the DISTRICT.
- B. Frames and covers shall be designed for HS-20 highway wheel loading.
  - 1. Manhole frame and cover shall be per District Standard Drawing S-14 to S-15.
- C. Covers shall be cast with the words “RINCON” and “SEWER”. No other lettering will be permitted on the top portion of the cover.
- D. Casting shall be smooth, clean, and free from blisters, blowholes, and shrinkage. Mating surfaces of the frame and cover shall be machined smooth and true to prevent rocking and lateral movement of the lid. Frames and covers shall be match marked in sets before shipping to the site.
- E. All castings shall be dipped twice in a preparation of asphalt or coal tar and oil applied at a temperature of not less than 290 degrees F nor more than 310 degrees F and in such a manner as to form a firm and tenacious coating.
- F. Castings Manufacturers per the Approved Materials List.

## 2.03 MANHOLE LINING

- A. New manholes shall be lined in accordance with the specification Section 09801.

## PART 3 - EXECUTION

### 3.01 GENERAL

- A. Pre-cast concrete sections shall be transported and handled with care in accordance with the manufacturer’s written recommendations. Where lifting devices are provided in pre-cast sections, such lifting devices shall be used as intended. Where no lifting devices are provided, the CONTRACTOR shall follow the manufacturer’s recommendations for lifting procedures to provide proper support during lifting.
- B. The manhole base shall be poured in place against a minimum of 6-inches of 3/4” crushed rock base situated on undisturbed soil. The manhole stubs and sewer main shall be set before the concrete is placed and shall be rechecked for alignment and grade before the concrete has set. The various sized inlets and outlets to the manhole shall be located as indicated on the Approved Plans. The manhole base shall extend 10 inches below the bottom of the lowest pipe. Invert elevations of connecting sewers may vary depending upon sizes. When intercepting flows from smaller pipelines in manholes, set invert of the smaller mains at  $\frac{3}{4}$  of the depth of the larger main.

- C. The invert of the manhole base shall be hard worked so as to provide channels conforming in size and shape to the lower portions of the inlets and outlets. The channel shall vary uniformly in size and shape from inlet to outlet and be constructed higher than pipe as indicated on the Approved Plans. The manhole invert channels shall be smooth and accurately shaped. Channels may be formed directly in the concrete base. All transitions shall be smooth and of the proper radius to give an uninterrupted transition of flow. The concrete base shall be shaped with a wood float and shall receive a hard-steel trowel finish prior to the concrete setting.
- D. In the event additional mortar is required after initial set has taken place, the surface to receive the mortar shall be primed with Sika Armatec 1C or approved equal in the amounts and proportions recommended by the manufacturer. The bases shall set a minimum of 24 hours before the manhole construction is continued.
- E. Straight through channels in manholes with no tributaries may have SDR 35 PVC pipe installed through the manhole. The top section of pipe shall be removed flush with top of shelf. All cuts shall be neat and dressed minimizing burrs and rough edges.
- F. Each manhole section shall be sealed with butyl rubber sealant rope (see Standard Detail S-5) to make a watertight joint, shall be neatly banded on the inside and outside and shall be set plumb. All manholes shall be vacuum tested in accordance with the procedures specified herein in Paragraph 3.03 of this Section.
- G. Sections of various height grade rings shall be used in order to bring the top of the manhole ring and cover to the elevation on the Approved Plans but limited to a maximum of 18 inches of grade ring. The precast concrete manhole rings shall be jointed with a minimum thickness of ½ inch of Portland cement mortar along with butyl rubber sealant rope. Mortar shall be composed of one part Portland cement to two parts clean well-graded sand of such size that all pass a No. 8 sieve. Preformed, cold applied ready-to-use plastic joint sealing compound may be substituted for mortar between units and shall be used when ground water is encountered.
- H. The finished elevations at which the manhole frames and covers are to be set shall conform to the requirements set forth in the Approved Plans. Where the frame and cover are in existing pavement or in the traveled way of the existing road shoulder, it is to be placed flush with the existing surface. When the structure is outside the limits of the traveled shoulder but not in the roadside ditch, it should be placed 1/10-foot above the existing ground surface.
- I. Where the manhole cover falls in the existing roadside ditch or easement right-of-way “offsite”, it is to be placed approximately 6-inches above the existing ground surface. Manhole frames shall be set at the required grade and shall be securely attached to the top precast manhole shaft unit with a cement-mortar bed and fillet. After the frames are securely set-in place, covers shall be installed and all necessary cleaning and scraping of foreign materials from the frames and cover shall be accomplished to ensure a satisfactory fit.
  - 1. Damp-proof material shall be applied, when ground water is present or anticipated and at the discretion of the DISTRICT, to the exterior surfaces of manholes in accordance with the manufacturer’s recommendations. The material shall be applied to all exterior surfaces below a point one foot above the maximum water

table or indications of seepage or moisture as directed by the DISTRICT. Use water-proofing material for exterior surface when below ground water, or as required by DISTRICT.

2. Selected clean backfill material shall be used around all manholes and shall be non-reactive with concrete. It shall be compacted by pneumatic tampers unless shown otherwise on the Approved Plans.
3. A concrete ring shall be cast around manhole frames to within 3” of finished grade and capped with asphalt, as shown on the Approved Plans. The ring shall be placed after the final grading or paving together with the final cleanup.

### **3.02 WATER-TIGHTNESS OF MANHOLES**

- A. All manholes and appurtenances shall be watertight and free from infiltration. All manhole joints shall use butyl rubber sealant material to provide a watertight seal and shall comply with the vacuum test requirements specified herein in Paragraph 3.03 of this Section. Sections of manholes below ground water levels or anticipated ground water levels shall have sealant material installed on the external surface.

### **3.03 VACUUM TESTING OF MANHOLES**

- A. All sewer manholes shall be vacuum tested in accordance with the requirements specified herein and in accordance with ASTM C1244.
- B. Vacuum testing equipment shall be as manufactured by P.A. Glazier, Inc. or approved equal.
- C. Manholes shall be tested after assembly and prior to mortaring the joints or backfilling. In case of manholes incorporating a PVC liner, the testing is to take place prior to mortaring the joints, welding the liner seams between sections, and backfilling.
- D. All lift holes shall be plugged with an approved grout prior to testing. All pipes entering the manhole shall be plugged and bracing installed to prevent the plug from being drawn into the manhole. The test head shall be placed inside the top of the cone section and the seal inflated in accordance with the manufacture’s recommendations. A vacuum of 10 inches of mercury shall be drawn. The time shall be measured for the vacuum to drop 9-inches. The manhole shall pass the test if the time taken for the drop is greater than 60 seconds. If the manhole fails the test, necessary repairs shall be made, and the test repeated until acceptable results are obtained. The leak(s) shall be located and repaired, according to the type of leak, with material in-kind.

### **3.04 PULL TESTING OF PVC LINED MANHOLES**

- A. PVC lined manholes shall have field-welded joints pull tested. Field welds shall withstand a pull test of at least 100 lbs per linear inch, applied perpendicularly to the concrete surface for a period of one minute, without evidence of cracks or separations. This test shall be conducted at a temperature of 70°F to 80°F inclusive.

**3.05 HOLIDAY TESTING OF PVC LINED AND POLYURETHANE COATED MANHOLES**

- A. PVC lined and Polyurethane coated surfaces shall be holiday tested with an electrical holiday detector as manufactured by Tinker and Rasor (Model # AP-W with power pack) or approved equal with the instrument set at 20,000 volts and used as directed by the DISTRICT's. All imperfections identified on the PVC lining or polyurethane coating shall be repaired with materials-in-kind and the test shall be repeated until no holidays are evident.

**END OF SECTION**

**SECTION 04200****CONCRETE MASONRY UNIT****PART 1 - GENERAL****1.01 DEFINITIONS**

- A. This Section includes materials, and application of concrete masonry units (CMUs), mortar and grout, reinforcing steel, control joint materials, masonry joint reinforcement, ties and anchors, embedded flashing, and miscellaneous masonry accessories. Provide materials to achieve the net compressive strength of concrete unit masonry equal to or greater than the  $f_m$  as indicated.

**1.02 RELATED SECTIONS**

- A. Section 01300 – Record Drawings and Submittals
- B. Section 03200 – Steel Reinforcement
- C. Section 03300 – Cast-in-Place Structural Concrete
- D. Section 05500 – Miscellaneous Metalwork

**1.03 STANDARD SPECIFICATIONS**

- A. Except as otherwise indicated in this Section of the Specifications, the Contractor shall comply with the Standard Specifications for Public Works Construction (SSPWC).

**1.04 REFERENCES**

- A. TMS 602/ACI 530.1/ASCE 6 2011 Specification for Masonry Structures
- B. ASTM International (latest versions)
1. ASTM A36/A36M Standard Specification for Carbon Structural Steel
  2. ASTM A82/A85M Standard Specification for Steel Wire, Plain, for Concrete Reinforcement
  3. ASTM A153/A153M Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
  4. ASTM A185/A182M Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete
  5. ASTM A307 Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength

6. ASTM A615 Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
7. ASTM A641/A641M Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
8. ASTM A653/A653M Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by the Hot-Dip Process
9. ASTM A884/A884M Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Fabric for Reinforcement
10. ASTM A899 Standard Specification for Steel Wire Epoxy-Coated
11. ASTM A951 Standard Specification for Masonry Joint Reinforcement
12. ASTM A1008/A1008M Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable
13. ASTM C90 Standard Specification for Loadbearing Concrete Masonry Units
14. ASTM C140 Standard Test Method for Sampling and Testing Concrete Masonry Units
15. ASTM C150 Standard Specification for Portland Cement
16. ASTM C270 Standard Specification for Mortar for Unit Masonry
17. ASTM C476 Standard Specification for Grout for Unit Masonry
18. ASTM C618 Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for use in Concrete
19. ASTM C989 Standard Specification for Slag Cement for Use in Concrete and Mortars
20. ASTM C1019 Standard Test Method for Sampling and Testing Grout
21. ASTM C1314 Standard Test Method for Compressive Strength of Masonry Prisms
22. ASTM C1586 Standard Guide for Quality Assurance of Mortars
23. ASTM C1611/C1611M Standard Test Method for Slump Flow of Self-Consolidating Concrete
24. ASTM C1714/C1714M Standard Specification for Preblended Dry Mortar Mix for Unit Masonry

25. ASTM D2000 Classification System for Rubber Products in Automotive Applications
26. ASTM D2287 Standard Specification for Nonrigid Vinyl Chloride Polymer and Copolymer Molding and Extrusion Compounds

#### **1.05 RELATED SECTIONS**

- A. Section 01300 – Record Drawings and Submittals
- B. Section 03200 – Steel Reinforcement
- C. Section 03300 – Cast-in-Place Structural Concrete
- D. Section 05500 – Miscellaneous Metalwork

#### **1.06 SUBMITTALS**

- A. The following shall be submitted in compliance with Section 01300:
  1. Samples of concrete masonry unit colors with texture ranges as specified under products shall be submitted to the Engineer for selection of color. Full size samples of the blocks selected shall be submitted for final approval by the Engineer after color and texture selection. Samples of mortar colors shall be submitted for color selection by the Engineer.
  2. Certification shall be submitted showing material compliance with these Specifications. The Engineer's approval shall be obtained prior to delivery of concrete masonry units to the job site.
  3. A 4-ft minimum square free-standing sample panel shall be prepared for approval by the Engineer before starting masonry work and shall remain at the work site for reference until all masonry work is completed.
  4. Mill Certificates: Steel producer's certificates of mill analysis, tensile and bend tests for reinforcement steel.
  5. Drawings shall be submitted for fabrication, bending, and placement of reinforcement bars. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures." Bar schedules, diagrams of bend bars, stirrup spacing, lateral ties and other arrangements and assemblies shall be shown as required for fabrication and placement.

#### **1.07 DISTRICT'S MANUAL**

- A. The following shall be included in the District's Manual in compliance with Section 01300:
  1. Test reports of mortar and grout.
  2. Test reports of masonry prisms.



**1.08 FACTORY TESTING OF MASONRY UNITS**

- A. Concrete block masonry units shall be sampled and tested for compressive strength, absorption and moisture content in accordance with ASTM C 140

**1.09 TESTING OF MORTAR AND GROUT**

- A. The Engineer will have the mortar and grout tested in accordance with CBC to assure compliance with the Specifications and the governing codes. Test samples shall be stored in a moist environment until tested, unless directed otherwise by the Engineer or the testing laboratory. Tests shall be in accordance with CBC Standard No. 21 16 for mortar. The grout and mortar strengths shall be not less than the minimum strengths indicated herein.
- B. Tests will be taken at the following times:
1. At the commencement of the masonry work, at least 2 test samples each of mortar and grout taken on 3 successive working days.
  2. At any change in materials or job conditions, at least 2 samples of each modified material, grout and mortar.
  3. 3. Four random tests each of mortar and grout. The random test samples shall be taken when requested by the Engineer.
  4. 4. Additional samples and tests may be required whenever, in the judgment of the Engineer, additional tests (beyond the random tests) are necessary to determine the quality
- C. The Contractor shall store the test samples in a moist environment until tested, unless directed otherwise by the Engineer.
- D. The grout and mortar strengths shall be not less than the minimum strengths specified herein.

**1.10 TESTING OF MASONRY PRISMS**

- A. The Engineer will have masonry prisms tested to assure compliance with the Specifications and the governing codes.
- B. Tests will be taken at the following times:
1. At the time of construction of the sample panel, as indicated herein, at least five masonry prisms shall be made for each type of block indicated herein; except separate prisms are not required for block which only varies by texture.
  2. At any change in materials during construction, at least five masonry prisms shall be made for each type of block affected.
  3. One set of at least five masonry prisms shall be made for each masonry structure, besides the structure that the sample panel is part of, or for each week in which block is laid, for each type of block involved, whichever occurs first.

4. Additional sets of at least five masonry prisms may be required whenever, in the judgment of the Engineer, additional tests are necessary to determine the quality of the materials.
- C. The prisms shall be constructed by the Contractor in the presence of the Engineer or the Engineer's representative. The same personnel who are laying the block in the structure shall construct the masonry prisms.
  - D. The masonry prisms shall be constructed and will be tested as specified in "Test Methods for Compressive Strength of Masonry Prisms" ASTM E 447-84, Method B, except as modified herein. The prisms shall be composed of one complete cell using full-size blocks which are saw-cut. The minimum ratio of height to smaller width dimension shall be 1.5. The prism shall be at least 15 inches high. A minimum of two horizontal bed joints shall be used to form the prism. The prism shall be grouted, after the required 24-hour minimum cure period, using the same grout used in the walls.
  - E. Compression tests will include two prisms tested at 7 days after grouting and three prisms tested at 28 days after grouting.
  - F. The average compressive strength of prisms tested at 28 days after grouting, multiplied by the appropriate correction factor as given in the California Building Code, shall not be less than the indicated masonry compressive strength.
  - G. If the compressive strength of the prisms, made during the construction of the sample panel and tested as indicated herein, fails to meet the requirement, adjustments shall be made to the mix designs for the mortar, or grout, or both, as needed to produce the specified strength. The masonry units shall also be retested to verify compliance with the requirements of ASTM C 90, Grade N-1.
  - H. If the compressive strength of the prisms, made during construction of the WORK and tested as indicated herein, fails to meet the requirement, prisms or cores shall be cut from the walls in sufficient numbers and in sufficient locations to adequately determine the strength of the walls. Those portions of the walls represented by specimens failing to meet the required compressive strength shall be subject to removal and replacement.

#### **1.11 SPECIAL INSPECTION**

- A. Continuous inspection by a special inspector approved by the local building department having jurisdiction will be required where necessary to conform with code requirements. Special inspection shall be provided by the District.

#### **1.12 PRODUCT DELIVERY, STORAGE AND HANDLING**

- A. Cement, lime, and other cementitious materials shall be delivered to the site and stored in dry, weather-tight sheds or enclosures, in unbroken bags, barrels, or other containers, plainly marked and labeled with the manufacturers' names and brands. Mortar and grout shall be stored and handled in a manner which will prevent the inclusion of foreign materials and damage by water or dampness. Masonry units shall be handled with care to avoid chipping and breakage, and shall be stored as directed in the Concrete Masonry Handbook. Materials stored on newly constructed floors shall be stacked in such manner that the uniformly-distributed loading does not exceed 30

psf. Masonry materials shall be protected from contact with the earth and exposure to the weather and shall be kept dry and clean until used.

## **PART 2 - MATERIALS (NOT USED)**

### **2.01 CONCRETE MASONRY UNITS**

- A. Concrete masonry units shall conform to ASTM C 90, hollow open-end load bearing units with maximum linear shrinkage of 0.06 percent from standard to oven-dried condition. Units shall be medium weight units with a net area compressive strength of 2,800 psi unless indicated otherwise.
- B. Concrete masonry units shall be 12-inch by 8-inch by 16-inch modular size, with [smooth] [split] [slump] [fluted] faces. Units shall be [integrally-colored with color selections from light and medium color range (white, black and dark green not included in color range)] [of natural gray color].
- C. All bond beam, corner, lintel, sill, and other specially shaped blocks shall be provided and used where required or necessary. Specially shaped non-structural blocks may be constructed by saw cutting. Color and texture shall match that of adjacent units.
- D. Concrete masonry units hidden from view entirely may be natural color units the same size as other adjacent masonry units.
- E. Concrete masonry units at interior walls shall be medium weight block 12-inch by 8-inch by 16-inch modular size of [color matching the integrally colored block] [natural color].

### **2.02 MATERIALS FOR MORTAR AND GROUT**

- A. Portland cement shall be Type II, low alkali, conforming to ASTM C 150.
- B. Lime paste shall be made with pulverized quicklime, or with hydrated lime, which shall be allowed to soak not less than 72 hrs before use; except, that hydrated lime processed by the steam method shall be allowed to soak not less than 24 hrs and shall be made by adding the lime to the water. In lieu of hydrated lime paste for use in mortar, the hydrated lime may be added in the dry form. Hydrated lime shall be Type S, conforming to ASTM C 207. Pulverized quicklime shall conform to ANSI/ASTM C 5, shall pass a No. 20 sieve, and 90 percent shall pass a No. 50 sieve.
- C. Sand shall conform to ASTM C 144. Coarse aggregate shall conform to ASTM C 404.
- D. Water for mixing shall be clear potable water.
- E. Reinforcing steel shall be deformed bars conforming to ASTM A 615, Grade 60 for bars No. 3 to No. 18, except as otherwise indicated.
- F. Admixture for mortar shall not be detrimental to the bonding or help the process of efflorescence.

### **2.03 MANUFACTURERS**

- A. Products shall be per the Approved Materials List or of the following manufacture and type (or equal):

1. Admixture for Mortar:
  - a. Master Builder's "PS 235 or Rheomix 235"
  - b. Sika Chemical Co. "Sika Red Label"
2. Admixture for Grout:
  - a. Sika Chemical Co. "Sika Grout Aid" Type II
  - b. Master Builder's "Pozzoloth" normal

### **PART 3 - EXECUTION**

#### **3.01 GENERAL**

- A. Concrete masonry units shall not be placed when air temperature is below 40 degrees F (4 degrees C) and shall be protected against direct exposure to the wind and sun when erected when the ambient air temperature exceeds 99 degrees F (37 degrees C) in the shade with relative humidity less than 50 percent.
- B. Concrete masonry shall conform to the California Building Code, the Masonry Design Manual published by the Masonry Industry Advancement Committee, and other applicable codes and standards of governing authorities.
- C. All work shall conform to the standard of quality established by the Engineer's acceptance of the free-standing sample panel required to be constructed prior to starting the masonry work.
- D. Tolerances for concrete masonry units shall conform to the following:
  1. Maximum variation from plumb:
    - a. In walls and corners: 1/4-inch in 10 feet; 3/8-inch in any story or 20 feet maximum; 1/2-inch in 40 feet.
    - b. For external corners and other conspicuous lines: 1/4-inch in any story or 20 feet maximum; 1/2-inch in 40 feet.
  2. Maximum variation from level or indicated elevations: 1/4-inch in any bay or 20 feet; 1/2-inch in 40 feet.
  3. Maximum variation from plan position indicated on the Drawings: 1/2-inch maximum.
- E. Measurements for mortar and grout shall be accurately made. Shovel measurements are not acceptable. Mortar proportions shall be accurately controlled and maintained.

#### **3.02 INSPECTION**

- A. Contractor shall thoroughly examine all substrates, areas and conditions under which installation Work of this Section is to be undertaken and notify Engineer in writing of conditions detrimental

to proper, timely, and successful completion of the installation. Installation shall not proceed until unsatisfactory conditions have been corrected.

- B. Inspection by the Contractor shall be required during preparation of masonry wall prisms, sampling and placing of all masonry units, placement of reinforcement, and inspection of grout space immediately prior to closing of cleanouts and during all grouting operations

### **3.03 SHORING AND BRACING**

- A. All shoring and bracing shall be provided as required for the Work. Shoring and bracing shall be constructed to required shapes and sizes, capable of supporting and sustaining the loads to which they will be subjected without failure or deflection. Shores and bracing shall be left in place until concrete masonry can safely carry all required live and dead loads.
- B. Concrete masonry walls shall be adequately braced to withstand all forces to which they will be subjected during construction. Walls are not designed to be self supporting for lateral loads until attached to floor and roof elements.

### **3.04 MORTAR**

- A. Mortar for concrete block masonry shall be Type S per Table 2 of TMS 602-13/ACI 530.1/ASCE 6-13, with a minimum 28-day compressive strength of 2500 psi. Proportions shall be one part portland cement, 1/4- to 1/2-part lime paste or hydrated lime, and damp, loose sand in an amount (by volume) of not less than 2-1/4 or more than 3 times the sum of the volumes of cement and lime used, with the precise amount of water required to produce the required workability and strength.
- B. Mortar for use with colored masonry units shall have integral color as approved by the Engineer.

### **3.05 GROUT**

- A. Grout shall have a minimum 28-day compressive strength of 2800 psi. Proportions shall be one part portland cement, not more than 1/10-part lime paste or hydrated lime, 2-1/4 to 3 parts damp, loose sand, not more than 2 parts pea gravel, and water in the amount necessary to produce a consistency for pouring without segregation of components. Where the grout space is less than 4 inches, pea gravel shall be omitted.
- B. Admixtures may only be used when approved by the Engineer. When it has been approved for use, admixtures shall be used in accordance with the manufacturer's published recommendations for the grout.

### **3.06 CONSTRUCTION - GENERAL**

- A. All work shall be performed in accordance with the provisions of the applicable code for reinforced concrete hollow-unit masonry.
- B. The Contractor shall set or embed in his work all anchors, bolts, reglets, sleeves, conduits, and other items as required.
- C. All block cutting shall be by machine.

- D. Masonry units shall be supported off the ground and shall be covered to protect them from rain. Only clean, dry, uncracked units shall be incorporated into the Work. Concrete masonry units shall not be wetted.
- E. All reinforcing steel shall be cleaned of all loose rust and scale, and all oil, dirt, paint, laitance, or other substances which may be detrimental to or reduce bonding of the steel and concrete.
- F. Immediately before starting work, the concrete upon which the masonry will be laid shall be cleaned with water under pressure.
- G. A full mortar joint for first course shall be provided.
- H. Units shall be shoved tightly against adjacent units to assure a good mortar bond.

### **3.07 EQUIPMENT**

- A. All equipment for mixing and transporting the mortar and grout shall be clean and free from set mortar, dirt, or other foreign matter.

### **3.08 MIXING**

- A. Mortar shall be mixed by placing 1/2 of the water and sand in the operating mixer, after which the cement, lime, and remainder of the sand and water shall be added. After all ingredients are in the mixer, they shall be mechanically mixed for not less than 5 minutes. Retempering shall be done on the mortar board by adding water within a basin formed within the mortar, and the mortar reworked into the water. Mortar which is not used within one hour shall be discarded.

### **3.09 ERECTION OF CONCRETE BLOCK MASONRY**

- A. Masonry work shall be erected in-plane, plumb, level, straight, and true to dimensions shown and executed in accordance with acceptable practices of the trade.
- B. Concrete masonry units shall be laid with full-face shell mortar beds. Vertical head joints shall be solidly filled with mortar from face of unit to a distance behind the face equal to not less than the thickness of longitudinal face shells. Cross-webs of starting course courses shall be solidly bedded in mortar.
- C. Unless noted or shown otherwise, masonry shall be laid up in straight uniform courses with running bonds.
- D. All masonry shall be erected to preserve the unobstructed vertical continuity of the cells measuring not less than 3-inch by 3-inch in cross-section. Walls and cross webs shall be fully bedded in mortar. All head and end joints shall be solidly filled with mortar for a distance in from the face of the wall or unit not less than the thickness of the longitudinal face shells.
- E. Where horizontal reinforced beams are shown, special units shall be used or regular units shall be modified to allow for placement of continuous horizontal reinforcement bars. Small mesh expanded metal lath or wire screening shall be used in mortar joints under bond beam courses over cores or cells of non-reinforced vertical cells, or units shall be provided with solid bottoms.

### 3.10 JOINTS

- A. Vertical and horizontal joints shall be uniform and approximately 3/8-inch wide. Exterior joints and interior exposed block joints shall be concave-tooled to a dense surface. Special care shall be used in tooling joints so as to match existing construction. Interior or exterior non-exposed masonry and masonry behind plaster shall have flush joints.

### 3.11 CLEANOUT

- A. Cleanout openings shall be provided at the bottoms of all cells to be filled at each lift or pour of grout, where such lift or pour is over 4 ft in height. Any overhanging mortar or other obstructions or debris shall be removed from the insides of such cell walls. The cleanouts shall be sealed before grouting and after inspection. Cleanout openings shall match the finished wall in exposed masonry

### 3.12 REINFORCEMENT

- A. General: Reinforcement bars shall not be used with kinks or bends not shown on the drawings or final shop drawings, nor shall bars be used with reduced cross-section due to excessive rusting or other causes.
- B. Reinforcement shall be positioned accurately at the spacing indicated. Vertical bars shall be supported and secured against displacement. Horizontal reinforcement shall be placed as the masonry work progresses. Where vertical bars are indicated in close proximity, a clear distance shall be provided between bars of not less than the normal bar diameter or 1-inch, whichever is greater.
- C. Reinforcement bars shall be spliced where shown; bars shall not be spliced at other points unless acceptable to the Engineer. In splicing vertical bars or attaching to dowels, ends shall be lapped, placed in contact and wire tied. Not less than the minimum lap indicated shall be provided, or if not indicated, as required by governing code.
- D. Splices shall be welded where indicated. Contractor shall comply with the requirements of AWS D1.4 for welding materials and procedures.
- E. Prefabricated horizontal joint reinforcement shall be embedded as the work progresses, with a minimum cover of 5/8-inch on exterior face of walls and 1/2-inch at other locations. Units shall be lapped not less than 6 inches at ends. Prefabricated "L" and "T" units shall be used to provide continuity at corners and intersections. Units shall be cut and bent as recommended by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures and other special conditions.
- F. Anchoring: Reinforced masonry Work shall be anchored to supporting structures as indicated. Where required, reinforced masonry walls shall be anchored to non-reinforced masonry walls where they intersect.
- G. Deep cut bond beam blocks shall be used where horizontal reinforcing steel is embedded. H-block bond beams may be used at locations other than openings.
- H. Knock-out openings shall have no steel or joint reinforcing running through the opening. Head, jambs, and sill blocks shall be used to provide an even finish surface to install the window unit when blocks are removed. Joints at head, jambs, and sills shall be stacked and continuous.

- I. Vertical reinforcement shall be held in position at top and bottom and at intervals not exceeding 192 diameters of the reinforcement.

### **3.13 GROUTING**

- A. All cells and bond beam spaces shall be filled solidly with grout unless indicated otherwise. Grouting shall not be started until the wall has cured for 24 hours. Grout shall not be poured in more than 8-ft lifts.
- B. All grout shall be consolidated at time of pouring by puddling or vibrating. Where the grouting operation has been stopped for one hour or longer, horizontal construction joints shall be formed by stopping the grout pour 1-1/2 inches below the top of the uppermost unit.

### **3.14 PROTECTION**

- A. Wall surfaces shall be protected from droppings of mortar or grout during construction.

### **3.15 FINISHING AND CLEANING**

- A. Masonry shall not be wet-finished unless exposed to extreme hot weather or hot wind and then only by using a nozzle-regulated fog spray sufficient only to dampen the face but not of such quantity to cause water to flow down over the masonry.
- B. Finish masonry shall be cleaned and pointed in a manner satisfactory to the Engineer, based upon the standards established by the approved sample panel.
- C. All exposed to view interior and exterior colored masonry work shall be cleaned by light sandblasting to remove all stains and other imperfections.
- D. All exposed masonry surfaces of openings and window and door openings such as sills, heads, and jambs shall be finish block surfaces, not formed surfaces, unless indicated otherwise. Closed bottom bond beam blocks shall be used at heads and sills. Pour holes may be used at the sill under window frame and where approved by the Engineer.

**END OF SECTION**



**SECTION 05500****MISCELLANEOUS METALWORK****PART 1 - GENERAL****1.01 DESCRIPTION**

- A. The Contractor shall furnish, fabricate, and install miscellaneous metalwork and appurtenances, complete, in accordance with the requirements of the Contract Documents. The Contract Documents shall take precedence over these Specifications.

**1.02 RELATED SECTIONS**

- A. Section 01300 – Shop Drawings and Submittals

**1.03 REFERENCE SPECIFICATIONS, CODE AND STANDARDS**

- A. Federal Specifications:

MIL-G-18015 A (3)	(Ships) Aluminum Planks. (6063-T6)
MIL-A-907E	Antiseize Thread Compound, High Temperature

- B. Government Standards:

Cal OSHA Occupational Safety and Health Administration

- C. Trade Standards:

Aluminum Association (AA) publications, as referenced herein.

- D. Commercial Standards:

AA-M32C22A41	Aluminum Assn.
AASHTO	HS-20 Truck Loading
AISC	Specifications and Commentary
AISI	Design of Light Gauge, Cold-Formed Steel Structural Members
ASTM A 36	Specification for Structural Steel
ASTM A 48	Specification for Gray Iron Castings
ASTM A 53	Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
ASTM A 123	Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 125	Specification for Steel Springs, Helical, Heat Treated
ASTM A 153	Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A 307	Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile

ASTM A 500	Specification for Cold-Formed Welded and Seamless Carbon Steel Tubing in Rounds and Shapes
ASTM A 563	Specification for Carbon and Alloy Steel Nuts
ASTM A 575	Specifications for Steel Bars, Carbon, Merchant Quality, M-Grades
ASTM A 786	Specification for Rolled Steel Floor Plates
ASTM B 98	Specification for Copper-Silicon Alloy Rod, Bar, and Shapes
ASTM B 438	Specification for Sintered Bronze Bearings (Oil-Impregnated)
ANSI/AWS D1.1	Structural Welding Code - Steel
ANSI/AWS D1.2	Structural Welding Code - Aluminum
ANSI/AWS QC1	Specification for Qualification and Certification of Welding Inspectors
NFPA 101	Life Safety Code
NAAMM	Metal Stairs Manual

E. I.C.B.O. Evaluation Reports:

ER-5279 Simpson SET Adhesive Anchor Systems

#### 1.04 SUBMITTALS

- A. Shop Drawings: Shop drawings of all miscellaneous metalwork shall be submitted to the Engineer for review in accordance with Section 01300 – Shop Drawings and Submittals.
- B. Layout drawings for grating shall be submitted showing the direction of span, type, material and depth of grating, size and shape of grating panels, seat angle details, and details of grating hold down fasteners. Load and deflection tables shall be submitted for each style and depth of grating used.
- C. An ICBO report listing the ultimate load capacity in tension and shear for each size and type of concrete anchor used shall be submitted to the Engineer for review. Contractor shall submit manufacturer's recommended installation instructions and procedures for all adhesive anchors for Engineer's review. Upon review, by Engineer, these instructions shall be followed specifically.
- D. No substitution for the indicated adhesive anchors will be considered unless accompanied with ICBO report verifying strength and material equivalency, including temperature at which load capacity is reduced to 90 percent of that determined at 75 degrees F.
- E. Calculations: Engineering calculations shall be submitted for review. Engineering calculations shall include (but not be limited to) ladders, guardrail posts, railings, handrail brackets, brackets, support flanges, and fasteners or anchors.

#### 1.05 QUALITY ASSURANCE

- A. All weld procedures and welder qualification shall be available in the Contractor's field office for Engineer's review.
- B. All welding shall be inspected by a Contractor-provided inspector qualified in accordance with AWS requirements and approved by the Engineer.

- C. Inspection: All Work hereunder shall be subject to continuous inspection by a Special Inspector selected by the District and approved by the local Building Official having jurisdiction. Special Inspection shall be performed in accordance with the current edition of the Uniform Building Code.
- D. The Special Inspector shall observe the work as identified on the plans for conformance with the design drawings and specifications.

## **PART 2 - PRODUCTS**

### **2.01 GENERAL REQUIREMENTS**

- A. Steel
  - 1. Standard rolled steel sections wide flanges                      ASTM A992, Grade 50
  - 2. Shapes, Plates, Bars    ASTM A 36
  - 3. Pipe, Pipe Columns, Bollards                                      ASTM A 53, Type E or S, Grade B  
Standard weight unless noted otherwise
  - 4. Tubes    ASTM A 500 Grade B
- B. Corrosion Protection: Unless otherwise indicated, miscellaneous metalwork of fabricated steel, which will be used in a corrosive environment and/or will be submerged in water/wastewater shall be coated in accordance with Section 09900 – Painting and Coating and shall not be galvanized prior to coating. All other miscellaneous steel metalwork shall be hot-dip galvanized after fabrication as specified herein.
- C. Stainless Steel: Unless otherwise indicated, stainless steel metalwork and bolts shall be of Type 316 stainless steel and shall not be galvanized.
- D. Aluminum: Unless otherwise indicated, aluminum metalwork shall be of Alloy 6061-T6. Aluminum in contact with concrete, porous materials, or dissimilar metals shall have contact surfaces coated in accordance with the Section 09900 – Painting and Coating.
- E. Cast Iron: Unless otherwise indicated, iron castings shall conform to the requirements of ASTM A 48, Class 50B or better.

### **2.02 ACCESS HATCHES**

- A. Where access hatches are called for on the drawings to be mounted on a concrete slab (including top slabs, which are not covered with a roofing membrane) or on a concrete curb, the hatch shall be a flush type as indicated herein.
- B. Hatch door leaves shall be 1/2 inch thick, Type 316 stainless steel with SlipNOT Grade 2 surface finish. Channel frames shall be a minimum of 1/2 inch thick, Type 316 stainless steel of continuous weld construction. Door leaves shall have a flush lifting handle and oversized

padlock recess with cover that is flush with the surface. Hatch doors shall be spring loaded to facilitate opening and closing.

- C. All hatch hardware shall be Type 316 stainless steel including nuts, bolts, tamper-resistant hinges, lift handles, automatic hold-open arm, pins, lugs, and open compression spring assists.
- D. Hatches shall be rated for direct traffic duty and AASHTO H-20-44 wheel loading with recessed, Allen head bolts for the hatch and padlock recess cover.
- E. Hatch opening sizes, number and swing direction of door leaves, and locations, shall be as indicated. Sizes given shall be for the clear opening. Where the number of leaves is not given, openings larger than 42 inches in either direction shall have double-leaf doors. Unless indicated otherwise, hinges shall be located on the longer dimension side. Unless indicated otherwise, ladder hatches shall be a minimum of 30 inches wide by 36 inches long, with the ladder centered on the shorter dimension, and the door hinge opposite the ladder.
- F. Installation shall be in accordance with manufacturer's instructions. Manufacturer shall guarantee against defects in material or workmanship for a period of five years.
- G. Approved Manufacturer's:
  - 1. USF Fabrication, Inc.
  - 2. Bilco
  - 3. Or approved equal

### **2.03 IRON CASTINGS**

- A. Iron castings shall be of uniform quality, free from blowholes, porosity, hard spots, shrinkage, distortion, or other defects. They shall be smooth and well cleaned by shotblasting.
- B. Covers and grates shall fit together evenly, so that the cover fits flush with the surrounding finishes surface and the cover does not rock or rattle when loading is applied. Round covers and frames shall have machined bearing surfaces.
- C. Covers and grates with matching frames shall be designed to support the following loadings:
  - 1. Where located within a structure, the design loading shall match that required for the adjacent floor area, or, if no loading is given, a minimum of 300 pounds per square foot, unless indicated otherwise.
  - 2. Exterior covers and grates shall be designed for AASHTO H20 loading unless indicated otherwise.

### **2.04 BOLTS AND ANCHORS**

- A. Standard Service Bolts (Not Buried or Submerged): Except where otherwise indicated, all bolts, anchor bolts, and nuts shall be ASTM A307 steel.

- B. Buried or Submerged Bolts: Unless other corrosion-resistant bolts are indicated, all bolts, anchor bolts, nuts, and washers which are buried, submerged, or below the top of the wall inside any hydraulic structure shall be Type 316 stainless steel conforming to ASTM A 193 for bolts and to ASTM A 194 for nuts. All threads on stainless steel bolts shall be protected with an antiseize lubricant suitable for submerged stainless steel bolts, to meet government specification MIL-A-907E.
1. Antiseize lubricant shall be classified as acceptable for potable water use by the NSF.
  2. Antiseize lubricant shall be "PURE WHITE" by Anti-Seize Technology, Franklin Park, IL, 60131, AS-470 by Dixon Ticonderoga Company, Lakehurst, NJ, 08733, or equal.
- C. Bolt Requirements:
1. The bolt and nut material shall be free-cutting steel.
  2. The nuts shall be capable of developing the full strength of the bolts. Threads shall be Coarse Thread Series conforming to the requirements of the American Standard for Screw Threads. All bolts and cap screws shall have hexagon heads and nuts shall be Heavy Hexagon Series.
  3. The length of all bolts shall be such that after joints are made up, each bolt shall extend through the entire nut, but in no case more than 1/2-inch beyond the nut.
- D. Adhesive Anchors: Unless otherwise indicated, all drilled, concrete or masonry anchors shall be adhesive anchors. No substitutions will be considered unless accompanied with ICBO report verifying strength and material equivalency.
1. Epoxy adhesive anchors are required for drilled anchors where exposed to weather, in submerged, wet, splash, overhead, and corrosive conditions, and for anchoring handrails, pumps, mechanical equipment, and reinforcing bars. Epoxy anchor grout shall comply with Section 03315 - Grout. Threaded rod shall be ASTM A36 steel, unless noted otherwise, except in submerged location where stainless steel threaded rod shall be used.
  2. Unless otherwise indicated, adhesive anchors shall be Simpson SET. Adhesive anchors made by other manufacturers may be used if approved by the Engineer. Such adhesive anchor shall be I.C.B.O. approved. The I.C.B.O. Evaluation Report for the proposed substitute anchors shall demonstrate that the anchors have at least much capacity as the specified anchors. Proposed substitute anchors shall meet all requirements of their I.C.B.O. Evaluation Report, including edge distance, anchor spacing, embedment, base material thickness.
- E. Expansion Anchors: Material and Installation shall conform to ICBO ER-4627. Expansion anchors shall be Hilti "Kwik-Bolt II" or ICBO approved equal. Lead caulking anchors will not be permitted. Size shall be as indicated. Expansion type anchors shall be 316 stainless steel. Expansion anchors may only be used where specifically detailed. Expansion type anchors shall not be used unless approved by the Engineer.

**PART 3 - EXECUTION****3.01 WELDING**

- A. Method: All welding shall be by the metal-arc method or gas-shielded arc method as described in the American Welding Society's "Welding Handbook" as supplemented by other pertinent standards of the AWS. Qualification of welders shall be in accordance with the AWS Standards governing same.
- B. Quality: In assembly and during welding, the component parts shall be adequately clamped, supported and restrained to minimize distortion and for control of dimensions. Weld reinforcement shall be as indicated by the AWS Code. Upon completion of welding, all weld splatter, flux, slag, and burrs left by attachments shall be removed. Welds shall be repaired to produce a workmanlike appearance, with uniform weld contours and dimensions. All sharp corners of material to be painted or coated shall be ground to a minimum of 1/32-inch on the flat.

**3.02 GALVANIZING**

- A. All structural steel plates shapes, bars and fabricated assemblies required to be galvanized shall, after the steel has been thoroughly cleaned of rust and scale, be galvanized in accordance with the requirements of ASTM A 123. Any galvanized part that becomes warped during the galvanizing operation shall be straightened. Field repairs to galvanizing shall be made using "Galvinox," "Galvo-Weld," or equal.

**3.03 CRAFTSMANSHIP**

- A. All Work shall be performed by craftsmen experienced in the fabrication of architectural metal work. Exposed surfaces shall be free from defects or other surface blemishes. All dimensions and conditions shall be verified in the field in advance. All joints, junctions, miters, and butting sections shall be precision-fitted, with no gaps occurring between sections, and all surfaces shall be flush and aligned.

**3.04 DRILLED ANCHORS**

- A. Drilled anchors and reinforcing bars shall be installed in strict accordance with the applicable I.C.B.O. Evaluation Report and manufacturer's instructions. Holes shall be roughened with a brush on a power drill, cleaned and dry. Drilled anchors shall not be installed until the concrete has reached the specified 28-day compressive strength. Adhesive anchors shall not be loaded until the adhesive has reached its indicated strength in accordance with the manufacturer's instructions.

**END OF SECTION**

**SECTION 09801****MANHOLE LINING****PART 1 - GENERAL****1.01 WORK OF THIS SECTION**

- A. The Work of this section includes the lining of new and existing sewer manholes. The CONTRACTOR shall coordinate his work so as not to interfere with the existing sanitary sewer service. Lining shall consist of preparing the interior surface of each manhole, application of repair mortar where needed to restore damaged surfaces, application of epoxy primer, and polyurethane lining and all incidentals necessary to complete the work contained in these technical provisions in accordance with District Standards and SSPWC Section 500- 2.4, latest edition.
- B. The CONTRACTOR shall furnish all traffic control, labor, materials, tools, and equipment necessary to complete all work in accordance with these Contract Documents and at the direction of the AGENCY.

**1.02 RELATED WORK SPECIFIED ELSEWHERE**

- A. Section 01015 – General Requirements
- B. Section 01300 – Record Drawings and Submittals
- C. Section 02960 – Temporary Bypass Pumping
- D. Section 03460 – Precast Concrete Manholes
- E. Section 09900 – Painting and Coating
- F. EVMWD Standard Drawings

**1.03 CONTRACTOR SUBMITTALS**

- A. Submittals shall be made in accordance with the requirements set forth in the standard specifications.
- B. The CONTRACTOR shall submit copies of manufacturer's technical data and installation instructions for protective coating system required.
- C. The Contractor shall submit copies of manufacturer's written instructions for recommended maintenance practices. Include the following information:
  - 1. Product name and number.
  - 2. Name, address and telephone number of manufacturer and local distributor.
  - 3. Detailed procedures for routine maintenance and cleaning.
  - 4. Detailed procedures for repairs.

**1.04 QUALITY ASSURANCE**

- A. Packaging: The CONTRACTOR shall store all products to be used in their original packaging. The packaging shall indicate the manufacturer and product contained.
- B. All products to be used in the work covered by this section of the specifications shall be delivered, stored, and handled in accordance with the product manufacturer's written recommendations.
- C. Manufacturer and applicator both shall demonstrate a minimum of five (5) years of experience and five (5) successfully completed projects of similar magnitude and nature as this project. Experience and project references shall include project name, project number where applicable, agency or AGENCY, contact name, phone number, and project description. All Applicators shall be certified or licensed by the protective coating materials manufacturer.
- D. Provide each component of protective coating produced by a single manufacturer, including recommended underlayment and resurfacing compound, filler compounds and corrosion resistant lining.
- E. Upon completion of the Work under this Section, submit a statement to the DISTRICT, signed by Contractor and the protective Coating Applicator stating that the installed protective coating complies with the requirements of the Specifications, and that the installation and materials comply with the manufacturer's printed recommendations related to the condition of installation and use.

**1.05 PRODUCT DELIVERY, STORAGE AND HANDLING**

- A. Deliver material in manufacturer's original unopened and undamaged packages. Clearly identify manufacturer, brand name, manufactured date or lot number on each package. Packages showing indications of damage that may affect condition of contents are not acceptable.
- B. Store materials in original packaging under protective cover and protect from damage. Stack and store all containers including fillers at temperatures recommended by the manufacturer.
- C. Handle materials in such a manner as to prevent damage to products or finishes.

**1.06 JOB CONDITIONS**

- A. Maintain proper substrate and air temperature before, during and after installation as required by Manufacturer and detailed in Manufacturer's technical data sheets and installation instructions or in writing from the Manufacturer. Provide adequate ventilation during application and curing periods.



**PART 2 - PRODUCTS****2.01 MANHOLE PROTECTIVE LINING**

- A. Mortar repair materials used for existing manholes to be rehabilitated shall be in accordance with the standard specifications.

**2.02 MANUFACTURER**

- A. The lining material shall be a two-component, 100% solid, non-solvent hybrid polyurethane coating, with a shore "D" hardness of 57 at 77 degree Fahrenheit, such as Zebron #386 as manufactured by Zebron Corporation, Newport Beach, CA
- B. Sauereissen SewerGard No.210, Sauereisen, Pittsburg, PA (412) 963-0303.
- C. SprayWall, Sprayroq, Irondale, AL (205) 957-0020
- D. Utilithane Polyurethane, Prime Coating Incorporated, Tustin, CA (714) 963-4303
- E. Raven 405, Raven Lining Systems, Kansas City, KS (800) 321-0906
- F. Or approved equal

**2.03 MATERIAL**

- A. Zebron, Zebron #386
  - 1. Polyurethane Coatings: High performance, plural component, 3-1 ratio, 100 percent solids polyurethane coating.
  - 2. Physical Properties:
    - a. Color: Cream.
    - b. Specific Gravity (ASTM D792):
    - c. Series 300: 1.3 (10.84 lbs. per gal.)
    - d. Tensile Strength (ASTM D638): 2500 psi at 77 degrees F (25 degrees C).
    - e. Elongation (ASTM D638): Recoverable; 67 percent at 77 degrees F (25 degrees C).
    - f. Flexibility (ASTM D792): No effect bending 0.5 mm plate coated with 20 mils over 8 mm diameter mandrel.
    - g. Compressibility (ASTM D695): 4200 psi.
    - h. Surface Hardness: 60 to 70, Shore "D".
    - i. Abrasion Resistance (ASTM D4060): 2.12 oz. (60 mg).
    - j. Thermal Conductivity (ASTM C177): 0.000723 cal. per sec. cm<sup>2</sup> per degree C per cm at 20 degrees C (0.175 btu per hr. ft. degree F per ft. at 77 degrees F).
    - k. Permeability (ASTM E96):

- (1) Type 386: 0.262 gms per m<sup>2</sup> per 24-hrs; 0.0358 U.S. perms.
    - (2) Type 396: 0.193 gms per m<sup>2</sup> per 24-hrs; 0.0264 U.S. perms.
  3. Underlayment (Surface Patch): Lean concrete mix, unless otherwise recommended by the coatings manufacturer.
  4. Apply coatings in strict accordance with manufacturer's instructions.
    - a. Use techniques best suited for substrate and type of material being applied.
    - b. Provide adequate ventilation to prevent the build-up of fumes or objectionable odors during application.
    - c. Maintain proper personnel equipment including respirators which are mandatory for applicators engaged in spray-on coating.
    - d. Protect adjacent areas against damage from coating operation.
    - e. Provide coating systems which are compatible with substrates indicated.
  5. Application:
    - a. Apply materials at not less than manufacturer's recommended spreading rate, to establish a total coating thickness as indicated, or, if not indicated, as recommended by the manufacturer.
      - (1) Total Coating Thickness: Not less than 125 mils DFT.
    - b. Apply first-coat of material to surfaces that have been cleaned, pretreated or otherwise prepared for coating as soon as practicable after preparation and before subsequent surface deterioration.
    - c. Prepare surfaces between each subsequent coat in accordance with manufacturer's directions.
    - d. Apply additional coats until final coat is of uniform finish, color, appearance, and overall specified thickness has been achieved.
    - e. Ensure that edges, corners, crevices, and similar features receive a coating thickness equivalent to that of flat surfaces.
    - f. Coat surfaces behind movable equipment same as similar exposed surfaces. Coat surfaces behind permanently-fixed equipment before final installation of such equipment.
    - g. Provide a final finish free of holidays, voids, sags, and other surface imperfections.
- B. Sauereissen SewerGard No. 210X.
1. SewerGard No. 210X shall be a complete system for substrate repair, water infiltration prevention and epoxy based corrosion protection including:
    - a. Cementitious resurfacing/ underlayment compound is required, and shall be installed to fill surface irregularities and large voids in the prepared concrete substrate; minimum application thickness 1/8".
    - b. Epoxy filler compound to fill all voids and bug holes in NEW concrete to provide a properly prepared and uniform surface for the epoxy lining.

- c. 100% solids epoxy, moisture tolerant, polymer lining designed specifically for municipal wastewater exposure at a thickness of 125 mils.
  - d. The applicator shall supply all accessory components such as sealers, infiltration control products or other compounds or products as recommended by the protective lining manufacturer for maximum protective lining adherence to substrate and long-term service performance.
2. Types of protective lining system components for the corrosion protection work required, including surface treatment of prepared surfaces prior to coating application, shall include, but are not necessarily limited to trowel or gun applied, fast setting, high-early strength cementitious resurfacing/underlayment compounds, epoxy formulation filler compound for new construction application, corrosion-resistant, moisture tolerant, 100% solids epoxy, spray or trowel applied, monolithic protective lining and miscellaneous materials.
  3. Underlayment Resurfacing Compound: Cementitious resurfacing products shall be used for surface leveling, large bug holes, and for general concrete patching and shall be installed and cured according to Manufacturer’s written guidelines as outlined in product technical data sheets. All voids must be completely filled and existing substrate covered in its entirety so that the finish of underlayment resurfacing compound should be uniform in appearance. Apply a “broom” finish to resurfacing compound at time of installation to create adhesion profile.
  4. Properties: Sauereisen No. F-121 Trowel Grade
 

Application Time:		
Working Time at 70F		30 minutes
Initial Set at 70F		3 hours
Color		Tan
Compressive Strength:		
@24 hours		3500 psi
@5 hours		2500 psi
@28 hours		6000 psi
Density:		
Mix Ratio (Powder to Water, by Weight)		9:1
Abrasion Resistance (ASTM C-704)	Volume	5.14 cm <sup>3</sup>
Loss, cm <sup>3</sup>		
Volume Loss, %		0.65%
Freeze-thaw Durability Factor (ASTM C666-A)		87.2
  5. Underlayment shall be a fast-setting, high early strength, Portland/Calcium Aluminate-based resurfacing material. Underlayment shall be trowelable formulation, except where Applicator recommends alternate use of sprayable, castable or gunite formulations by the same manufacturer for intended service application. Underlayment Resurfacing Compound shall be applied to the entirety of the interior surface to fill all irregularities to provide uniform surface for the application of the epoxy corrosion resistant lining system. The underlayment may be substituted with the Epoxy Filler Compound or High Build Epoxy Filler Compound based upon contractor recommendation and site conditions at time of installation.

6. Epoxy Filler Compound: Epoxy filler, where required, shall be used for filling small bug holes, static cracks and joints, and for general concrete patching, in NEW concrete and to provide a uniform, void free surface for epoxy lining application

- a. Properties: Sauereisen Epoxy Filler Compound No. 209 Color Off White

Compressive Strength	10,000 psi
Density (ASTM C-905)	87.2 pcf
Flexual Strength (ASTM C-580)	4000 psi
Modulus of Elasticity (ASTM C-580)	5.2x10 <sup>4</sup>
psi Tensile Strength (ASTM C-307)	2200 psi
Bond Strength to Concrete (ASTM D-4541)	Concrete
Failure Moisture Absorption (ASTM C-413)	<0.25%
Shrinkage (ASTM-531)	<0.2%
Working Time	15 min @ 70F
Topcoat	3 hrs @ 70F

- b. Filler Compound shall be an epoxy formulation specifically designed to fill voids, irregularities and air pockets in NEW concrete surfaces. The filler compound shall be applied to the interior substrate to provide a uniform surface for the application of the epoxy corrosion resistant lining system. Filler compound shall be confirmed by the Manufacturer as compatible with any underlayment materials and with the protective coating. The filler compound may be substituted with the Underlayment Resurfacing Compound based upon contractor recommendation and site conditions at time of installation.

7. Epoxy Lining Protective Coating: Epoxy lining protective coating shall be spray applied to the entire interior surface of the sewer manhole including the walls from the manhole base up through the bottom of the manhole lid frame, and the manhole bench from the wall to the channel low flow line and cured on the properly prepared surface in accordance with Manufacturer's written guidelines as outlined in product technical data sheets. The epoxy lining should not overlap the manhole lid frame.

- a. Properties: Sauereisen SewerGard No. 210X

Adhesion (ASTM D4541)	Concrete Failure
Application Time (ASTM C308 modified), Working Time at 70F	30 minutes
Bond Strength to Concrete (ASTM D7234)	Concrete Failure
Bond Strength by Slant Shear (ASTM C882-99)	700psi (49.2kg/cm <sup>2</sup> )
Modified Compressive Strength (ASTM D695)	15,500psi (1089.7kg/cm <sup>2</sup> )
Components	2 parts

Elongation (ASTM D638)	12.9%
Flexural Strength (ASTM D700) @28 days	8000psi (562.4kg/cm <sup>2</sup> )
Maximum Service Temperature (Dry)	150F (65C)
Mix Ratio (By Volume)	1 part A (Harder): 3 Parts B (Resin)
Modulus of Elasticity (ASTM D700)	5.1 x 104psi
Permeability (ASTM D790)	1.32 x 10 <sup>-10</sup>
Shore D (ASTM D638)	95
Tensile Strength @7 days (ASTM D638)	4300psi (302.3kg/cm <sup>2</sup> )
Recommended Thickness	100-125 mils

- b. Epoxy lining shall be a self priming (to concrete), 100% solids, spray-applied epoxy polymer protective coating material specifically designed to protect concrete surfaces in wastewater structures subjected to municipal wastewater service conditions, including associated abrasive physical attack and chemical attack mechanisms related to hydrogen sulfide and organic acids generated by microbial sources. (Note: an alternate trowel applied formulation of the identical resin and hardener system with different fillers may be applied at the specified thickness when approved in writing by the Manufacturer.)

### C. Sprayroq, SprayWall

1. Spraywall material shall be solvent-free rigid polyurethane material application.
2. Existing Products
  - a. Cementitious patching and repair materials should not be used unless their manufacturer provides information as to its compatibility and procedures for topcoating with the approved coating. Project specific submittals should be provided including application, cure time and surface preparation procedures which permit optimum bond strength with the approved coating.
  - b. Remove existing coatings prior to application of the new protective coating. Applicator is to maintain strict adherence to applicable NACE and SSPC recommendations with regard to proper surface preparation and compatibility with existing coatings.
3. Repair Materials
  - a. Repair materials shall be used to; fill voids, bugholes, structurally reinforce and/or rebuild surfaces, etc. as determined necessary by the manufacturer and protective coating applicator. Repair materials must be compatible with the specified coating and shall be applied in accordance with the manufacturer's recommendations.

- b. The following products may be accepted and approved as compatible repair basecoat materials for approved topcoating for use within the specifications:
  - (1) 100% solids, solvent-free grout specifically formulated for approved topcoating compatibility. The grout manufacturer shall provide instructions for trowel or spray application and for approved topcoating procedures.
  - (2) Factory blended, rapid setting, high early strength, non-shrink cementitious or epoxy repair mortar that can be troweled or pneumatically spray applied may be approved if specifically formulated to be compatible for approved topcoating. Such repair mortars should not be used unless their manufacturer provides information as to its suitability for topcoating with the approved topcoating. Project specific submittals should be provided including application, cure time and surface preparation procedures which permit optimum bond strength with the approved coating.
  - (3) In the case of excessive infiltration, a hydraulic cement or plug may be used to stop the flow of the infiltration. Approved manufacturer's include "The Strong Company, Inc.", or approved equal. The hydraulic cement shall be compatible with the spray applied resin coating.

4. Protective Coating Material

- a. The resin based material shall be used to form the sprayed structurally enhanced monolithic liner covering all interior surfaces of the structure, including benches and inverts of manholes. The finished liner shall be 100% Solids polyurethane and conform to the minimum physical requirements listed below. The physical requirements must be verified by an independent, certified, third party testing laboratory within the last five years and must be submitted with the submittals.

Compressive strength:	ASTM D 695	> 18,000 psi
Tensile strength:	ASTM D 638	> 7,450 psi
Bond (Concrete):	ASTM D7234	> 200 psi
	Or Substrate Failure	
Bond (Steel):	ASTM D4541	> 1,000 psi
Flexural Modulus (Initial):	ASTM D 790	> 735,000 psi
Flexural Modulus (Long Term):	ASTM D 2990	> 529,000 psi
Density:	87 ± pcf	
Chemical Resistance:	ASTM D543	
Severe Municipal Sewer:	All types of service	
Successful Pass:	Sanitation District of L.A. County Coating	

- b. When groundwater loading is not an issue and only a corrosion barrier is required, the rehabilitation lining shall be installed to the thickness necessary to qualify as a monolithic (void free) liner. The roughness of the substrate will dictate the thickness needed to create the monolithic liner and eliminate any opportunity for voids in the lining. The minimum value for coating thickness for corrosion protection for non-structural

rehabilitation shall be 125 mils and structural rehabilitation shall be a minimum of 250 mils or the design thickness determined by the proper design protocol.

D. Raven 405

1. Raven 405 material shall be ultra-high build, 100% solids, solvent free epoxy coating.

Test	Method	Result
Tensile Strength	ASTM D 638	>9,000 psi
Tensile Elongation	ASTM D 638	>6%
Compressive Strength	ASTM D 695	>18,000
Flexural Strength	ASTM D 790	>15,000
Hardness, Shore D	ASTM D 2240	87
Taber Abrasion, CS-17	ASTM D 4060, 1 kg load/1,000 cycles	57
Adhesion, Steel	ASTM D 4541	>2,500 psi
Adhesion, Concrete	ASTM D 7234	Substrate Failure
VOC	Calculated	0 g/l

2. Prior to application of the lining, all surfaces shall receive a 100% solids non-solvented, moisture tolerant epoxy primer as manufactured by Raven Lining Systems, or approved equal. Lining must have passed chemical resistance test of the SSPWC.
3. Prior to coating, the substrate must be prepared in a manner that provides a uniform, clean, sound, neutralized surface suitable for the specified coating. The substrate must be free of all contaminants, such as oil, grease, rust, scale or deposits. In general, coating performance is proportional to the degree of surface preparation.

## PART 3 - EXECUTION

### 3.01 SURFACE PREPARATION

- A. Surface preparation shall be performed in accordance with the manufacturer's requirements to achieve required adhesion as specified hereon. All loose material, coatings, corroded concrete, and any rust shall be removed in its entirety. Damaged concrete exceeding ¼-inch in depth shall be repaired with mortar which is compatible with the approved lining system and meets the requirements for adhesion as set forth in this specification.
- B. Contractor shall remove existing linings in their entirety prior to performing concrete rehabilitation and new lining application.
- C. New and existing concrete structures to receive protective coating system must be capable of withstanding imposed loads. All oil, grease and chemical contaminants must be removed from the surface. Surfaces must be firm, free of standing water, form release agents and existing coating. Suitable surface preparation methods include abrasive blasting, hydro blasting, mechanical scrapping and hand tool grinding to remove surface contaminants.

- D. When protective coatings are installed within polymer manholes with concrete bases the coatings shall only be installed onto the exposed portions of the concrete base per the requirements of this specification.

### 3.02 WATER TIGHTNESS

- A. The end cuts of the liner inside the manhole shall be fully sealed to prevent water entering into the space between the host pipe and the liner.

### 3.03 LINING APPLICATION

- A. The lining application shall be performed only by workers approved by the manufacturer as trained and experienced with the specified material. The lining shall be applied by high pressure airless equipment approved by the lining manufacturer. The equipment shall be in good working order to ensure correct proportioning and mixing of the components.
- B. Protective coating systems shall be installed when ambient air and surface temperature is between 50F and 90F. Store material within a range of 60F to 85F range for 48 hours prior to use. Application and storage temperatures outside of this range will require written approval from the Manufacturer.
- C. Application in direct sunlight and/or with rising surface temperatures will result in blistering of the materials due to expansion of entrapped air or moisture (out-gassing) in the concrete. In such cases, it will be necessary to postpone the application until later in the day when the temperature of the substrate is falling. Concrete surfaces that have been in direct sunlight must be shaded for at least 24 hours prior to application and remain shaded until the initial set has taken place. Consult Manufacturer for application schedule guidelines specific to temperature conditions and possible sealer application recommendations to reduce out-gassing.
- D. The lining shall be applied to a thickness of 125 mils (1/8-inch) in one continuous coat without seams, free from any holes or defects. The lining shall be installed from three (3) inches below the low-flow water level to the base of ring and cover. The lining shall be installed over dry concrete below the water level by using appropriate by-pass equipment. Coating in trough shall not be thicker than 125 mils to ensure smooth taper from trough to shelf. A mandrel shall be inserted into upstream and downstream pipe to insure the accessibility.
- E. During lining application, the CONTRACTOR shall take wet gauge thickness readings as required to insure correct lining thickness.
- F. Installed epoxy lining protective coating and shall be tested for pinholes after a minimum 24-hour cure at a temperature of 70F. Pinhole testing shall be accomplished in accordance with ASTM D4787 using a Tinker Razor Holiday Detector, San Gabriel, CA, Model AP/W, or an approved equal device. Test voltage of 100 volts/mil of coating thickness shall be applied. All pinholes shall be marked and repaired using manufacturer's approved Patch Kit, or other approved method.
- G. Adhesion testing shall be performed on a minimum of 1 structure or 15 percent of all coated structures, whichever is greater. Adhesion testing shall be conducted after a minimum 24-hour cure of the Epoxy Lining Protective Coating at 70F. A minimum of two measurement



of bond strength of the protective coating to the substrate shall be made. Bond strength shall be measured in accordance with ASTM D7234-05. Prior to the pull test, the tester shall utilize a scoring device to cut through the coating until the substrate is reached. The pull tests in each structure shall meet or exceed 200 psi and shall include substrate adhered to the back of the dolly or no visual signs of coating material in the test hole. Any areas detected to have less than 200 psi bond strength to concrete shall be removed and/or repaired by the CONTRACTOR in accordance with the manufacturer's recommendations. All costs shall be borne by the CONTRACTOR.

- H. The uniform lining shall be free from porosity, without bubbles or pinholes and uniform in color. All areas in question shall be removed and reworked and patched.
- I. Before accepting the finished product, testing with a holiday or porosity detector shall be made by the CONTRACTOR, and any pinholes found shall be patched.
- J. Application of the lining shall not take place when exposed to rain, fog or high winds. It is the CONTRACTOR's responsibility to insure protection of the work from the above-mentioned conditions.

### **3.04 ADJUSTMENTS AND CLEANING**

- A. At the completion of the Work, CONTRACTOR shall remove all materials and debris associated with the Work of this Section.
- B. Clean all surfaces not designated to receive protective coating. Restore all other work in a manner acceptable to the DISTRICT.
- C. All finished protective coating shall be protected from damage until Final Acceptance of the Work. Protective coating damaged in any manner shall be repaired or replaced at the discretion of Inspector. All costs shall be borne by the CONTRACTOR.
- D. Clean all protective coating as recommended by the manufacturer to provide finished Work acceptable to AGENCY, just prior to Final Acceptance.

### **3.05 TEMPORARY FLOW THROUGH PLUG OR BYPASS SYSTEM**

- A. The CONTRACTOR shall provide, install, maintain, and remove all temporary flow bypassing equipment and materials needed to complete the manhole rehabilitation work in accordance with the Contract Documents and the standard specifications. The CONTRACTOR shall be responsible for selection of all means and methods to bypass flows as necessary to perform the work. The CONTRACTOR shall also install a temporary rack at the manhole directly downstream of the manhole that the temporary bypass equipment is being used to prohibit the passage of any loose or unanchored equipment from entering the downstream sewer system.
- B. The CONTRACTOR shall submit a plan to the AGENCY for approval before beginning work describing the flow bypassing equipment to be used, how it is to be installed, maintained, and removed, including any precautionary measures. Submittal shall show how the CONTRACTOR will monitor and prevent the obstruction of flow in the flow bypass equipment and shall also include the equipment and procedures that will be used to prohibit the passage of any loose or unanchored equipment from entering the sewer system.

All products, equipment, and materials used to complete the Work shall be able to withstand the active sewer conditions and shall be able to handle flows specified in the Contract Drawings.

**END OF SECTION**

**SECTION 09811****FUSION BONDED EPOXY LINING AND COATING****PART 1 - GENERAL****1.01 DESCRIPTION**

- A. This Section includes materials, application, and testing of one part, fusion-bonded, heat cured, thermosetting, 100% solids epoxy lining and coating on metallic surfaces including steel, cast iron, and ductile iron such as pipe, equipment (e.g., valves, fittings, couplings), and structural steel. The generic term "coating" as used herein refers to either interior lining or exterior coating.

**1.02 RELATED WORK SPECIFIED ELSEWHERE**

- A. The work of the following Specifications, Divisions, or Sections apply to the work of this Section. Work of other Sections of the Specification, not referenced below, shall also apply to the extent required for proper performance of this work.
1. Section 01300 – Shop Drawings and Submittals
  2. Section 15064 – Steel Pipe and Fittings

**1.03 SUBMITTALS**

- A. Submit the following in accordance with Specification Section 01300:
1. Manufacturer's catalog literature and product data sheets, describing the physical and chemical properties of the epoxy coating. Describe surface preparation, application and curing procedures.

**1.04 QUALITY ASSURANCE**

- A. Submittals shall be made in conformance with standard specifications.
- B. Submit catalog data for all highline materials and components.

**PART 2 - PRODUCTS****2.01 PIPING AND EQUIPMENT SURFACES**

- A. Pipe and equipment to be coated shall be new and free of salts, oil, and grease to the coating applicator.

**2.02 SHOP APPLIED EPOXY COATING**

- A. Lining and coating shall be 100% solids, thermosetting, fusion-bonded, dry powder epoxy resin. Provide: Scotchkote 134 or 206N, Lilly Powder Coatings "Pipeclad 1500 Red," H.B. Fuller 1F-3003, or District approved equal.

- B. Epoxy lining and coating shall meet or exceed the following requirements:

Hardness (Minimum)	Barcol 17 (ASTM D 2583) Rockwell 50 ("M" Scale)
Abrasion Resistance (Minimum)	1,000 cycles: 0.05 gram removed 5,000 cycles: 0.115 gram removed ASTM D 1044, Tabor CS 17 wheel, 1,000 gram weight
Adhesion (Minimum)	3,000 psi (Elcometer)
Tensile Strength	7,300 psi (ASTM D 2370)
Penetration	0 mil (ASTM G 17)
Adhesion Overlap Shear, 1/8-inch steel panel, 0.010 glue line	4,300 psi (ASTM D 1002)
Impact (Minimum Value)	100 inch-pounds (Gardner 5/8-inch diameter tup)

### 2.03 FIELD APPLIED EPOXY COATING FOR COATING REPAIR

- A. Use a two-component, 80% solids, liquid resin, such as Scotchkote 306 or District approved equal.

## PART 3 - EXECUTION

### 3.01 SHOP APPLICATION OF FUSION BONDED – GENERAL

- A. Do not apply fusion-bonded epoxy to aluminum, brass, bronze, copper, plastic, rubber, or stainless steel surfaces.
- B. Grind surface irregularities, welds, and weld spatter smooth before applying the epoxy. The allowable grind area shall not exceed 0.25 square foot per location, and the maximum total grind area shall not exceed 1 square foot per item or piece of equipment. Do not use any item, pipe, or piece of equipment in which these requirements cannot be met.

- C. Remove surface imperfections, such as slivers, scales, burrs, weld spatter, and gouges. Grind outside sharp corners, such as the outside edges of flanges, to a minimum radius of 1/4-inch.
- D. Uniformly preheat the pipe, item, or piece of equipment prior to blast cleaning to remove moisture from the surface. The preheat shall be sufficient to ensure that the surface temperature is at least 5°F above the dew point temperature during blast cleaning and inspection.
- E. Sandblast surfaces per SSPC SP-5. Protect beveled pipe ends from the abrasive blast cleaning.
- F. Apply a phosphoric acid wash to the pipe, item, or piece of equipment after sandblasting. The average temperature, measured in three different locations, shall be 80°F to 130°F during the acid wash procedure. The acid wash shall be 5% by weight phosphoric acid solution. The duration in which the acid is in contact with the surface shall be determined by using the average temperature as tabulated below:

Pipe Temperature (°F)	<b>CONTACT TIME (SECONDS)</b>
80	52
85	45
90	36
95	33
100	<b>28</b>
105	24
110	21
130	10

After the acid wash has been completed, remove the acid with demineralized water having a maximum conductivity of 5 micro-mhos/cm (micro-Siemens/cm) at a minimum nozzle pressure of 2,500 psi.

- G. Do not allow oxidation of surfaces to occur prior to coating. Do not permit surfaces to flash rust before coating.
- H. Apply lining and coating by the electrostatic spray or fluidized bed process. Heat and cure per the epoxy manufacturer's recommendations. The heat source shall not leave a residue or contaminant on the metal surface.
- I. The cured lining or coating shall be smooth and glossy, with no graininess or roughness. The lining or coating shall have no blisters, cracks, bubbles, underfilm voids, mechanical damage, discontinuities, or holidays.

**3.02 SHOP APPLICATION – PIPE AND FITTINGS**

- A. In addition to the above requirements, apply lining and coating per AWWA C213 except as modified herein.

- B. Grind 0.020-inch (minimum) off the weld caps on the pipe weld seams before beginning the surface preparation and heating of the pipe.
- C. Minimum dry film thickness of lining or coating shall be 12 mils.
- D. Linings shall be certified to be holiday free.

### **3.03 SHOP APPLICATION – VALVES AND EQUIPMENT**

- A. Minimum dry film thickness of lining or coating shall be 8 mils minimum.
- B. Linings shall be certified to be holiday free.

### **3.04 SHOP TESTING OF LINING AND COATING – GENERAL**

- A. Test linings and coatings with a low-voltage wet sponge holiday detector in accordance with AWWA C213, Section 5.3.3. If the number of holidays for flat or smooth surfaces such as pipe is one per 10 square feet of coating surface, repair and retest. If the number of holidays for valves, couplings, and fittings is 3 or less per item, repair and retest. Repair by applying the coating manufacturer's recommended repair compound to each holiday. If the number of holidays or pinholes exceeds these allowable quantities, remove the entire lining or coating and recoat the pipe or item and retest.
- B. Measure the coating thickness at three locations on each item or piece of equipment or pipe section using a coating thickness gauge calibrated at least once per eight-hour shift. Record each measured thickness value. Where individual measured thickness values are less than the specified minimum thickness, measure the coating thickness at three additional points around the defective area. The average of these measurements shall exceed the specified minimum thickness value, and no individual thickness value shall be more than 2 mils below or 4 mils above the specified minimum value. If a section of the pipe, item, or piece of equipment does not meet these criteria, remove the entire lining or coating and recoat the entire item or piece of equipment.
- C. Check for coating defects on the weld seam centerlines. There shall be no porous blisters, craters, or pimples along the peak of the weld crown or insufficient thickness of coating.
- D. The District's Representative will conduct an independent inspection of the lining and coating in the field for compliance with the above criteria. Coated items failing this inspection will be cause for rejection.

### **3.05 FIELD REPAIRS**

- A. Patch scratches and damaged areas incurred while installing fusion bonded epoxy coated items with a two-component, 80% solids (minimum), liquid epoxy resin.
- B. Wire brush or sandblast the damaged areas per SSPC SP-10. Lightly abrade or sandblast the lining or coating on the sides of the damaged area before applying the liquid epoxy coating.
- C. Apply a two-part epoxy coating to damaged linings and coatings to flat surface areas smaller than 9-square-inches. Repaired areas shall overlap the base coating a minimum of 1/2-inch. Apply the liquid epoxy coating to the minimum dry-film thickness specified for the component, or 8 mils minimum, unless otherwise specified in individual product specifications.
- D. If a damaged area exceeds 9-square-inches, remove the entire lining and coating and recoat the entire item or piece of equipment and retest.

**END OF SECTION**

**SECTION 09867****POLYETHYLENE SHEET OR TUBE ENCASEMENT****PART 1 - GENERAL****1.01 DESCRIPTION**

This section includes materials, application, and inspection of polyethylene sheet or tube encasement for buried steel and iron pipe, fittings, couplings, valves, and appurtenances.

**1.02 RELATED WORK SPECIFIED ELSEWHERE**

Section 01300 – Contractor Submittals

Section 15062 – Ductile Iron Pipe and Fittings

Section 15080 – Miscellaneous Piping Specialties

Section 15100 – Resilient Wedge Gate Valves

**1.03 SUBMITTALS**

Submit manufacturer's catalog literature and product data sheets describing the physical, chemical and electrical properties of the encasement material in accordance with Section 01300.

**PART 2 - MATERIALS****2.01 POLYETHYLENE MATERIAL**

The encasement shall consist of a clear polyethylene sheet or tube at least 8 mils in thickness and conforming to AWWA C105.

**2.02 PLASTIC ADHESIVE TAPE**

Tape for fastening and sealing encasement seams shall be 2-inch wide plastic adhesive tape such as Calpico Vinyl Tape, Polyken 900 or approved equal.

**PART 3 - EXECUTION****3.01 TUBE ENCASEMENT OF BURIED PIPE, FITTINGS, AND VALVES**

- A. Pipe, fittings, and valves shall be double-wrapped. Cut polyethylene tube 2 feet longer than the length of pipe to receive the encasement. Prior to placing the pipe into the trench, raise the pipe section and slip the polyethylene tube over the spigot end of the pipe. Bunch up the tube in accordion fashion between the spigot end and the supporting sling.
- B. Lower the pipe section into the trench and seat the spigot end into the bell of the previously installed pipe. Provide a shallow hole at the bell to facilitate the joint overlap.



- C. Remove the sling from the pipe. Raise the pipe from the bell end about 3 or 4 inches and slip the bunched up polyethylene tube along the full length of pipe. Leave one foot of bunched up polyethylene tube at each end of the pipe for joint overlap.
- D. To make the joint overlap, pull the polyethylene tube from the bell end over the pipe joint to the spigot end. Fold the tube around the pipe and secure with three circumferential wraps of plastic adhesive tape or a plastic tie strap. Then pull the bunched up polyethylene tube on the spigot end over the wrapped pipe joint to the bell end. Fold tube and secure with tape or a plastic tie strap as previously described.
- E. Pull the loose polyethylene tube on the pipe snugly around the pipe barrel. Fold the excess material over at the top of pipe and secure the fold with 6-inch long strips of plastic adhesive tape at 3 feet on center.
- F. Polyethylene sheet will not be allowed as a substitute for tube when required for installation on buried pipe.

### **3.02 SHEET ENCASEMENT OF BURIED VALVES**

Wrap valves by pulling the bunched up polyethylene tube (where installed) from the adjacent pipe over the bells or flanges of the valve. Secure the tube to the valve body with plastic adhesive tape strips wrapped around the valve body. Then wrap the valve with a flat sheet of polyethylene. Place the sheet under the valve and fold in half. Extend the sheet to the valve stem and secure the sheet in place with plastic adhesive tape. Apply the second layer and secure with tape. Pour concrete anchor and support blocks after the wrap has been properly placed.

### **3.03 SHEET ENCASEMENT OF BURIED FITTINGS, COUPLINGS, AND APPURTENANCES**

- A. Wrap buried ferrous metal pipe fittings, couplings, adapters, and appurtenances with polyethylene sheet. Overlap the adjoining pipe or fitting a minimum of one-foot and secure in place with plastic adhesive tape. Apply a second layer and secure with tape around the barrel of the connecting pipe to prevent the entrance of soil. Pour concrete anchor and thrust blocks after the wrap has been placed.
- B. Wrap base elbows and risers of hydrants and backflow prevention assemblies with 2 layers of polyethylene sheet and secure with plastic adhesive tape. Extend the wrap to the finish ground level of the assembly. Pour concrete anchor and support blocks after the wrap has been placed.

### **3.04 REPAIR OF POLYETHYLENE MATERIAL**

Repair polyethylene material that is damaged during construction. Use polyethylene sheet, place over damaged or torn area, and secure with plastic adhesive tape.

**END OF SECTION**

**SECTION 09868****COLD APPLIED WAX TAPE COATING****PART 1 - GENERAL****1.01 DESCRIPTION**

This section includes materials and application of a three-part, cold applied wax tape coating system for buried fittings and valves. The coating system shall conform to AWWA C217 and as specified herein.

**1.02 RELATED SECTIONS**

- A. Section 01300 – Record Drawings and Submittals
- B. Section 09867 – Polyethylene Sheet or Tube Encasement

**1.03 SUBMITTALS**

Submit manufacturer's catalog data sheets and application instructions in accordance with the Section 01300.

**PART 2 - MATERIALS****2.01 PRIMER**

- A. Primer shall be a blend of petroleums, plasticizers, and corrosion inhibitors having a paste-like consistency. The primer shall have the following properties:

Color:	Brown
Pour Point:	100°F to 110°F
Flash Point:	350°
Coverage:	1 gallon/100 square feet

- B. Primer shall be Trenton Wax Tape Primer or approved equal.

**2.02 WAX TAPE**

- A. Wax tape shall consist of a synthetic-fiber felt saturated with a blend of microcrystalline wax, petrolatums, plasticizers, and corrosion inhibitors forming a tape coating that is easily formable over irregular surfaces. The tape shall have the following properties:

Color:	Brown
Saturant Pour Point:	115°F to 120°F

Thickness: 50 to 70 mils

Tape Width: 6 inches

Dielectric Strength: 100 volts/mil

- B. Wax tape shall be Trenton No. 1 Wax Tape or approved equal.

### 2.03 PLASTIC WRAPPER

- A. Wrapper shall be a polyvinylidene chloride plastic with three 50-gauge plies wound together as a single sheet. The wrapper shall have the following properties:

Color: Clear

Thickness: 1.5 mils

Tape Width: 6 inches

- B. Plastic wrapper shall be Trenton Poly-Ply or approved equal.

### 2.04 POLYETHYLENE ENCASEMENT

See Section 09867.

## PART 3 - EXECUTION

### 3.01 WAX TAPE COATING APPLICATION

- A. Surfaces shall be clean and free of dirt, grease, water, and other foreign materials prior to the application of the primer and wax tape.
- B. Apply primer by hand or brush to all surfaces of the pipe, fitting, flanges, and bolts to be wrapped by wax tape. Work the primer into all crevices, around bolts and nuts, into the threads, and completely cover all exposed metal surfaces. Extend the primer coating beyond the indicated limits of application a minimum of 3 inches onto adjacent surfaces of the piping.
- C. Apply the wax tape immediately after the primer application. Work the tape into the crevices around fittings or flanges. Cut short lengths of tape, place over each bolt head and nut, and work the tape into the crevices. Wrap the wax tape spirally around the pipe and across fittings or flanges. Use a minimum overlap of 55 percent of the tape width.
- D. Work the tape into the crevices and contours of irregularly shaped surfaces and smooth out so that there is a continuous protective layer with no voids or spaces under the tape.
- E. Overlap the completed wax tape coating installation with the plastic wrapping material. Wrap spirally around the pipe and across fittings or flanges. Use a minimum overlap of 55 percent of the tape width and apply two layers or applications of over-wrap. Secure plastic wrapper to pipe with adhesive tape.

**3.02 POLYETHYLENE ENCASEMENT**

- A. Wrap the completed wax tape coating system with polyethylene sheet per Section 09867 and secure around the adjacent pipe circumference with adhesive tape.

**END OF SECTION**

**SECTION 09900**  
**PAINTING AND COATING**

**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. This section includes materials and application of painting and coating systems for the following surfaces:
  - 1. Submerged Metal
  - 2. Exposed Metal
  - 3. PVC, CPVC and FRP
  - 4. Metal in Contact with Concrete
  - 5. Plaster, Wood, Masonry and Drywall
- B. This section does not include coating steel tanks and reservoirs.

**1.02 RELATED WORK SPECIFIED ELSEWHERE**

- A. Section 01300 - Contractor Submittals
- B. Section 15064 – Steel Pipe
- C. Section 15100 – Resilient Wedge Gate Valves

**1.03 REFERENCE SPECIFICATIONS, CODE AND STANDARDS**

- A. Air Pollution Control District, San Diego Division  
  
Rule 66.1 Miscellaneous Surface Coating Operations and Other Processes Emitting Volatile Organic Compounds
- B. American Society for Testing and Materials  
  
ASTM D2697 Standard Test Method for Volume Nonvolatile Matter in Clear or Pigmented Coatings  
ASTM D4258 Standard Practice for Surface Cleaning Concrete for Coating  
ASTM D4541 Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
- C. National Sanitation Foundation

## NSF61          Drinking Water System Components - Health Effects

## D.      The Society for Protective Coatings

SSPC PA-1	Shop, Field, and Maintenance Painting of Steel
SSPC SP-1	Solvent Cleaning
SSPC SP-2	Hand Tool Cleaning
SSPC SP-3	Power Tool Cleaning
SSPC SP-5	White Metal Blast Cleaning
SSPC SP-6	Commercial Blast Cleaning
SSPC SP-7	Brush-Off Wet Blast Cleaning
SSPC SP-8	Pickling
SSPC SP-10	Near-White Metal Blast Cleaning
SSPC SP-11	Bare Metal Power Tool Cleaning

## E.      National Association of Corrosion Engineers

SP0188	Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates
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**1.04 SUBMITTALS**

- A. Submit coating manufacturer's data sheets for the products to be applied in accordance with Section 01300. Data sheets shall show the following information:
1. Percent solids by volume.
  2. Minimum and maximum recommended dry-film thickness per coat for prime, intermediate, and finish coats.
  3. Recommended surface preparation.
  4. Recommended thinners.
  5. Statement verifying that the specified prime coat is recommended by the manufacturer for use with the specified intermediate and finish coats.
  6. Application instructions including recommended equipment and temperature limitations.
  7. Curing requirements and instructions.
- B. Submit color swatches.
- C. Submit certificate identifying the type and gradation of abrasives used for surface preparation.
- D. Certification that all paints and coatings comply with San Diego Air Pollution Control District's requirements.

- E. Material safety data sheets for each coating material, solvent, cleaning agent, and other potentially hazardous material to be used.
- F. Coatings Schedule. At least 30 working days before the start of shop or project site coating work, submit a schedule of coating products to be used. The list shall indicate the manufacturer's brand name of each material to be used, the surfaces to which each material is to be applied, and the method of holiday testing.
- G. Application procedures and quality control inspection plan with hold points for the application of shop applied coating and for field-applied coating on joints.
- H. At least 30 working days before the start of coating work at the project site, submit a plan to protect existing previously painted surfaces, detailed procedure for abrasive blasting, and plan to contain and dispose of blasting products and debris.
  - 1. Overspray and Paint Protection Plan. Submit detailed procedures to prevent overspray damage to existing structures and protection of existing paint from damage during installation and welding operations.
  - 2. Submittals for equipment or items to be prepared and painted in the shop or manufacturing plant shall include information in accordance with this section. Coordinate the material compatibility certifications, color, and time to recoat requirements with the manufacturers and with the proposed field coatings.
- I. Abrasive blast media shall be in compliance with federal, state and local regulations, including Title 17 California Code of Regulations, Sections 92000-92530; Abrasive Blasting. Abrasives used for dry unconfined abrasive blasting are to have current certification by the California Air Resources Board (CARB). Provide the following information for all abrasives to be used for dry, unconfined abrasive blasting.
  - 1. The manufacturer's name or identifiable trade name.
  - 2. The grade or brand name of the abrasive.
  - 3. Verification that the abrasives are CARB certified for dry unconfined blasting.
- J. Provide a NACE Certified CIP Level III Peer Reviewed Coating Inspector (NACE Level III Coating Inspector), from the start of surface preparation, to the coating application, to the final curing and inspection. The NACE Level III Coating Inspector shall provide instruction, guidance, and inspection to the Contractor for all aspects of surface preparation, coating application, and final coating inspection including repair and touch up.
  - 1. Submit name and certification number of the NACE Level III Coating Inspector.
- K. Inspection Reports and Records. All reports for painting and coating shall be signed by the NACE Level III Coating Inspector certifying compliance with the Contract Documents. Inspection reports for field applied coatings shall be submitted within two days after the work has been performed.

- L. Qualifications. Submit a list of names and qualifications, including years of experience applying coating systems used in this specific project, for each individual worker performing application and mixing.
1. Employ trained, experienced applicators, trained by NACE or SSPC, certified quality control inspectors, and trained coating mixer/helpers.
  2. These workers shall work under the direction of qualified and experienced supervisors.
  3. Supervisors shall have a minimum two years recent, continuous experience supervising industrial maintenance coating application operations similar to the operations required to complete this project.
  4. Applicators and mixer-helpers shall be trained and certified by the coating manufacturer for all coating products used on this project.

#### **1.05 DELIVERY, STORAGE AND HANDLING**

- A. All materials shall be in the original sealed containers. They shall not be opened or used until the Construction Manager has physically inspected contents and obtained necessary data from information printed on containers or label. Materials exceeding storage life recommended by the manufacturer shall be rejected.
- B. All coating materials shall be stored in enclosed structures to protect them from weather and excessive heat or cold. Coatings materials shall be stored at a temperature between 50 degrees F and 100 degrees F in a well ventilated area at all times, unless the manufacturer's requirements are more stringent. Take measures to prevent any fire hazards associated with storage of the materials.

#### **1.06 EQUIPMENT AND TOOLS**

- A. Compressed-air units used in cleaning, abrasive blasting, and painting shall be equipped with oil and water separators. Separators shall be placed as close as practical to the application equipment.
- B. Application equipment shall be thoroughly cleaned whenever changing the type of paint or color.

#### **1.07 QUALITY CONTROL**

- A. Quality control procedures and practices shall be utilized to monitor all phases of surface preparation, application and inspection. Procedures or practices not specifically defined herein may be utilized provided they meet recognized and acceptable professional standards and are accepted by the Construction Manager.
- B. The NACE Level III Coating Inspector shall provide to the Construction Manager daily project progress reports which include the type of coating work conducted and significant coating's preparation and application data to include, but not be limited to ambient temperature, surface temperature, relative humidity, dew point, anchor profile, coatings mixture, dry film thickness, coating adhesion, holiday testing, and coating cure.



- C. The NACE Level III Coating Inspector shall ensure that coated surfaces are properly prepared and that the coating is applied in accordance with the manufacturer's recommendations and verification statement that all work is in compliance with Contract Documents.
- D. All mixing, thinning, application, and testing of coatings shall be accomplished in the presence of the NACE Level III Coating Inspector. Work accomplished in the absence of required inspection may be required to be removed and replaced under the proper inspection.
- E. Test thickness of coatings and paints with a non-destructive film thickness gauge. An instrument such as a Tooke Gage, or equal, shall be used if destructive testing is deemed necessary by the Construction Manager or the NACE Level III Coating Inspector. Testing shall be accomplished in conformance with SSPC-PA 2, "Measurement of Dry Paint Thickness with Magnetic Gages" except as modified herein.
- F. Coating integrity of all coated surfaces shall be holiday tested with an inspection device approved by the Construction Manager and in accordance with NACE RP0188-06. Perform testing in the presence of the NACE Level III Coating Inspector and the Construction Manager. Mark all holidays, repair in accordance with the manufacturer's printed recommendations, and retest. The final coating shall be 100 percent holiday-free with no pinholes or other irregularities.
- G. Furnish inspection devices in good working condition for detection of holidays and measurement of dry-film thickness. Dry film thickness gauges and holiday detectors shall be available at all times during painting and coating activities. Inspection devices shall be operated by, or in the presence of the Construction Manager with location and frequency basis determined by the Construction Manager.
- H. Acceptable devices for ferrous metal surfaces include, but are not limited to, Tinker and Rasor Models AP and AP-W holiday detectors, or equal, and Positest unit, Positector unit, iQuanix unit, or equal, for dry film thickness gauging. Operate inspection devices in accordance with the Contract Documents and the manufacturer's instructions.
- I. Dehumidification equipment or other alternate ventilation systems shall be approved by the NACE Level III Coating Inspector and the Construction Manager. Operate equipment on a continuous basis during all blasting, coating and curing operations, including shifts during which no work is being accomplished. Monitoring devices approved by the NACE Level III Coating Inspector shall be used to ensure continuous operation.
- J. Submit material safety data sheets for each coating.

## **PART 2 - MATERIALS**

### **2.01 PAINTING AND COATING SYSTEMS**

- A. Coating products shall conform to San Diego Air Pollution Control District Rule 67.0, where products cannot contain more than 250 grams per liter of volatile organic compound (VOC) per gallon of coating product as applied. The following index lists the various painting and coating systems by service and generic type.

PAINT COATINGS SYSTEM INDEX

No.	Title	Generic Coating
	<u>Submerged Metal Coating System</u>	
5.	Submerged or Intermittently Submerged Metal, Potable or Recycled Water	Epoxy

No.	Title	Generic Coating
<u>Exposed Metal Coating Systems</u>		
10.	Exposed Metal, Corrosive Environment	High Build Epoxy (2 Coat System) with Polyurethane Topcoat
15.	Exposed Metal, Atmospheric Weathering Environment	Acrylic
20.	Exposed Metal, Exterior	Epoxy with Urethane Topcoat
<u>PVC, CPVC and FRP Coating System</u>		
41.	PVC, CPVC and FRP, Ultraviolet Exposure	Polyurethane
<u>Metal in Contact with Concrete Coating System</u>		
51.	Aluminum and Concrete	Epoxy
<u>Plaster, Wood, Masonry and Drywall Coating System</u>		
60.	Plaster, Wood, Masonry and Drywall	Acrylic Latex

- B. These systems are specified in detail in the following paragraphs. For each coating, the required surface preparation, prime coat, intermediate coat (if required), topcoat, and coating thicknesses are described. Mil thicknesses shown are minimum dry-film thicknesses.

**2.02 SUBMERGED METAL COATING SYSTEM**

System No. 5 - Submerged Metal, Potable or Recycled Water:

Type: Epoxy

Service Conditions: For use with steel structures, piping, valves, or equipment in potable or recycled water.

Surface Preparation: SSPC SP-10.

Coating System: Apply the manufacturer’s recommended number of coats to attain the specified minimum coating thickness. Products: Devoe Bar-Rust 233H, Tnemec N140 or 100, Sherwin-Williams Tank Clad HS B62-80, PPG AQUAPON® LT NSF Low Temperature Epoxy Coatings 95-172, or District approved equal; 12 mils total. Color of topcoat: white. Each coat shall be different color than the one preceding it.

**2.03 EXPOSED METAL COATING SYSTEMS**

- A. System No. 10 - Exposed Metal, Corrosive Environment:

Type: High-build epoxy finish coat having a minimum volume solids of 60%, with an inorganic zinc prime coat and a pigmented polyurethane finish coat having a minimum volume solids of

52%.

Service Conditions: For use with metal structures, pipes, or valves subjected to water condensation; chemical fumes; and chemical contact.

Surface Preparation: SSPC SP-10.

Prime Coat: Self-curing, two-component inorganic zinc-rich coating recommended by the manufacturer for overcoating with a high-build epoxy finish coat. Minimum zinc content shall be 12 pounds per gallon. Apply to a thickness of 3 mils. Products: Tnemec 90E-92, Devoe Catha-Coat 304 or 304V, International Interzinc 22HS, Ameron 9HS, Sherwin-Williams Zinc-Clad II Plus, PPG METALHIDE® 28 Inorganic Zinc-Rich Primer 97-672, or District approved equal.

Intermediate Coat: Tnemec 104, ICI Devoe Devran 224HS or 231, International Interseal 670HS, Ameron 385, Sherwin-Williams Macropoxy 646 B58-600, PPG PITT-GUARD® Direct-to-Rust Epoxy Mastic Coating 97-145 series, or District approved equal; 5 mils.

Finish Coat: Two-component pigmented acrylic or aliphatic polyurethane recommended by the manufacturer for overcoating a high-build epoxy coating. Apply to a thickness of at least 2 mils. Products: Tnemec Series 1075, ICI Devoe Devthane 379, International Interline 990HS, Ameron 450HS, Sherwin-Williams Hi-Solids Polyurethane B65-300, PPG PITTHANE® Ultra Gloss Urethane Enamel 95-812 series, or District approved equal.

B. System No. 15 - Exposed Metal, Atmospheric Weathering Environment:

Type: One component acrylic enamel having a minimum volume solids content of 35% with an acrylic inorganic zinc primer.

Service Conditions: For use on interior and exterior metal and piping subject to sunlight, weathering, and water condensation.

Surface Preparation: SSPC SP-10.

Prime Coat: Sherwin-Williams Zinc Clad II Plus primer, ICI Devoe Inorganic Zinc 304V, Tnemec 90E-92, or District approved equal applied to a minimum dry-film thickness of 3 mils.

Finish Coats: Two or more coats of Sherwin-Williams Sher-Cryl B66-300, ICI Devoe Devflex 659, Tnemec Series 28 or 29, or District approved equal. Apply sufficient coats to provide a total minimum dry-film thickness of 8 mils. Thickness of any individual coat shall not exceed 4 mils.

C. System No. 20 - Exposed Metal, Exterior:

Type: High-build epoxy prime coat with a pigmented high-build aliphatic or acrylic polyurethane finish coat.

Service Conditions: For use on exterior metal piping appurtenances, such as valve box lids, hydrant heads, and guard posts.

Surface Preparation: SSPC SP-10.

Prime Coat: Two-component high-build epoxy. Apply to a thickness of 8 mils. Products: Ameron

400, ICI Devoe 235, Tnemec 104, International Interseal 670HS, Sherwin-Williams Macropoxy 646 B58-600, PPG PITT-GUARD® Direct-to-Rust Epoxy Mastic Coating 97-145 series, or District approved equal.

Finish Coat: Two-component pigmented high-build polyurethane. Apply one or more coats to a total thickness of 5 mils. Products: Ameron “Amershield,” ICI Devoe Devthane 359, Tnemec Series 1075, International Interthane 990HS, Sherwin-Williams Hi-Solids Polyurethane B65-300 series, PPG PITTHANE® Ultra Gloss Urethane Enamel 95-812 series, or District approved equal.

#### **2.04 PVC, CPVC AND FRP COATING SYSTEM**

System No. 41 - PVC, CPVC and FRP, Ultraviolet Exposure:

Type: Epoxy primer with a minimum volume solids of 54% and a pigmented Polyurethane enamel having a minimum volume solids of 52%.

Service Conditions: PVC or CPVC piping and FRP exposed to sunlight.

Surface Preparation: SSPC SP-1. Then lightly abrade the surface with medium-grain garnet paper.

Prime Coat: One coat of Tnemec Series N69 Epoxoline, International 7510, Ameron 385, ICI Devoe Devran 224HS, Sherwin-Williams Macropoxy 646 B58 series, PG PITT-GUARD® Direct-to-Rust Epoxy Mastic Coating 97-145 series, or District approved equal. Apply to a minimum dry-film thickness of 4 mils.

Finish Coat: One coat of Tnemec Series 1075, International Interthane 990HS, Ameron 450HS, ICI Devoe Devran 379, Sherwin-Williams Hi-Solids Polyurethane B65-300 series, PPG PITTHANE® Ultra Gloss Urethane Enamel 95-812 series, or District approved equal. Apply to a minimum dry-film thickness of 3 mils

#### **2.05 METAL IN CONTACT WITH CONCRETE, COATING SYSTEM**

System No. 51 - Aluminum insulation from Concrete and Carbon Steel:

Type: High solids epoxy or phenolic epoxy having a minimum volume solids of 80% (ASTM D2697).

Service Conditions: Coat areas of aluminum grating, stairs, framing, structural members, or aluminum fabrications in contact with concrete or carbon steel with this system.

Surface Preparation: Preparation: Solvent or steam cleaning per SSPC SP-1; do not use alkali cleaning. Then dust blast.

Coating System: Apply three or more coats of Ameron 400, Tnemec Series 135, ICI Devoe Bar-Rust 233H, Sherwin-Williams Macropoxy B58-600, PPG PITT-GUARD® Direct-to-Rust Epoxy Mastic Coating 97-145 series, or District approved equal; 30 mils total. Maximum thickness of an individual coating shall not exceed the manufacturer’s recommendation.

#### **2.06 PLASTER, WOOD, MASONRY AND DRYWALL COATING SYSTEM**

System No. 60 - Plaster, Wood, Masonry and Drywall, Normal Exposure:

Type: Acrylic latex coating having a minimum volume solids of 40%.

Service Conditions: For use in coating weather-exposed or enclosed concrete masonry, drywall, wood, and plaster.

Surface Preparation: Surfaces shall be dry, clean, and free of contaminants.

Prime Coat: Self-priming.

Finish Coats: Two coats of Tnemec Series 6, Tneme-cryl, 2 mils each; two coats of ICI Dulux Professional, 2 mils each; two coats of Sherwin-Williams Metalatex B42 series, 2 mils each; two coats of PPG PITT-TECH® Int/Ext Satin DTM Industrial Enamel 90-474 series, 2 to 3 mils each, or District approved equal.

## **2.07 ABRASIVES FOR SURFACE PREPARATION**

- A. Abrasives used for preparation of iron and steel surfaces shall be one of the following:
1. 16 to 30 or 16 to 40 mesh silica sand or mineral grit.
  2. 20 to 40 mesh garnet.
  3. Crushed iron slag, 100% retained on No. 80 mesh.
  4. SAE Grade G-40 or G-50 iron or steel grit.
- B. Abrasives used for preparation of copper and aluminum surfaces shall be one of the following:
1. Crushed slag, 80 to 100 mesh.
  2. Very fine silica sand, 80 to 100 mesh.
- C. In the above gradations, 100% of the material shall pass through the first stated sieve size and 100% shall be retained on the second stated sieve size.

## **PART 3 - EXECUTION**

### **3.01 WEATHER CONDITIONS**

- A. Do not paint in the rain, wind, snow, mist, and fog or when steel or metal surface temperatures are less than 5 degrees F above the dew point.
- B. Do not apply paint when the relative humidity is above 85% or the temperature is above 90 degrees F or when temperature of metal to be painted is above 120 degrees F.
- C. Do not apply paints if air or surface temperature is below 40 degrees F or expected to be below 40 degrees F within 24 hours.
- D. Do not apply epoxy, acrylic latex, and polyurethane paints on an exterior or interior surface if air or surface temperature is below 60 degrees F or expected to drop below 60 degrees F in 24 hours.

**3.02 SURFACE PREPARATION**

- A. Remove oil and grease from metal surfaces in accordance with SSPC-SP 1. Use clean cloths and cleaning solvents and wipe dry with clean cloths. Do not leave a film or greasy residue on the cleaned surfaces before sandblasting.
- B. Remove weld spatter and weld slag from metal surfaces and grind smoothly rough welds, beads, peaked corners, and sharp edges in accordance with SSPC SP-2 and SSPC SP- 3. Grind 0.02 inch (minimum) off the weld caps on pipe weld seams. Grind outside sharp corners, such as the outside edges of flanges, to a minimum radius of ¼ inch.
- C. Neutralize welds with a chemical solvent that is compatible with the specified coating materials. Use clean cloths and chemical solvent. Wipe dry with clean cloths. Do not leave a residue on the cleaned surfaces.
- D. Do not abrasive blast or prepare more surface area than can be coated in one day. Remove all sharp edges, burrs, and weld spatter. Do not abrasive blast PVC, CPVC, or FRP piping or equipment. Do not abrasive blast epoxy, enamel coated, or fusion-bonded epoxy pipe that has already been factory coated, except to repair scratched or damaged coatings.
- E. Surface preparation shall conform with the SSPC specifications as follows:

Solvent Cleaning	SP-1
Hand Tool Cleaning	SP-2
Power Tool Cleaning	SP-3
White Metal Blast Cleaning	SP-5
Commercial Blast Cleaning	SP-6
Brush-Off-Blast Cleaning	SP-7
Pickling	SP-8
Near-White Blast Cleaning	SP-10

- F. Wherever the words "solvent cleaning," "hand tool cleaning," "wire brushing," or "blast cleaning" or similar words are used in these specifications or in paint manufacturer's specifications, they shall be understood to refer to the applicable SSPC (Society for Protective Coatings), surface preparation specifications listed above.
- G. Dust blasting is defined as cleaning the surface through the use of very fine abrasives, such as siliceous or mineral abrasives, 80 to 100 mesh. Etch the metal surface to clean the surface of any contamination or oxide and to provide a surface profile for the coating.

**3.03 ABRASIVE BLAST CLEANING**

- A. Use dry abrasive blast cleaning for metal surfaces. Do not use abrasives in automatic equipment that have become contaminated. When shop or field blast cleaning with handheld nozzles, do not recycle or reuse blast particles.
- B. After abrasive blast cleaning and prior to application of coating, dry clean surfaces to be coated by dusting, sweeping, and vacuuming to remove residue from blasting. Apply the specified primer or touch-up coating within eight hours. Reclean any blast cleaned surface not coated within the specified time period prior to the application of primer or touch-up coating. Do not apply coating over damp or moist surfaces.
- C. Keep the area of the work in a clean condition and do not permit blasting particles to accumulate

and constitute a nuisance or hazard.

- D. During abrasive blast cleaning, prevent damage to adjacent coatings. Schedule blast cleaning and coating such that dust, dirt, blast particles, old coatings, rust, mill scale, etc., will not damage or fall upon wet or newly coated surfaces.

### **3.04 SHOP PRIMING**

Handle shop-primed items with care during unloading, installation, and erection operations to minimize damage. Do not place or store shop-primed items on the ground or on top of other work unless ground or work is covered with a protective covering or tarpaulin. Place shop-primed items above the ground upon platforms, skids, or other supports.

### **3.05 FIELD TOUCH-UP OF SHOP-APPLIED PRIME COATS**

- A. Remove oil and grease surface contaminants on metal surfaces in accordance with SSPC SP-1. Use clean rags wetted with a degreasing solution, rinse with clean water, and wipe dry.
- B. Remove dust, dirt, salts, moisture, chalking primers, or other surface contaminants that will affect the adhesion or durability of the coating system. Use a high-pressure water blaster or scrub surfaces with a broom or brush wetted with a solution of trisodium phosphate, detergent, and water. Before applying intermediate or finish coats to inorganic zinc primers, remove any soluble zinc salts that have formed by means of scrubbing with a stiff bristle brush. Rinse scrubbed surfaces with clean water.
- C. Remove loose or peeling primer and other surface contaminants not easily removed by the previous cleaning methods in accordance with SSPC SP-7. Take care that remaining primers are not damaged by the blast cleaning operation. Remaining primers shall be firmly bonded to the steel surfaces with blast cleaned edges feathered.
- D. Remove rust, scaling, or primer damaged by welding or during shipment, storage, and erection in accordance with SSPC SP-10. Take care that remaining primers are not damaged by the blast cleaning operation. Remaining primers shall be firmly bonded to the steel surfaces with blast cleaned edges feathered.
- E. Use repair procedures on damaged primer which protects adjacent primer. Blast cleaning may require the use of lower air pressure, smaller nozzles, and abrasive particle sizes, short blast nozzle distance from surface, shielding, and/or masking.
- F. After abrasive blast cleaning of damaged and deflective areas, remove dust, blast particles, and other debris by dusting, sweeping, and vacuuming; then apply the specified touch-up coating.
- G. Surfaces that are shop primed with inorganic zinc primers shall receive a field touch-up of organic zinc primer to cover all scratches or abraded areas.
- H. Other surfaces that are shop primed shall receive a field touch-up of the same primer used in the original prime coat.

### **3.06 PAINTING SYSTEMS**

- A. All materials of a specified painting system, including primer, intermediate, and finish coats, shall be produced by the same manufacturer. Thinners, cleaners, driers, and other additives shall be as



recommended by the paint manufacturer for the particular coating system.

- B. Deliver paints to the jobsite in the original, unopened containers.

### **3.07 PAINT MIXING**

- A. Prepare multiple-component coatings using all of the contents of the container for each component as packaged by the paint manufacturer. Do not use partial batches. Do not use multiple-component coatings that have been mixed beyond their pot life. Provide small quantity kits for touchup painting and for painting other small areas. Mix only the components specified and furnished by the paint manufacturer. Do not intermix additional components for reasons of color or otherwise, even within the same generic type of coating.

### **3.08 COATING PROCEDURES**

- A. Conform to the requirements of SSPC PA-1. Follow the recommendations of the coating manufacturer including the selection of spray equipment, brushes, rollers, cleaners, thinners, mixing, drying time, temperature and humidity of application, and safety precautions.
- B. Stir, strain, and keep coating materials at a uniform consistency during application. Apply each coating evenly, free of brush marks, sags, runs, holidays, and other evidence of poor workmanship. Use a different shade or tint on succeeding coating applications to indicate coverage where possible. Finished surfaces shall be free from defects or blemishes.
- C. Do not use thinners unless recommended by the coating manufacturer. If thinning is allowed, do not exceed the maximum allowable amount of thinner per gallon of coating material. Stir coating materials at all times when adding thinner. Do not flood the coating material surface with thinner prior to mixing. Do not reduce coating materials more than is absolutely necessary to obtain the proper application characteristics and to obtain the specified dry-film thicknesses.
- D. Remove dust, blast particles, and other debris from blast cleaned surfaces by dusting, sweeping, and vacuuming. Allow ventilator fans to clean airborne dust to provide good visibility of working area prior to coating applications. Remove dust from coated surfaces by dusting, sweeping, and vacuuming prior to applying succeeding coats.
- E. Apply coating systems to the specified minimum dry-film thicknesses as measured from above the peaks of the surface profile.
- F. Apply primer immediately after blast cleaning and before any surface rusting occurs, or any dust, dirt, or any foreign matter has accumulated. Reclean surfaces by blast cleaning that have surface colored or become moist prior to coating application.
- G. Apply a brush coat of primer on welds, sharp edges, nuts, bolts, and irregular surfaces prior to the application of the primer and finish coat. The brush coat shall be done prior to and in conjunction with the spray coat application. Apply the spray coat over the brush coat.

### **3.09 SURFACES NOT TO BE COATED**

Do not paint the following surfaces unless otherwise noted on the Drawings or in other Specification sections. Protect during the painting of adjacent areas:

- A. Cement mortar coated pipe and fittings or concrete surfaces.

- B. Stainless steel.
- C. Metal plates/nameplates or letters.
- D. Fencing.
- E. Copper tubing, red brass piping and PVC piping except where such piping occurs in rooms where the walls are painted or required for color coding.
- F. Electrical fixtures except for factory coatings.
- G. Grease fittings.
- H. Buried pipe unless specifically required in the piping specifications.
- I. Fiberglass items.
- J. Aluminum handrails, stairs and grating, unless in contact with concrete.

### **3.10 PROTECTION OF SURFACES NOT TO BE PAINTED**

- A. Remove, mask, or otherwise protect hardware, lighting fixtures, switchplates, aluminum surfaces, machined surfaces, couplings, shafts, bearings, nameplates on machinery, and other surfaces not intended to be painted. Provide drop cloths to prevent paint materials from falling on or marring adjacent surfaces. Protect working parts of mechanical and electrical equipment from damage during surface preparation and painting process. Mask openings in motors to prevent paint and other materials from entering the motors.

### **3.11 SURFACES TO BE COATED**

- A. Coat mechanical equipment as described in the various mechanical equipment specifications. Color shall match the color of the connecting piping.
- B. Coat aboveground and exposed piping or piping in vaults and structures as described in the various piping specifications. Color shall be as indicated or as selected by the District.
- C. Coat valves as described in the various valve specifications. Aboveground valves or valves in vaults and structures shall match the color of the connecting piping.
- D. Coat aluminum surfaces in contact with concrete per System No. 51.
- E. Coat exposed surfaces of enclosures, guard posts, marker posts, fire hydrants, valve boxes, and test boxes as described in the particular specifications for the above items.

### **3.12 DRY FILM THICKNESS TESTING**

- A. Measure coating thickness specified for metal surfaces with a magnetic-type dry-film thickness gage. Test the finish coat (except zinc primer and galvanizing) for holidays and discontinuities with an electrical holiday detector, low-voltage, wet-sponge type. Provide measuring equipment. Provide detector as manufactured by Tinker and Razor or K-D Bird Dog. Provide dry-film thickness gage as manufactured by Mikrotest or Elcometer. Check each coat for the correct dry-film thickness. Do not measure within eight hours after application of the coating.

- B. If the item has an improper finish color or insufficient film thickness, clean and topcoat the surface with the specified paint material to obtain the specified color and coverage. Hand or power-sand visible areas of chipped, peeled, or abraded paint, feathering the edges. Then prime and finish coat in accordance with the specifications. Work shall be free of runs, bridges, shiners, laps or other imperfections.

**END OF SECTION**

**SECTION 15000****GENERAL PIPING SYSTEM AND APPURTENANCES****PART 1 - GENERAL****1.01 DEFINITIONS**

- A. The CONTRACTOR shall furnish and install all piping systems shown and specified, in accordance with the requirements of the approved plans and standard specifications. Each system shall be complete with all necessary fittings, hangers, supports, anchors, seismic restraints, expansion joints, flexible connectors, valves, accessories, tracing, insulation, lining and coating, testing, excavation, backfill and encasement, to provide a functional installation.

**1.02 RELATED SECTIONS**

- A. Section 01300 – Record Drawings and Submittals
- B. Section 01600 – Materials and Equipment
- C. Section 02222 – Protecting Existing Underground Utilities
- D. Section 02223 – Trenching, Backfilling and Compacting
- E. Section 09900 – Painting and Coating

**1.03 REFERENCE STANDARDS**

- A. Uniform Mechanical Code
- B. Uniform Plumbing Code
- C. Uniform Fire Code
- D. Commercial Standards: All equipment, products, and their installation shall be in accordance with the following standards, as applicable, and as indicated in each Section:
  - 1. American Society for Testing and Materials (ASTM)
  - 2. American National Standards Institute (ANSI)
  - 3. American Society of Mechanical Engineers (ASME)
  - 4. American Water Works Association (AWWA)
  - 5. American Welding Society (AWS)
  - 6. American Iron and Steel Institute (AISI)
  - 7. National Fire Protection Association (NFPA)

E. The following standards have been referenced in this Section:

ANSI B16.1	Gray Iron Pipe Flanges and Flanged Fittings
ANSI B16.5	Pipe Flanges and Flanged Fittings, NPS ½ through NPS 24
ANSI/AWWA C207	Steel Pipe Flanges for Water Works Service, Sizes 4 in through 144 in
ANSI/AWS D1.1	Structural Welding Code – Steel
ASTM A 193	Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service
ASTM A 194	Carbon and Alloy Steel Nuts for Bolts for High Pressure and High Temperature Service
ASTM A 307	Specification for Carbon Steel Bolts and Studs, 60000 PSI Tensile strength
ASTM A 325	Specification for High-Strength Bolts for Structural Steel Joints
ASTM A 563	Specification for Carbon and Alloy Steel Nuts
ASTM/AWWA C219	Bolted, Sleeve-Type Couplings for Plain-End Pipe
AWWA Manual M11	Steel Pipe – A Guide for Design and Installation

#### 1.04 CONTRACTOR SUBMITTAL

- A. The CONTRACTOR shall submit complete shop drawings and certificates, test reports, affidavits of compliance, of all piping systems for review by the DISTRICT in accordance with the standard specifications, and as indicated in the individual piping sections. The shop drawings shall include dimensions and details on pipe joints, fittings, fitting specials, harnessed joints, valves, and appurtenances, and shall include design calculations and material lists. The submittals shall include detailed layout, spool, or fabrication drawings which show all pipe spools, spacers, adapters, connectors, fittings, and pipe supports and seismic restraints necessary to accommodate the equipment and valves provided in a complete and functional system.
- B. Where new pipelines connect to existing pipelines, submit individual details for each connection point of the layout, including fabrication drawings which show all pipe spools, spacers, adapters, connectors, closure pieces, fittings, and pipe supports, thrust blocks and seismic restraints necessary to accommodate the equipment and valves provided in a complete and functional system.
- C. The CONTRACTOR shall submit information containing the following:
1. Manufacturer's product data.
  2. Manufacturer's installation instructions
  3. Manufacturer's certification of compliance.

**1.05 QUALITY ASSURANCE**

- A. Inspection: All pipe shall be subject to inspection at the place of manufacture. The CONTRACTOR shall notify the DISTRICT in writing of the date for the start of each phase of pipe production and the dates for the proof of design tests. The notification shall be given at least 15 days prior to the start of the pipe manufacture. During the manufacture of the pipe, the DISTRICT shall be given access to all areas where manufacturing is in progress and shall be permitted to make all inspections necessary to confirm compliance with the standard specifications.
- B. Tests: Except where otherwise indicated, all materials used in the manufacture of the pipe shall be tested in accordance with the applicable specifications and standards. Welds shall be tested as indicated. The CONTRACTOR shall perform all tests. All costs for testing shall be borne by the CONTRACTOR. Copies of all test reports shall be submitted to the DISTRICT.

**1.06 MANUFACTURER'S SERVICE REPRESENTATIVE**

- A. Where the assistance of a manufacturer's service representative is advisable in order to obtain the specified pipe joints, supports, or special connections, the CONTRACTOR shall furnish such assistance at no additional cost to the DISTRICT.

**1.07 MATERIAL DELIVERY, STORAGE, AND PROTECTION**

- A. All piping materials, fittings, valves, and accessories shall be delivered in a clean and undamaged condition and shall be stored off the ground to provide protection against oxidation caused by ground contact. All defective or damaged materials shall be replaced with new materials.

**1.08 CLEANUP**

- A. After completion of the work, all remaining pipe cuttings, joining and wrapping materials, and other scattered debris, shall be removed from the site by the CONTRACTOR. The entire piping system shall be handed over to the DISTRICT in a clean and functional condition.

**PART 2 - MATERIALS****2.01 GENERAL**

- A. All pipes, fittings, and appurtenances shall be furnished in accordance with the requirements of the approved plans and the Design Standards.
- B. Pressure Rating: All piping systems shall be designed for a minimum pressure of 250 psi.
- C. Alternative pipe materials including but not limited to Fusible Polyvinyl Chloride (PVC) and High Density Polyethylene (HDPE) pipe with require DISTRICT approval prior to design and construction.

**2.02 PIPE FLANGES**

- A. Flanges: Flanges on ductile iron pipe and fittings shall conform to the Design Standards. All flanges shall be flat faced.
- B. Flange coating shall be in accordance with the Design Standards.
- C. Flange Nuts and Bolts: All bolts and nuts shall conform to the Design Standards. Studs and bolts shall extend through the nuts a minimum of 1/2-inch. All-thread studs shall be used on all valve flange connections, where space restrictions preclude the use of regular bolts. Provide Type 316 heavy hex bolts and nuts for above and below ground installations.
- D. Flange Gaskets: Gaskets shall be in accordance with the Design Standards.
- E. Insulating Flanges: Insulated flanges bolt holes shall be drilled oversize by an amount equal to two times the insulating sleeve thickness to maintain the same minimum clearance for bolts.
- F. Insulating Flange Sets: Insulating flange sets shall be provided where shown on the approved drawings. Each insulating flange set shall consist of an insulating gasket, insulating sleeves and washers and a steel washer. Insulating sleeves and washers shall be one piece when flange bolt diameter is 1-1/2 inches or smaller and shall be made of acetyl resin. For bolt diameters larger than 1- 1/2 inches, insulating sleeves and washers shall be two-piece and shall be made of polyethylene or phenolic. Steel washers shall be in accordance with ASTM A325. Insulating gaskets shall be full-face.
- G. Insulating Flange Manufacturers, per approved material list or approved equal:
  - 1. Calpico, Inc.
  - 2. Farwest
  - 3. PSI Products, Inc., Gardena, California.

**2.03 THREADED INSULATING CONNECTIONS**

- A. General: Threaded insulating bushings, unions, or couplings, as appropriate, shall be used for joining threaded pipes of dissimilar metals and for piping systems where corrosion control and cathodic protection are involved.
- B. Materials: Threaded insulating connections shall be of nylon, Teflon, polycarbonate, polyethylene, or other nonconductive materials, and shall have ratings and properties to suit the service and loading conditions.
- C. Manufacturers: Isojoint or approved equal.

**2.04 PIPE THREADS**

- A. All pipe threads shall be in accordance with ANSI/ASME B1.20.1.

**2.05 FLEXIBLE PIPE COUPLINGS FOR PLAIN END DUCTILE IRON PIPE, PVC PRESSURE PIPE, OR PVC DISTRIBUTION PIPE**

- A. Flexible pipe couplings for ductile iron pipe, PVC pressure pipe, or PVC distribution are not allowed.

**2.06 TRANSITION COUPLINGS**

- A. Transition couplings for connecting different pipes having different outside diameters shall be steel: Dresser Style 62 or 162, Smith-Blair Series 413 or 415, Baker Series 212 or 220, or approved equal.

**2.07 FLANGED COUPLING ADAPTERS FOR DUCTILE IRON PIPE, PVC PRESSURE PIPE, OR PVC DISTRIBUTION PIPE**

- A. Flanged coupling adapters for ductile iron pipe, PVC pressure pipe, or PVC distribution pipe shall be cast iron, ductile iron, or steel: Dresser Style 127 or 128, Smith-Blair Type 912 or 913, Baker Series 601 or 602, or approved equal. Flange ends shall match the flange of the connecting pipe.

**2.08 FLANGED COUPLING ADAPTERS FOR EXISTING ASBESTOS CEMENT PIPE**

- A. Flanged coupling adapters for existing asbestos cement pipe shall be cast iron or ductile iron: Dresser Style 127 or 128, Smith-Blair Series 912, or DISTRICT approved equal. Flange ends shall match the flange of the connecting pipe. Verify in the field the actual outside diameter of the existing pipe to be connected.

**2.09 LINING AND COATING FOR COUPLINGS**

- A. Coat interior and exterior ferrous surfaces of flexible pipe couplings, transition couplings, and flanged coupling adapters with epoxy in accordance with the standard specifications. Coating shall be holiday free on interior surfaces. Buried couplings shall be wax tap coated in accordance with Design Standards.

**2.10 SERVICE SADDLES**

- A. Service saddle shall be in accordance with the Design Standards.

**PART 3 - EXECUTION****3.01 GENERAL**

- A. All pipes, fittings, and appurtenances shall be installed in accordance with the requirements of these standard specifications and approved plans.
- B. Where core drilling is required for pipes passing through existing concrete, core drilling locations shall be determined by radiograph of concrete construction to avoid damage to embedded raceways and rebar.



**3.02 SANITATION OF PIPE INTERIOR**

- A. During laying operations, do not place tools, clothing, or other materials in the pipe.
- B. When pipe laying is not in progress, including the noon hour, close the ends of the installed pipe with a plug to deter entry of vermin, children, dirt, storm water, or foreign material.

**3.03 INSTALLING COUPLINGS**

- A. Clean oil, grease, scale, and dirt from pipe ends. Repair any damage or holidays in the shop applied coating before installing couplings. Clean gaskets in flexible pipe couplings, transition couplings, and flanged coupling adapters before installing.
- B. Clean sleeve bolts and nuts by wire brushing before installing in follower rings. Lubricate threads of bolts and nuts with oil or graphite prior to installation. Tighten nuts uniformly and in a progressive diametrically opposite sequence, and torque with a calibrated torque wrench.
- C. If couplings leak under pressure testing, loosen or remove the nuts and sleeve bolts, reset or replace the gaskets, reinstall or retighten the bolts and nuts, and retest the coupling. Couplings shall be watertight.
- D. After testing, wrap sleeve bolts and nuts of buried couplings with wax tape coating in accordance with Design Standards.

**3.04 INSTALL SERVICE SADDLES**

- A. Place the service saddle on the pipe and hand tighten the nuts while positioning the saddle in its final location. Uniformly tighten the nuts in a progressive diametrically opposite sequence and torque with a calibrated torque wrench to the saddle manufacturer's recommended values.
- B. Connect a corporation stop to the saddle. Apply Teflon joint compound or tape to the male threads before installing the corporation stop. Make joints watertight.
- C. Mount a tapping machine on the corporation stop to cut a hole in the pipe with a shell type cutter made specifically for PVC pipe. Do not use other devices or hand equipment to bore through the pipe wall.
- D. Submit method for tapping other pipe materials to DISTRICT prior to installation.

**3.05 INSTALLING FLANGED PIPING**

- A. Flanges shall be coated in accordance with the Design Standards.
- B. Set pipe with the flange bolt holes straddling the pipe horizontal and vertical centerline. Install pipe without springing, forcing, or stressing the pipe or any adjacent connecting valves or equipment. Before bolting up, align flange faces to the design plane within 1/16-

inch per foot measured across any diameter. Align flange bolt holes within 1/8-inch maximum offset.

- C. Clean bolts, nuts, washers and flange faces by wire brushing before installing gasket and adjoining flange. Inspect gasket seating surfaces, gasket, each bolt, nut, washer, and facing on which the nuts will rotate. Replace any damaged item.
- D. Lubricate threads in accordance with the Design Standards. Assemble all bolts, nuts, and washers in the flange, and then tighten nuts in a progressive diametrically opposite sequence, and torque with a calibrated torque wrench. All clamping torque shall be applied to the nuts only.
- E. Bolt lengths shall extend a minimum of ½” through their nuts.
- F. Do not use more than one gasket between contact faces in assembling a flanged joint.
- G. Place washers under all nuts. Place washers under bolt heads where the flanges have been epoxy coated. Do not damage coated surfaces during installation.
- H. If flanges leak under pressure testing, loosen or remove the nuts and bolts, reset or replace the gasket, reinstall or retighten the bolts and nuts, and retest the joints. Joints shall be watertight. Replace galled, cracked, or distorted bolts and nuts.

### **3.06 INSTALLING BLIND FLANGES**

- A. At outlets not indicated to be connected to valves or to other pipes and to complete the installed pipeline hydrostatic test, provide blind flanges with bolts, nuts, washers, and gaskets.
- B. Blind flanges shall be coated in accordance with the Design Standards.

### **3.07 INSTALLING POLYETHYLENE ENCASEMENT**

- A. Wrap buried couplings and adapters with polyethylene material in accordance with Design Standards.

### **3.08 PAINTING AND COATING**

- A. Coat flexible pipe couplings, transition couplings, flanged coupling adapters and joint harnesses located aboveground, or in vaults and structures, the same as the adjacent pipes and in accordance with the standard specifications. Apply finish coats in the field. Color of finish coat shall match color of the adjacent piping.

### **3.09 INSTALLING MARKING TAPE**

- A. After the pipe zone has been backfilled and compacted, place the marking tape on the compacted pipe zone material and center over the pipe. Run tape continuously along the trench and tie ends of tape together.

**3.10 PRESSURE TESTING**

- A. Test couplings and adapters at the same time that the connecting pipelines are pressure tested in accordance with Design Standards and standard specifications.

**END OF SECTION**

**SECTION 15010****WET TAPS AND TEMPORARY PIPING SYSTEMS****PART 1 – GENERAL****1.01 DESCRIPTION**

This Section describes general requirements for wet taps, temporary piping systems, and their appurtenances. This Section is to be used as a guideline for the Contractor's design of temporary piping systems and for the Contractor's preparation of a sequence of work for wet taps and temporary piping systems.

**1.02 RELATED WORK SPECIFIED ELSEWHERE**

- A. Section 01043 – Coordination with District's Operations
- B. Section 01300 – Contractor Submittals
- C. Section 01530 – Protection of Work, Property and Existing Utilities
- D. Section 02050 – Demolition and Removals
- E. Section 02140 – Dewatering
- F. Section 02223 – Trenching, Backfilling, and Compaction
- G. Section 02350 – Excavation Support Systems
- H. Section 02950 – Highlining for Watermains
- I. Section 15041 – Disinfection of Piping
- J. Section 15042 – Hydrostatic Testing of Pressure Pipelines

**1.03 PIPE TAPPING (WET TAP)**

- A. Pipe tap connections (wet taps) to existing pipelines, whether for mainline extension or service laterals, shall be performed by the Contractor.
- B. The sequence of work and materials for wet taps shall be approved by the District. Tapping operations shall be continuously witnessed by the District.
- C. The Contractor shall provide all materials, labor, and equipment to excavate, shore or brace the trench, cast thrust block, backfill, compact, and repair pavements in accordance with the Contract Documents.

**1.04 TEMPORARY PIPELINES**

- A. Temporary pipelines, where shown on the Drawings or required by the District, shall provide temporary service to customers during construction.

- B. Contractor shall prepare a highline plan submittal (conformed to the Schedule of Values) for District review and approval prior to commencement of the Work. The submittal shall depict the highline pipe limits and layout, materials, sizing, installation schedule and duration of use, and highline supply connection locations and details per Specification Section 02950 Highlining for Watermains.
- C. All temporary piping, fittings, and service connections shall be furnished, installed, and maintained by the Contractor, and the Contractor shall make connections to a water source designated or approved by the District.
- D. The Contractor shall be responsible for disinfecting all pipe, connections, flushing, and assisting the District in taking water samples for bacteriological testing in accordance with the Contract Documents and Specification Section 15041 Disinfection
- E. Following disinfection and acceptance of the temporary pipe as a potable water system, the Contractor shall maintain continuous service through the temporary piping. Damage to the temporary piping system shall be immediately repaired.
- F. Upon completion of the work, the Contractor shall remove the temporary piping and appurtenances and shall restore all surfaces to the satisfaction of the District.

## **PART 2 – PRODUCTS**

### **2.01 GENERAL**

- A. **Manufacturer's Product Data:** The Contractor shall submit manufacturer's product data for all materials and products to be used in the work in accordance with Section 01300 including, but not limited to, tapping sleeves, tapping valves, jointing and gasket materials, special pieces, flexible couplings, mechanical couplings, harnessed and flanged adapters, tie rods, and all other items required to provide a complete and operable system.
- B. The Contractor shall submit the proposed temporary piping layout where a temporary highline is shown or specified.
- C. All components of temporary piping systems pipe furnished by the Contractor shall be of good quality, clean, and suitable for conveying potable water in the opinion of the District.

### **2.02 TAPPING EQUIPMENT**

- A. The tapping machine shall have the ability to positively flush all shavings and other residue created when installing tapped outlets of 4 inches or larger.
- B. The shell cutter bell on the tapping machine shall be tapped with a 2-inch minimum outlet.
- C. A ball valve shall be installed on the outlet to regulate flow.
- D. A hose and filter shall be connected to the ball valve to retrieve shavings and residue generated during the tapping process.

- E. A multi-toothed shell cutter is required to minimize the size of shavings generated when tapping PVC pipe.
- F. The shell cutter pilot tool shall be designed to capture the coupon generated by performing the wet tap.
- G. The tapping machine shall be filled with water prior to commencing the tapping procedure.

### **PART 3 – EXECUTION**

#### **3.01 GENERAL**

- A. The Contractor shall furnish tapping sleeves or tees, valves and all other materials as called for in the Contract Documents or as required for a complete and functional installation.
- B. The Contractor shall provide all equipment and labor required for the excavation and installation of the connection including but not limited to dewatering equipment, temporary piping, thrust blocks, trench cover plates, trench shoring and/or bracing, backfill and site restoration.
- C. The Contractor shall provide emergency standby equipment or materials to the satisfaction of the District.

#### **3.02 WET TAPS AND CUT-IN TEE AND VALVE INSTALLATIONS**

- A. The Contractor shall obtain the District's written approval of the Contractor's construction schedule, sequence of work, and materials for all work to be performed by the Contractor.
- B. Prior to construction, Contractor shall pothole the existing pipe at the location of the proposed connection. The District shall inspect the pothole prior to Contractor's repair of trench. Contractor shall record the following information on the construction drawings for record purposes:
  - 1. Pipe type such as AC, PVC, ductile-iron or steel
  - 2. Pipe outside diameter (AC, PVC, ductile iron). Cement mortar coated steel pipe will require removal of the mortar coat to determine the steel cylinder outside diameter and characteristics of reinforcing steel.
  - 3. Pipe class and/or pressure rating
  - 4. Elevation, grade, and alignment (based on at least two points)
  - 5. Location of collars, pipe bells, fittings or couplings within 5 feet of the proposed connection point
  - 6. Potential conflicts with existing utilities

- C. The new pipeline shall have successfully passed pressure testing in accordance with Section 15042 and disinfection and bacteriological testing in accordance with Section 15041 prior to proceeding with connection work.
- D. After the District has given approval to proceed with the connection, the Contractor shall schedule the wet tap or cut-in installation with the District.
1. Shutdowns will be scheduled at the convenience of the District. Shutdowns may be scheduled for nights or weekends if required by operational criteria of the District.
  2. The Contractor shall give the District a minimum of five (5) working days notice prior to any proposed excavation or shutdown of existing mains or services. Scheduling shall be subject to District approval.
  3. The District may postpone or reschedule any shutdown operation if, for any reason, the District believes that the Contractor is inadequately prepared with competent personnel, equipment, or materials to proceed with the connection.
  4. If progress in completing the connection within the time specified is inadequate, the District may order necessary corrective measures. Corrective measures may consist of directing District personnel or another contractor to complete the work. All costs for corrective measures shall be borne by the Contractor.
- E. The Contractor may proceed with excavation only when potholing has been completed, materials and sequence of work have been approved, materials have been delivered, wet tap or cut-in installation has been scheduled and a copy of the approved traffic control plan has been furnished to the District.
1. The Contractor shall provide lights, barricades and traffic control in accordance with the agency of jurisdiction and as deemed necessary for the excavation by the District.
  2. The Contractor shall saw-cut pavement, excavate and provide and install shoring and steel plating, when necessary, one day prior to the wet tap or cut-in installation.
  3. The Contractor shall dewater existing mains where cut-in installations are required in the presence of the District. Only District personnel are authorized to operate existing valves. The Contractor shall be responsible for any and all damage resulting from unauthorized operation of existing District facilities.
  4. In areas where cut-ins are to be performed, the Contractor shall line the bottom of the trench with 12 to 18 inches of 3/4-inch crushed rock and construct a 12- to 16-inch deep sump for dewatering the trench.
  5. Wet Taps:
    - a. Disinfect and install the tapping saddle and tapping valve. Clean and disinfect the tapping machine prior to attachment to the tapping valve and saddle.

- b. Install concrete valve support blocks and thrust blocks.
  - c. Constantly monitor feed settings and motor speed of the tapping machine to ensure a successful tapping operation.
6. Cut-ins:
- a. Spirally reinforced steel pipe will require special procedures prior to cutting into the pipe. Weld the existing steel reinforcing rod to the steel cylinder on both sides of the cut location so that the reinforcement remains in tension after cutting the pipe.
  - b. Cut and remove portions of existing mains, and disinfect and install tees, valves, couplings, thrust restraint devices, and appurtenances required to complete the closure. The Contractor shall discard pipe and appurtenances removed from service in accordance with the Contract Documents.
7. After the tapping or cut-in operations are completed and the District has given approval to proceed, the Contractor shall complete the installation as shown on the Contract Documents including, but not limited to:
- a. Disinfecting and installing the pipe section(s) necessary to make the closure to the new system.
  - b. Installing and setting the valve gate well(s),
  - c. Installing thrust and anchor blocks,
  - d. Completing all backfill and compaction of the trench,
  - e. Repairing or replacing pavement as necessary in accordance with jurisdictional agency requirements.

### **3.03 TEMPORARY PIPELINES**

- A. The temporary pipe shall be installed in such a manner that it will not present a hazard to vehicle traffic or pedestrians and will not interfere with access to driveways along its route.
- B. Isolation valves shall be installed at 400-foot intervals or as shown on the Drawings or ordered by the District.
- C. If repairs to temporary piping are necessary, the Contractor shall make such repairs in a timely manner as directed by the District. If progress in making repairs is inadequate in the sole opinion of the District, or in the event of emergency, the District may take corrective measures, which may include the performance of repair work by District forces or another contractor. All costs for corrective measures shall be borne by the Contractor.

**END OF SECTION**



**SECTION 15041****DISINFECTION OF PIPING****PART 1 – GENERAL****1.01 DESCRIPTION**

This section describes requirements for disinfection by chlorination of potable water mains, services, pipe appurtenances and connections.

**1.02 REFERENCED STANDARDS**

The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.

- A. AWWA B300 -Standard for Hypochlorites
- B. AWWA B301 -Standard for Liquid Chlorine
- C. AWWA C651 -Disinfecting Water Mains
- D. Standard Methods for the Examination of Water and Wastewater, a joint publication of the American Public Health Association (APHA), the American Water Works Association (AWWA), and the Water Environment Federation (WEF)

**1.03 RELATED SECTIONS**

- A. Section 15042 – Hydrostatic Testing of Pressure Pipelines
- B. Section 15058 – PVC Pipe and Fittings
- C. Section 15060 – PVC Pressure Pipe
- D. Section 15062 – Ductile Iron Pipe and Fittings
- E. Section 15064 – Steel Pipe and Fittings
- F. Section 15057 – Copper, Brass, and Bronze Pipe, Fittings, and Appurtenances

**1.04 SERVICE APPLICATION**

- A. All water mains and appurtenances taken out of service for inspection, repairs, or other activity that might lead to contamination shall be disinfected before they are returned to service.
- B. All new water mains and temporary pipelines shall be disinfected prior to connection to the District's existing system. Disinfection against a closed valve connected to the existing water system will not be allowed.

- C. All temporary appurtenances used during the disinfection process (bulkheads, fittings, gages, isolation valves, air release valves, etc.) shall be furnished by the Contractor and shall be disinfected.
- D. All components incorporated into a connection to the District's existing system shall be disinfected prior to installation.

#### **1.05 SUBMITTALS**

A written disinfection and dechlorination plan, including all methods and equipment to be used, signed by a certified chlorinator shall be submitted to the District for review and approval prior to starting disinfection operations.

#### **1.06 DELIVERY, STORAGE AND HANDLING**

Chlorination and dechlorination shall be performed by competent individuals knowledgeable and experienced in the operation of the necessary application and safety equipment in accordance with applicable Federal, State and Local laws and regulations. The transport, storage and handling of these materials shall be performed in accordance with Code of Federal Regulations (CFR) 1910.120 Hazardous Waste Operations and Emergency Response, CFR 49.172 Hazardous Materials Regulations, and the General Industry Safety Orders of the California Code of Regulations, Title 8, Section 5194.

#### **1.07 CONCURRENT DISINFECTION AND HYDROSTATIC TESTING**

The specified disinfection of the pipelines may not be performed concurrently with the hydrostatic testing in accordance with Section 15042. In the event repairs are necessary, as indicated by the hydrostatic test, additional disinfection may be required by the Engineer in accordance with this specification.

#### **1.08 CONNECTION TO EXISTING MAINS**

Prior to connection to existing mains, disinfection and bacteriological testing shall be performed in accordance with this specification, and hydrostatic testing shall be performed per Section 15042. District authorization for connection to the existing system shall be given only on the basis of acceptable hydrostatic, disinfection and bacteriological test results.

### **PART 2 – MATERIALS**

#### **2.01 LIQUID CHLORINE (GAS)**

- A. Liquid chlorine contains 100-percent available chlorine and is packaged in steel containers in net weights of 150 lb. or 1 ton.
- B. Liquid chlorine shall be used with appropriate gas flow chlorinators, heaters, and injectors to provide a controlled, high-concentration solution feed to the water. The chlorinators and injectors shall be the vacuum-operated type.

**2.02 SODIUM HYPOCHLORITE (LIQUID)**

Sodium hypochlorite is available in liquid form in glass or plastic containers, ranging in size from 1 qt. to 5 gal. The solution contains approximately 10% to 15% available chlorine.

**2.03 TABLET OR GRANULAR HYPOCHLORITE**

Tablet or granular hypochlorite shall not be used at any time.

**PART 3 – EXECUTION****3.01 GENERAL**

- A. Disinfection of pipelines shall not proceed until all appurtenances and any necessary sample ports have been installed and the District inspector provides authorization.
- B. Keep the water main and its appurtenances clean and dry during the installation process.
- C. All piping, valves, fittings, and appurtenances which become contaminated during installation shall be cleaned, rinsed with potable water, and then sprayed or swabbed with a 5 percent sodium hypochlorite solution prior to installation.
- D. Water mains under construction that become flooded by storm water, runoff, or ground water shall be cleaned by draining and flushing with metered potable water until clear water is evident. Upon completion, the entire main shall be disinfected using a method approved by the District.

**3.02 METHODS**

- A. Continuous Feed:
  - 1. The continuous feed method of chlorination, as defined in AWWA C651-14, is the only acceptable method of chlorination. Tablet chlorination and slug chlorination are not acceptable.
  - 2. Chlorine used for the continuous feed method can be liquid sodium hypochlorite that is NSF 60 approved for the use in potable water, or gas chlorine using a vacuum operated chlorinator.
- B. Liquid Chlorine (Gas):
  - 1. Only vacuum-operated equipment shall be used. Direct-feed chlorinators, which operate solely from gas pressure in the chlorine cylinder, shall not be permitted. The equipment shall incorporate a backflow prevention device at the point of connection to the potable water source used to fill the line being tested.
  - 2. The chlorinating agent shall be applied at the beginning of the system to be chlorinated and shall be injected through a corporation stop, a hydrant, or other approved connection to ensure treatment of the entire system being disinfected.

3. Only a certified, licensed chlorination and testing contractor shall perform gas chlorination work. The chlorination contractor must also possess a Grade II Treatment Plant Operator Certification from the State of California if required by the Engineer.

C. Sodium Hypochlorite Solution (Liquid):

1. Sodium hypochlorite solution shall be used for cleaning and swabbing piping and appurtenances immediately prior to installation and for disinfecting all components of connections to the District's existing system.
2. Sodium hypochlorite solution may be used for the initial disinfection of newly installed water mains. The solution shall be applied at a terminus of the system to be chlorinated using an injector which can adjust the amount of solution being injected into the piping system. The solution shall be injected in the appropriate concentration to achieve the specified concentration range of chlorine throughout the entire piping system. Where pumping equipment is used in conjunction with an injector, an integral backflow prevention device shall be installed and connected to the potable water supply.
3. Water trucks, pumping equipment, piping, appurtenances and all other equipment in contact with potable water shall be disinfected prior to use.
4. Sodium hypochlorite solution may also be used to increase the total chlorine residual if the concentration from the initial chlorination of the system is found to be low. The solution shall be added to the system in sufficient amounts at appropriate locations to insure that the disinfecting solution is present at a concentration within the specified range throughout the piping system.

### 3.03 PREPARATION

1. An appropriate water source will be determined by the District representative based on proximity to work location and available flow. Adequacy of flow will be confirmed by water operations staff. Typically a fire hydrant or wharf head.
2. A dedicated meter and backflow will be set at the source location prior to any source connections to the water main being tested. The District will set the meter and the contractor will set and test an RP type backflow device that is the same size as the meter, or larger than the meter. This source will only be used for water main testing and no construction purposes for the duration of water main testing.
3. A 2.5" construction meter is only suitable for up to 12" diameter water main. Larger pipe will require at least a 4" meter/backflow.
4. Clean water hose will be provided by the contractor to convey water from the water source to the water main. This hose should be at least 2.5" in diameter, NSF 61 approved for potable water use (cloth fire hose is not acceptable), and the hose should be disinfected and flushed. Care should be taken to ensure the backflow assembly is clean prior to introducing water to the new main.

5. The main being tested should not be connected hydraulically to the existing District water system except for the backflow protected source. Physical separations or test plates must be used at all future tie-in points. The presence of a physical separation or test plate will be confirmed by the inspector. Testing against a closed valve is not acceptable.
6. Sample points will be selected by the inspector. The same sample points should be used for chlorine disinfection testing as well as bacteriological samples. Sets of samples shall be collected every 1,200 ft, plus one set from the end of the line, and at least one from each branch greater than one full pipe length. Samples should not be drawn from hydrants if possible.
7. A District provided form will be used by the inspector to document a diagram of the water main being tested, location and type of all designated sample points, date and field result of chlorine confirmation tests, and date and field results of all bacteriological samples taken.

#### **3.04 PRESSURE TESTING**

1. Pressure testing will be performed in accordance with Section 15042 Hydrostatic Testing Pressure Water Mains.

#### **3.05 PROCEDURE FOR DISINFECTING WATER MAINS AND APPURTENANCES**

1. Chlorine will be introduced downstream of the RP backflow device. This could be the #4 test port on the backflow.
2. The water main will be filled with chlorinated water dosed at 25-150 mg/L of free chlorine residual. Care shall be taken to push the water to all dead ends of the new main and through all services.
3. The inspector will confirm that 25-150 mg/L of free chlorine is present at all designated sample points on the main. This will be accomplished using a Hach high chlorine titration kit.
4. The District inspector will witness the contractor operate all isolation valves on the water main segment being tested. All valves will be closed then completely reopened. Valves will remain completely open for the remainder of the test.
5. The water main will be isolated with static pressure until the following day. The source hose should stay connected if possible.
6. At 24 hours after the chlorine dosed and tested, the inspector will test each designated sample point to ensure the water main has at least 10 mg/L free chlorine residual at all points.
7. If 10 mg/L is present at all designated points, the chlorine can be flushed to commence bacteriological testing. If 10 mg/L is not present at all designated points, the water main must be chlorinated again.

**3.06 PROCEDURE FOR DISINFECTING TIE-INS AND CONNECTIONS**

- A. Connections equal to or less than 18 feet: Pipes, fittings, valves and all other components incorporated into connections with the existing water system shall be spray disinfected or swabbed with a 1 to 5 percent liquid chlorine solution in accordance with AWWA C651-14 and as specified herein. Upon connection to the main, the line shall be flushed as directed by the District.
- B. Connections greater than 18 feet: If the total length of the connection exceeds 18 feet, then the pipe required for the connection shall be “pre-disinfected” in accordance with AWWA C651 prior to installation. The pipe shall be set up above-ground, disinfected, and samples taken for bacteriological testing as described in this Section. The ends of the piping must be sealed with water-tight caps during the period of bacteriological testing. The “pre-disinfected” pipe can be used in connection work after satisfactory bacteriological test results are received.

**3.07 DISCHARGE OF CHLORINATED WATER**

- A. Indiscriminate onsite disposal or discharge to sewer systems, storm drains, drainage courses or surface waters is prohibited. It shall be the responsibility of the Contractor to file a Notice of Intent and obtain a General Waste Discharge Requirements Permit for Discharges of Hydrostatic Test Water and Potable Water to Surface Waters, Storm Drains or Other Conveyance Systems, San Diego Region (Hydrostatic Test Permit) for any discharge of hydrostatic test water or other potable water. The Contractor shall be solely responsible to evaluate, obtain and comply with the provisions of the Hydrostatic Test Permit, including any monitoring and reporting as may be required. The Contractor shall comply with all requirements of the State Water Resources Control Board and the San Diego Regional Water Quality Control Board. The Contractor shall provide copies of all reports and monitoring information to the District. A District representative shall be present to witness the reporting.
- B. Failure to comply with the Hydrostatic Test Permit is a violation of federal and state law. The Contractor hereby agrees to indemnify and hold harmless the District, its Board members, officers, agents, employees and authorized volunteers from and against any and all claims, demands, losses or liabilities of any kind or nature which District, its Board members, officers, agents, employees and authorized volunteers may sustain or incur for noncompliance with the Hydrostatic Test Permit arising out of or in connection with the Project.
- C. The environment to which the chlorinated water is to be discharged shall be reviewed by the Contractor and the Engineer. Where it is deemed necessary, federal, state and local regulatory agencies should be contacted to determine special provisions for the disposal of chlorinated water. Any indication that the discharge of chlorinated water may cause damage to the environment shall require the neutralizing of the chlorine residual by means of a reducing agent in accordance with AWWA C651 and the requirements of this specification.
- D. In locations where chlorine neutralization is required, the reducing agent shall be applied to the water as it exits the piping system. The Contractor shall monitor the chlorine residual during the discharge operations. Total residual chlorine limits in these locations,

and for the discharge of chlorinated water from the testing of pipelines to surface waters of the San Diego Region are as follows:

Total Residual Chlorine Effluent Limitations

30-Day Average	0.002 mg/l
Average Daily Maximum	0.008 mg/l
Instantaneous Maximum	0.02 mg/l

- E. The various methods of dechlorination available can remove residual chlorine to concentrations below standard analytical methods of detection, 0.02 ppm, which will assure compliance with the effluent limit. The Contractor will perform all necessary tests to ensure that the total residual chlorine effluent limitations listed above are met.
- F. In locations where no hazard to the environment is evident based on the joint examination described above, the chlorinated water may be broadcast for dust control on the surface of the immediate site. Care shall be exercised in broadcasting the water to prevent runoff.

### 3.08 BACTERIOLOGICAL TESTING

Contractor shall be responsible for paying for and performing all laboratory testing by an independent qualified laboratory approved by the District per Specification Section 01410 Testing Laboratory Services.

1. Two consecutively passing sets of bacteriological samples are required for the water main to be accepted for tie-in to the DISTRICT water system. Samples will be analyzed for coliform (presence/absence) and heterotrophic plate count (HPC). Passing samples shall be absent for coliform and have an HPC of less than 500 colony forming units (CFU) or less than 500 most probable number (MPN). If deemed applicable based on project size and conditions, it is recommended that samples be tested for acceptable aesthetic quality (e.g., pH, alkalinity, specific conductance, turbidity).
2. During flushing, the District inspector will use a chlorine residual analyzer to confirm that all highly concentrated chlorine has been flushed from the main. The chlorine residual should be no more than 4 mg/L prior to bacteriological sampling.
3. The water main will be thoroughly flushed then shut off for a 16 hour period. During this period, the main should remain under static pressure with a valve on the source off (a backflow device valve). The inspector will read the construction meter. No water is allowed to pass through this meter prior to the arrival of the inspector for the bacteriological samples the following day.
4. After at least 16 hours have passed, the District inspector will confirm no water has passed through the meter. Bacteriological samples will be taken at each designated point. Two samples from each sample point will be taken a minimum of 15 minutes apart with the sample taps left running between samples, in accordance with "Bacteriological Tests, Option B". The source water will only be

turned on to provide pressure for samples if needed. Flushing of the water main is not permitting on the day samples are being drawn.

5. The water source will be turned on after sampling is complete to provide continuous positive pressure on the tested main. The main must remain connected to the metered and backflow protected source and pressurized until all samples have been accepted by the District and the tie-in work starts. The main will be depressurized only by District Water Operations staff on the date of the scheduled tie-in.
6. Once bacteriological samples have been taken, the contractor cannot depressurize or otherwise tamper with the tested water main. Any unauthorized depressurization or tampering witness by District staff will require bacteriological testing to start again. After sample results are sent to the inspector from the lab, proceed based on the following table:

Total Coliform Bacteria	E. Coli Bacteria	HPC (CFU or MPN)	Follow-up Actions
Absent (all samples)	-	< 500 (all samples)	Water Main can be accepted for tie-in
		=/> 500	Flush and repeat testing at elevated HPC sites. Repeat disinfection Optional.
PRESENT (1 <sup>st</sup> Round <= 25% samples)	Absent	Regardless	Flush and repeat testing of all sample sites. Repeat disinfection Optional.
<b>PRESENT</b> (>25% samples)	Absent	Regardless	Flush and repeat testing of all sample sites. <b>Repeat disinfection REQUIRED.</b>
<b>PRESENT</b> (>1 <sup>st</sup> Round)	Absent	Regardless	Flush and repeat testing of all sample sites. <b>Repeat disinfection REQUIRED.</b>
<b>PRESENT</b>	<b>PRESENT</b> (any sample)	Regardless	Flush and repeat testing of all sample sites. <b>Repeat disinfection REQUIRED.</b>

**3.09 TIE-IN**

1. The final tie-in of the tested water main will occur no sooner than five calendar days after the passing bacteriological results, and not later than 14 calendar days after passing bacteriological results. If job progress is dependent on an immediate shutdown and tie-in, District inspectors and Operations staff will work together to complete the work in less than five days.

**END OF SECTION**



## **SECTION 15042**

### **HYDROSTATIC TESTING OF PRESSURE PIPELINES**

#### **PART 1 - GENERAL**

##### **1.01 DESCRIPTION**

This section describes the requirements and procedures for pressure and leakage testing of pressure distribution mains.

##### **1.02 RELATED SECTIONS**

A. Section 15041 – Disinfection of Piping

##### **1.03 CONNECTION TO EXISTING MAINS**

The test shall be made before connection of the new line to the existing District pipes and mains (excepting hot taps).

##### **1.04 TESTER**

District may require testing to be performed by a District-approved testing company who will be required to provide the District Representative with certified testing results. Tester will have a gage and meter that is calibrated annually.

##### **1.05 REQUIREMENTS PRIOR TO TESTING**

- A. Before testing, the pipe trench shall be backfilled with a minimum of 2-1/2 feet of material, or center loaded to hold the pipe in place while testing.
- B. All concrete anchor blocks shall be allowed to cure a sufficient time to develop a minimum strength of 2,000 psi before testing unless otherwise approved by the District Representative.
- C. Steel pipelines shall not be tested before the mortar lining and coating on the entire pipe length to be tested have attained an age of twenty-four (24) hours. Cement-mortar lined pipe shall not be filled with water until a minimum period of twenty-four (24) hours has elapsed after the last joint in any section has been made.

#### **PART 2 - MATERIALS**

##### **2.01 WATER**

- A. Use only potable water for the hydrostatic pressure test. Make up water for testing shall be potable water.
- B. The same water used for chlorination of other sections of the pipeline may not be used to fill the line for hydrostatic pressure or leakage testing.

## **2.02 TEST BULKHEADS**

- A. Design and fabricate test bulkheads per Section VIII of the ASME Boiler and Pressure Vessel Code. Materials shall comply with Part UCS of said code.
  - 1. The bulkhead design pressure shall be at least 2.0 times the specified test pressure for the section of pipe containing the bulkhead.
  - 2. Limit the stresses in the bulkhead at the design pressure to 70 percent of yield strength of the bulkhead material.
  - 3. Include air-release and water drainage connections.

## **2.03 TEST OUTLETS AND TEMPORARY VALVES AND PIPING**

- A. Provide additional outlets and temporary valves for releasing air or apply the test where automatic air valves or other outlets are available in the pipeline. Construct the outlets in the same manner as for a permanent outlet and seal with a blind flange, pipe cap, or plug and apply coating equal to that of the adjacent pipe after use.
- B. Provide a reduced pressure backflow prevention assembly if the source of potable water is from a public waterline.
- C. Provide temporary piping to convey and dispose of the test fluid used in the pipeline. Disconnect and remove temporary piping after successful completion of testing.
- D. Locate and install test bulkheads, temporary valves and connections to existing pipelines and other appurtenances in a manner to provide air gap separation between existing potable water pipelines and the pipeline being tested.

## **2.04 TEST EQUIPMENT**

Provide pressure gages, pipes, pumps, meters, and other equipment necessary to perform the hydrostatic pressure test.

## **PART 3 - EXECUTION**

### **3.01 GENERAL**

- A. Existing facilities will be operated by or under the direction of the District's Representative only.
- B. Disinfect the pipeline to be pressure tested before pressure testing when it is connected to a potable water pipeline. Otherwise, perform the required disinfection after pressure testing.
- C. All labor, materials, tools, and equipment for testing shall be furnished by the contractor.
- D. The pipeline shall be subjected to a field hydrostatic test pressure of 50 psi in excess of the class rating of the pipe being tested for a period of four hours. At the District's sole

discretion, a test pressure corresponding to 50 psi above the operating pressure (based on the hydraulic grade line of the pipeline) may be used with prior District approval.

- E. The test pressure shall not exceed the rated pressure of valves when the boundary of the test section includes closed, resilient-seat gate valves or rubber-seat butterfly valves. Testing against closed valves will NOT be allowed. Valves should not be operated in either direction at differential pressure exceeding the rated valve working pressure.
- F. Hydrants in a test section shall be tested with only the main valve of the hydrant closed.
- G. Noticeable leaks shall cause the test to be terminated until the leak is repaired and the test is rescheduled.
- H. The test shall further be conducted with valves open, and the open ends of pipes, valves, and fittings suitably closed. Valves shall be operated during the test period.

### 3.02 LENGTH OF TEST SECTION

Test the pipeline in sections. The length of the test section in any one test shall not exceed 2,500 feet, the distance between closed valves, or as directed by the District's Representative.

### 3.03 FIELD TEST PROCEDURE

- A. The pipeline should be filled at a rate such that the average velocity of flow is less than 1 foot per second. At no time shall the maximum velocity of flow exceed 2 fps during filling. The following table relates the filling velocity to an equivalent volume flow rate.

<u>Nominal Size (inches)</u>	<u>Flow Rate*(gpm)</u>
6	85
8	150
10	240
12	340
16	600
18	750
24	1,300

\* Filling rate equivalent to pipeline filling velocity of 1 fps for pipe flowing full.

- B. All air shall be purged from the pipeline at each service lateral, air valve, blowoff, and hydrant before checking for leaks or performing pressure or acceptance tests on the system. To accomplish this, if air valves or hydrants or other outlets are not available, taps shall be made at the high points to expel the air, and these taps shall be tightly plugged afterwards.
- C. After the pipeline has been filled and allowed to sit a minimum of 24 hours (48 hours for mortar-lined pipelines), the pressure in the pipeline shall then be pumped up to the specified test pressure. If a large quantity of water is required to increase the pressure during testing, entrapped air, leakage at joints, or a broken pipe can be suspected. Tests should be discontinued until the source or trouble is identified and corrected.

- D. When the test pressure has been reached, the pumping shall be discontinued until pressure in the line has dropped 30 psi, at which time the pressure shall again be pumped up to the specified test pressure. This procedure shall be repeated until four hours have elapsed from the time the specified test pressure was first applied. At the end of the four-hour period, the pressure shall be pumped up to the test pressure for the leakage test.
- E. No pressure drop due to leakage is allowed. Any variations in pressure not accounted for by ambient temperature fluctuation or gauge accuracy tolerances shall be considered a failed test.
- F. Any noticeable leak shall be stopped and all defective pipe, fittings, valves, and other accessories discovered in consequence of the test shall be removed and replaced by the Contractor. The defective material shall be replaced with sound material, and the test shall be repeated until passing results are achieved.

#### **3.04 BULKHEAD AND TEST FACILITY REMOVAL**

After a satisfactory test, drain the water; remove test bulkheads, temporary valves and piping, and other test facilities; connect to existing facilities; and restore the pipe coatings.

**END OF SECTION**

**SECTION 15057****COPPER, BRASS, AND BRONZE PIPE, FITTINGS, AND APPURTENANCES****PART 1 - GENERAL****1.01 DESCRIPTION**

This section includes materials and installation of copper, brass, and bronze pipe, fittings and appurtenances.

**1.02 APPROVED MANUFACTURERS**

- A. All materials shall be the appropriate model number specified in the District Specifications as manufactured by the companies listed herein, or approved equal.
- B. Copper Tubing:
  - 1. Per Approved Materials List or approved equal.
- C. Service Saddle:
  - 1. Per Approved Materials List or approved equal.
- D. Corporation Stop:
  - 1. Per Approved Materials List or approved equal.
- E. Angle Meter Stop:
  - 1. Per Approved Materials List or approved equal.
- F. Customer Valve:
  - 1. Per Approved Materials List or approved equal.
- G. Insulating Pipe Bushings, Unions, or Couplings:
  - 1. Per Approved Materials List or approved equal.

**1.03 SERVICE SADDLES**

- A. Strap-type (single and double) bronze service saddles shall only be installed on asbestos-cement or ductile iron pipe.
- B. All service saddles installed on C900 PVC pipe shall be a two or three-piece casting designed for use with the specific outside diameter of the pipe.

**PART 2 - MATERIALS****2.01 DESCRIPTION**

All materials shall be manufactured domestically unless written approval is granted by the District.

**2.02 COPPER**

- A. Copper tubing shall conform to the requirements of ASTM B88 for seamless copper water tube. Copper tubing shall be true, smooth and clean on both inside and outside and free from any cracks, seams, or other defects. It shall be truly cylindrical, of the full specified outside and inside diameters, and of uniform thickness of metal. All copper tubing shall be Type K.
- B. Hard copper shall be used for 1-1/2 inch and larger services. Soft copper may be used for 1-inch services.
- C. Fittings shall be copper conforming to ASTM B75 and ANSI B16.22, with compression or grip joint connections.

**2.03 BRASS PIPE, NIPPLES, AND FITTINGS**

- A. Short threaded nipples, brass pipe and fittings shall conform to ASTM B43, regular wall thickness. Threads shall conform to ANSI B1.20.1, NPT.

**2.04 BRONZE APPURTENANCES**

- A. All items specified herein shall be manufactured of bronze conforming to ASTM B62, "Composition Bronze or Ounce Metal Castings."
- B. All service saddle bodies shall be manufactured of bronze and shall be tapped for an iron pipe thread. The seal with the pipe shall be effected with either a rubber gasket or an O-ring.
  - 1. All service saddles shall be of the double-strap type for asbestos-cement or ductile iron pipe.
  - 2. All service saddles for C900 PVC pipe shall be cast in two sections for pipe up to and including 8 inches in diameter. Service saddles for use on 10 and 12-inch diameter C900 PVC pipe may be cast in two or three sections. Each saddle shall accurately fit the contour of the pipe O.D. without causing distortion of the pipe. The sections shall be securely held in place with stainless steel or silicon bronze screws or bolts. Casting sections may be hinged and secured with 316 stainless steel pins. The casting sections shall be tapped to receive the screws or bolts. All bolts shall be tightened using a torque wrench as recommended by the manufacturer.
- C. Corporation stops shall be manufactured of bronze. The inlet fitting shall be male iron pipe thread when used with saddle and the outlet connection shall be a compression type or iron-pipe thread.

- D. Angle meter stops shall be manufactured of bronze. The inlet connection shall be a compression type or iron-pipe thread and the outlet fitting shall be a meter flange or meter coupling. The inlet and outlet shall form an angle of 90 degrees on a vertical plane through the centerline of the meter stop. A rectangular lug and lock wing shall be provided on the top of the fitting to operate the shutoff mechanism. Two-inch angle meter stops shall be with "slotted" holes for 1-1/2 inch or 2-inch meters.
- E. Customer Service valves shall be manufactured of bronze with lever-type turn handle. The inlet connection shall be a meter flange or a meter coupling and the outlet female iron pipe.

## **2.05 FLANGES, GASKETS, BOLTS, AND NUTS**

- A. Connect to flanged valves and fittings with bronze flanges conforming to ANSI B16.24, Class 125 or Class 150, to match the connecting flange.
- B. Gaskets for flanged-end-fittings shall be made of synthetic rubber binder and shall be full-face, 1/8-inch-thick per Approved Materials List or approved equal.
- C. When both aboveground adjoining flanges are bronze, use bronze bolts and nuts. Bolts shall conform to ASTM F468, Grade C65100 or C63000. Nuts shall conform to ASTM F467, Grade C65100 or C63000.
- D. When only one of the aboveground adjoining flanges is bronze, use Type 316 stainless-steel bolts and nuts conforming to ASTM A193, Grade B8M for bolts and ASTM A194, Grade 8M for nuts.
- E. Connect to buried ferrous flanges with flange insulation kits. Bolts used in flange insulation kits shall conform to ASTM B193, Grade B7. Nuts shall comply with ASTM A194, Grade 2H. If the adjoining buried flange is bronze, use bronze bolts and nuts as described above, without a flange insulation kit.
- F. Provide one (1) washer for each nut. Each washer shall be of the same material as the nut.

## **PART 3 - EXECUTION**

### **3.01 COPPER TUBING AND FITTINGS**

- A. Cut tubing square and fully remove burrs both inside and outside. Do not miter joints for elbows or notch straight runs of pipe for trees.
- B. Bends in soft copper tubing shall be long sweep. Shape bends with shaping tools. Form bends without flattening, buckling, or thinning the tubing wall at any point.
- C. Brazing procedures shall be in accordance with Articles XII and XIII, Section IX, of the ASME Boiler and Pressure Vessel Code. Silver solder shall be used. Solderers shall comply with ANSI B31.3, paragraph 328.
- D. Buried piping shall be installed with some slack to provide flexibility in the event of a load due to settlement, expansion or contraction. A minimum cover of 36 inches below

the finished street grade shall be adhered to. The tubing is to be bedded and covered with sand or select material as determined by the District Representative.

- E. All domestic service laterals shall be 1-inch minimum size copper tubing. End connections shall be compression type.
- F. All 2-inch size services shall be installed with straight lengths of hard copper water tube Type K.

### **3.02 SERVICE SADDLE**

- A. The service saddle shall be no close than 18 inches to a valve, coupling, joint, or fitting unless it is at the end of the main. The installation of a service saddle on any machined section of ACP will not be permitted.
- B. The surface of the pipe shall be filed to remove all loose material and to provide a hard, clean surface before placing the service saddle.
- C. The service saddle shall be tightened firmly to ensure a tight seal; however, care shall be used to prevent damage or distortion of either the corporation stop or service saddle by over tightening. A torque wrench shall be used per manufacturer's recommendation to avoid damage.
- D. The tap into the pipe shall be made in accordance with the pipe manufacturer's recommendation.

### **3.03 INSTALLING FLANGE BOLTS AND NUTS**

- A. Lubricate bolt threads with graphite and oil prior to installation.
- B. Set flanged pipe with the flange bolt holes straddling the pipe horizontal and vertical centerlines.

### **3.04 INSULATING BUSHING AND UNIONS**

Pipe or fittings made of nonferrous metal shall be isolated from ferrous metals by nylon insulating pipe bushings, unions, or couplings.

**END OF SECTION**



**SECTION 15058****PVC PIPE AND FITTINGS (SCHEDULE SERIES)****PART 1 - GENERAL****1.01 DESCRIPTION**

This section includes materials and installation of polyvinyl chloride (PVC) pipe, conduit, and fittings with iron pipe size outside diameters and solvent welded or threaded joints for miscellaneous applications. Size range is ½-inch to 12-inch.

**1.02 RELATED SECTIONS**

- A. Section 01300 – Record Drawings and Submittals
- B. Section 15041 – Disinfection of Piping
- C. Section 15042 – Hydrostatic Testing of Pressure Pipelines

**1.03 SUBMITTALS**

- A. Submit shop drawings in accordance with Section 01300.
- B. Submit manufacturer's catalog data and descriptive literature for PVC conduit, pipe, fittings, solvent, and miscellaneous materials. Show dimensions and materials of construction by specification reference and grade.
- C. Provide NSF/ANSI Standard 61 certification for materials used in potable water systems.

**1.04 QUALITY ASSURANCE**

All materials delivered to the job site shall be new, free from defects, and marked to identify the material, class, and other appropriate data such as thickness for piping. Materials shall be subject to inspection prior to acceptance.

**PART 2 - MATERIALS****2.01 PVC CONDUIT**

- A. PVC conduit shall be Schedule 40 conforming to NEMA TC-2, Type EC-40 with long radius elbows and solvent welded joints.

**2.02 PVC PIPE**

- A. PVC pipe shall be Schedule 80, Type I, Grade I (Class 12454-B), conforming to ASTM D1784 and D1785. PVC pipe used in for potable water applications shall be listed by the National Science Foundation (NSF).

**2.03 NIPPLES**

- A. Short nipples shall be the same as the PVC pipe.

**2.04 FITTINGS**

- A. Fittings shall be Schedule 80 conforming to ASTM D2466 for socket-type.

**2.05 JOINTS**

- A. Pipe and fitting joints shall be solvent welded except where threaded joints are required.
- B. Solvent cement for socket joints shall comply with ASTM D2564.

**PART 3 - EXECUTION****3.01 GENERAL**

- A. Do not install PVC pipe when the temperature is below 40 degrees or above 90 degrees F.
- B. Store pipe and fittings indoors in their original packaging, or outdoors and protected from direct sunlight exposure.
- C. Store solvent cement indoors or, if outdoors, shade from direct sunlight exposure. Do not use solvent cements which have exceeded the shelf life marked on the storage container.
- D. Before installation, check pipe and fittings for cuts, scratches, gouges, buckling, kinking, or splitting on pipe ends. Remove any pipe section containing defects by cutting out the damaged section as a complete cylinder.
- E. Do not drag pipe over the ground, drop it into the ground, or drop objects on it.

**3.02 SOLVENT WELDED JOINTS**

- A. Prior to solvent welding, remove fittings and couplings from their cartons and expose them to the air for at least one hour to the same temperature conditions as the pipe.
- B. Cut pipe ends square and remove all burrs, chips, and filings before joining pipe or fittings. Bevel solvent welded pipe ends as recommended by the pipe manufacturer.
- C. Wipe away loose dirt and moisture from the inside and outside of the pipe end and the inside of the fitting before applying solvent primer and cement. Do not apply solvent primer to wet surfaces. Apply primer and cements in accordance with manufacturer's recommendations.
- D. Make up solvent welded joints per ASTM D2855.
- E. Allow at least 8 hours of drying time before moving solvent welded joints or subjecting the joints to any internal or external loads or pressures.

**3.03 INSTALLING BURIED PIPE**

- A. Use imported sand conforming to Section 02223 in the pipe base and pipe zone.
- B. Grade the bottom of the trench uniformly to the line and grade to which the pipe is to be laid. Place pipe base and pipe zone material conforming to Section 02223.
- C. Remove foreign matter and dirt from inside of pipe and keep clean during and after pipe laying.
- D. Do not backfill the pipe trench until the solvent welded joints have set. Support the pipe uniformly and continuously over its entire length on firm, stable bedding. Do not use blocking to change pipe grade or to support pipe in the trench.

**3.04 WARNING/IDENTIFICATION TAPE**

- A. Install detectable warning/identification tape above PVC pipe in public right-of-way or District easements. See Section 15080.

**3.05 PRESSURE TESTING**

- A. Test miscellaneous piping at the same time that the connecting pipelines are pressure tested. See Section 15042. Repair any leaks in the piping and retest.

**3.06 DISINFECTION**

- A. See Section 15041.

**END OF SECTION**

**SECTION 15060****POLYVINYL CHLORIDE (PVC) PIPE****PART 1 - GENERAL****1.01 DESCRIPTION**

This section includes materials and installation procedures for polyvinyl chloride (PVC) pressure pipe.

**1.02 RELATED WORK SPECIFIED ELSEWHERE**

- A. Section 02140 – Dewatering
- B. Section 02223 – Trenching, Backfilling and Compaction
- C. Section 03300 – Cast-In-Place Concrete
- D. Section 09867 – Polyethylene Encasement
- E. Section 09868 – Cold Applied Wax Tape Coating
- F. Section 15041 – Disinfection of Piping
- G. Section 15042 – Hydrostatic Testing of Pressure Pipelines
- H. Section 15062 – Ductile Iron Pipe and Fittings

**1.03 REFERENCE STANDARDS**

The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.

- A. AWWA C900 – Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 12 In. (100mm Through 300mm), for Water Transmission and Distribution
- B. AWWA C905 – Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 In. Through 48 In. (350mm Through 1,200mm), for Water Transmission and Distribution
- C. AWWA M23 – PVC Pipe - Design and Installation
- D. Uni-Bell – Handbook of PVC Pipe Design and Construction

**1.04 CONTRACTOR SUBMITTALS**

- A. Submit shop drawings in accordance with Section 01300.

- B. Provide affidavit of compliance meeting all requirements of AWWA C900 or C905, as applicable.
- C. Provide National Sanitation Foundation (NSF) 61 certification where pipe will be used in potable water service.
- D. Submit manufacturer's catalog data and descriptive literature for high deflection couplings, repair couplings, tracer wire, marking tape, and miscellaneous piping materials.

#### **1.05 QUALITY ASSURANCE**

- A. The manufacturer of each shipment of pipe shall be required to supply a statement certifying that each lot or load of pipe has been subjected to the tests specified for PVC pipe, and has been found to meet all the requirements of AWWA C900 and/or C905 as applicable.
- B. PVC pipe and couplings shall bear indelible identification markings as required by AWWA C900 and C905. In addition, all pipe shall bear a "home" mark on the spigot end to indicate proper penetration when the joint is made.
- C. Pipe that shows evidence of exposure to sunlight, age, surface deterioration, or other physical damage shall be rejected. The decision of the District shall be final as to the acceptability of the pipe to be installed.
- D. Where new pipelines are to be connected to existing pipelines, the Contractor shall field verify the location, elevation, pipe material, pipe outside diameter, and any other characteristics of the existing pipe before proceeding with pipe installation.

#### **1.06 DELIVERY, STORAGE AND HANDLING**

- A. PVC pipe shall be stored in suppliers' yards and on the job site in accordance with AWWA M23 and the manufacturer's recommendations. Store PVC pipe in the field by supporting the pipe uniformly in accordance with AWWA M23. Pipe shall not be stacked higher than 4 feet or with weight on the bell ends.
- B. Cover stored PVC pipe with an opaque material to protect it from the sun's ultraviolet radiation. PVC pipe that has been subjected to excess ultraviolet radiation as identified by color fading or chalking shall not be used. The determination as to the acceptability of PVC pipe shall rest solely with the District Engineer.
- C. PVC pipe that has been contaminated in any way with petroleum products (on the inside or outside of the pipe) shall not be used.

**PART 2 - MATERIALS****2.01 PVC PIPE**

- A. Pipe shall be polyvinyl chloride (PVC) conforming to AWWA C900 or C905 with material cell classification 12454-B per ASTM D 1784. Pipe shall have an integral bell end with elastomeric gasket and a spigot end.
- B. PVC pipe in diameters 4-inch through 12-inch shall comply with the requirements of AWWA C900, dimension ratio (DR) 14.
- C. PVC pipe in diameters 14-inch through 36-inch shall comply with the requirements of AWWA C905, dimension ratio (DR) 18.
- D. Provide pipe in standard 20-foot laying lengths. Random lengths will not be permitted.
- E. PVC Pipe manufacturer shall be per the Approved Materials List or approved equal.

**2.02 HIGH DEFLECTION COUPLINGS**

- A. Provide polyvinyl chloride (PVC) couplings with twin elastomeric gaskets which allow for 2½-degree deflection at each bell for a maximum of 5-degree total deflection per coupling. If specified on the plans, couplings shall be restrained.
- B. Couplings for cast iron outside diameter pipe sizes shall meet the requirements of AWWA C900.
- C. Couplings for iron pipe size (IPS) outside diameter pipe shall meet ASTM D3139.
- D. High Deflection Couplings manufacturer shall be per the Approved Materials List or approved equal.

**2.03 CLOSURE/REPAIR COUPLINGS**

- A. Provide polyvinyl chloride (PVC) couplings with twin elastomeric gaskets which are designed to connect plain ends of straight pipe. Couplings shall meet the material requirements of high deflection couplings specified herein.
- B. Do not deflect pipe in these couplings.
- C. Closure/Repair Couplings manufacturer shall be per the Approved Materials List or approved equal.

**2.04 FITTINGS**

- A. Ductile-iron fittings shall meet the requirement of Section 15062.
- B. Fittings shall have mechanical joints compatible for use with cast iron outside diameter PVC pipe.
- C. Fittings manufacturer shall be per the Approved Materials List or approved equal.

## 2.05 OUTLETS

- A. For outlets 2 inches and smaller with working pressures 200 psi or less, attach a service saddle and corporation stop to the pipe. Provide service saddles with full width, cast bronze bodies conforming to ASTM B62, O-ring gaskets, and iron pipe threads. Provide Type 316 stainless steel double band straps with four bolts or a single wide strap with four bolts. All stainless steel shall be fully passivated for enhanced corrosion resistance. Saddles shall be manufactured for installation on cast iron equivalent outside diameter PVC pipe conforming to AWWA C900 or C905.
- B. Service saddles shall be per the Approved Materials List or approved equal.
- C. For outlet diameters 3 inches and larger, use a ductile iron tee with a flanged outlet.

## 2.06 RESTRAINED JOINTS

- A. Mechanical Joint Restraint.
  - 1. The restraining mechanism for mechanical joints shall consist of a follower gland having a seal gasket and individually actuated wedges that increase their resistance to pullout as pressure or external forces increase. The system manufacturer shall provide all the components (follower ring, wedges, and gaskets) for the restraining device.
  - 2. The device shall be capable of full mechanical joint deflection during assembly and the flexibility of the joint shall be maintained after burial.
  - 3. The joint restraint ring and its wedging components shall be constructed of ductile iron conforming to ASTM A 536, Grade 60-42-10. The wedges shall be ductile iron, heat-treated to a minimum hardness of 370 BHN. Dimensions of the gland shall be such that it can be used with mechanical joint bells conforming to AWWA C111 and AWWA C153. The design shall use torque limiting twist-off nuts to provide actuation of the restraining wedges.
- B. Restraint for PVC Pipe.
  - 1. Joint restraint for C900 PVC pipe and fitting systems shall be effected by an internal self-restraining system. Such a system shall be rated by the manufacturer to pressures that meet or exceed the rating of the C900 PVC pipe being restrained (e.g. DR 18 is rated for service at 235 psi). No degradation of the pipe's performance is allowed. Use a system such as RieberLok or approved equivalent.
  - 2. Gasket material shall be SBR or approved equal.
  - 3. Pipe shall be manufactured according to ANSI/AWWA C900 specifications and shall originally be fitted with a Rieber gasket or approved equal.
  - 4. Installation shall be in accordance with ANSI/AWWA C605 and the restraint manufacturers recommendations.

- C. Minimum rated pressure shall be equal to that of the pipe on which the fittings will be installed.
- D. Restraint fittings shall be per the Approved Materials List or approved equal.

### **2.07 TRACER WIRE**

- A. Use AWG No. 8 stranded copper wire with high molecular weight polyethylene (HMW/PE) insulation specifically designed for direct burial in corrosive soil or water. Polyethylene insulation shall conform to ASTM D1248, Type 3, Class C, Grade 5. Refer to the Approved Materials List for manufacturer.

### **2.08 MARKING TAPE**

- A. Use marking tape consisting of one layer of aluminum foil laminated between two colored layers of inert plastic film. The lamination bond should be strong enough that the layers cannot be separated by hand. Tape shall be a minimum of 5 mils thick and 6 inches wide. Elongation shall be a minimum of 600 percent. Tape shall bear a continuous, printed message every 16 to 36 inches warning of the installation buried below. Tape shall be per the Approved Materials List, or approved equal.

## **PART 3 - EXECUTION**

### **3.01 DELIVERY AND TEMPORARY STORAGE**

- A. Support the pipe uniformly during transport and storage. Avoid scratching the pipe surface. Do not stack higher than 4 feet nor stack with weight on bells. Cover to protect from sunlight.
- B. Do not install pipe that is gouged or scratched forming a clear depression.
- C. Do not install pipe that has been contaminated with a petroleum product (inside or outside).
- D. Do not install any pipe that shows evidence of exposure to sunlight, age, surface deterioration, or other physical damage. The decision of the District's Representative shall be final as to the acceptability of the pipe to be installed.

### **3.02 HANDLING OF PIPE**

- A. Lift pipes with mechanical equipment using wide belt slings. Do not use cable slings or chains. Do not move pipe by inserting any devices or pieces of equipment into the pipe barrel.

### **3.03 SANITATION OF PIPE INTERIOR**

- A. During laying operations, do not place tools or any other materials in the pipe.
- B. When pipelaying is not in progress, including the noon hour, close the ends of the installed pipe with plugs to prevent entry of vermin or persons.



### **3.04 INSTALLING PIPE IN TRENCH**

- A. See Section 02200 and 02223 for earthwork requirements.
- B. Inspect each pipe and fitting before lowering into the trench. Clean ends of pipe thoroughly. Remove foreign matter and dirt from inside of pipe and keep clean during and after laying.
- C. Handle pipe in a manner to avoid any damage to the pipe. Do not drag pipe over the ground, drop it onto the ground, or drop objects on it. Do not drop or allow pipe to fall into trenches.
- D. Laying tolerances for the installed pipe shall not vary greater than 0.3-foot horizontally, or greater than 0.1-foot vertically from the alignment and elevations shown on the Drawings.
- E. Grade the bottom of the trench to the line and grade to which the pipe is to be laid, with allowance for pipe thickness. Remove hard spots that would prevent a uniform thickness of pipe base material (imported sand). Before laying each section of the pipe, check the grade with a straightedge and correct any irregularities found. The trench bottom shall form a continuous and uniform bearing and support for the pipe at every point between bell holes, except that the grade may be disturbed for the removal of pipe handling slings.
- F. At the location of each joint, dig bell holes in the bottom of the trench and at the sides to permit visual inspection of the entire joint and to prevent the pipe from being supported by the bell end or fitting.
- G. Keep the trench in a dewatered condition during pipelaying.
- H. When pipelaying is not in progress, including the noon hours, close the open ends of pipe. Do not permit trench water, animals, or foreign material to enter the pipe.

### **3.05 DEWATERING**

- A. Dewatering of trench excavations shall be performed in accordance with Section 02140. If flooding of the trench does occur, the Contractor shall immediately dewater and restore the trench. Damaged or altered pipelines, appurtenances, or trench materials shall be repaired or replaced as directed by the District Engineer.

### **3.06 PIPE INSTALLATION**

- A. When the work requires and the size of the pipe allows entry of personnel into the pipe, the Contractor shall comply with all Federal and State regulations for confined space entry. Work inside pipelines shall not be undertaken until all the tests and safety provisions of the Code of Federal Regulations 1910.146, and the General Industry Safety Orders of the California Code of Regulations, Title 8, Section 5159 for confined space entry have been performed and the area is verified as safe to enter. The Contractor shall furnish and install all pipe, specials, fittings, closure pieces, valves, supports, bolts, nuts, gaskets, jointing materials, and all other appurtenances as shown on the Approved Plans and as required to provide a complete and workable installation. Install pipe in the trench

as follows: A. Inspect each section of pipe prior to lowering the pipe into the trench. Thoroughly clean the ends of the pipe. Remove foreign matter and dirt from inside of the pipe and keep clean during and after installation.

- B. Install pipe according to the manufacturer's approved order of installation to the proper lines and grades in accordance with the Approved Plans and as follows:
1. Install pipe uphill if the grade exceeds ten percent (10%).
  2. Installation tolerances for the pipe shall not vary more than 50mm (2") horizontally or 25mm (1") vertically from the alignment and elevations shown on the Approved Plans.
  3. Install the pipe such that the identification markings on each pipe section are continuously aligned for the total length of the pipeline alignment. Orient the strip marking upward to the 12 o'clock position (top) of the trench opening.
- C. The pipe shall have firm bearing along its full length, and bell holes shall be provided to each joint to permit visual inspection of the joint and prevent the pipe from being supported by the bell end or coupling.
- D. The beveled end of the pipe shall be removed prior to insertion into a mechanical joint fitting.
- E. Field cutting and milling shall be performed in accordance with the manufacturer's written instructions to equal the quality of shop-fabricated ends.
- F. Pipe Assembly:
1. Push-On Type: Assemble the pipe joint using a lubricant selected from the Approved Materials List. Insert the spigot end into the bell or coupling to the proper insertion mark. Check that the elastomeric ring has not left the groove during assembly by passing a feeler gauge around the completed joint. Drive spigot ends of the pipe into bell ends in accordance with the manufacturer's recommendations. Stabbing shall not be permitted.
  2. Mechanical-Joint Type: Assembly of mechanical joint fittings shall be in accordance with the manufacturer's recommendations regarding installation.
- G. PVC pipe shall not be bent, nor shall PVC pipe be deflected at pipe connections other than deflection couplings. Install deflection couplings selected from the Approved Materials List for horizontal and vertical changes in direction not greater than 5°, and for installation of pipe through curves. Pipe sections of differing lengths may be used as follows to facilitate the installation of pipelines through curves:
1. Allowable lengths of pipe sections through curves are 6.10m (20'), 3.05m (10'), or 1.52m (5') only. 2. No more than two 1.52m (5') pipe sections may be used in succession without being separated by a 6.10m (20') or 3.05m (10') section. Pipe layout through curves is subject to approval by the District Engineer. In no case shall the minimum radius be less than 23.16m (76').

### **3.07 INSTALLING FLANGE ADAPTERS**

- A. Clean bolts, nuts and flange faces by wire brushing before installing gasket and adjoining flange. Coat bolt shafts with waterproof gear grease or primer for wax tape coating prior to insertion in flange bolt holes. Do not apply grease or primer to threads. Lubricate threads of bolts and nuts with oil or graphite prior to installation. Assemble all bolts and nuts in the flange, then uniformly tighten bolts and nuts in a progressive diametrically opposite sequence, and torque with a calibrated torque wrench. All clamping torque shall be applied to the nuts only.
- B. If flanges leak under pressure testing, loosen or remove the nuts and bolts, reset or replace the gasket, reinstall or retighten the bolts and nuts, and retest the joints. Joints shall be watertight. Replace galled, cracked, or distorted bolts and nuts.

### **3.08 INSTALLING SERVICE SADDLES**

- A. Place the service saddle on the pipe and hand tighten the nuts while positioning the saddle in its final location. Uniformly tighten the nuts in a progressive diametrically opposite sequence and torque with a calibrated torque wrench to the saddle manufacturer's recommended values.
- B. Connect a corporation stop to the saddle. Apply Teflon joint compound or tape to the male threads before installing the corporation stop. Make joints watertight.
- C. Mount a tapping machine on the corporation stop to cut a hole in the pipe with a shell type cutter made specifically for PVC pipe. Do not use other devices or hand equipment to bore through the pipe wall.

### **3.09 INSTALLING POLYETHYLENE ENCASEMENT**

Wrap buried metallic components including service saddles, fittings and valves with a three-part, cold applied wax tape coating system per Section 09868 and polyethylene encasement per Section 09867. Complete the wrap prior to placing concrete anchors, supports, or thrust blocks. Repair polyethylene material damaged during construction prior to backfilling.

### **3.10 INSTALLATION AND TESTING OF TRACER WIRE**

- A. Prior to backfill, install tracer wire on top of pipe and secure with 2-inch wide plastic adhesive tape at maximum 10-foot intervals. Run tracer wire continuously along pipe and terminate in adjacent valve boxes for buried assemblies or buried valves. Where buried splices occur, use an electrical splicing kit consisting of a split bolt connector, mold, and a two-part encapsulating epoxy resin such as Scotchcast, or approved equal.
- B. Provide 24 inches of coiled wire at access points for attachment of pipe locating equipment. Each installed run of pipe shall be capable of being located using the tracer wire. Protect wire insulation from damage during installation and backfilling. Wires with cut or damaged insulation are not acceptable and replacement of the entire wire which has been damaged will be required at the Contractor's expense.

- C. After all utilities have been installed and backfilled, the wire shall be tested for continuity by the Contractor using an approved tone testing device. District staff shall witness the continuity testing. Wires not passing the continuity test shall be replaced at the Contractor's expense.

**3.11 INSTALLING MARKING TAPE**

- A. After the pipe zone and the first 12 inches in the trench zone have been backfilled and compacted, place the marking tape on the compacted backfill and center the tape over the pipe. Run the tape continuously along the trench and tie the end of the tape to the preceding tape segment. Wrap the marking tape around valve box extension pipes and continue along the pipe.

**3.12 PRESSURE TESTING**

- A. See District Standard Specifications Section 15042 Hydrostatic Testing of Pressure Pipelines.

**3.13 DISINFECTION**

- A. See District Standard Specifications Section 15041 Disinfection of Piping.

**END OF SECTION**

**SECTION 15062****DUCTILE IRON PIPE AND FITTINGS****PART 1 - GENERAL****1.01 DESCRIPTION**

This section covers materials and installation of ductile iron pipe and fittings for distribution and transmission pipelines and appurtenances.

**1.02 RELATED SECTIONS**

- A. Section 09867 – Polyethylene Sheet or Tube Encasement
- B. Section 09868 – Cold Applied Wax Tape Coating
- C. Rincon del Diablo Municipal Water District, Standard Specifications

**1.03 REFERENCE STANDARDS**

The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.

- A. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs
- B. ASTM C150 - Standard Specification for Portland Cement
- C. ASTM A536 - Standard Specifications for Ductile Iron Castings
- D. AWWA C104 - Cement Mortar Lining for Ductile Pipe and Fittings for Water mains
- E. AWWA C105 - Polyethylene Encasement for Ductile Iron Pipe
- F. AWWA C110 - Ductile Iron Fittings
- G. AWWA C111 - Rubber-Gasket Joints for Ductile Iron Pipe and Fittings
- H. AWWA C115 - Flanged Ductile Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges
- I. AWWA C150 - Thickness Design of Ductile Iron Pipe
- J. AWWA C151 - Ductile Pipe, Centrifugally Cast
- K. AWWA C153 - Ductile Iron Compact Fittings
- L. AWWA C217 - Cold-Applied Petroleum Wax Tape Coatings
- M. AWWA C600 - Installation of Ductile Iron Water Mains

- N. AWWA C602 - Cement-Mortar Lining of Water Pipelines
- O. AWWA C606 - Grooved and Shouldered Type Joints

#### **1.04 CONTRACTOR SUBMITTALS**

- A. Submit shop drawings in accordance with Section 01300.
- B. Provide an affidavit of compliance with standards referenced in this Specification.
- C. Submit manufacturer's literature on ductile iron pipe and fittings including dimensions, thickness, weight, coating, lining, and a statement of inspection and compliance with the acceptance tests of AWWA C151 and C110, respectively.
- D. Submit manufacturer's literature on ductile iron pipe fittings conforming to AWWA C153 including dimensions, thickness, weight, coating and lining. Submit certificate of compliance with AWWA C153. Include legible engineering analysis sealed by a registered professional engineer or test results confirming the hydrostatic design in accordance with Section 53-5.3 of AWWA C153 for each size and configuration of fitting to be supplied. Submit results of foundry tests required by AWWA C153 including chemical analysis per Section 53-13.
- E. Submit dimensions of push-on joints and other joints which do not conform to rubber gasket joints in accordance with AWWA C111.
- F. Submit tabulated layout schedule and drawing location and dimensions of pipe and fittings including:
  - 1. Pipe station and top of pipe elevation at each change of grade and alignment.
  - 2. Elements of curves and bends, both in horizontal and vertical alignment, including elements of the resultant true angular deflection in cases of combined curvature.
  - 3. The limits of each reach of pipe thickness class and of restrained joints.
  - 4. The limits of each reach of concrete encasement or encasement in casing.
  - 5. Locations and details of bulkheads for field hydrostatic testing of the pipeline.
  - 6. Locations of closures for length adjustment and for construction convenience.
  - 7. Locations of manholes and other points of access for placement of mortar lining at field joints and removal of test bulkheads.
  - 8. Locations of valves and other mechanical equipment.
- G. Submit joint details.
- H. Submit manufacturer's literature on restrained joint systems and calculations and/or test data proving that the proposed restrained joint arrangement can transmit the required thrust.

- I. Submit copy of manufacturer's quality control check of pipe material and production.
- J. Submit certificate that cement complies with ASTM C150, designating type.
- K. Submit test report on physical properties of rubber compound used in the gaskets.
- L. Submit manufacturer's catalog data and descriptive literature on marking tape.

#### **1.05 INSPECTION AND FIELD VERIFICATION**

- A. The Engineer may inspect materials, productions, and testing of pipes, fitting, and special pieces at manufacturer's plant.
- B. Where new pipelines are to be connected to existing waterlines, the Contractor shall verify in the field the location, elevation, pipe material, pipe outside diameter, and any other characteristics of the existing waterline before proceeding with the installation. This field verification shall be performed in the presence of the Engineer.

### **PART 2 - MATERIALS**

#### **2.01 DUCTILE IRON PIPE**

- A. Pipe shall be ductile iron pipe manufactured in accordance with the ANSI/AWWA C151/A21.51. Provide pipe in nominal 18-foot or 20-foot laying lengths.
- B. Plainly mark each length of straight pipe to identify the design pressure class or thickness class, the wall thickness, and date of manufacture. Mark the spigot end of plain end pipe to clearly show the required depth of insertion into the bell.

#### **2.02 PIPE WALL THICKNESS**

- A. Pipe wall thickness shall be designed in accordance with ANSI/AWWA C150/21.50 and shall be based on laying conditions and internal pressures as indicated on the Drawings. The minimum pressure class shall be Class 350 for 24-inch and smaller pipe diameters and Class 250 for larger pipe diameters.
- B. Minimum wall thickness for pipe having threaded flanges shall be Special Thickness Class 53 per AWWA C151.
- C. Minimum wall thickness for pipe having grooved end joints shall conform to AWWA C606.

#### **2.03 TYPE OF PIPE JOINTS**

- A. Joints in aboveground piping or piping located in vaults and structures shall be flanged or mechanical clamp-type couplings. Use flange adapters only if shown on the Drawings.
- B. Joints in buried piping shall be push-on or mechanical joint per AWWA C111 except where flanged joints are required to connect to valves, meters and other equipment or as shown on the Drawings. Push-on joints shall be per the Approved Materials List or District approved equal.

- C. Where specified on the Drawings, restrained push-on joint for buried pipe shall be per the Approved Materials List or District approved equal.
- D. Mechanical joint restraining glands shall be of the type specified elsewhere in this Section.
- E. Provide plain end pipe where flexible pipe couplings are to be used.

#### **2.04 DUCTILE IRON FITTINGS**

- A. For 3-inch to 24-inch, provide ductile iron push-on or mechanical joint fittings conforming to AWWA C110 with a rated working pressure of 350 psi.
- B. Provide ductile iron push-on or mechanical joint fittings conforming to AWWA C110 with a rated working pressure of 250 psi for 30-inch to 48-inch, and 200 psi for 54-inch through 64-inch.
- C. In lieu of fittings conforming to AWWA C110, provide ductile iron compact fittings conforming to AWWA C153 with a minimum rated working pressure of 350 psi. Provide fittings constructed of Grade 70-50-05 ductile iron having a minimum weight equal to the weight tabulated in AWWA C153. Mechanical joint bells shall conform to AWWA C111. Mechanical joint glands shall be Grade 70-50-05 ductile iron and cast in one continuous ring. Fittings with repaired defects are not acceptable and will be rejected.
- D. For mechanical joint fittings with glands, use tee-head or non-hex head bolts and hex head nuts for joint makeup and gasket seating. Bolts and nuts shall be zinc coated carbon steel.
- E. For grooved or shouldered end fittings, use ductile iron fittings conforming to AWWA C606. The minimum thickness of pipe to be used with grooved or shouldered ends shall conform to AWWA C606.
- F. Material for fittings with welded on bosses shall have a Charpy notch impact value of minimum 10 ft-lbs under the conditions defined in AWWA C151. Test completed welds by the liquid penetrant method per ASTM E 165.
- G. Ductile Iron Fittings shall be per the Approved Materials List or approved equal.

#### **2.05 FLANGES**

- A. Provide flat faced ductile iron flanges with serrated facings conforming to AWWA C110 and ANSI B16.42 Class 150.
- B. For flanged fittings with working pressures greater than 250 psi, use ductile iron fittings conforming to ANSI B16.42 Class 300.



- C. Ductile iron blind flanges shall be of pressure rating and drilling to match those of the mating fitting, valve, or flange. Blind flange thickness shall not be less than those specified for flanges in AWWA C115.
- D. Threaded flanges shall be flat faced, solid back, ductile iron per AWWA C115.
- E. Flanged pipe shall be either cast or threaded. Flanged pipe shall be shop fabricated, not field fabricated. Prior to assembly of the threaded flange onto the pipe, apply a thread compound to the threads to provide a leak-free connection. There shall be zero leakage through the threads at a hydrostatic test pressure of 250 psi without the use of the gasket. Flanges shall be machined flat and perpendicular to the pipe barrel. Flanges shall be backfaced parallel to the face of flange. Bolt holes of flanges shall straddle the horizontal and vertical centerline of the pipe.
- F. All machined faces of flanges shall be coated with a temporary rust-inhibitive coating until final coating or the installation is completed.

## **2.06 LINING AND COATING**

- A. Line the interior of pipe and fittings with cement mortar with a seal coat per AWWA C104. Provide double thickness lining and use cement conforming to ASTM C150, Type II.
- B. Coat the exterior of buried pipe and fittings with an asphalt material per AWWA C151. Apply coating in shop.
- C. Epoxy coat the interior and exterior of pipe and fittings in vaults or above-grade per Section 09900, System No. 5. Apply coatings in shop. Coatings shall be holiday free.

## **2.07 BOLTS, NUTS AND GASKETS FOR FLANGES**

- A. Provide heavy hex, carbon steel bolts and nuts for buried flanges to be wrapped with polyethylene materials, where located aboveground, or in vaults and structures. Bolts and nuts shall conform to ASTM A307 Grade B and ASTM A563 Grade A, respectively.
- B. Provide washers for each bolt head and nut. Washers shall be of the same material as the bolts and nuts.
- C. Gaskets shall be asbestos-free, drop-in ring type, 1/16-inch or 1/8-inch thick, and shall be acrylic or aramid fiber bound with nitrile. Gaskets shall be suitable for a water pressure of 500 psi at a temperature of 400 degrees F.
- D. Gaskets shall be per the Approved Materials List or District approved equal.

## **2.08 SERVICE SADDLE OUTLETS**

- A. For outlets 2 inches and smaller with working pressures 200 psi or less, drill the pipe and attach a service saddle to the pipe. Provide service saddles with full width, cast bronze bodies conforming to ASTM B62, O-ring gaskets, and iron pipe threads. Provide Type 304 stainless steel double band straps with four bolts or a single wide strap with four

bolts. All stainless steel shall be fully passivated for enhanced corrosion resistance. Service saddles shall be per the Approved Materials List or District approved equal.

- B. For outlets 3 inches and larger or with working pressures greater than 200 psi and less than 300 psi, use a ductile iron tee with a flanged outlet. For 2-inch and smaller outlets, install a ductile iron reducing flange with iron pipe threads and an insulating bushing on the outlet.

## **2.09 MECHANICAL CLAMP-TYPE COUPLINGS AND FLANGE ADAPTERS**

- A. Mechanical clamp-type couplings and flange adapters for grooved or shouldered end pipe shall be malleable iron, ASTM A47 Grade 32510; or ductile iron, ASTM A536 Grade 65-45-12. Bolts shall conform to ASTM A183, 110,000 psi tensile strength. Gaskets shall be halogenated butyl rubber or EPDM conforming to ASTM D2000.
- B. Couplings for pipe 24 inches and smaller shall conform to AWWA C606 for rigid, radius cut grooved joints in ductile iron pipe. Couplings shall be per the Approved Materials List or approved equal.
- C. Couplings for pipe, larger than 24 inches, shall conform to AWWA C606 for shouldered end pipe. Couplings shall be per the Approved Materials List or approved equal.
- D. Grooved end flange adapters for piping having an operating pressure of 150 psi and less shall have dimensions conforming to ANSI B16.42 Class 150 and shall be per the Approved Materials List or approved equal.

## **2.10 MECHANICAL JOINT RESTRAINT**

- A. The restraining mechanism for mechanical joints shall consist of a follower gland having a seal gasket and individually actuated wedges that increase their resistance to pullout as pressure or external forces increase. The system manufacturer shall provide all the components (follower ring, wedges, and gaskets) for the restraining device.
- B. The device shall be capable of full mechanical joint deflection during assembly and the flexibility of the joint shall be maintained after burial.
- C. The joint restraint ring and its wedging components shall be constructed of ductile iron conforming to ASTM A 536, Grade 60-42-10. The wedges shall be ductile iron, heat-treated to a minimum hardness of 370 BHN. Dimensions of the gland shall be such that it can be used with mechanical joint bells conforming to AWWA C111 and AWWA C153. The design shall use torque limiting twist-off nuts to provide actuation of the restraining wedges.
- D. Minimum rated pressure shall be 350 psi for sizes 16 inches and smaller and 250 psi in sizes 18 inches and larger.
- E. Mechanical joint restraint shall be per the Approved Materials List or approved equal.

**2.11 DUCTILE IRON PIPE WELDMENTS**

- A. All welding to ductile iron pipe, such as for bosses or joint restraint shall be done at the place of manufacture of the pipe. Perform welding by skilled welders who have experience in the method and materials to be used. Welders shall be qualified under the standard qualification procedures of the ASME Boiler and Pressure Vessel Code, Section IX, Welding Qualifications.
- B. Welds shall be of uniform composition, neat, smooth, full strength, and ductile. Completely grind out porosity and cracks, trapped welding flux, and other defects in the welds in such a manner that will permit proper and complete repair by welding.
- C. Completed welds shall be inspected at the place of manufacture by the liquid penetrant method. Conform to the requirements specified in ASTM E 165, Method A, Type I or Type II. The materials used shall be water washable and nonflammable.

**2.12 CEMENT MORTAR**

- A. Cement mortar for buttering and pointing the inside joints shall consist of one part cement to 1-1/2 parts sand by damp loose volume. The quantity of mixing water shall be no more than necessary for handling and placing. Cement shall conform to ASTM C150, Type II. Sand shall conform to ASTM C144 for masonry sand.

**2.13 MARKING TAPE**

- A. Marking tape shall consist of one layer of aluminum foil laminated between two colored layers of inert plastic film. The lamination bond shall be strong enough to withstand separation by hand. Tape shall be a minimum of 5 mils thick and 6 inches wide. Tape shall bear a continuous, printed message every 16 to 36 inches warning of the installation buried below. Tape shall be per the Approved Materials List or approved equal.

**PART 3 - EXECUTION****3.01 PRODUCT MARKING**

- A. Plainly mark each length of straight pipe to identify the ductile iron wall thickness and date of manufacturer. Mark the spigot end of restrained joint pipe to show clearly the required depth of insertion into the bell.

**3.02 DELIVERY AND TEMPORARY STORAGE**

- A. Limit onsite pipe storage to a maximum of one week. Place the pipe alongside the trench and secure it from rolling. Support the pipe on wooden blocks, sandbags, mounds of sand, or other suitable supports. Do not roll or drop the pipe on the ground or allow the pipe to fall from the pipe trailer trucks.
- B. Avoid cracking of the cement mortar lining. If necessary, use plastic sheet bulkheads to close pipe ends and keep lining moist.

- C. Do not install pipe or fittings with damaged linings. Patch damaged areas in the field with material similar to the original. Where damage cannot be repaired in the field, replace the defective pipe or fittings.

### **3.03 HANDLING OF PIPE**

Lift pipes with mechanical equipment using wide belt slings. Do not use cable slings or chains. Do not move pipe by inserting any devices or pieces of equipment into the pipe barrel.

### **3.04 SANITATION OF PIPE INTERIOR**

- A. During laying operations, do not place tools, clothing, or other materials in the pipe.
- B. When pipelaying is not in progress, including the noon hour, close the ends of the installed pipe with a plug to deter entry by vermin or children.

### **3.05 POLYETHYLENE ENCASUREMENT OF PIPING, FITTINGS, AND VALVES**

- A. See Section 09867

### **3.06 INSTALLING PIPE IN TRENCH**

- A. See ANSI/AWWA C600-Installation of Ductile Iron Water Mains and their Appurtenances, for trench requirements.
- B. Inspect each pipe and fitting before lowering into the trench. The Engineer will inspect all pipe prior to installation for damage to the interior protective coatings. Patch damaged areas in the field with material similar to the original. Clean ends of pipe thoroughly. Remove foreign matter and dirt from the inside of pipe and keep clean during and after laying.
- C. Handle pipe in a manner to avoid any damage to the pipe. Do not drag pipe over the ground, drop it onto the ground, or drop object on it. Do not drop or dump pipe into trenches.
- D. Laying tolerances for the installed pipe shall not vary greater than 0.3-foot horizontally, or greater than 0.1 foot vertically from the alignment and elevations shown on the Approved Plans.
- E. Grade the bottom of the trench to the line and grade to which the pipe is to be laid, with allowance for pipe thickness. Remove hard spots that would prevent a uniform thickness of pipe base material (imported sand). Before laying each section of the pipe, check the grade with a straightedge and correct any irregularities found. The trench bottom shall form a continuous and uniform bearing and support for the pipe at every point between the bell holes, except that the grade may be disturbed for the removal of pipe handling slings.
- F. At the location of each joint, dig bell holes in the bottom of the trench and at the sides to permit visual inspection of the entire joint and to prevent the pipe from being supported by the bell end or fitting.

- G. Keep the trench in a dewatered condition during pipelaying.
- H. When the pipelaying is not in progress, including the noon hours close the open ends of pipe. Do not permit trench water, animals, or foreign material to enter the pipe.
- I. For pipes 24 inches in diameter and larger, the amount of pipe to be laid and assembled in a trench shall be limited to a distance of approximately 320 feet. No additional pipe will be allowed to be installed in the trench until the other related operations of pipeline construction are completed. Other operations include, but are not limited to, bond wires, backfilling and compacting, completion of interior joints, and inspection of the pipe interior. The interior of the pipeline is considered a confined or enclosed space having a limited means of egress which is subject to the accumulation of toxic or flammable contaminants or has an oxygen deficient atmosphere.

### **3.07 ASSEMBLING PUSH-ON PIPE JOINTS**

- A. The spigot and integral bell shall be dirt free and slide together without displacing the rubber ring gasket. Lay the pipe section with the integral bell facing the direction of laying.
- B. Clean the groove of the bell of all foreign materials. Insert the gasket into the groove of the bell prior to installation. Observe the correct direction of the shaped gasket. Feel that the gasket is completely and evenly seated in the groove.
- C. Lubricate the exposed gasket surface and the beveled spigot up to the full insertion length with the lubricant supplied by the pipe manufacturer. If the lubricated pipe end touches dirt, clean the pipe end and reapply lubricant.
- D. Insert the spigot into the bell and apply slow, continuous force until insertion to the mark on the spigot end is achieved.
- E. Check that the rubber ring gasket has not left the groove during assembly by passing a feeler gage around the completed joint.
- F. Assemble restrained joints per manufacturer's instructions.

### **3.08 INSTALLING BURIED FITTINGS**

- A. The Engineer will inspect all fittings prior to installation for damage to the interior protective coatings. Patch damaged areas in the field with material similar to the original.
- B. For mechanical joint fittings, clean the bell socket and the plain end of the pipe of all foreign material and dirt. Place the gland on the pipe spigot with the lip extension toward the plain end. Lubricate the pipe spigot and gasket. Use the same lubricant as supplied by the pipe manufacturer. Install the gasket on the pipe spigot with the narrow edge of the gasket toward the plain end. Install the pipe into the bell socket and press the gasket firmly into the gasket recess. Keep the joint straight during assembly. Push the gland towards the socket and center it around the pipe with the gland lip against the gasket. Insert bolts and hand tighten nuts. Make joint deflection after assembly but before tightening bolts. Uniformly tighten bolts and nuts in a progressively diametrically

opposite sequence, and torque nuts to 75- to 90-foot pounds with a calibrated torque wrench.

- C. For push-on and restrained push-on fittings, clean the bell ends of the fitting of all foreign material and dirt. Insert the gasket in the groove of the bell and make sure the gasket faces the correct direction. Feel that the gasket is completely and evenly seated in the groove. When pipe is cut in the field, bevel the plain end prior to installation. Lubricate the exposed gasket surface and the beveled pipe spigot with the same lubricant supplied by the pipe manufacturer. Insert the spigot into the bell and apply slow, continuous force while keeping the joint straight. Make joint deflection after the joint is assembled. Remove all slack between the pipe and the fitting after installing restrained joint fittings.

### 3.09 JOINT DEFLECTIONS FOR BURIED PIPE

- A. When necessary to deflect pipe from a straight line in either the horizontal or vertical plane, do not exceed the following joint deflection angles for unrestrained buried pipe or fittings. The angles shown are for each joint and are maximum deflections.

Nominal Pipe Size (inches)	Mechanical Joint (inches)	Push-On Joint (degrees)
4 through 12	5	4
14 through 16	4	3
18 through 30	3	2-1/2
36 through 48	2	2

- B. Do not exceed 80 percent of the manufacturer's recommended maximum deflection.

### 3.10 INSTALLING PIPE IN VAULTS

- A. Install pipe in vaults without springing, forcing, or stressing the pipe or any adjacent connecting valves or equipment. Provide temporary supports and place the assembled piping at the correct grade and position in the vault.
- B. Provide pipe supports as shown on the Drawings.

### 3.11 INSTALLING FLANGED JOINTS

- A. Clean bolts, nuts and flange faces by wire brushing before installing gasket and adjoining flange. Coat bolt shafts with waterproof gear grease or primer for wax tape coating prior to insertion in flange bolt holes. Do not apply grease or primer to threads. Lubricate threads of bolts or nuts with oil or graphite prior to installation. Assemble all bolts and nuts in the flange, and then uniformly tighten bolts and nuts in a progressive diametrically opposite sequence, and torque with a calibrated torque wrench. All clamping torque shall be applied to the nuts only.
- B. If flanges leak under pressure testing, loosen or remove the nuts and bolts, reset or replace the gasket, reinstall or retighten the bolts and nuts, and retest the joints. Joints shall be watertight. Replace galled, cracked, or distorted bolts and nuts.
- C. After testing, coat exposed surfaces of bolts and nuts to be buried with primer for wax tape coating per Section 09868.

- D. Wrap flanges which connect to buried valves or other buried equipment with sheet polyethylene per Section 09867. Extend the polyethylene material over the flanges and bolts, and secure it around the adjacent pipe circumference with plastic adhesive tape.
- E. When joining ductile iron flanges to steel flanges, remove the raised face on the steel flange.

### **3.12 INSTALLING SERVICE SADDLES**

- A. Drill a hole through the pipe wall equal to the nominal pipe size of the saddle. Remove all burrs and rough edges by grinding. Patch any damage to the cement mortar lining.
- B. Place the service saddle on the pipe and hand tighten the nuts while positioning the saddle in its final location. Uniformly tighten the nuts in a progressive diametrically opposite sequence with a calibrated torque wrench to saddle manufacturer's recommended values.
- C. Connect a corporation stop to the saddle per Standard Drawings. Apply Teflon joint compound and tape the male threads before installing the corporation stop. Make joints watertight.
- D. Wrap service saddle including body, straps, bolts, nuts, and adjacent surfaces of the pipe with wax tape coating per Section 09868. Wrap completed wax tape coating system with polyethylene sheet.

### **3.13 INSTALLING MECHANICAL CLAMP-TYPE COUPLINGS FOR FLANGE ADAPTERS**

- A. Install mechanical clamp-type couplings and flange adapters on grooved or shouldered end pipe and fittings in accordance with the manufacturer's recommendations and the following.
- B. Clean oil, grease, and dirt from the grooved or shouldered end pipe and fittings. Repair any damage or holidays in the shop applied coating before installing coupling or adapter. Apply the coupling manufacturer's gasket lubricant to the gasket exterior including lips, pipe ends, and housing interiors.
- C. Lubricate threads of bolts and nuts with oil or graphite prior to installation. Uniformly tighten bolts and nuts alternately and evenly until coupling segments are seated. Use torques as recommended by the coupling manufacturer.

### **3.14 POINTING INSIDE JOINT RECESSES FOR PIPES 24 INCHES IN DIAMETER AND GREATER**

- A. Backfill the trench before pointing the inside joint recesses with cement mortar. Joints shall be pointed immediately after backfilling and at no time shall the completion of the pointing be further than 320 feet behind the pipe laying.
- B. Working inside the pipe, remove foreign substances from joint recesses and pack with cement mortar. Finish the surface with a steel trowel to match adjoining pipe.

- C. Remove excess mortar and other construction debris from the pipe interior. Sweep pipe clean of all foreign substances.

### **3.15 INSTALLING MARKING TAPE**

- A. After the pipe zone and the first 12 inches in the trench zone have been backfilled and compacted, place the marking tape on the compacted backfill and center the tape over the pipe. Run the tape continuously along the trench and tie the end of the tape to the preceding tape segment. Wrap the marking tape around valve box extension pipes and continue along the pipe.

### **3.16 PRESSURE TESTING**

- A. See District Standard Specifications Section 15042 Hydrostatic Testing of Pressure Pipelines.

### **3.17 DISINFECTION**

- A. See District Standard Specifications Section 15041 Disinfection of Piping.

**END OF SECTION**



**SECTION 15064****STEEL PIPE AND FITTINGS****PART 1 - GENERAL****1.01 DESCRIPTION**

This section covers materials and installation of steel pipe and fittings for distribution and transmission pipelines and appurtenances.

**1.02 RELATED SECTIONS**

- A. Section 01300 – Shop Drawings and Submittals
- B. Section 01410 – Testing Laboratory Services
- C. Section 09811 – Fusion Bonded Epoxy Lining and Coating
- D. Section 09900 – Painting and Coating

**1.03 REFERENCE STANDARDS**

Except as otherwise indicated in this Section, the Supplier shall comply with the following reference standards and specifications:

- A. AWWA C200 - Steel Water Pipe - 6 In. and Larger
- B. AWWA C205 - Cement Mortar Protective Lining and Coating for Steel Water Pipe - 4 In. and Larger - Shop Applied
- C. AWWA C206 - Field Welding of Steel Water Pipe
- D. AWWA C207 - Steel Pipe Flanges for Waterworks Service - Sizes 4 In. through 144 In
- E. AWWA C208 - Dimensions for Fabricated Steel Water Pipe Fittings
- F. Standard Specifications for Public Works Construction (SSPWC), latest edition

**1.04 WARRANTY**

- A. The supplier shall warranty the material for a period of 12 months (from acceptance by District) against material/fabrication defects.

**1.05 CONTRACTOR SUBMITTALS**

Submittals shall be in accordance with Section 01300. Submittals shall include, as a minimum, the following information:

- A. Layout drawings showing stations and elevations of pipe horizontal alignment and profile, connections, outlets or fittings.

- B. Material of construction with ASTM reference and grade.
- C. Design and dimensions of all joints including flanges, couplings, butt straps, hand holes, and bulkheads.
- D. Design and dimensions of fittings and specials.
- E. Data on linings and/or coatings including types and thicknesses.
- F. Submit certificate that cement complies with ASTM C150, designating type.
- G. Submit certified copies of mill test reports on each heat from which steel is rolled.
- H. Prior to shipment of pipe, submit certified test reports that the pipe was manufactured and tested in accordance with the AWWA standards specified herein.
- I. Submit welder and welding operator qualifications, welding procedure specifications, procedure qualification records including all destructive and non-destructive test results and welding bead profiles as required.
- J. Submit fabricator's written Quality Assurance Control Program prior or with shop drawings. Manufacturers without a written, approved Quality Assurance Control Program will not be accepted for this project and shop drawings will not be reviewed or approved without the manufacturer's complete Quality Assurance Control Program. Submit manufacturer's quality control program results in one complete binder including all inspection reports, conducted tests, certified mill test reports, weld test coupon reports, welder qualification records, hydrostatic testing reports, shop testing reports, final fabrication checklist for each special, and affidavit of compliance. The quality control program results shall document all phases of the fabrication process.
- K. Submit qualifications for field welders. Field welders shall be certified under Section IX, Part A of the ASME Boiler and Pressure Vessel Code or in accordance with AWWA C206, Section 4. Certifications shall be dated within three (3) years of the job to be performed.
- L. Submit qualifications for Certified Welding Inspector(s) for field welding with the following minimum endorsements: AWS D1.1 Structural Welding – Steel or API 1104 Welding of Pipelines and Related Facilities.

#### **1.06 INSPECTION AND FIELD VERIFICATION**

- A. All work hereunder shall be subject to continuous inspection by a Special Inspector approved by the District. Field welding shall be inspected by a Certified Welding Inspector. Special Inspection shall be performed in accordance with the latest edition of the Uniform Building Code. The Special Inspector shall work under the direct supervision of the Contractor. All costs of such inspection shall be borne by the Contractor and shall be included in the price bid for completion of the work.
- B. Where new pipelines are to be connected to existing waterlines, the Contractor shall verify in the field the location, elevation, pipe material, pipe outside diameter, and any other characteristics of the existing pipe before proceeding with fabrication of pipe or

special fittings. This field verification shall be performed in the presence of the District or its representative.

- C. The District reserves the right to inspect materials, productions, and testing of pipes, fitting, and special pieces at the manufacturer's plant. The Contractor shall provide 10 days advance notice of the start of fabrication.

## **PART 2 - MATERIALS**

### **2.01 STEEL PIPE**

- A. Steel pipe shall conform to AWWA C200.
- B. The steel cylinder thickness for pipe that is 12 inches in nominal diameter or less shall be designed for a 300 psi working pressure and 36,000 psi minimum yield strength conforming to requirements of ASTM A36 or 10 gauge minimum.
- C. The steel cylinder thickness for pipe greater than 12 inches in nominal diameter shall be designed for a 300 psi working pressure and 36,000 psi minimum yield strength conforming to requirements of ASTM A36 or ¼-inch minimum.

### **2.02 ALIGNMENT**

- A. For horizontal and vertical curve alignment, use straight or beveled pipe of normal or one half normal lengths pulled partially on one side of the joint or use pipes with a welded mitered bend of up to 10 degrees next to the bell end. Design pipes with a bend in excess of 10 degrees as a special. Do not use angular deflections at butt strap joints.
  - 1. Deflection by Pulled Joints:
    - a. For welded joints, do not pull joint to exceed the minimum overlap of the assembled bell and spigot lap joint or more than 1/2-inch on the outside of the curve. The minimum overlap of the assembled joint shall be 1 inch or 3 times the pipe wall thickness, whichever is greater, per AWWA C206. Maintain a minimum 1/4-inch space between the spigot end and the rolled end of the bell.
  - 2. Deflection by Beveled Joints: For welded joints only, use pipe sections having beveled bell ends for curves and angles in the alignment which cannot be accomplished using the maximum allowable deflection by pulled joints. Beveled pipe sections used in curved alignment shall be of standard length except when shorter sections are required to fit the radius of curvature in which case all sections shall be of equal length. Do not bevel spigot ends. The beveled end of a pipe shall not have a deflection from a plane perpendicular to the pipe axis exceeding 5 degrees. Form the bell end perpendicular to the plane of the beveled end so there is no loss of lap joint tolerance. Do not pull beveled joints.
  - 3. Deflection by Mitered Bends: Use pipe sections with welded mitered bends of up to 10 degrees next to the bell end for curves and angles which cannot be accomplished using the maximum allowable deflections by pulled or beveled joints. Pipe sections with mitered bends used in curved alignment shall be of

standard length except when shorter sections are required to fit the radius of curvature in which case all sections shall be of equal length.

### **2.03 FITTINGS FOR STEEL PIPE**

- A. Fittings shall conform to the dimensions of AWWA C208 and shall be made of segmentally welded sections of hydrostatically tested pipe (same material and thickness), with ends compatible for type of joints shown. The minimum radius of elbows shall be 2.5 times the pipe diameter and the maximum miter angle on each section of elbow shall not exceed 11.25 degrees. Fittings shall be equal in pressure design strength and shall have the same lining and coating as the abutting steel pipe.

### **2.04 JOINTS FOR STEEL PIPE**

- A. Pipe joints for buried pipe shall be welded bell and spigot joint or welded butt-strap.
- B. Use flanged joints for attaching pipe to valves, other appurtenances, or as shown on the Drawings. Use slip-on or ring type welded to the interior and exterior circumference of the pipe section.
- C. Flanges shall be in accordance with AWWA C207 Class E for working pressures of 150 psi or less, or Class F for working pressures greater than 150 psi to 300 psi. Flanges shall be flat faced.
- D. Flange faces shall be shop coated with a soluble rust-preventative compound. Gaskets shall be full-face, 1/8-inch thick, cloth-inserted rubber. Bolts on buried flanges shall be Type 316 stainless steel with coal tar epoxy applied after installation.
- E. Welded Joints: Use expanded bell with matching spigot to penetrate a minimum of 2 inches into the bell. Joints shall be welded on the exterior for pipe diameters 18 inches and smaller, and on the exterior and interior for 24-inch and larger pipe diameters.
- F. Butt straps shall be furnished in one or two sections, requiring one or two longitudinal welds in addition to the circumferential fillet welds. Butt straps for pipe diameters 18 inches and larger shall have two handholes.
- G. Use grooved joints where shown on the Drawings to join plain end pipe with mechanical clamp-type couplings. Couplings for grooved end pipe shall be ductile iron, ASTM A536, Grade 65-45-12. Bolts shall conform to ASTM A183, 110,000 psi tensile strength. Gaskets shall be EPDM (ethylene propylene diene monomer) conforming to ASTM D2000. Couplings shall conform to AWWA C606 for flexible, square cut grooved joints in steel pipe.

### **2.05 CEMENT MORTAR LINING**

Cement mortar lining of pipe and fittings shall conform to the following:

- A. Cement shall conform to ASTM C150 Type II.
- B. Except as otherwise provided in AWWA C205, the interior of all steel pipe, fittings and specials, shall be cleaned and lined in the shop with cement mortar lining applied

centrifugally in conformance with AWWA C205. Every precaution shall be taken to prevent damage to the lining. If lining is damaged or found faulty at the construction site, the damage or unsatisfactory portions shall be replaced with lining conforming to these specifications.

- C. Linings shall be continuous to the end of the pipe except where field welding on the interior of the joint will occur. Hold back the interior lining 1/2-inch where interior welding will occur. Ends of the lining shall be square and uniform. Feathered or uneven edges will not be permitted.
- D. Defective linings as identified in AWWA C205 shall be removed from the pipe wall and shall be replaced to the full thickness required. Defective linings shall be cut back to a square shoulder in order to avoid feather-edged joints.

## **2.06 CEMENT MORTAR COATING**

Cement coating of pipe and fittings shall conform to the following:

- A. Cement for exterior mortar coating shall conform to ASTM C150 Type V.
- B. All buried pipe shall receive a 3/4-inch thick reinforced cement mortar coating.
- C. Hold back mortar coatings sufficiently to allow field welding of pipe joints. Mortar coating shall be half-thickness for one bolt length behind the back of flange.
- D. The coating shall be reinforced with spirally wound, 14-gauge steel wire spaced at 1-1/2 inch centers positioned approximately at the center of the mortar coating. In lieu of a spirally wound wire, a 14-gauge wire mesh with 2-inch square opening may be used. The mesh shall be fastened with welded wire clips or strips of metal so as to hold the wire approximately at the center of the mortar coating. Splices shall be lapped four inches and the free ends tied or looped to ensure continuity.
- E. Exterior field welded pipe joints shall be encased in grout reinforced with 14-gauge wire mesh with 2-inch square opening fastened securely with at least 3/8-inch offset from the exterior surface of the pipe. The joint shall be formed with heavy-duty diapers or grout bands. Grout shall be non-shrink grout sufficiently fluid to permit it to be poured down one side of the pipe and allowed to flow up the other side. The grout shall be poured in such a manner that all exposed portions of the pipe joint shall be completely protected with cement mortar.

## **2.07 PAINT COATING**

- A. Coat the interior and exterior of pipe and fittings in accordance with Section 09900, System No. 5. Hold back the coating two inches from where field welding will occur.

## **2.08 FUSION BONDED EPOXY COATING**

- A. Apply fusion bonded epoxy coatings to the interior and exterior of pipe and fittings in accordance with Section 09811. Hold back the coating two inches from where field welding will occur.

**PART 3 - EXECUTION****3.01 TESTING OF PIPE AND SPECIALS**

- A. General: After completion of fabrication and welding in the shop, and prior to the application of any lining or coating, test each component according to the following requirements.
- B. Shop Test Requirements
1. Perform tests of production welds in accordance with AWWA C200 for each heat of steel used. A guided-bend test specimen shall be considered as having passed only if no crack or other open defect exceeding 1/8-inch measured in any direction is present in the weld metal or heat affected zone of the base material after the bending. A tension test specimen shall be considered as having passed only if failure occurs in the base metal at a stress in excess of the minimum specified tensile strength. There shall be at least one set of welding tests as described in AWWA C200, Section 3.3.5 for each 1,000 linear feet of spiral seam weld in addition to tests specified in Section 3.3.6 of the same standard.
  2. Test each straight pipe section in the shop by the hydrostatic test method.
  3. Inspect all welds in the expanded portion of the pipe bell in accordance with the magnetic particle test.
  4. Test back-gouge and completed weld of all manual process groove welds by the liquid penetrant method. Test completed fillet welds by the liquid penetrant method.
  5. Any production weld or manual process weld that appears to be of poor quality as determined by the District's Representative shall be subjected to 100 percent radiographic testing. One hundred percent ultrasonic testing may be used in lieu of 100 percent radiographic testing.
  6. After shop fabrication, retest each pipe section with a mitered bend or reducer. Test the mitered or butt joints by the liquid penetrant method or by 100 percent radiographic testing.
  7. After shop fabrication, retest each pipe section with an attached outlet. Test the collar or wrapper with the soap and compressed air method. Test the outlet by the liquid penetrant method.
  8. Test each slip-on or ring type flange welded to the pipe by the liquid penetrant method or with the soap and compressed air method.
- C. Test Methods
1. Shop Hydrostatic Test: Vent air from the pipe section before the test pressure is applied. Hold the test pressure on each section for a sufficient length of time to permit inspection of all joints.

2. Use the following hydrostatic test pressure for testing straight pipe sections:

$$P = \frac{2ST}{D}$$

Where: P = Hydrostatic test pressure, PSI  
S = Stress, PSI, use 75% of the minimum yield point of the steel  
T = Wall thickness of the steel pipe section to be tested in inches  
D = Actual outside diameter of the steel pipe section to be tested in inches

3. When subjected to the above hydrostatic test pressure, the pipe shall show no leaks, distortion, or other defects. Repair any leaks or other defects which develop during the hydrostatic test by chipping out and rewelding, after which the repaired section shall again be tested until it shows no leaks or other defects.
4. Test Bulkheads: Furnish and attach suitable dished heads and blind flanges for making the hydrostatic tests, and after completion of the tests, remove the heads and properly restore the ends of the sections.
5. Radiographic Test: Make the radiographs in accordance with the requirements of the ASME Boiler and Pressure Vessel Code, Section VIII, Pressure Vessels. Repair defects in the welds disclosed by the radiographs. Submit all radiographs and the notation of areas for repair to the District's Representative for review.
6. Ultrasonic Test: Make the ultrasonic tests in accordance with the requirements of the ASME Boiler and Pressure Vessel Code, Section VIII, Pressure Vessels. Repair defects in the welds disclosed by ultrasonic testing. Prepare a report of the ultrasonic testing and submit to the District's Representative for review.
7. Soap and Compressed Air Test: Use compressed air at maximum 40-psi pressure into the joint, and while the joint is under pressure, swab every portion of every welded seam forming a part of the joint with a heavy soap solution or a commercial bubble-producing leak test fluid. Examine for leakage. Repair any defects disclosed by the test by chipping out, rewelding the chipped section, and retesting. Drill and tap the necessary test holes, and plug weld the holes after testing.
8. Liquid Penetrant Test: Conform to the requirements specified in ASTM E165, Method B. The materials used shall be either water washable or nonflammable. Products: "Spotcheck" by the Magnaflux Corporation or "Met-L-Check Flaw-Findr" by the Met-L-Check Company. Chip out all defects, reweld, and retest the section affected until it shows no leaks or other defects.
9. Magnetic Particle Test: Magnetic particle test shall conform to the requirements specified in ASTM E709, using the dry powder technique. Chip out all defects, reweld, and retest the section affected until it shows no leaks or other defects.

**3.02 SHIPPING AND STORAGE**

- A. The manufacturer shall supply pipe complete with sufficient struts and cross bracing to maintain the pipe in a round condition and to limit its deflection during storage, transport, and installation. The Contractor and manufacturer shall determine the dimensions, spacing, and configuration of stulls in order to resist transport and storage loads without failure of the stulls or damage to linings and coatings.
- B. Handle pipe with wide belt slings. Chains, cables or other equipment likely to damage the pipe or coating shall not be used.
- C. Steel pipe and fittings shall be shipped and stored in strict accordance with the manufacturer's instructions.

**3.03 INSTALLATION OF STEEL PIPE**

The Contractor shall provide and install all required piping and accessories in accordance with the contract documents and manufacturer's recommendations. Pipe installation as specified in this section supplements AWWA M11. Only approved certified Welders shall weld joints.

- A. Piping runs shown on the drawings shall be followed as closely as possible. Proposed deviations shall be submitted in accordance with Section 01300.
- B. Inspect each pipe and fitting before lowering into the trench. Inspect the interior and exterior protective coatings. Patch damaged areas in the field with material similar to the original. Remove foreign matter and dirt from inside the pipe and keep it clean during and after laying.
- C. Handle pipe in a manner to avoid any damage to the pipe. Do not roll or drop the pipe into trenches under any circumstances.
- D. Before laying each section of pipe, check the grade and correct any irregularities found. Grade the bottom of the trench and place a bedding layer of select material under pipe in accordance with the Standard Drawings. The trench bottom and bedding shall provide uniform bearing and support for the pipe.
- E. At the location of each joint, dig bell holes in the bottom of the trench and at the sides to permit completion and visual inspection of the entire joint.
- F. Field welding shall be performed in accordance with AWWA C206 and inspected by a Certified Welding Inspector. Field welds shall be tested using the liquid penetrant method.
- G. Interior and exterior joint surfaces shall be completed in accordance with the lining and coating requirements of the referenced standards.
- H. Maintain the trench in a dewatered condition during pipe laying.
- I. When the pipe laying is not in progress, close the open ends of the pipe. Do not permit trench water, animals, or foreign objects to enter the pipe.



**3.04 PRESSURE TESTING**

- A. See District Standard Specifications Section 15042 Hydrostatic Testing of Pressure Pipelines.

**3.05 DISINFECTION**

- A. See District Standard Specifications Section 15041 Disinfection of Piping.

**END OF SECTION**

**SECTION 15070****HIGH DENSITY POLYETHYLENE (HDPE) PIPE****PART 1 – GENERAL****1.01 DESCRIPTION**

- A. The Work under this section includes providing all labor, materials, tools, and equipment necessary for furnishing and installing high density polyethylene (HDPE) pressure pipe, including fittings, in accordance with these specifications and in conformity with the lines and grades shown on the drawings.
- B. Type: HDPE pressure pipe shall comply fully with AWWA C906 and ASTM D3350. HDPE pipe shall have Ductile Iron Pipe Size (DIPS) nominal diameter, unless noted otherwise. HDPE pipe joints shall be fused, except where explicitly detailed otherwise on the plans.

**1.02 RELATED SECTIONS**

- A. Section 01300 – Record Drawings and Submittals
- B. Section 15041 – Disinfection of Piping
- C. Section 15042 – Hydrostatic Testing of Pressure Pipelines
- D. Section 15062 – Ductile Iron Pipe and Fittings
- E. Section 15057 – Copper, Brass, and Bronze Pipe, Fittings, and Appurtenances

**1.03 REFERENCED STANDARDS**

- A. HDPE pressure pipe shall comply with the requirements of the latest editions of the following standards:

AWWA M55	Manual of Practice – PE Pipe Design and Installation
AWWA C906	Polyethylene (PE) Pressure Pipe and Fittings, 4 in. Through 63 in. For Water Distribution
ASTM D2774	Standard Practice for Underground Installation of Thermoplastic Pressure Piping
ASTM D3035	Standard Specification for Polyethylene (PE) Plastic Pipe (DR- PR) Based on Controlled Outside Diameter
ASTM D3261	Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing

ASTM D3350	Standard Specification for Polyethylene Plastics Pipe and Fittings Materials
ASTM F714	Standard Specification for Polyethylene (PE) Plastic Pipe (SDR- PR) Based on Outside Diameter
ASTM F2164	Standard Practice for Field Leak Testing of Polyethylene (PE) Pressure Piping Systems Using Hydrostatic Pressure
ASTM F2206	Standard Specification for Fabricated Fittings of Butt-Fused Polyethylene (PE) Plastic Pipe, Fittings, Sheet Stock, Plate Stock, or Block Stock
ASTM F2620	Standard Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings
ASTM F3124	Standard Practice for Data Recording the Procedure Used to Produce Heat Butt Fusion Joints

#### 1.04 QUALITY ASSURANCE

- A. All requirements, tests and inspections called for therein shall apply, together with additional requirements specified herein. The District reserves the right to witness all factory tests.
- B. HDPE Fusion Technician Qualifications:
  - 1. The Technician performing fusion bonding of HDPE pipe joints shall be employed or trained by the fusion equipment supplier.
  - 2. The Technician shall have the following minimum experience:
    - a. Performed fusion bonding on at least three previous projects.
    - b. Performed fusion bonding on at least 20,000 feet of 12-inch (or larger) HDPE pipe.
- C. HDPE Fusion Measurements:
  - 1. Record fusion machine heater plate surface temperature and hydraulic cylinder interface pressures during butt fusion joining operations. Measurements shall be permanently recorded utilizing a McElroy Datalogger or approved equal.
  - 2. Submit recorded data of fusion machine within two (2) days following the completion of butt joints. Failure to submit this information may be cause for rejection of the joint.
- D. HDPE Fabricated Fittings:

1. The fitting fabricator shall have at least three (3) years experience in the fabrication of pressure-rated HDPE fittings of similar size and complexity as this project.
2. The Fabrication Shop Supervisor must have at least one (1) year experience of shop supervision and three (3) years of experience fabricating HDPE fittings.
3. The technician fabricating the HDPE fabricated fittings shall have the following minimum experience:
  - a. Two (2) years of experience fabricating HDPE fittings.
  - b. Fabricated at least forty (40) fittings that are DR17 or thicker and 18-inch diameter or larger.

### 1.05 SUBMITTALS

- A. The Contractor shall provide the following submittals, as a minimum, in accordance with Technical Specification Section 01300:
  1. Product Data: Pipe material indicating manufacturer, pressure rating and compliance with AWWA C906.
  2. Manufacturer's fittings fabrication and butt fusion procedure including cool down time and datalogger equipment.
  3. Data sheet listing and describing proposed butt fusion joint machine(s).
  4. Qualifications of fusion machine technician. Qualifications of piping installation crew.
  5. Written certification from the HDPE pipe fusion equipment supplier that the fusion technician has received training in the proper use of the fusion equipment and the manufacturer's recommended fusion equipment.
  6. Fusion Data (heater plate temperature, hydraulic cylinder interface pressures, time/duration, etc.) shall be submitted to the District within two days following the completion of any joint.
  7. Shop drawings and cutsheets providing information on fittings, including dimensions, certification of compliance with standards and pressure rating.
  8. Information on pipe accessories, including but not limited to special adaptors for connections to steel and ductile iron fittings.
  9. HDPE pressure pipe manufacturer shall furnish an affidavit of compliance that all delivered materials comply with the requirements of these specifications.
  10. Specifications and data sheets for flange adapters, including hardware and flange back-up rings. Information shall include manufacturer's written installation

directions including alignment and bolt tightening recommendations.

11. Line Lay Drawings: Submit line laying drawings showing layout of pipeline incorporating accommodating expansion and contraction for temperature fluctuations of at-grade installation. Drawings shall also show thrust blocks, anchor blocks and layout of barricades.
12. Thermal calculations showing expansion and contraction of installed at-grade HDPE pipeline layout shown in the Line Layout Drawings is capable of accommodating temperature fluctuations as follows:
  - a. Low Temperature: 60-degrees Fahrenheit
  - b. High Temperature: 85-degrees Fahrenheit
  - c. Temperature Differential: 25-degrees Fahrenheit

An industry-accepted rate of expansion and contraction in pipeline length is 1 inch/10 degrees/100 feet of pipe. This is a performance specification for the installation of at-grade HDPE pipeline. Thermal calculations shall be prepared by a CA licensed civil engineer demonstrating the Line Lay drawings accommodate calculated thermal expansion and contraction of installed at-grade HDPE pipeline.

13. Proposed Testing plan.

## **1.06 QUALITY OF WORKMANSHIP**

- A. The pipe and fittings shall be homogenous throughout and free from visible cracks, holes, foreign inclusions or other injurious defects. The pipe shall be as uniform as commercially practical in color, opacity, density and other physical properties.

## **PART 2 – PRODUCTS**

### **2.01 HIGH DENSITY POLYETHYLENE (HDPE) PIPE**

- A. Material: All material shall be manufactured from a PE 4710 resin listed with the Plastic Pipe Institute (PPI) as TR-4. The resin material shall meet the specifications of ASTM D 3350 with a minimum cell classification of 445474C. The polyethylene compound shall be suitably protected against degradation by ultraviolet light by means of carbon black of not less than 2 percent. HDPE pipe and fittings shall contain no recycled compounds except that generated in the manufacturer's own plant from resin of the same specification from the same raw material. The pipe shall be homogeneous throughout and free of visible cracks, holes, foreign inclusions, voids, or other injurious defects. Pipe shall have a manufacturing standard of ASTM D3035 and be manufactured by an ISO 9001 certified manufacturer.
- B. Pipe Size: HDPE pipe shall have a nominal diameter as indicated with outside dimension (OD) correlating to standard ductile iron pipe size (DIPS) as specified in AWWA C906. Pipe size shall be manufactured to the dimensional requirements listed in ASTM F714. Pipe shall meet AWWA C906 and shall be listed as meeting NSF-61.
- C. Dimension Ratio: HDPE pipe shall have dimension ratio (DR) as indicated.

- D. Color and Identification: Pipe, fittings, and appurtenances shall be provided in accordance with the following color schedule:

<b>DESIGNATION (SERVICE)</b>	<b>PIPE WALL COLOR</b>	<b>PIPE IDENTIFICATION</b>
Water	Black	Blue striped
Fittings	Black	Not striped

## 2.02 JOINTS

### A. General

1. HDPE pipe-to-pipe joints and pipe-to-fitting joints shall be butt-fused, except where indicated otherwise or specified herein.
2. HDPE pipe to flange joints on steel piping shall be integral flange with ductile iron flange back-up ring as indicated.
3. Friction or pressure couplings are not acceptable and will not be allowed.

### B. Butt Fusion Joints:

1. Butt fusion joints and fusion techniques shall meet all requirements of ASTM D2657 and D3261.

### C. Flanged Joints:

1. Flanged joints shall consist of HDPE flange adapters and flange back-up ring, unless otherwise shown on the Contract Drawings.
2. Full face flat ring gaskets of 1/8-inch black reinforced rubber conforming to ANSI B-16.21 shall be installed between the flange adapter and opposing flange. Gaskets shall be full-faced with bolt holes and be held in position by the through-bolts.
3. Flange back-up rings shall be ductile iron.
4. Flange back-up rings shall be compatible with AWWA C115 flanges and bolting.
5. Flanged back-up rings pressure ratings shall meet or exceed the pressure class of the pipe.
6. Bolts, studs, nuts and washers for flanged joints shall be low-carbon steel conforming to ASTM A307 and AWWA C110 and C115. Coat threads with anti-seize lubricant.

## 2.03 FITTINGS

- A. HDPE fittings shall be made from material meeting the same requirements as the pipe.

HDPE fittings shall be molded, turned or otherwise fabricated by the manufacturer of the pipe. All fittings shall be marked with size, dimension ratio (DR), and appropriate ASTM specification number. All fabricated fittings shall meet the requirements of AWWA C906 and ASTM F2206.

1. All fittings shall have taper bored ends to meet adjoining pipe wall thickness.
  2. Fittings shall be shop fabricated. Fittings shall not be field fabricated.
  3. All fittings shall be pressure tested to the full working pressure of the pipe for five seconds or alternative back-bend test as provided for in AWWA C906.
- B. Butt Fusion Fittings: Butt fusion fittings shall be in accordance with ASTM D3261 and shall be manufactured by injection molding, a combination of extrusion and machining, or fabricated from HDPE pipe conforming to this specification. All fittings shall be pressure rated to provide a working pressure rating no less than that of the pipe. Fabricated fittings shall be manufactured using a McElroy Datalogger to record fusion pressure and temperature. A graphic representation of the temperature and pressure data for all fusion joints made producing fittings shall be maintained as part of the quality control. The fitting shall be homogeneous throughout and free of visible cracks, holes, foreign inclusions, voids, or other injurious defects.
- C. Flange Adapters: Flange Adapters shall be made of HDPE material with a minimum material designation code of PE 4710 and with a minimum Cell Classification as noted in 2.01A. Adapters shall be pressure rated to provide a working pressure rating no less than that of the pipe.
1. Flange adapters shall be of sufficient length to fit in the fusion machine for joining adapter to pipe.
  2. Flange adapters shall have an integral flange to fit with a back-up ring.

#### **2.04 FUSION EQUIPMENT REQUIREMENTS**

- A. Butt fusion equipment must be in satisfactory working order and the hydraulic system must be leak free. Heater plates shall be free from scrapes, gouges, and have a consistent clean coated surface. The pressure gage and thermometer should be checked for accuracy. When requested by the District, records showing a maintenance service/inspection within 3 months prior to use for this project shall be provided.

#### **2.05 MANUFACTURERS**

- A. HDPE pipe shall be the product of one of the following manufacturers:
1. JM Eagle
  2. Performance Pipe
  3. Or Approved Equal

- B. HDPE fittings shall be the product of one of the following manufacturers:
  - 1. ISCO Industries
  - 2. IPF
  - 3. Or Approved Equal

## **PART 3 – EXECUTION**

### **3.01 GENERAL**

- A. General: HDPE piping shall be installed in conformance with AWWA M55, the manufacturer's recommendations, comply with the alignment and profile as indicated, and in conformance with approved Line Lay drawings. Installation of HDPE piping shall conform with the performance specification of Part 3.1.H regarding thermal expansion and contraction of HDPE piping with respect to allowable ambient temperature range.
- B. Shipping and Storage: HDPE pressure pipe shall be shipped and stored by supporting the pipe uniformly. The transportation carriers shall use appropriate methods and intermittent checks to ensure the pipe is properly supported, stacked and restrained during transportation such that the pipe is not nicked, gouged, or physically damaged. The transportation carrier shall provide tarpaulins to cover any pipe subject to exposure to diesel exhaust or smoke. During loading, transportation, and unloading, every precaution should be taken to prevent damage to the pipe. Pipe shall be stored on clean, level ground to prevent undue scratching or gouging. If the pipe must be stacked for storage, such stacking shall be done in accordance with the pipe manufacturer's recommendations. Pipe shall be covered to protect it from sunlight, while permitting adequate air circulation above and around the pipe. Pipe shall be stored in the unit packages provided by the manufacturer. The open ends of all sections of joined and/or installed pipe (not in service) shall be plugged to prevent animals or foreign material from entering the pipeline. All sealing surfaces of mating components (i.e. flange faces) shall be kept free from dirt or debris at all times.
- C. Installation Manual: The manufacturer shall supply an installation manual to the District which outlines guidelines for handling, joining, installing, and testing of polyethylene pipeline. These guidelines shall be used as reference material for the District in his determination of the required procedures.
- D. Pipe Handling: The pipe shall be handled in such a manner that it is not pulled over sharp objects or cut by chokers or lifting equipment. Fused segments of the pipe shall be handled to avoid damage to the pipe. Chains or cable type chokers must be avoided when lifting fused sections of pipe. Nylon slings are preferred. Spreader bars are recommended when lifting long fused sections. Sections of pipe with cuts and gouges exceeding 10 percent of the pipe wall thickness or kinked sections shall be removed and the ends rejoined. Additionally, the first 10 feet of pipe installed during pullback will be cut out and inspected for excess gouging.
- E. Joining: Joints between plain ends of polyethylene pipe shall be made by butt fusion when



possible. The pipe manufacturer's fusion procedures shall be followed at all times as well as the recommendations of the fusion machine manufacturer. The wall thicknesses of the adjoining pipes and fittings shall have the same DR at the point of fusion.

1. Butt Fusion: Sections of HDPE pipe should be joined into continuous lengths on the jobsite above ground. The joining method shall be the butt fusion method outlined in ASTM F2620 and shall be performed in strict accordance with the pipe manufacturer's recommendations. The butt fusion equipment used in the joining procedures should be capable of meeting all conditions recommended by the pipe manufacturer, including, but not limited to, temperature requirements of 400 degrees Fahrenheit, alignment, and an interfacial fusion pressure of 75 PSI. The butt fusion joining will produce joint weld strength equal to or greater than the tensile strength of the pipe itself. All field welds shall be made with fusion equipment equipped with a McElroy Data Logger. Temperature, fusion pressure and a graphic representation of the fusion cycle shall be part of the quality control records.

At the beginning of each week that butt fusions are to be made, the Contractor shall perform a "bend-back test" in accordance with AWWA M55. The first fusion of the week shall be a trial fusion. The trial fusion shall be allowed to cool completely, then fusion test straps shall be cut out. The test strap shall be 12-inches or 30 times the wall thickness in length (minimum) and one inch, or 1.5 times the wall thickness in width (minimum). Bend the test strap until the ends of the strap touch. If the fusion fails at the joint, a new trial fusion shall be made, cooled completely and tested. Butt fusion of pipe to be installed shall not commence until a trial fusion has passed the bent strap test.

2. Mechanical: Bolted joining may be used where the butt fusion method cannot be used. Bolted joints shall be flanged as specified in Part 2.2.C.
- F. Fusion Beads: Butt-fused welds will result in a weld bead on the inside and outside surface of the fused joint. Fusion beads may remain on the pipe joint and do not need to be removed.
- G. Pipe Laying: Install at-grade HDPE pipeline in conformance with approved Line Lay drawings.

### **3.02 QUALITY AND WORKMANSHIP**

- A. General: Contractor shall be responsible for employing a rigorous quality control procedure for field welding butt fusion joints quality control and documentation. All field welding shall be accomplished with District-Approved Equipment. Documentation of each field weld shall be submitted to the District for record within two days of weld completion.
- B. Data Collector and Recording Device: Review Manufacturer's data collection to verify proper fusion procedures were followed during fabrication of fittings. The Data Collector shall be as specified in Part 2.3.B.

- C. Weld Quality Control Documentation: Contractor shall produce and submit field weld butt fusion reports within two days of welding activity. Report shall provide the following information, at a minimum:
1. Date, time, and ambient temperature
  2. Joint Number that correlates to Project pipeline stationing
  3. Employee Identification that is unique to Project-approved HDPE Fusion Technician
  4. Equipment Identification and specifications including piston area
  5. Pipe Data including material, size, Dimension Ratio
  6. Interfacial Pressures in pounds per square inch (psi) including Heat, Soak, Fuse, and Cool
  7. Recommended Gauge Pressures in pounds per square inch (psi) including Heat Soak, Fuse, and Cool
  8. Recorded Data including Drag pressure, weld temperature
  9. Graphs of pressure and temperature over time. Provide one graph for the first five minutes of weld procedure and a summary plot of the entire weld and cooldown process.

### **3.03 DAMAGED PIPE**

- A. Pipe sections with gouges or cuts deeper than ten percent (10%) of the wall thickness shall be cut out, removed and replaced by the Contractor at no additional cost to the District. Undamaged pipe portions may be rejoined using butt-fusion joining methods.

### **3.04 PRESSURE TESTING AND FLUSHING OF HDPE PRESSURE PIPE**

- A. Flushing, testing and disinfection shall be performed per the Greenbook specifications to satisfaction of the District.

**END OF SECTION**

## **SECTION 15074**

### **BLOWOFF ASSEMBLIES**

#### **PART 1 – GENERAL**

##### **1.01 DESCRIPTION**

This section includes materials, testing, and installation of blowoff assemblies.

##### **1.02 SERVICE APPLICATION**

- A. Blowoff assemblies shall be installed on potable water mains.
- B. Blowoff assemblies shall be sized and located as shown on the Approved Plans and/or Standard Drawings. In general, blowoff assemblies will be installed at the ends and at low points of pipelines as shown below:
  - 1. 2" blowoff assemblies will be required on pipelines 12" and smaller or for temporary use or as otherwise directed by the District Engineer.
  - 2. 4" blowoff assemblies will be required on pipeline sizes 14" through 18" or as shown on the Drawings.
  - 3. 6" blowoff assembly will be required on pipeline sizes larger than 18" or as shown on the Drawings.
  - 4. Blowoff assemblies less than 2" will not be allowed.

#### **PART 2 – MATERIALS**

##### **2.01 GENERAL**

- A. Materials for blowoff assemblies shall conform to the requirements of the District's Standard Drawings, Approved Materials List, and other applicable Sections of the specifications.

##### **2.02 CONCRETE**

- A. Concrete used for thrust or anchor blocks shall be in accordance with Section 03300.

##### **2.03 WARNING/IDENTIFICATION TAPE**

- A. Detectable pipe marking tape shall be installed for blowoff piping. Marking tape shall conform to the requirements of Section 15062.

## **PART 3 – EXECUTION**

### **3.01 INSTALLATION**

- A. Blowoff assemblies shall be installed at locations shown on the Approved Plans or as directed by the District Engineer in accordance with the Standard Drawings.
- B. Blowoff assemblies shall be connected to water mains no closer than 24” to a bell, coupling, joint or fitting.
- C. Locations of blowoff assembly meter boxes shall be in accordance with the Standard Drawings.

### **3.02 CONCRETE**

- A. Concrete thrust and anchor blocks shall be installed in accordance with Section 03300 and the Standard Drawings. Refer to Section 03300 for the minimum concrete curing time required.

### **3.03 WARNING/IDENTIFICATION TAPE**

- A. Warning/Identification tape shall be installed in accordance with Section 15062.

### **3.04 DISINFECTION OF BLOWOFF ASSEMBLIES**

- A. Blowoff assemblies shall be disinfected in accordance with Section 15041 in conjunction with disinfecting the main to which it is connected. Blowoff assembly valves shall be operated and the assembly shall be flushed to completely disinfect all internal parts.

### **3.05 HYDROSTATIC TESTING**

- A. Blowoff assemblies shall be hydrostatically tested in accordance with Section 15042 in conjunction with hydrostatically testing the pipeline to which it is connected.

### **3.06 FIELD PAINTING AND COATING**

- A. Blowoff assembly appurtenances shall be field-painted in accordance with District Specifications and the Approved Materials List.

**END OF SECTION**

**SECTION 15080****MISCELLANEOUS PIPING SPECIALTIES****PART 1 - GENERAL****1.01 DESCRIPTION**

This Section includes miscellaneous piping materials, fittings, valves, and installation as required for a complete and properly functioning system. Testing shall be in accordance with the associated facilities.

**1.02 RELATED WORK SPECIFIED ELSEWHERE**

- A. Section 01300 – Record Drawings and Submittals
- B. Section 09867 – Polyethylene Sheet or Tube Encasement
- C. Section 09868 – Cold Applied Wax Tape Coating
- D. Section 15041 – Disinfection of Piping
- E. Section 15042 – Hydrostatic Testing of Pressure Pipelines

**1.03 SUBMITTALS**

- A. Submit shop drawings in accordance with Section 01300.
- B. Submit manufacturer's catalog data, descriptive literature and assembly drawings. Show dimensions, materials of construction by specification reference and grade, linings and coatings.
- C. Certification that exterior coatings meet holiday and dry film thickness requirements specified in this Section.

**1.04 QUALITY ASSURANCE**

- A. All materials and equipment furnished under this Section shall be from a manufacturer who has been regularly engaged in their design and manufacture for a period of at least 5 years. If an alternate product manufacturer is proposed, the Contractor shall demonstrate to the satisfaction of the Engineer that the quality is equal to the materials and equipment made by those manufacturers specifically named herein.
- B. The Contractor shall test all products as required herein and by the reference specifications. The Contractor shall be responsible for the costs of additional inspection and retesting by the District resulting from noncompliance.
- C. All materials delivered to the job site shall be new, free from defects, and marked to identify the material, class, and other appropriate data such as thickness for piping.

Acceptance of materials shall be subject to quality testing in addition to inspection of the completed product.

## **PART 2 - MATERIALS**

### **2.01 DUCTILE IRON PIPE**

- A. See Section 15062.

### **2.02 PIPE THREADS**

- A. Pipe threads shall conform to ANSI/ASME B1.20.1.

### **2.03 GROOVED JOINT COUPLINGS**

- A. Couplings for cut groove ductile iron pipe joints shall be Victaulic (Style 31) or approved equal Housing shall be ductile iron, ASTM A536, grade 65-45-12 ductile iron. Coatings shall be fusion bonded epoxy 12 to 15 mil dry film thickness. Nuts and bolts shall be Type 316 stainless steel. Couplings shall conform to AWWA C606.

### **2.04 CORPORATION STOPS - BRONZE, 2 INCHES AND SMALLER**

- A. For working pressures from zero to 300 psi, per Approved Materials List or approved equal.
- B. Stops shall be bronze (ASTM B 62) with inlet male iron pipe threads and outlet with quick joint for copper water tube. Quick joint shall consist of a threaded nut, external nut stop, stainless steel gripper ring, and gasket. Gripper rings can only be used once. If the threaded nut of the quick joint is loosen after assembly and the copper water tube removed from the corporation stop, a new gripper ring shall be used in the reinstallation of the copper water tube and the corporation stop. Compression or pack joints will not be allowed.

### **2.05 BALL VALVES - BRONZE, 2 INCHES AND SMALLER**

- A. For 1-inch and 2-inch valves with working pressures from zero to 300 psi, use per Approved Materials List or approved equal. Valves shall be bronze (ASTM B 62) with both ends female iron pipe threads and full port. Provide brass handles, per Approved Materials List or approved equal.
- B. For 1/2-inch valves with working pressures from zero to 600 psi, per Approved Materials List or approved equal. Valves shall have threaded ends, two piece bronze body, standard port, bronze trim, chrome plated ball, and blowout proof stem. Use a lever handle for non-buried installations and a tee handle for buried installations.

### **2.06 ANGLE VALVES - BRONZE, 2 INCHES AND SMALLER**

- A. For working pressures from zero to 300 psi, use per Approved Materials List or approved equal. Valves shall be bronze (ASTM B 62), union bonnet, angle design, 300 psi WOG rated with both ends female iron pipe threads.

**2.07 ANGLE VALVES - BRONZE HYDRANT HEAD**

- A. For working pressures from zero to 300 psi, per Approved Materials List or approved equal. Valves shall be bronze (ASTM B 62) with 4-inch inlet female iron pipe threads and 2-1/2-inch outlet male national standard hose threads with cap and chain.

**2.08 INSULATING BUSHINGS**

- A. For working pressures from zero to 200 psi, use soft nylon insulating bushings to avoid galvanic or electrolytic deterioration wherever dissimilar metals are connected. Bushings shall be as manufactured per Approved Materials List or approved equal.

**2.09 INSULATING COUPLINGS**

- A. For working pressures from zero to 300 psi, use insulating couplings to avoid galvanic or electrolytic corrosion wherever dissimilar metals are connected. Couplings shall be steel; lined with an inert, non-conductive, linen impregnated laminate material; both ends female iron pipe threads; and rated to 300 psi working pressure at 225°F. Exterior surface of coupling is uncoated, bare steel. Couplings shall be per Approved Materials List or approved equal.

**2.10 SERVICE SADDLES - BRONZE, 2 INCHES AND SMALLER**

- A. Provide service saddles for asbestos cement pipe, ductile iron pipe, and PVC pressure pipe with working pressures 200 psi or less that are specifically designed to fit the type, size, and class of pipe.
- B. Provide service saddles with full width, cast bronze bodies conforming to ASTM B62, O-ring gaskets, and iron pipe threads. Provide Type 304 stainless steel double band straps or a single wide strap. All stainless steel shall be fully passivated for enhanced corrosion resistance. Use tapping machines and cutting tools that have been specifically designed for the type of pipe to be drilled.
- C. Service saddles for working pressures of 200 psi or less shall be per Approved Materials List or approved equal.

**2.11 TAPPING SLEEVES**

- A. Perform wet taps on existing asbestos cement pipe, ductile iron pipe, and PVC pressure pipe with working pressures 150 psi or less. Provide tapping sleeves that have been specifically designed to fit the type, size and class of pipe of the installation.
- B. Tapping sleeves shall be of Type 304 stainless steel construction with two half sleeves and flanged outlet. Sleeve halves shall be bolted together with stainless steel bolts and nuts. Gaskets shall completely surround the pipe to be tapped and be the same length as the sleeves. Gaskets shall be SBR conforming to ASTM D 2000. Flanged outlet shall be flat faced conforming to ANSI B16.5, Class 150. Use tapping machines and cutting tools that have been specifically designed for the type of pipe to be tapped.
- C. Tapping sleeves for use on pipe with working pressures 150 psi or less shall be per Approved Materials List or approved equal.

**2.12 WELD-ON OUTLETS**

- A. Perform dry taps on existing welded steel pipe unless wet taps are specifically noted on the Drawings. Prior to making the tap, submit to the District's Representative a letter outlining the procedures to be followed.
- B. Use a manufactured steel wrapper plate, outlet pipe, and flange. Cement mortar line the outlet pipe prior to the installation and cement mortar coat the wrapper and outlet pipe after welding to the existing steel pipe. Provide weld-on outlets that conform to the applicable requirements of Section 15062 or Section 15064.

**2.13 LINK SEALS**

- A. Contractor shall furnish and install complete link seal assemblies of size and location as shown on the drawings. Link seal assemblies shall be as follows:
  - 1. Wall opening sizes (i.e. cored hole) shall be selected according to the manufacturer's recommendations based on most recent manufacturer catalog.
  - 2. Each individual link shall be clearly and permanently shown with the name of the manufacturer and model number.
- B. Link seals shall be modular, mechanical type consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and the wall opening. The elastomeric element shall have the following properties as designated by ASTM: EPDM = ASTM D2000 M3 BA510
- C. Link seals shall be seal tight to 20 psig.
- D. Link seals shall have Type 316 stainless steel hardware.
- E. References to installation guidelines shall be to the latest published edition of manufacturer's selection guide for the service intended.
- F. Approved Manufacturer's:
  - 1. Per Approved Materials List Approved equal

**2.14 DETECTABLE PIPE MARKING TAPE**

- A. Detectable pipe marking tape shall conform to the requirements of Section 15060, 15062 or 15064.

**PART 3 - EXECUTION****3.01 INSTALLATION**

- A. Installation shall be in accordance with manufacturer's recommendations. Tightening of nuts, bolts, screws, flanges shall be accomplished so that zero leakage is obtained.



- B. Clean threaded joints with a wire brush. Apply Teflon joint compound or Teflon tape to pipe threads before installing screwed valves.
- C. Lubricate bolt threads with oil or graphite prior to installation.
- D. Tighten nuts uniformly and progressively.
- E. After testing, coat exposed surfaces of bolts and nuts to be buried with primer for wax tape coating per Section 09868.
- F. Wrap buried ferrous fittings and appurtenances with polyethylene material per Section 09867.

### **3.02 PRESSURE TESTING**

- A. Test miscellaneous piping specialties at the same time that the connecting pipelines are pressure tested. See Section 15042. Repair leaks in piping and retest.

### **3.03 DISINFECTION**

- A. See Section 15041.

**END OF SECTION**

**SECTION 15100****RESILIENT WEDGE GATE VALVES****PART 1 – GENERAL****1.01 DESCRIPTION**

- A. This section includes materials, testing, and installation of manually operated resilient wedge gate valves (RWGV).

**1.02 REFERENCE STANDARDS**

- A. The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.

AWWA C210	Liquid Epoxy Coating Systems for the interior and exterior of steel water pipelines
AWWA C213	Fusion Bonded Epoxy Coating for the interior and exterior of steel water pipelines
AWWA C509	Resilient Seated Gate Valves for water supply service
AWWA C515	Reduced Wall, Resilient Wedge Gate Valves for water supply service
AWWA C550	Protective Epoxy Interior Coatings for valves and hydrants
SSPC	Steel Structure Painting Council

**1.03 RELATED WORK SPECIFIED ELSEWHERE**

- A. Section 09867 – Polyethylene Sheet or Tube Encasement
- B. Section 09868 – Cold Applied Wax Tape Coating

**1.04 SERVICE APPLICATION**

- A. Resilient wedge gate valves shall be installed on potable water mains and appurtenances in accordance with the Approved Plans and the Standard Drawings.
- B. Resilient wedge gate valves shall be used for open/closed operations, throttling service and frequent operation after long periods of inactivity.
- C. In general, resilient wedge gate valves shall be used when valves are required on pipelines and appurtenances 4” through 12”.

- D. Valves for pipelines sized 14" and larger generally require the use of butterfly valves in accordance with Section 15103.

#### **1.05 SUBMITTALS**

The following items shall be submitted for review and approval by the Engineer prior to ordering or delivery of resilient wedge gate valves:

- A. An affidavit from the valve manufacture stating that valves have successfully passed hydrostatic tests in accordance with AWWA C509 and manufacturer's own coatings tests.
- B. The valve manufacturer's catalog data showing the size to be used, valve dimensions, pressure rating and materials of construction.
- C. Manufacturer's catalog data and proof of NSF certification for the lining materials to be used.

#### **1.06 DELIVERY, STORAGE AND HANDLING**

- A. Valves shall be delivered and stored in accordance with AWWA C550. The port openings shall be covered with plastic, cardboard or wood while in transit and during storage in the field. These covers shall remain in place until valves are ready to be installed. Valves shall not be stored in contact with bare ground. Valves shall not be stacked.

#### **1.07 SIZING OF VALVES**

- A. Valves shall be the same size as the line in which they are installed unless otherwise noted on the Approved Plans.

#### **1.08 VALVE ENDS**

- A. Valve ends shall be flange by flange.

#### **1.09 VALVE TESTING**

- A. Resilient wedge gate valves shall be hydrostatically tested and valve coatings shall be holiday detected prior to shipment. Valves delivered to the site prior to successful hydrostatic and holiday testing shall be subject to rejection.

#### **1.10 POLYETHYLENE WRAP**

- A. Buried valves shall be encased in polyethylene wrap in accordance with Section 09867.

**PART 2 – MATERIALS****2.01 RESILIENT WEDGE GATE VALVES**

- A. Resilient wedge gate valves and appurtenant components and materials shall be selected from the Approved Materials List.
- B. Valves shall be ductile-iron in accordance with AWWA C509 and C515 except as modified herein.
- C. Each valve shall have a smooth, unobstructed waterway free from any sediment pockets.
- D. Valves shall be leak-tight at their rated pressure.
- E. Valves shall have a non-rising low-zinc bronze or stainless steel stem, opened by turning left (counterclockwise).
- F. Stem seals shall be the O-ring type incorporating a minimum of two rings as required by AWWA C509.
- G. Low-friction torque-reduction thrust washers or bearings shall be provided on the stem collar.
- H. Wedge (gate) shall be fully encapsulated with a bonded-in-place Nitrile elastomer covering. Minimum thickness of the rubber seating area shall be ¼" (6.35 mm).
- I. Valves for buried applications shall be provided with a 2" (50 mm) square operating nut, and valves located above ground or in structures shall be equipped with a hand wheel in accordance with AWWA C509 unless otherwise indicated on the Approved Plans.
- J. Valve interior and exterior surfaces (except for the encapsulated disc) shall be coated as described below.
- K. All bolts and nuts shall be Type 316 stainless steel.

**2.02 RESILIENT WEDGE GATE VALVES (TAPPING)**

- A. Valves shall have a rated working pressure of not less than 150 psi.
- B. Valves shall have a resilient wedge disc, non-rising stem and conform to AWWA C509.
- C. Valve ends shall be ANSI B16.1 flange end with centering ring on the tapping sleeve side and mechanical joint conforming to AWWA C111 on the outlet side.
- D. Provide Type 304 or 316 stainless steel body bolts conforming to ASTM F593.
- E. The Contractor shall have responsibility for full compatibility of tapping valves with tapping sleeves.

- F. Valves shall be hydrostatically tested in the field prior to tapping.
- G. Valves shall be per the Approved Material's list, or approved equal.

### **2.03 EPOXY LINING AND COATING**

Epoxy linings and coatings for valves shall be provided in accordance with AWWA C210, C213 and C550, with the following modifications:

- A. Epoxy lining and coating of valve surfaces shall be performed by the manufacturer in a facility with qualified personnel, where the environment can be controlled. Epoxy lining and coating of valves in the field is prohibited.
- B. Repairs made to manufactures applied coatings shall be performed in a facility with qualified personnel, where the environment can be controlled. The facility shall be approved by the valve manufacturer.
- C. Surface preparation shall be as detailed in SSPC-SP5, White-Metal Blast Cleaning.
- D. Liquid epoxy lining and coating materials shall be listed in the NSF Listing for Drinking Water Additives, Standard 61, certified for use in contact with potable water.
- E. The minimum dry film thickness for epoxy linings shall be 8 mils (0.203 mm). Liquid epoxy lining shall be applied in two (2) coats in accordance AWWA C210.
- F. Powder epoxy coating materials shall contain one hundred percent (100%) solids in accordance with AWWA C213.

### **2.04 GATE WELLS AND EXTENSION STEMS**

- A. Gate wells and extension stems for buried valves shall be in accordance with the District's Standard Drawings and Standard Specifications.

### **2.05 CONCRETE**

- A. Concrete used for anchor or thrust blocks shall be in accordance with Section 03300.

### **2.06 POLYETHYLENE WRAP**

- A. See Section 09867.

## **PART 3 – EXECUTION**

### **3.01 INSTALLATION**

- A. Install valves with the bolt holes straddling the vertical centerline of pipe and the operating nut in the vertical position unless otherwise noted on the Approved Plans.

- B. Valves shall be installed in accordance with the manufacturer's recommendations and the applicable section of these specifications for the piping material and joint type being used.

**3.02 POLYETHYLENE WRAP**

- A. Installation of polyethylene wrap for buried valves shall be in accordance with Section 09867.

**3.03 CONCRETE**

- A. Concrete thrust, anchor, and support blocks shall be installed in accordance with Section 03300 and the Standard Drawings. The concrete shall be placed so that valves and valve operators will be accessible for repairs or replacement. Refer to Section 03300 for the minimum concrete curing time required prior to pressure testing the pipeline.

**3.04 GATE WELLS AND EXTENSION STEMS**

- A. Gate wells and extension stems for buried valves shall be installed in accordance with the Standard Drawings.

**3.05 DISINFECTION OF VALVES**

- A. Disinfection and flushing of valves shall be performed in accordance with Section 15041 during disinfection of the pipeline on which the valves are installed. The valves shall be operated during the disinfection period to completely disinfect all internal parts.

**3.06 HYDROSTATIC TESTING**

- A. Valves shall be hydrostatically tested in conjunction with the pipeline in which they are installed in accordance with Section 15042.

**END OF SECTION**

**SECTION 15103****BUTTERFLY VALVES****PART 1 – GENERAL****1.01 DESCRIPTION**

The Contractor shall provide all butterfly valves, actuators, and appurtenances, as shown in the Drawings and specified herein, in accordance with the requirements of the Contract Documents. The Contractor shall be responsible for coordinating all required components, including valve and actuator (manual or motorized) for a complete and functional valve installation.

**1.02 REFERENCE SPECIFICATIONS, CODES AND STANDARDS**

- A. Except as otherwise indicated in this Section of the Specifications, the Contractor shall comply with the latest adopted edition of the Standard Specifications for Public Works Construction (SSPWC).
- B. Except as otherwise indicated, the current editions of the following standards apply to the Work of this section:
- |                  |   |
|------------------|---|
| ANSI/ASME B16.1  | Cast Iron Pipe Flanges and Flanged Fittings   |
| ANSI/ASME B16.5  | Pipe Flanges and Flanged Fittings, NPS ½ through 24   |
| ANSI/ASME B16.47 | Large Diameter Steel Flanges  |
| ASME B16.34      | Valves, Flanged Threaded and Welding End  |
| ASME B16.10      | Face to Face and End to End Dimensions of Valves  |
| ANSI/AWWA C504   | Rubber-Seated Butterfly Valves  |
| ANSI/AWWA C540   | Power Actuating Devices for Valves and Slide Gates  |
| ASTM A126        | Gray Iron Castings for Valves, Flanges and Pipe Fittings  |
| ASTM A216        | Steel Castings, Carbon, Suitable for Fusion Welding, for High Temperature Service                     |
| ASTM A351        | Steel Castings Austenitic, Austenitic-Ferric (Duplex), for Pressure-Containing Parts                  |
| ASTM A515        | Pressure Vessel Plates, Carbon Steel, for Intermediate and Higher Temperature Service                 |
| ASTM A536        | Ductile Iron Castings   |
| ASTM A743        | Castings, Iron-Chromium, Iron-Chromium-Nickel, Corrosion-Resistant for General Application            |
| MSS-SP-25        | Standard Marking System for Valves, Fittings, Flanges and Unions                                      |
| MSS-SP-6         | Standard Finishes for Contact Faces of Pipe Flanges and Connecting-End Flanges of Valves and Fittings |
| API 598          | Valve Inspection and Testing  |
| API 6D           | Specification for Pipeline Valves   |
| API 607          | Fire Test for Soft-Seated Quarter Turn Valves   |
| API 609          | Butterfly Valves: Double-Flanged, Lug and Wafer Type  |
| ISO 5752         | Metal Valves for Use in Flanged Pipe Systems - Face-to-face and Centre-to-Face Dimensions             |

AWWA C210	Liquid Epoxy Coating Systems for the interior and exterior of steel water pipelines
AWWA C509	Resilient Seated Gate Valves for water supply service
AWWA C515	Reduced Wall, Resilient Wedge Gate Valves for water supply service
AWWA C550	Protective Epoxy Interior Coatings for valves and hydrants
SSPC	Steel Structure Painting Council

### 1.03 SUBMITTALS

- A. The Contractor shall furnish submittals in accordance with Section 01300.

### 1.04 FACTORY TESTING

- A. Valves shall be facility tested in compliance with AWWA C504.
- B. Proof-of-design tests reports shall be submitted in compliance with AWWA C504.

## PART 2 – MATERIALS

### 2.01 BUTTERFLY VALVES (AWWA)

- A. General: Butterfly valves shall conform to ANSI/AWWA C504 - Rubber-Seated Butterfly Valves, subject to the following requirements. Buried, Class 150B butterfly valves shall also comply with the Standard Specification for Public Works Construction (SSPWC) Regional Supplement Amendment Section 212-5.2 unless indicated otherwise. Buried Class 250 butterfly valves shall comply with the SSPWC Regional Supplement Amendment Section 207-26.4.1 unless indicated otherwise. Valves shall be of the size and class indicated. Flanged valves shall have Class 250 flanges, complying with ASME/ANSI B16.1, and shall be short-bodied except as otherwise noted. Shaft seals shall be designed for use with standard split-V type packing, or other acceptable seal. The interior passage of butterfly valves shall not have any obstructions or stops. The seats shall be positively mounted in the body of the valve; cartridge-type seats which rely on a high coefficient of friction for retention shall not be acceptable.
- B. Epoxy lining and coating:
  - 1. Epoxy linings and coatings for valves shall be provided in accordance with AWWA C210, C213 and C550, with the following modifications:
    - a. Epoxy lining and coating of valve surfaces shall be performed by the manufacturer in a facility with qualified personnel, where the environment can be controlled. Epoxy lining and coating of valves in the field is prohibited.
    - b. Repairs made to manufactures applied coatings shall be performed in a facility with qualified personnel, where the environment can be controlled. The facility shall be approved by the valve manufacturer.



- c. Surface preparation shall be as detailed in SSPC-SP5, White-Metal Blast Cleaning.
  - d. Liquid epoxy lining and coating materials shall be listed in the NSF Listing for Drinking Water Additives, Standard 61, certified for use in contact with potable water.
  - e. The minimum dry film thickness for epoxy linings shall be 8 mils (0.203 mm). Liquid epoxy lining shall be applied in two (2) coats in accordance AWWA C210.
  - f. Powder epoxy coating materials shall contain one hundred percent (100%) solids in accordance with AWWA C213.
- C. Manual Operators:
1. Operators shall conform to ANSI/AWWA C540, subject to the following requirements. Unless otherwise indicated, all manually-operated butterfly valves shall be equipped with a hand wheel (exposed) or two-inch (2") square operating nut, 316 stainless steel with couplings extension stem wall and guide brackets and position indicator (buried or submerged). Valve key extensions shall be installed on all buried butterfly valves unless indicated otherwise in accordance with District Standards.
  2. Valves, twelve-inches (12") and larger, as well as all submerged and buried valves, shall be equipped with worm-gear operators, lubricated and sealed to prevent entry of dirt or water into the housing. Screw-type (traveling nut) operators will not be permitted for valves twelve-inches (12") in diameter and larger. Operators shall require a minimum of 40 turns to rotate the disc from fully open to fully closed position.
- D. Butterfly valves shall be manufactured per the Approved Materials List or approved equal.

## **PART 3 – EXECUTION**

### **3.01 INSTALLATION**

- A. Install valves with the bolt holes straddling the vertical centerline of pipe and the operating nut in the vertical position unless otherwise noted on the Approved Plans.
- B. Valves shall be installed in accordance with the manufacturer's recommendations and the applicable section of these specifications for the piping material and joint type being used.
- C. All exposed butterfly valves shall be installed with a means of removing the complete valve assembly without dismantling the valve or operator.

**END OF SECTION**

**SECTION 15109****FIRE HYDRANTS****PART 1 – GENERAL****1.01 DESCRIPTION**

This section includes the materials for and installation of fire hydrant assemblies.

**1.02 REFERENCE STANDARDS**

The publications listed below form part of this specification to the extent referenced and are referred to in the text by the basic designation only. Reference shall be made to the latest edition of said standards unless otherwise called for.

AWWA C210	Liquid Epoxy Coating Systems for the Interior and Exterior of Steel Water pipelines
AWWA C213	Fusion Bonded Epoxy Coating for the Interior and Exterior of Steel Water pipelines
AWWA C503	Wet-Barrel Fire Hydrants
AWWA C550	Protective Epoxy Interior Coatings For Valves and Hydrants

**1.03 RELATED WORK SPECIFIED ELSEWHERE**

- A. Rincon del Diablo MWD (District) Standard Drawings and Approved Materials List
- B. Section 03300 – Cast-In-Place Concrete
- C. Section 15041 – Disinfection of Pipe
- D. Section 15042 – Hydrostatic Testing of Pressure Pipe
- E. Section 15062 – Ductile Iron Pipe and Fittings

**1.04 SYSTEM DESCRIPTION**

- A. Hydrant outlet sizes and configuration shall be as shown on the Approved Plans or as directed by the fire department of jurisdiction.
- B. Hydrants shall generally have the following number and size of outlets as directed by the fire department of jurisdiction:
  - 1. Residential: One 2 1/2" outlet and one 4" outlet
  - 2. Commercial: Two 2 1/2" outlets and one 4" outlet.

3. Industrial: One 2 1/2" outlet and two 4" outlets.

#### **1.05 SERVICE APPLICATION**

- A. Wet-barrel hydrants shall generally be used for pressures up to 200 PSI. System pressures up to and including 150 PSI require standard wet-barrel hydrants, and pressures up to 200 PSI require high-pressure wet-barrel hydrants in accordance with the Approved Materials List.
- B. Dry-barrel hydrants shall generally be used for pressure ranges in excess of 200 PSI, up to 250 PSI as specifically shown on the approved drawings.

#### **1.06 DELIVERY, STORAGE AND HANDLING**

- A. Fire hydrants shall be delivered and stored in accordance with AWWA C210, AWWA C213, and AWWA C550. The port openings shall be covered with plastic, cardboard or wood while in transit and during storage in the field. These covers shall remain in place until the valve is ready to be installed. Fire hydrants shall not be stored in contact with bare ground. Fire hydrants shall not be stacked.

#### **1.07 MASONRY RETAINING WALLS**

- A. If the aboveground portion of the assembly is located within a cut slope or embankment fill, a masonry retaining wall shall be constructed on three sides around the assembly per District Standards. The face of wall shall be a minimum of one foot beyond the dimensional values of the concrete pad to be poured for the assembly as shown on the District Standard Drawings. Use tan colored slump block and grout each cell solid. The concrete pad to be poured around the assembly shall extend to the face of the three walls and also to the adjacent sidewalk or curb. The District's Representative will decide whether the requirements of this paragraph are being followed by the Contractor. If in the opinion of the District's Representative modifications or changes are necessary, the work shall be performed as directed.

### **PART 2 – MATERIALS**

#### **2.01 HYDRANTS**

- A. Fire hydrants and appurtenances shall be selected from the Approved Materials List.
- B. Wet-barrel fire hydrants shall comply with AWWA C503 and these specifications unless otherwise indicated on the Standard Drawings.
- C. The interior of ductile-iron hydrants shall be fusion-epoxy lined per AWWA C550.
- D. All outlets shall be provided with National Standard Fire-Hose Threads. Outlets shall be equipped with plastic caps with plastic chains.
- E. Wet-barrel fire hydrant flanges and appurtenant bury ells and spools shall incorporate a six-hole bolt pattern.

**2.02 BOLTS AND NUTS**

- A. Hydrant flange bolts and nuts shall be selected from the Approved Materials List.

**2.03 CONCRETE**

- A. Concrete used for splash pads, thrust or anchor blocks shall be in accordance with Section 03300.

**2.04 WARNING/IDENTIFICATION TAPE**

- A. Use marking tape consisting of one layer of aluminum foil laminated between two colored layers of inert plastic film. The lamination bond should be strong enough that the layers cannot be separated by hand. Tape shall be a minimum of 5 mils thick and 6 inches wide. Elongation shall be a minimum of 600-percent. Tape shall bear a continuous, printed message every 16 to 36 inches warning of the installation buried below. Tape shall be selected from the Approved Materials List.

**2.05 FIELD PAINTING AND COATING**

- A. Field painting and coating shall not be permitted. Painting and coating shall be done at the manufacturer.

**PART 3 – EXECUTION**

**3.01 GENERAL**

- A. Fire hydrant assemblies shall be installed at locations shown on the Approved Plans or as directed by the fire department of jurisdiction in accordance with the District Standard Drawings.
- B. The location and port orientation of the Fire Hydrant shall be in accordance with the Standard Drawings and as required by the Fire Department.
- C. Fire hydrant flange bolts shall be set with nuts on top. Torque nuts uniformly and progressively in accordance with the manufacturer's recommendations.
- D. Depending on location, fire hydrant assemblies may require protection posts or concrete retaining walls. When required by the District Engineer, or when shown on the Approved Plans, protection posts or retaining walls shall be installed in accordance with the District Standard Drawings.

**3.02 CONCRETE**

- A. Concrete thrust and anchor blocks shall be installed in accordance with Section 03300 and the District Standard Drawings. Refer to Section 03300 for the minimum concrete curing time required.

**3.03 WARNING/IDENTIFICATION TAPE**

- A. After the pipe zone and the first 12 inches in the trench zone have been backfilled and compacted, place the marking tape on the compacted backfill and center over the pipe. Run tape continuously along the trench and tie ends of tape together. Wrap marking tape around valve box extension pipes and continue along pipe.

**3.04 DISINFECTION OF FIRE HYDRANT**

- A. The fire hydrant assembly shall be disinfected in accordance with Section 15041, as part of the process of disinfecting the main pipeline. The assembly valves shall be operated and the assembly flushed to completely disinfect all internal parts.

**3.05 HYDROSTATIC TESTING**

- A. Fire hydrant assemblies shall be hydrostatically tested in accordance with Section 15042 in conjunction with the pipeline to which it is connected.

**3.06 PAINTING AND COATING**

- A. Field painting and coating shall not be permitted. Painting and coating shall be done at the manufacturer. Hydrants connected to potable water pipelines shall be colored yellow, and hydrants connected to reclaimed water pipelines shall be colored purple.

**END OF SECTION**

## **SECTION 15112**

### **BACKFLOW PREVENTION ASSEMBLIES**

#### **PART 1 – GENERAL**

##### **1.01 DESCRIPTION**

This section includes materials, installation, and testing of backflow preventer assemblies and detector check assemblies. Assemblies shall be installed at the locations as shown on the Drawings or as established in the field by the District's Representative. The District will perform the initial test of the completed assembly to certify the installation. Future maintenance and annual certification of the assembly shall be the responsibility of the Customer.

##### **1.02 RELATED SECTIONS**

- A. Section 01300 – Record Drawings and Submittals
- B. Section 02223 – Trenching, Backfilling, and Compacting
- C. Section 03000 – Hydrostatic Testing of Pressure Pipelines
- D. Section 09900 – Painting and Coating
- E. Section 15042 – Hydrostatic Testing of Pressure Pipelines
- F. Section 15041 – Disinfection of Piping

##### **1.03 SUBMITTALS**

- A. Submit submittals packages in accordance with Section 01300.
- B. Submit manufacture's catalog data, descriptive literature, and assembly drawings. Show dimensions, materials of construction by specification reference and grade, linings, and coatings.
- C. Submit manufacturer's certificate of compliance with AWWA C511 for reduced pressure principle backflow preventers.

##### **1.04 MASONRY RETAINING WALLS**

- A. If the aboveground portion of the assembly is located within a cut slope or embankment fill, a masonry retaining wall shall be constructed on three sides around the assembly. Construct the concrete foundation and retaining wall similar to the requirements that San Diego Gas and Electric uses for their facilities. The face of wall shall be a minimum of one foot beyond the dimensional values of the concrete pad to be poured for the assembly as shown on the Drawings. Use tan colored slump block and grout each cell solid. The concrete pad to be poured around the assembly shall extend to the face of the three walls and also to the adjacent sidewalk or curb. The District's Representative will decide whether the requirements of this paragraph are being followed by the Contractor. If in the

opinion of the District's Representative modifications or changes are necessary, the work shall be performed as directed.

### **1.05 PRIVATE PUMPING FACILITIES**

- A. The addition of a backflow prevention assembly to any given size water service assembly will reduce the available water service pressure. A larger size water service and backflow prevention assembly may be required to provide adequate water service pressure. The District will not provide pumping facilities to increase water service pressure. Private pumping facilities shall be independent and located downstream of backflow prevention assemblies

### **1.06 THERMAL EXPANSION**

- A. The addition of a backflow prevention assembly to a water service will constitute a closed system. The District will not provide thermal expansion facilities for this condition. Provide sufficient facilities for thermal expansion and check for proper operation of existing thermal or pressure relief devices.

## **PART 2 – MATERIALS**

### **2.01 MANUFACTURERS**

- A. Provide backflow prevention assemblies of the described type that are on the "List of Approved Backflow Prevention Assemblies" as issued by the State of California, Department of Health Services. A copy of the list is available from the District's Backflow Department.

### **2.02 BACKFLOW PREVENTERS**

- A. General: Backflow preventers shall be the same size as and never smaller than the upstream water service assembly. Where normal minimum water service pressure is less than 80 psi; the District may require the next larger assembly size.
- B. Backflow preventers of the reduced pressure principle type shall conform to the material specifications of the state approved manufacturers. See the instructions in paragraph 2.1 for obtaining the "List of Approved Backflow Assemblies".
- C. Backflow preventers, 2 inches and smaller, shall be of the conventional in-line design for installation in a horizontal position. See the instructions in paragraph 2.1 for obtaining the "List of Approved Backflow Assemblies".
- D. Backflow preventers, 2-1/2 inches through 10 inches, shall be of the conventional in-line design for installation in a horizontal position. Provide adjustable pipe supports to augment the installation to prevent flange damage. See the instructions in paragraph 2.1 for obtaining the "List of Approved Backflow Assemblies".

### 2.03 DETECTORS CHECKS

- A. General: Detector shall be sized according to the demands of the fire protection system. Provide double check detector checks for Class 1, 2, 3, and 4 fire protection systems. Provide reduced pressure detector checks for Class 5 and greater fire protection systems.
- B. Double check detector checks shall conform to AWWA C510 with a minimum rated working pressure of 175 psi for operation on cold water pipelines. Provide two independently acting, spring loaded check valves; two resilient seated gate valves with outside stem and yoke; four full ported, bronze ball valve test cocks; and a low flow by-pass line with registration meter and double check valve assembly in series. Assemble the by-pass meter and double check valves to the main line assembly as an integral unit. The meter shall be a totalizing type with registration in cubic feet. Main check valves shall be constructed for servicing without removing the assembly from the line. Construct main line valve bodies and covers of ductile iron conforming to ASTM A 536 Grade 65-45-12 with bronze trim conforming to ASTM B 584 Alloy C83600. Construct by-pass line components of bronze or brass.
1. Double check detector checks, 4 inches through 8 inches, shall be of the compact design ("N" series) for inlet flow in a vertical up direction and outlet flow in a vertical down direction. Provide valve setters with the appropriate end connections to augment the installation. Double check detector checks shall be District approved.
  2. In lieu of the compact design, double check detector checks, 4 inches through 10 inches, shall be of the conventional in-line design for installation in a horizontal position. Provide adjustable pipe supports to augment the installation. Double check detector checks shall be District approved.
- C. Reduced pressure detector checks, 4 inches through 10 inches, shall be similar to backflow preventers of the reduced pressure type described in paragraph 2.02, B. Provide a by-pass line with registration meter and a bronze reduced pressure backflow preventer assembly in series. The by-pass reduced pressure backflow preventer shall operate identically to the main line assembly and open to detect initial flow. The meter shall be a totalizing type with registration in cubic feet. Reduced pressure detector checks shall be of the conventional in-line design for installation in a horizontal position. Provide adjustable pipe supports to or granular hypochlorite shall not be used at any time. augment the installation to prevent flange damage. Detector checks shall be Cla-ValModel RD7L, Febco Model 826YD, or District approved equal.
- D. Where required by the fire department, provide an exposed inlet connection on the downstream side of the detector check. Replace the ductile iron bend with a ductile iron flanged tee. Install a flange with a 4-inch threaded outlet on the run. Thread a 4-inch brass nipple into the flange and install a swing check valve and a two-way, 90 degree, angle inlet connection. The 4-inch swing check valve shall be of brass construction with spring loaded check and have threaded ends. The inlet connection shall be a two-way, 90 degree angle outlet of cast brass construction with 4-inch by 2-1/2-inch size. Provide either single or double clapper style as specified by the fire department and pin lug swivels. Cast on the top of the connection the words "AUTO SPKR" or "STANDPIPE" as directed by the fire department. Provide brass plug with chain for each inlet swivel.



The swing check valve and inlet connection shall be as manufactured by Potter-Roemer, Inc. or District approved equal.

#### **2.04 LINING AND COATING OF ASSEMBLIES**

- A. Coat interior and exterior ferrous surfaces of the backflow preventers and detector checks with fusion-bonded epoxy per Section 09961. Do not coat bronze, rubber, or stainless steel items.

#### **2.05 VALVE END CONNECTIONS**

- A. Valves, 2 inches and smaller, shall have screwed ends. Valves, 2-1/2 inches and larger, shall have flanged ends.
- B. Screwed ends shall conform to ANSI B1.20.1, NPT.
- C. Flanged ends shall conform to ANSI B16.1, Class 125.

#### **2.06 PACKING, O-RINGS, AND GASKETS**

- A. Unless otherwise stated; packing, O-rings, and gaskets shall be one of the following non-asbestos materials.
  - 1. A. Teflon.
  - 2. B. Kevlar aramid fiber.
  - 3. Acrylic or aramid fiber bound by nitrile. Provide Garlock "Blurgard", Klinger "Klingersil C440", or District approved equal.
  - 4. Buna-N (Nitrile).

#### **2.07 BOLTS, NUTS AND GASKETS FOR FLANGES**

- A. See Section 15050.

#### **2.08 VALVE SETTERS**

- A. Provide valve setters to augment the installation of the compact design ("N" series) detector checks. Valve setters shall be constructed with integral support arms between the elbows to transfer thrust downstream. Construct valve setters of ductile iron conforming to ASTM A 536 Grade 65-45-12. Coat interior and exterior surfaces of the ductile iron with fusion-bonded epoxy per Section 09961. End connections shall be a combination of flanged ends and mechanical joints as shown on the Drawings. Flanged ends shall conform to ANS B16.1 Class 125. Valve setters shall be District approved.

#### **2.09 ADJUSTABLE PIPE SUPPORTS**

- A. Provide adjustable pipe support of welded steel construction with fusion-bonded epoxy coating. Locate the pipe supports under flanges or valve bodes as shown. Provide 2-

inchgalvanized steel pipe, cut to length, and place between the collar and base. Provide Material Resources “Standon Pipe Support Model S-89,” or District approved equal.

## **2.10 POLYETHYLENE ENCASEMENT**

- A. See Section 09954.

## **2.11 GUARD POSTS**

- A. See Section 05121. Provide guard posts around the assembly when directed by the District’s Representative to protect the installation.

## **2.12 ENCLOSURE**

- A. Provide an enclosure over and around the assembly when directed by the District’s Representative to protect installation.

## **PART 3 – EXECUTION**

### **3.01 INSPECTION BEFORE INSTALLATION**

- A. Operate the shutoff valves and test cock on the assemblies from closed to fully open, then close again before installing. Check for broken, cracked, or missing parts; malfunctioning stems; and faulty operation.

### **3.02 INSTALLATION**

- A. See Section 02223 for earthwork requirements. Use imported sand in the pipe base and pipe zone.
- B. Install piping and riser section per the instructions contained in the appropriate for the material used.
- C. Piping from the main to the backflow prevention assembly shall be placed level or on a continuous upward grade to avoid pocketing air. No outlets will be allowed in the piping between the main and the assembly. Trench backfilling shall not commence until the District’s Representative has inspected this section of piping and is satisfied with the installation.
- D. Install backflow prevention assemblies in a horizontal position, aboveground, and at the dimensions shown on the Drawings. Locate the assemblies where shown or as established in the field by the District’s Representative. The District shall be the final authority as to location, installation, size, and type of backflow prevention assembly required.
- E. Clean threaded joints by wire brushing or swabbing. Apply Teflon joint compound or Teflon tape to pipe threads before installing screwed valves. Joints shall be watertight.
- F. Install flanged joints per the installation instructions in Section 15050.

**3.03 INSTALLING POLYETHYLENE ENCASEMENT**

- A. After applying primer for wax tape coating to all buried bolts and nuts, wrap ferrous pipe risers including base bends and valve setters with polyethylene material per Section 09954. Complete the wrap prior to placing concrete anchor blocks or concrete trust blocks on base bends or valve setters. Repair polyethylene material damaged during construction.

**3.04 PLACING CONCRETE**

- A. Place concrete anchor blocks around the elbow of the pipe riser or valve setter. Where a thrust block is required, place concrete against the base bends and undisturbed ground. Place concrete back to back between the base bends. Allow concrete to set and be hard enough to be self-supporting. Place and compact trench backfill up to the subgrade of the concrete pad on grade. Pour a concrete pad on grade around the pipe risers. Concrete shall be Class C per Section 03000.

**3.05 SETTING GUARD POSTS**

- A. Position guard posts to protect the backflow prevention assembly. Locate posts as directed by the District's Representative. Excavate a hole 16 inches in diameter by 3-1/2 feet deep for each post. Set posts plumb, fill holes with concrete to 2 inches above finish grade, and crown to slope away from post. Posts shall be embedded a minimum of 3 feet in

**3.06 INSTALLING THE ENCLOSURE**

- A. Set enclosure over the assembly and center in place as directed by the District's Representative. Use driller in or adhesive stainless steel anchors to attach the enclosure to the concrete pad.

**3.07 PAINTING AND COATING**

- A. Paint aboveground surfaces of the pipe risers, elbows or bends, and adjustable pipe supports per Section 09900, System No. 20. Color of finish coat shall be OSHA Blue. Do not paint backflow prevention assemblies.
- B. Paint aboveground surfaces of the guard posts per Section 09900, System No.20. Color of finish coat shall be OSHA Yellow.

**3.08 PRESSURE TESTING**

- A. Pressure testing will be performed in accordance with Section 15042 Hydrostatic Testing Pressure Water Mains. Test backflow prevention assemblies at the same time that the connecting pipelines are pressure tested. Repair leaks in the backflow prevention assemblies and joints of the interconnecting piping and retest.

**3.09 INITIAL TESTING**

- A. Upon completion of the installation and inspection by the District's Representative, an initial test will be performed by certified personnel of the District's Backflow

Department. The initial test will be conducted to certify the adequacy and operational compliance of the assembly with both state and District regulations. Backflow prevention assemblies will not be placed into service until the District has tested and certified the installation.

### **3.10 DISINFECTION**

- A. See Section 15041 for chlorination requirements.

**END OF SECTION**

**SECTION 15122****FLEXIBLE PIPE COUPLINGS & JOINTS****PART 1 - GENERAL****1.01 DESCRIPTION**

This Section includes materials, installation, and testing of flexible pipe couplings for steel pipe, PVC pipe and ductile iron pipe.

**1.02 RELATED WORK SPECIFIED ELSEWHERE**

- A. Section 01300 – Record Drawings and Submittals
- B. Section 09867 – Polyethylene Sheet or Tube Encasement
- C. Section 09868 – Cold Applied Wax Tape Coating
- D. Section 15041 – Disinfection of Piping
- E. Section 15042 – Hydrostatic Pressure Testing of Piping

**1.03 SUBMITTALS**

- A. Submit shop drawings in accordance with Section 01300.
- B. Submit manufacturer's catalog data, descriptive literature, and assembly drawings. Show manufacturer's model or figure number for each type of coupling or joint for each type of pipe material for which couplings are used.
- C. Submit manufacturer's recommended torques to which the coupling bolts shall be tightened.
- D. Show dimensions, materials of construction by specification reference and grade, linings, and coatings.
- E. Show number, size and material of construction for rods and lugs for each joint harness.

**PART 2 - MATERIALS****2.01 STEEL FLEXIBLE PIPE COUPLINGS**

- A. Steel couplings shall have middle rings made of steel conforming to ASTM A36, A53 (Type E or S), or A512 having a minimum yield strength of 30,000 psi. Follower rings shall be malleable iron (ASTM A47, Grade 32510), ductile iron (ASTM A536) or steel (ASTM A108, Grade 1018, or ASTM A510, Grades 1018 or 1021). Minimum middle ring length shall be 5 inches for pipe sizes 3/4-inch through 4-1/2 inches; 7 inches for pipe sizes 5 inches through 24 inches; and 10 inches for pipe sizes larger than 24 inches.

- B. Sleeve bolts shall have a minimum yield strength of 40,000 psi, an ultimate strength of 60,000 psi, and shall conform to AWWA C111.
- C. Steel follower rings shall be cast, forged, or hot rolled in one piece. Rings fabricated from two or more shapes shall not be used.
- D. Wall thickness of sleeve shall be at least that specified for the size of pipe in which the coupling is to be used.
- E. Gaskets shall be Buna-N.

## **2.02 CAST IRON FLEXIBLE PIPE COUPLINGS**

- A. Cast iron couplings shall have sleeves made of gray iron conforming to ASTM A126, Class B; cast iron conforming to ASTM A48, Class 30 (minimum) or ductile iron conforming to ASTM A536. Follower rings shall be made of malleable iron (ASTM A47, Grade 32510) or ductile iron (ASTM A536).
- B. Sleeve bolts shall have a minimum yield strength of 40,000 psi, an ultimate strength of 60,000 psi and shall conform to AWWA C111.
- C. Gaskets shall be Buna-N.

## **2.03 FLEXIBLE PIPE COUPLINGS FOR PLAIN END STEEL PIPE**

- A. Flexible pipe couplings for steel pipe shall be steel: Approved Materials List or approved equal.

## **2.04 FLEXIBLE PIPE COUPLINGS FOR PLAIN END DUCTILE IRON OR PVC PIPE**

- A. Flexible pipe couplings for ductile iron or PVC pipe shall be cast iron or ductile iron: Approved Materials List or approved equal.

## **2.05 TRANSITION COUPLINGS**

- A. Transition couplings for connecting different pipe materials having different outside diameters shall be steel: Approved Materials List or approved equal.

## **2.06 FLANGED COUPLING ADAPTERS FOR STEEL PIPE**

- A. Flanged coupling adapters for steel pipe shall be steel: Approved Materials List or approved equal. Flange ends shall match the flange of the connecting pipe.

## **2.07 FLANGED COUPLING ADAPTERS FOR DUCTILE IRON OR PVC PIPE**

- A. Flanged coupling adapters for ductile iron pipe or PVC pipe shall be cast iron, ductile iron, or steel: Approved Materials List or approved equal. Flange ends shall match the flange of the connecting pipe.

**2.08 FLANGED COUPLING ADAPTERS FOR EXISTING ASBESTOS CEMENT PIPE**

- A. Flanged coupling adapters for existing asbestos cement pipe shall be cast iron or ductile iron: Approved Materials List or approved equal.
- B. Flange ends shall match the flange of the connecting pipe. The Contractor shall field verify the actual outside diameter of the existing pipe to be connected.

**2.09 DISMANTLING JOINTS**

Dismantling joints shall be of the restrained flanged adaptor type allowing for longitudinal adjustment. Non-restrained, seal only flanged adaptors will not be acceptable.

- A. The dismantling joint shall be pressure rated to 250 psi. Flanges shall be Class 150 in accordance with ANSI B16.42.
- B. The flanged spool and end ring and body shall be ductile iron. All nuts, bolts and tie rods shall be Type 316 stainless steel.
- C. Gasket material shall be Buna-N.

**2.10 FLEXIBLE EXPANSION JOINTS**

- A. Flexible expansion joints shall be installed in the locations indicated on the drawings and shall be manufactured of ductile iron conforming to the material requirements of ASTM A536 and ANSI/AWWA C153/A21.53. Foundry certification of material shall be readily available upon request.
- B. Each flexible expansion joint shall be pressure tested prior to shipment against its own restraint to a minimum of 350 psi (250 psi for flexible expansion joints 2 inch and 30 inches diameter and larger.) A minimum 2:1 safety factor, determined from the published pressure rating, shall apply. Factory Mutual Approval for the 3 inch through 12 inch sizes is required.
- C. Each flexible expansion joint shall consist of an expansion joint designed and cast as an integral part of a ball and socket type flexible joint, having a minimum per ball deflection of: 20°, 2" - 12"; 15°, 14" - 36"; 12°, 42"-48" and 4-inches minimum expansion. Additional expansion sleeves shall be available and easily added or removed at the factory or in the field. Both standardized mechanical joint and flange end connections shall be available.
- D. All internal surfaces (wetted parts) shall be lined with a minimum of 15 mils of fusion bonded epoxy conforming to the applicable requirements of ANSI/AWWA C213. Sealing gaskets shall be constructed of EPDM. The coating shall meet ANSI/NSF-61.
- E. Exterior surfaces shall be coated with a minimum of 6 mils of fusion bonded epoxy conforming to the applicable requirements of ANSI/AWWA C116/A21.16.

- F. Appropriately sized polyethylene sleeves, meeting ANSI/AWWA C105/A21.5, shall be included for direct buried applications.
- G. Manufacturer's certification of compliance to the above standards and requirements shall be readily available upon request. The purchaser (or District) shall reserve the right to inspect the manufacturer's facility for compliance. All flexible expansion joints shall be per Approved Materials List or approved equal.

## **2.11 LINING AND COATING FOR COUPLINGS**

- A. Coat the interior and exterior ferrous surfaces of couplings, flange adapters, and dismantling joints with fusion-bonded epoxy per Section 09811. The coating shall be holiday free on interior surfaces.

## **2.12 JOINT HARNESSSES**

- A. Provide joint harnesses for flexible pipe couplings located in vaults and structures where the piping is not restrained or anchored. Joint harnesses of this design shall be limited to a maximum nominal pipe diameter of 8 inches and applies only to steel pipe.
- B. Steel ring plates shall conform to ASTM A36; ASTM A283, Grade B, C or D; or ASTM A285, Grade C. Ring plates shall be as shown on the Drawings.
- C. Bolt or stud material shall be high-strength alloy steel conforming to ASTM A193, Grade B7. Nuts shall conform to ASTM A194, Grade 2H.
- D. Provide washers for each nut. Washers shall be of the same material as the nuts.

## **2.13 BOLTS, NUTS AND GASKETS FOR FLANGES**

- A. Provide heavy hex, carbon steel bolts and nuts for flanges located above-ground, in vaults and structures, and for buried flanges to be wrapped with polyethylene material. Bolts and nuts shall conform to ASTM A307 Grade B and ASTM A563 Grade A, respectively.
- B. Provide washers for each nut. Washers shall be of the same material as the nuts.
- C. Gaskets shall be asbestos-free, drop-in ring type, 1/16-inch or 1/8-inch thick, and shall be acrylic or aramid fiber bound with nitrile. Gaskets shall be suitable for a water pressure of 500 psi at a temperature of 400 degrees F. Provide per Approved Materials List or approved equal.

## **2.14 WAX TAPE COATING**

- A. See Section 09868.



**2.15 POLYETHYLENE ENCASEMENT**

- A. See Section 09867.

**PART 3 - EXECUTION****3.01 INSTALLING COUPLINGS**

- A. Clean oil, grease, scale, and dirt from pipe ends. Repair any damage or holidays in the shop applied coating before installing couplings. Clean gaskets in flexible pipe couplings, transition couplings, and flanged coupling adapters before installing.
- B. Clean sleeve bolts and nuts by wire brushing before installing in follower rings. Lubricate threads of bolts and nuts with oil or graphite prior to installation. Tighten nuts uniformly and in a progressive diametrically opposite sequence and torque with a calibrated torque wrench. All clamping torque shall be applied to the nuts only.
- C. Where couplings are installed on buried metallic pipe, provide bond wires across the coupling and bond the follower ring to the pipe per Section 16640.
- D. If couplings leak under pressure testing, loosen or remove the nuts and sleeve bolts, reset or replace the gaskets, reinstall or retighten the bolts and nuts, and retest the coupling. Couplings shall be watertight.
- E. After testing, wrap sleeve bolts and nuts of buried couplings with wax tape coating per Section 09868.

**3.02 INSTALLING FLANGED JOINTS**

- A. Clean bolts, nuts, and flange faces by wire brushing before installing flanged coupling adapters. Inspect gasket seating surfaces, gasket, each stud or bolt, nut, and washer. Replace any damaged item. Coat bolt shafts with waterproof gear grease or primer for wax tape coating prior to insertion in flange bolt holes. Do not apply grease or primer to threads. Lubricate threads of bolts and nuts with oil or graphite prior to installation. Assemble all bolts and nuts in the flange, and then uniformly tighten bolts and nuts in a progressive diametrically opposite sequence and torque with a calibrated torque wrench. All clamping torque shall be applied to the nuts only.
- B. If flanges leak under pressure testing, loosen or remove the nuts and bolts, reset or replace the gasket, reinstall or retighten the bolts and nuts, and retest the joints. Joints shall be watertight. Replace galled, cracked, or disturbed bolts and nuts.
- C. After testing, coat exposed surfaces of bolts and nuts to be buried with waterproof gear grease or primer for wax tape coating per Section 09868.

**3.03 INSTALLING POLYETHYLENE ENCASEMENT**

- A. Wrap buried couplings and adapters with polyethylene material per Section 09867.

**3.04 PAINTING AND COATING**

- A. Coat flexible pipe couplings, transition couplings, flanged coupling adapters and joint harnesses located above-ground, in vaults or in structures per Section 09900. The color of the finish coat shall match that of the adjacent piping.

**3.05 PRESSURE TESTING**

- A. Test couplings and adapters at the same time that the connecting pipelines are pressure tested. See Section 15042 for pressure testing requirements. Repair leaks in piping and retest.

**3.06 DISINFECTION**

- A. See Section 15041 Disinfection of Piping.

**END OF SECTION**

**SECTION 15130****AIR RELEASE AND VACUUM VALVES****PART 1 - GENERAL****1.01 DESCRIPTION**

The work of this section includes providing air release and vacuum valves as indicated, complete and operable, including accessories and drain connections in accordance with the District Standard Drawings.

**1.02 QUALITY ASSURANCE**

- A. Valves shall be provided at the locations and shall be of the sizes shown. The valves shall be designed for the operating and testing pressure of the associated pipeline as specified.

**1.03 REFERENCES**

- A. This section references the following documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

ASTM A536                      Standard Specifications for Ductile Iron Castings

AWWA C512                      Air Release, Air/Vacuum, and Combination Air Valves for  
Waterworks Service

**1.04 SUBMITTALS**

The following shall be submitted in accordance with Section 01300.

- A. Manufacturer's catalog data including detailed drawings showing dimensions, materials, size, and weight.
- B. Manufacturer's installation, operation and maintenance instructions.
- C. Manufacturer's certification that products comply with the indicated requirements.

**PART 2 - PRODUCTS****2.01 GENERAL**

- A. Combination air/vacuum assemblies shall be furnished and installed by the Contractor at the locations shown on the Plans, or as required by the District.
- B. The tap of an air and vacuum valve assembly shall be no closer than 18-inches to the valve, coupling, joint or fitting.

- C. Air and vacuum relief valves shall be hydrostatically tested in conjunction with the connecting pipelines.

## **2.02 AIR AND VACUUM VALVES**

- A. Air and vacuum valves shall be capable of venting sufficient quantities of air, as determined by the manufacturer's approved sizing methods, while pipelines are being filled and allowing air to re-enter while pipelines are being drained.
- B. Air and vacuum valves shall be of the size indicated with flanged or screwed ends to match the piping.
- C. Screws and bolts shall be Type 316 stainless steel.
- D. Valves shall be rated for the maximum operating pressure of the pipeline on which they are installed.

## **2.03 AIR RELEASE VALVES**

- A. Air release valves shall vent accumulating air while system is in service and under pressure and be of the size indicated and shall meet the same general requirements as specified for air and vacuum valves except that the vacuum feature will not be required.

## **2.04 COMBINATION AIR VALVES**

- A. Combination air valves shall combine the characteristics of air and vacuum valves and air release valves by exhausting accumulated air in systems under pressure and releasing or re-admitting sufficient quantities of air, as determined by the manufacturer's approved sizing methods, while the system is being filled or drained, respectively.
- B. Combination air valves shall have the same general requirements as specified for air and vacuum valves.

## **2.05 MANUFACTURERS**

- A. Air release and vacuum valves shall be manufactured per Approved Materials List or approved equal.

## **2.06 AIR VALVE ENCLOSURES**

- A. Air valve closures shall be of polyethylene construction with UV stabilizers.
- B. The cover shall lock to the base with an integral latch and padlock. The base shall be designed to anchor to a concrete pad. All hardware shall be stainless steel.
- C. Color: submittal required.
- D. Manufacturer: Approved Materials List or approved equal.

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION**

- A. All valves shall be installed in accordance with the manufacturer's printed recommendations and District Standards.
- B. Air release and vacuum valves shall be installed at high points in piping systems and where indicated.
- C. Combination air/vacuum assemblies shall be installed on a section of pipe no closer than 18-inches to a bell, coupling, joint or fitting.
- D. Valves shall be installed with a sanitary vent screen on the exhaust port unless otherwise specified by the District.
- E. Valve assemblies shall have an isolation valve to permit future maintenance. Isolation valves installed above ground will have the capability to be locked out. Isolation valves installed below ground will be required to have a debris cap with a locking device.
- F. Gate well assemblies shall be field coated with safety yellow paint according to District Standards.

**END OF SECTION**

**SECTION 16640****CORROSION CONTROL FOR BURIED PIPE****PART 1 - GENERAL****1.01 DESCRIPTION**

- A. This section addresses the materials, installation and testing for basic corrosion control and monitoring facilities on buried metallic piping. Materials include herein are: test and bond stations, simple sacrificial anode installations, wire and cable, alumino-thermic welds, insulating flange kits, supplemental linings at insulators and marker posts.

**1.02 RELATED SECTIONS**

The Work of the following Sections also apply to the Work of this Section. Other Sections, not referenced below, shall also apply to the extent required for proper performance of this Work.

- A. Section 01300 – Record Drawings and Submittals
- B. Section 02223 – Trenching, Backfilling and Compaction
- C. Section 09868 – Cold Applied Wax Tape Coating
- D. Section 09900 – Painting and Coating

**1.03 CONTRACTOR SUBMITTALS**

- A. Submit shop drawings in accordance with Section 01300.
- B. Submit manufacturer's catalog data and descriptive literature for all material items listed below and included in the project. Show dimensions and materials of construction by specification reference and grade where applicable.

**PART 2 - MATERIALS****2.01 TEST STATIONS**

- A. Post Mounted Test Boxes:
  - 1. Enclosure: Post-mounted enclosures shall be constructed of one piece molded fiberglass and conform to NEMA 4X. The fiberglass-reinforced resins shall be chemically resistant to a wide range of corrosive atmospheres. It shall have a hinged cover with quick-release lockable latches and a seamless foam gasket. All hardware shall be stainless steel. Hinges shall be corrosion resistance polyester or stainless steel piano hinge. Size as follows unless noted otherwise on the Drawings:

No. of Wires	Size (inside)	Acceptable Product
2 or 3 wires	5.5x4.0x5.0"	Hoffman A-645JFGQRR
4 or 5 wires	7.5x6.0x5.28"	Hoffman A-865JFGQRR

2. Panel: The mounting panel shall be fiberglass, micarta or laminated phenolic sheet cross-laminated for resistance to warpage and weathering. Minimum panel thickness shall be 3/16-inch. Panel shall be mounted off of the back of the enclosure to allow sufficient access to make up wire terminals.
3. Components: All terminal lugs shall be solid brass. Provide a properly sized terminal lug for all wires. See detail drawings for wiring configuration and wire labels.
4. Post: Post shall be seasoned, construction heart garden grade redwood, 4 inches by 4 inches by 5 feet long, and surfaced on four sides. Cut a 3/4-inch chamfer in all 4 top edges and paint per Section 09900 using System No. 60. Color shall be white and green or as approved by the Owner.
5. Conduit: 2-inch diameter galvanized rigid steel conduit per UL 6 approximately 4-feet long with long radius sweeps. Fittings shall be galvanized rigid steel per UL 514.
6. Brass Tags: Wire identification tags shall be 1-1/2 inch diameter, 18 Ga. brass discs with a 3/16-inch diameter hole and die stamped with 1/4-inch characters. Tags shall be attached to test wires with un-insulated AWG No. 14 solid copper wire. Tag legend shall be as indicated in the drawings or as directed by the Owner.
7. Concrete Pad: ASTM C-94 ready mix concrete.

**2.02 PREPACKAGED MAGNESIUM ANODES**

- A. Magnesium Anode (High Potential): anodes shall be high potential prepackaged magnesium alloy ingot of the following chemical composition:

Aluminum	0.010%
Manganese	0.50 to 1.30%
Copper	0.02% MAX
Nickel	0.001% MAX
Iron	0.03% MAX
Other	0.05% Each or 0.3% MAX Total
Magnesium	Remainder

- B. Anode Weight: the ingot weight of prepackaged magnesium anodes shall be 48 pounds. The anode ingot shall have a trapezoidal cross section and be approximately 32 inches long. Other anode ingot weights (with different cross sections and dimensions) may be specified on the Drawings or may be approved by the Owner.
- C. Anode Backfill: Each magnesium anode shall be prepackaged in a permeable cloth bag with a backfill of the following composition:

Gypsum	75%
Powdered Bentonite	20%

Anhydrous Sodium Sulfate      5%

- D. Backfill grains shall be capable of 100 percent passing through a 100-mesh screen. The backfill shall be firmly packed around the anode by mechanical vibration to a density, which will maintain the magnesium ingot in the center of the cloth bag and surrounded by at least one inch of backfill.
- E. Prepackage Weight: The total packaged weight of 48-pound (ingot weight) magnesium anodes and backfill shall be approximately 105 pounds. The cloth bag diameter is 8 inches. The packaged weight and diameter of other anode sizes shall be as indicated on the Drawings or as approved by the Owner.
- F. Anode Lead Wire: Anode lead wire shall be AWG No. 12 stranded copper wire with THWN insulation conforming to UL Standard 83. Wire shall be connected to the strap core with silver solder. The connection shall be mechanically secured before soldering and shall have at least one and one-half turns of wire at the connection. The connection shall then be insulated by filling the remainder of the recess with electrical potting compound. Anode lead wire shall be of sufficient length to extend from the anode to the designated termination point without a splice. Wires with cut or damaged insulation will not be accepted and replacement of the entire lead will be required at the Contractor's expense.

### **2.03 SHUNTS**

- A. Shunts used in the anode test boxes shall be 0.01 ohms - resistance and rated at 6 amperes capacity and accurate to plus or minus 1 percent. Use Holloway Type RS shunt unless otherwise specified.

### **2.04 WIRE AND CABLE**

- A. General: All DC wires shall be stranded copper with high molecular weight polyethylene (HMWPE) or thermal plastic (THWN) insulation suitable for direct burial in corrosive soil and water conforming to UL 83 and ASTM Standards B3 or B8. HMWPE insulation shall conform to the requirements of ASTM D1248 Type 1, Class C. THWN insulation shall conform to the requirements of ASTM D2220. Wires with cut or damaged insulation will not be accepted and replacement of the entire length of wire will be required at the Contractor's expense.
- B. Test Leads: Unless otherwise indicated, test wires shall be AWG No. 8 HMWPE wire. THWN wire shall be used only where specifically called out. Each test lead shall be of sufficient length to extend from the attachment to the pipe or structure to the test box without a splice.
- C. Bond Wires: Bond wires shall be AWG No. 2, No. 4, or No. 6 HMWPE depending on the pipe diameter and as indicated on the Drawings or directed by the Owner. Bond wires shall be as short as possible.

### **2.05 LEAD WIRE CONNECTORS**

- A. Terminal Lugs: Terminal lugs shall be solderless, UL 486 copper or brass and sized to accommodate the wire.



- B. Split-bolt Connectors: Split bolt connectors shall be UL 486 copper or brass and sized to accommodate the lead wire and shunt being used.

## **2.06 INSULATING FLANGE KITS**

- A. General: Insulating flange kits shall consist of Type E, full-face gaskets, insulating sleeves and double washers (steel and dielectric) on each end. All insulating material shall be of the type designated by the manufacturer as suitable for the operating temperature and pressure of the service. If the insulating flange kit is not compatible with planned tapping valve, an additional flanged spool or a prefabricated insulating joint will be required.
- B. Gaskets: Insulating gaskets shall be dielectric neoprene-faced phenolic.
- C. Sleeves: Use 1/32-inch thick G10 epoxy glass tube material as per NEMA LI-1. Sleeves shall be full-length except for installation on threaded studs where half-length sleeves are required. For installation on threaded bolts, i.e., at butterfly valve flange bonnets and bases, the sleeves shall be half-length.
- D. Washers: Insulating washers shall be 1/8-inch thick G10 epoxy glass sheet material.
- E. Steel Washers: Steel washers shall be 1/8-inch thick cadmium plated or zinc plated carbon steel.

## **2.07 WAX TAPE WRAP**

- A. Surfaces Requiring Wax Tape: All buried piping system surfaces not coated with the primary pipe coating such as flanges, valves, couplings, insulating flanges, adapters, uncoated pipe spools or specialty fittings.
- B. Material and Application Standard: Petrolatum wax tape coating system per Section 09868.

## **2.08 ALUMINO-THERMIC WELD KITS AND WELD COATING**

- A. Weld Kits: Wire-to-pipe connections shall be made by the alumino-thermic welding process. Weld charges and mold size shall be as specified by the manufacturer for various pipe sizes and surface configurations. Weld charges for use on cast and ductile iron are different from those used on steel. Care should be taken during installation to be sure correct charges are used. Welding charges and molds shall be the product of a manufacturer regularly engaged in the production of such materials. Weld charges for steel pipelines have green caps. Weld charges for cast or ductile iron have orange caps.
- B. Weld Cap Primer: Weld cap primer shall be an elastomer-resin based corrosion resistant primer for underground services such as Royston Roybond Primer 747 or Owner approved equal.
- C. Weld Caps: Alumino-thermic welds shall be sealed with a pre-fabricated plastic cap filled with formable mastic compound on a base of elastomeric tape. Weld caps shall be Royston Handy Cap 2 or Owner approved.
- D. Weld Cap Overcoating: Weld caps and the surrounding area shall be overcoated with a cold-applied, black, thixotropic material containing plasticized coal tar pitch, solvents, and

special fillers per MIL-C-18480A such as Protecto Wrap 160/160H, Carboline 330M, Tape-Coat TC Mastic or 3M Scotch Clad 244. Apply to at least 20 mils thickness.

## **2.09 PLASTIC WARNING TAPE**

- A. Plastic warning tape shall be run in the wire trench at a depth of 12-inches and above each buried wire. The warning tape shall be 3 inches wide and shall have a printed warning - "Caution - Cathodic Protection Cable Buried Below" or similar.

## **2.10 MORTAR**

- A. Mortar used to repair concrete coated pipe after attachment of bond or pipe test lead wires shall be the fast drying, non-shrink type.

## **PART 3 - EXECUTION**

### **3.01 GENERAL**

- A. Except as directed differently below, the installation of corrosion control and monitoring facilities shall conform to NACE Publication RP0169 - Recommended Practice, Control of External Corrosion on Underground and Submerged Metallic Piping Systems and NACE RP0286 Electrical Isolation of Cathodically Protected Pipelines.

### **3.02 TEST BOXES**

- A. Post Mounted Test Boxes:
  1. Location: locate redwood post directly above the pipeline, if possible, but not in a roadway or in a location that clearly obstructs existing access or is particularly susceptible to damage. The Owner shall approve test station locations.
  2. Post: Use white paint for the finish coats and green paint for the top 4 inches of the chamfered end. Excavate a 16-inch diameter by 2-foot deep hole. Center the post and test box in the hole and fill the hole with concrete. The concrete shall be Class C in accordance to the "Greenbook" Section 201.
  3. Test box and Conduit: Connect 2-inch galvanized conduit to the anode test box with a threaded flange and collar connection. Attach test box to the redwood post using mounting brackets and threaded fasteners or wood screws through the back of the test box. Attach conduit to the post with conduit clamps and wood screws if necessary. Insert all test leads in the galvanized conduit and run into test box prior to setting the post in concrete.
  4. Wire Identification: Brass identification tags shall be securely attached to each of the wires in the test box. Tags shall be stamped with the size-material-service of the pipe to which the test leads are attached. For example 18"-STL-PW. Brass tags on wires in insulating flange test boxes shall be stamped with the additional identification of "N", "S", "E", or "W" for North, South, East or West to indicate on which side of the insulating flange the wires are attached. Attach tags with bare No. 14 copper wire.

5. Concrete Footing: Footing shall be 16-inch diameter by 24-inches deep. Dome concrete slightly to prevent ponding water next to wood post.

### 3.03 INSTALLING MAGNESIUM ANODES

- A. General: Anodes shall be installed at locations as shown on the Drawings or as directed by the Owner. Care shall be taken to ensure that the cloth bag is not damaged and no backfill material lost during installation. Each magnesium anode shall be centered in the cloth bag. It may be necessary to re-center the anode in the cloth bag by rolling it on the ground prior to installation. Each magnesium anode shall be lowered into the hole using a sling or rope and placed vertically at the bottom of the hole. Do not lower, transport, handle or lift the anode by the lead wire.
- B. Primary Excavation Method: Prepackaged magnesium anodes shall be installed in a vertical augured hole of 12-inches in diameter. The depth of the hole shall be 12 feet as measured from the finish surface to the bottom of the anode unless otherwise specified.
- C. Alternate Excavation Method: If the 12-foot depth cannot be obtained or if vertical auguring cannot be accomplished due to hard rock, the Owner's representative shall be notified for possible adjustment to the designed depth, position, and orientation of the anodes. Backhoe excavations must be approved by the Owner.
- D. Relative Position: Anode beds shall be offset from steel or ductile iron pipe a minimum of 10 feet unless otherwise indicated on corrosion protection detail drawings or approved by the Owner. At no time shall an anode be installed outside of the pipeline right-of-way or Owner's easement.
- E. Anode Soaking (Augured Holes): Once the prepackaged anode is in the hole, water shall be poured into the hole so that the anode is completely covered with water. Allow to soak for at least 15 minutes. Stone-free native soil shall then be used to backfill the anode hole. Do not use imported sand for backfilling. The anode hole shall be backfilled in stages and carefully tamped to ensure that no voids exist around the bag and that the bag and anode lead wire is not damaged. After backfill is level with the top of the anode, a minimum of 15 gallons of water shall be poured into the hole to completely saturate the soil backfill. More water shall be added if it is suspected that the backfill is not completely saturated. Care must be taken to avoid damage to the anode and anode lead wire.
- F. Anode Soaking (Backhoe Installations): Prepackaged must be pre-soaked in water for at least 15 minutes before installing in the trench. After covering the anode with native, rock-free soil (approximately 3 inches over the anode) the anode and initial backfill shall be further soaked with 15 to 20 gallons of water and allowed to soak for 15 minutes. The remainder of the trench is backfilled with native soil.
- G. Lead Wire: Anode lead wire shall be long enough to reach from the anode to the anode test box without a splice. Anode lead wires shall be trenched a minimum of 36-inches deep and terminate individually in the appropriate anode test box. Care shall be taken not to damage the lead wire thought the installation process.
- H. Wire Tags: Anode wires are not tagged.

### 3.04 INSTALLING ANODE LEAD WIRES

- A. Wire Trenching: All buried anode and test wires shall be installed at a minimum depth of 36 inches. The bottom of the finished trench shall be sand or stone-free earth. The first three inches of sand backfill material shall be placed directly on the wires. The remainder of the trench shall be backfilled with stone-free earth. Care shall be taken when installing wire and backfilling trench so that insulation is not broken, cut, nicked, or bruised. If wire insulation is damaged during installation, the wire and anode shall be replaced unless wire splices or insulation repairs are approved by the Owner. Anode replacement shall be at the Contractor's expense. Plastic warning tape shall be installed approximately 12 inches below finished grade.
- B. Wire Splicing and Insulation Repairs: Neither splices nor insulation repairs are allowed unless specifically approved by the Engineer.

### 3.05 WIRE AND CABLE

- A. General: No less than two test wires shall be attached to the pipe at each designated test site. All test wires shall terminate in a test box without a splice. A minimum of 18 inches of slack wire shall be coiled at the wire-to-pipe connection and in at-grade test boxes for each test wire. At post-mounted test stations slack wire shall be provided inside the box to the extent possible and with one 8-inch diameter loop at the below-grade entrance to the conduit.
- B. Connection to Pipe: Connections of copper wire to the pipeline shall be made with alumino-thermic weld charges or by brazing. Welding charges shall be the product of a manufacturer regularly engaged in the manufacture of the material. Manufacturer's recommend cartridge size and type shall be used. Each weld shall be installed, tested and coated as described below.
  - 1. Preparation of Wire: Use a cutter to prevent deforming wire ends. Remove only enough insulation from the wire to allow the weld connection to be made. Do not use a hacksaw for cutting.
  - 2. Preparation of Metal: Remove all coating, dirt, grime and grease from the metal pipe at weld location by wire brushing and/or use of suitable safe solvents. Clean the pipe to a bright, shiny surface free of all serious pits and flaws by use of mechanical grinder or a file. The area of the pipe where the attachment is to be made must be absolutely dry. Failure to provide a dry surface for welding will result in a poor quality weld and could result in serious injury to the workman. Do not cut reinforcing rods when preparing metal surface for wire attachment.
  - 3. Attachment of Wire to Pipe: The attachment of copper wire shall be made using an alumino-thermic weld as shown on the Approved Plans. The wire is to be held at a 30° to 45° angle to the surface when welding. Only one wire shall be attached with each weld.
  - 4. Testing of All Completed Welds: As soon as the weld has cooled, the weldment shall be tested for strength by striking a sharp blow with a two-pound hammer while pulling firmly on the wire. All unsound welds are to be re-welded and re-tested. All weld slag shall be removed from the weldment.

5. Coating of All Completed Welds: Thoroughly clean by wire brushing the area to be coated. The area must be completely dry. Apply the weld cap primer and the weld cap. Overcoat the weld cap with a bituminous mastic coating material in accordance with the manufacturer's recommendations. Completely coat the weld, all bare pipe surfaces around the weld and any exposed copper wire. Allow sufficient time to dry prior to repair of the mortar coating on steel pipe.
  6. Mortar Repair: On mortar coated pipe, the mortar coating shall be repaired after the bituminous weld coating has dried, using fast-setting, non-shrinkable mortar to restore the original outside diameter of the pipe at each weld location.
- C. Wire Trenching and Backfill:
1. Depth: All buried horizontal test lead runs shall be installed at a minimum depth of 36 inches.
  2. Backfill: The bottom 2 inches of the finished trench shall be sand or stone-free earth. The first three inches of the backfill shall be sand or stone-free earth placed directly on the wires. The remainder of the trench shall be backfilled with native earth with a maximum stone size of 2 inches and compacted as specified in Section 02223.
  3. Damaged Wire: Care shall be taken when installing wire and backfilling trench so that insulation is not broken, cut, nicked, or bruised. If wire insulation is damaged during installation, it shall be replaced completely at the Contractor's expense.
  4. Warning Tape: Plastic warning tape shall be installed over all wire runs 12 inches below grade.
- D. Installing Identification Tags
1. Characters: Tags shall be stamped with Owner, size, material and service. For example a 24-inch CML&C steel water line shall be stamped "Owner, 24"CML&C, W". An 8-inch ductile iron reclaimed water line would be tagged "Owner, 8"DIP, RW". Anode lead wires are not tagged. Tags on wires on insulating flanges shall be stamped with "N, E, S or W" indicating which side of the insulating joint to which the wires are attached. The character size shall be 1/4-inch high.
  2. Attachment to Wire: Identification tags shall be securely attached to each test wire in the test box with a bare No. 14 copper wire. Do not use plastic or nylon ties.
- E. Wire Splices or Repairs
1. Approval: No wire splices or insulation repairs shall be made unless approved by the Engineer.
  2. Splices: The minimum amount of insulation shall be removed from each wire end. Brass crimp or split-bolt connectors shall be used. The splice shall be encased in a plastic mold filled with insulating resin such as 3M Scotchcast splice kits.
  3. Insulating Repairs: Depending on the severity of the insulation damage, repairs shall be made with electrical tape or with a splice kit as determined by the Engineer.

4. Inspection: All splices and insulation repairs shall be inspected by the Engineer before they are buried.

### **3.06 CONTINUITY BONDING:**

- A. General: All joints on buried metallic pipe shall be metallicity continuous by welding or bonding. Joints to be bonded include all unwelded pipe joints and mechanical joints including flanges (except insulating flanges), valves, couplings, adapters and special fittings. All bonding shall be done with single conductor, stranded copper jumper wires with HMWPE insulation. Bond wires shall be as short as possible with only minimal slack. All pipe reaches with one or more unwelded joints (or one or more bonds) will be tested for continuity.
- B. Pipe Joints: At least two wires are required for each steel or ductile iron pipe bond. Two wires shall be installed unless otherwise specified. Three wires may be required at valves, couplings, special fittings and across unwelded joints on pipe larger than 24-inches. Bond wire sizes may be No. 2, 4 or 6. Use No. 4 bond wires unless indicated otherwise in the Approved Plans.
- C. Mechanical Joints and Fittings: All flanges and in-line fittings (valves, couplings, etc.) shall be completely bridged by at least two bond wires. Three wires may be required on fittings larger than 24-inches. One additional No. 6 HMWPE wire is required from the pipe (on either side) to the fitting. Bond wire sizes may be No. 2, 4 or 6. Use No. 4 bond wires unless indicated otherwise on the Drawings.
- D. Wire Attachment Method: Bond wire attachment, testing and subsequent coating of the welds shall be as specified in paragraph 3.5, B.
- E. Wire Attachment Location: Bond wires can either be attached to the pipe or pipe cylinder directly or to the outside edges of flanges that are welded to the pipe. Bond wires shall not be attached to valve bodies, but instead to the flange of the valve.

### **3.07 INSULATING FLANGE KITS**

- A. Flange Kits: Insulating kits shall be installed as shown on the Drawings and as recommended by the manufacturer. Moisture, soil, or other foreign matter must be carefully prevented from contacting any portion of the mating surfaces prior to installing insulator gasket. If moisture, soil, or other foreign matter contacts any portion of these surfaces, the entire joint shall be disassembled, cleaned with a suitable solvent and dried prior to reassembly.
- B. Spool Assembly: All direct buried insulating kits, greater than 20-inches in diameter, shall be pre-installed and tested on the pipe spool prior to installing the spool in the ditch. If possible, all smaller size direct buried insulating kits shall be similarly pre-installed and tested.
- C. Handling of Gasket: Care shall be taken to prevent any excessive bending or flexing of the gasket. Creased or damaged gaskets shall be rejected and removed from the job site.
- D. Alignment: Alignment pins shall be used to properly align the flange and gasket.

- E. Bolt Tightening: The manufacturer's recommended bolt-tightening sequence shall be followed. Bolt insulating sleeves shall be centered within the insulation washers so that the insulating sleeve is not compressed and damaged.
- F. Testing: All insulating flanges must be tested by a qualified Corrosion Technician or Engineer and accepted by the Owner. All buried insulating flanges must be tested prior to wax tape wrap coating and backfilling. The assembled flange shall be tested as described below.
- G. Wax Tape Coating: After testing and the Engineer's acceptance, the insulating flange shall be fully wrapped with petrolatum wax tape, including individual wrapping of all bolts, nuts, and washers, and irregular surfaces, per Section 09868.

## **PART 4 - SYSTEM TESTING**

### **4.01 TEST LEADS AND BOND WIRES**

- A. Responsibility: The Contractor shall be responsible for testing all test leads and bond wire welds.
- B. Test Method: All completed wire connection welds shall be tested for strength by striking the weld with a sharp blow with a 2-pound hammer while pulling firmly on the wire. Welds failing this test shall be re-welded and re-tested. Wire welds shall be spot tested by the Engineer. After backfilling pipe, all test lead pairs shall be tested using a standard ohmmeter or resistance meter for broken welds. Bond wires shall be tested through continuity testing described below.
- C. Acceptance: The resistance between each pair of test leads shall not exceed 150% of the total wire resistance as determined from calculations based on published wire resistance data and an estimate of test wire length.

### **4.02 ANODE INSTALLATIONS**

- A. Responsibility: The Contractor must provide the proper rated potential anode, sufficient anode lead wire length and the proper anode hole depth. The Owner shall test each installed anode for wire connection integrity and for open-circuit potential.
- B. Notification: The Contractor shall notify the Owner at least 5 days in advance of the start and completion of the anode installations, including anodes and test stations.
- C. Cathodic Protection Performance Test Method: The performance of the cathodic protection system shall be tested by the Engineer. The testing shall include: measurement of all open-circuit anode potentials; pipe-to-soil potentials at each test station and other locations as necessary before the anodes are connected; initial anode currents after connecting anode leads to the pipe leads; and the pipe-to-soil potential at each previously tested site with all anodes connected. Pre- and post cathodic protection potentials at midpoints between anode beds are required as necessary to verify that the pipeline is fully protected. Adequate protection shall be as defined in NACE RP0169.

- D. Field Report: All system deficiencies shall be listed and described in one or more field test reports and presented to the Contractor for repairs.
- E. Acceptance: The system will be accepted if all anodes, test stations, and supporting facilities are installed properly. Cathodic protection performance, with the exception of materials and installation deficiencies, is not the Contractor's responsibility.

#### 4.03 WIRE TRENCHING

- A. Responsibility: The Engineer, at his or her discretion, shall inspect wire trenches and backfill material and methods.
- B. Test Method: The depth, trench bottom padding and backfill material shall be visually inspected prior to backfilling.
- C. Acceptance: Conformance with project specifications.

#### 4.04 INSULATOR TESTING

- A. Responsibility: Insulating flanges shall be inspected and tested by the Owner Corrosion Engineer or Corrosion Technician. Buried insulators must be tested and approved prior to application of wax tape and backfilling. Large diameter insulators shall be tested on the spool prior to installation in the ditch.
- B. Test Method: The assembled flange shall be tested with an insulator testing device (i.e., Gas Electronics Model 601 Insulation Checker) specifically designed for this purpose. Additionally, the pipe-to-soil potential, using a high impedance voltmeter and suitable reference cell, shall be measured on each side of the insulator after installation in the trench but before backfilling. Potential testing can only be done on piping that has been installed in the ditch.
- C. Acceptance: The installation shall be considered complete when the insulator testing device indicates that no shorts or partial shorts are present and when the potential tests indicate greater than 20-millivolt pipe-to-soil potential difference across the flange. (Note that this test may not be valid if the pipe on each side of the insulator is in contact through interconnection piping or through contacts to the electrical grounding system.) If shorts are detected the Contractor shall assist the Owner in finding partial shorts or shorted bolts. All disassembly and re-assembly necessary to gain the acceptance of the Owner shall be done at the Contractor's expense.

#### 4.05 PIPELINE CONTINUITY

- A. Responsibility: The Owner's Corrosion Engineer shall test the continuity of all sections of buried pipe that contain non-welded pipe joints or mechanical joints or fittings. All such joints are required to be bonded per this Section.
- B. Test Method: Resistance shall be measured by the linear resistance method. A direct current shall be impressed from one end of the test section to the other (test station to test station) using DC power supply (battery). A voltage drop is measured for several current levels. The resistance (R) is calculated using the equation  $R = dV/I$ , where dV is the



voltage drop and  $I$  is the current. The resistance shall be calculated for three or four different current levels.

- C. Acceptance: Acceptance is reasonable comparison of the measured resistance with the calculated or theoretical resistance. The measured resistance shall not exceed the theoretical resistance by more than 130 percent. The Contractor shall submit calculations of the theoretical resistance and the measured resistance for each section of pipe tested.
- D. Deficiencies: If discontinuity or high resistance is found between sections of pipe tested, it is the Contractor's responsibility to locate, excavate, and repair all bonds that are found to be discontinuous. Continuity tests shall be repeated after repairs are made.
- E. Discontinuities may be difficult and expensive to locate and may require several excavations to expose pipe joints and attach temporary test leads for progressive continuity testing. Accordingly, the Contractor shall exercise due care in installing continuity bonds and should schedule continuity testing as early as possible so that discontinuity location and repairs, if necessary, do not conflict with surface improvements.

#### **4.06 TEST STATIONS**

- A. Responsibility: The District's Representative will inspect all test station installations for compliance with this specification. The Contractor's Subcontractor installing the test stations will test all wires for continuity and proper connection, to be witnessed by a District Representative.
- B. Test Method: Test stations will be visually inspected. Wire continuity will be tested by potential and resistance measurements.
- C. Acceptance: Installation in accordance with this specification and good workmanship and verification that all wires are properly connected.

#### **4.07 COATING AND SUPPLEMENTARY LINING**

- A. Responsibility: The Engineer shall inspect all completed wax tape wrapping and supplementary linings at insulators for compliance with these specifications prior to backfilling.
- B. Test Method: Inspection shall be visual.
- C. Wax Tape Acceptance: Wax tape applications shall be accepted if: the application conforms with this specification; there are no voids or gaps under the wax tape; stud-ends, nuts, couplings rods and all irregular surfaces are individually wrapped such that there is complete coverage with the petrolatum material; the outer wrap is complete and tightly adhering to the wax tape; and the application is done in a good workman-like manner.
- D. Supplementary Lining Acceptance: Internal supplementary linings must cover the specified length of pipe and must be well bonded to the substrate and free of voids or damage.

**4.08 DEFICIENCIES**

- A. Deficiencies: Any deficiencies or omissions in materials or workmanship found by these tests shall be rectified by the Contractor at his expense. Deficiencies shall include but are not limited to: broken or missing test leads; improper or unclean wire trench backfill; inadequate pipeline continuity; shorted or partially shorted insulators; lack of 18-inch slack wire in at-grade test boxes; improperly mounted or located test boxes; improper wire identification; poorly applied wax tape or supplementary lining; and other deficiencies associated with the workmanship, installation and non-functioning equipment.

**END OF SECTION**