



**CITY OF SOUTH GATE**

**STANDARD SPECIFICATIONS  
FOR**

**WATER AND SEWER SYSTEMS**

**2021 EDITION**



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**Public Works Department**

# TECHNICAL SPECIFICATIONS

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## **SECTION 01000: SUMMARY OF WORK**

### **PART 1 - GENERAL**

#### **1.1 SECTION INCLUDES**

This Section describes the Project and the Work to be performed hereunder. Detailed requirements and extent of Work are stated in applicable Specification Sections and shown on the Drawings.

#### **1.2 ORGANIZATION AND INTERPRETATION OF CONTRACT DOCUMENTS**

- A. Specifications and Drawings included in the Contract Documents establish the performance, quality, location and general arrangement of materials and equipment, and establish the minimum standards of quality workmanship and appearance.
- B. Specification Sections have not been divided into groups of work for subcontractors or various trades. If there are questions concerning the applicability or interpretation of a particular Section or part of a Section or Drawing, direct questions to the Engineer.
- C. Piping Work shown on the Drawings is intended to be depictive and may not be an exact and complete representation of the actual finished Work. Include fittings, joints, supports, nuts, bolts, and other accessories required to provide complete and satisfactory piping systems, as specified, even though some items may not be specifically shown on the Drawings.
- D. A part of the Work that is necessary or required to make each installation satisfactory and operable for its intended purpose, even though it is not specifically included in the Specifications or on the Drawings, shall be performed as incidental work as if it were described in the Specifications and shown on the Drawings.

#### **1.3 SERVICES TO BE PROVIDED BY CONTRACTOR**

- A. Contractor shall provide services to assist Owner in natural or manmade emergency situations when Owner has an insufficient number of personnel and/or insufficient materials and/or equipment required to take action necessary on an expedited basis to prevent a system outage, to expeditiously restore service to normal operating conditions or to maintain service during such emergencies. Contractor shall provide personnel, materials, tools, and equipment to assist Owner during such emergencies.
- B. Contractor shall, within ten (10) days after execution of a Contract, designate an authorized representative and one alternate who shall have authority to act on behalf of Contractor. Contractor shall, within ten (10)

days after execution of a Contract, give to Owner an emergency contact list containing name, job title, and emergency telephone number.

#### **1.4 DESCRIPTION OF WORK**

The Work described in this Section is for projects anticipated in the future. The Contractor is cautioned that the Work will be assigned on an as-needed basis and there is no guarantee that any Work will be assigned during the term of the Contract.

- A. Ductile-iron pipe water mains, including tie-in connections to existing pipelines, valves, fittings, and installation, surface restoration, chlorination and testing.
- B. VCP sewer mains, including tie-in connections to existing pipelines, service laterals, manholes, fittings, and installation, surface restoration and testing.
- C. Miscellaneous work including rehabilitation of sewer mains using cured-in-place pipe, pot holing, dewatering, and excavating and hauling contaminated soil.

#### **1.5 RESPONSIBILITIES OF OWNER**

- A. Documents. Owner will, on request, provide to Contractor copies of existing drawings, maps, and other existing information relevant to the services to be performed if same is readily available to Owner.
- B. Research of Owner Records. Owner will assist Contractor in researching Owner's record data pertaining to Owner's facilities.
- C. Review of Contractor's Work Product. Owner will review the services provided by Contractor and comment, as appropriate.

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

(Not Used)

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

(Not Used)

#### **PART 4 - PAYMENT**

(Not Used)

**END OF SECTION**

## **SECTION 01001: GENERAL REQUIREMENTS**

### **PART 1 - GENERAL**

#### **1.1 DESCRIPTION**

This Section contains general requirements and information for all aspects of the Work.

#### **1.2 REQUIREMENTS**

- A. From time to time, Owner requires the services of private contractors to provide as-needed or emergency repairs to its water and sewer systems.
- B. Owner desires to have contractors available to provide personnel, materials, tools, and equipment to assist Owner during such emergencies.
- C. Contractor's construction yard where the construction equipment is mobilized must be within a 40-mile radius from the City of South Gate Yard Located at 4244 Santa Ana Street, South Gate, California 90280.

#### **1.3 RELATED WORK DESCRIBED ELSEWHERE**

Refer to the following Specification Section(s) for additional requirements:

Submittals: Section 01300

#### **1.4 SUBMITTALS**

Submit Shop Drawings in accordance with Section 01300: Submittals, at Contractor's sole expense.

#### **1.5 REVIEW OF CONTRACT DOCUMENTS, DRAWINGS AND SPECIFICATIONS BY CONTRACTOR**

Carefully study and compare the Contract Documents and at once report to the Owner errors, inconsistencies or omissions discovered within one business day of discovery. The Owner shall not be liable to the Contractor for damage or delays resulting from errors, inconsistencies or omissions in the Contract Documents which should have been recognized by the Contractor and disclosed to the Owner. If the Contractor performs any construction activity knowing it involves a recognized error, inconsistency or omission in the Contract Documents without such notice to the Owner, the Contractor shall assume responsibility for such performance and pay the costs for corrections at Contractor's sole expense.

Take field measurements and verify field conditions and carefully compare such field measurements and conditions and other information known to the Contractor with the Contract Documents before commencing activities. Report errors, inconsistencies or omissions discovered to the Owner at once.

Inspect portions of Work, if any, already performed under this Contract to determine that such portions are in a proper condition to receive subsequent Work.

## **1.6 LOCAL CONDITIONS**

By submitting a bid, Contractor represents that it has carefully examined the Contract Documents and the site where the Work is to be performed and that it has familiarized itself with all local conditions and Federal, State and local laws, ordinances, rules, and regulations that may affect in any manner the performance of the Work, and further represents that it has studied all surveys and soils investigation reports about subsurface and latent physical conditions pertaining to the site, that it has performed such additional surveys and investigations as deemed necessary to complete the Work, and that it has correlated the results of all such data with the requirements of the Contract Documents. The submittal of a bid shall be conclusive evidence that the Contractor has investigated and is satisfied as to the conditions to be encountered, including locality, uncertainty of weather and all other contingencies, and as to the character, quality, quantities, and scope of the Work.

The Drawings for the Work show subsurface conditions or otherwise hidden conditions as they are supposed or believed by the Engineer to exist; but it is not intended or to be inferred that the conditions as shown thereon constitute a representation that such conditions are actually existent. Except as otherwise specifically provided in the Contract Documents, the Owner, the Engineer, and their consultants shall not be liable for any loss sustained by the Contractor as a result of any variance of such conditions as shown on the Drawings and the actual conditions revealed during the progress of the Work or otherwise.

## **1.7 INTERPRETATION OF PLANS**

The Contract Documents shall be interpreted as follows:

- A. Discrepancies between Drawings and the figures written thereon shall be resolved by taking the figures as correct.
- B. Figured dimensions shall govern over scaled dimensions.
- C. Full scale Drawings shall govern over reduced size Drawings.

- D. Where a dimension necessary for the prosecution of the Work can only be obtained by means of a scaled dimension, Contractor shall request a determination from the Owner's Representative.

## **1.8 REQUEST FOR WORK**

When an emergency exists and Work is needed, OWNER will contact via telephone the Contractor who ranks first on the on-call rotational list. On receipt of telephone call from the OWNER, promptly determine and notify OWNER within one hour whether Contractor is willing to accept the offer and able to provide the Work relating to the emergency. Once the offer is accepted by the Contractor, immediately mobilize all equipment and, within 30 minutes after acceptance, commence Work and diligently perform the Work, and continue to furnish all tools, equipment, apparatus, facilities, labor, services and transportation necessary to complete the Work.

## **1.9 ASSIGNMENT OF WORK**

When a Contractor indicates availability for Work and acceptance of an emergency repair project, a written Construction Order will be issued by the Owner which constitutes Notice to Proceed. Contractors will be notified and offered emergency projects in sequence as they appear on the on-call rotational list. Once a Contractor is offered a project, the Contractor's name will be moved to the end of the list. Although a Contractor may elect to refuse a job when offered and be moved to the end of the rotating list, refusal or inability to perform in three successive jobs will be cause for removal from the list.

At the discretion of the Owner, if the Contractor is unable to mobilize within 30 minutes after acceptance of Work, the Contractor will be moved to the end of the rotating list and the next Contractor on the rotating list may be notified and offered the project.

If the cost of performing emergency on-call Work cannot be agreed upon on a lump sum price prior to commencement of the Work, the Engineer may direct in writing that the Work be done on a Time and Material (T&M) basis or, at the discretion of the Engineer, the next Contractor on the rotating list may be notified and offered the project.

## **1.10 CESSATION OF WORK**

Owner may, at any time, declare that there is no further need for Contractor's Work in connection with a particular emergency, in which event Contractor shall cease Work promptly on notification to do so, but in no event later than twenty four (24) hours after notification. Contractor shall, on notification from Owner, take all actions to secure the Work prior to terminating the Work. Any cessation of Work ordered by Owner shall not terminate the Contract, and Owner may call for further Work in other



emergencies.

#### **1.11 WORK SCHEDULE**

Do not begin Work until a Work Schedule has been accepted by the Owner. File with the Owner a Work Schedule within 7 days after the award of the Contract. This schedule shall outline the various phases of Work and the estimated dates of commencement and completion for each. Said schedule shall be sufficiently detailed to permit ready comparisons with the actual construction as Work progresses. The schedule shall make allowances for delays and shall correlate to dates and times Contractor is allowed to Work.

Unless otherwise mutually agreed by the Owner and the Contractor, the Contractor's activities shall be confined to the hours between 7:30 a.m. and 4:00 p.m., Monday through Friday, excluding holidays. Deviation from these hours will not be permitted without the prior written consent of the Owner and all agencies having jurisdiction over the Work, except in emergencies involving immediate hazard to persons or property. Work on holidays or other hours is not allowed except emergency operations as required to protect the public health and safety.

#### **1.12 CONFERENCES**

At any time during the progress of the Work, the Owner shall have the authority to require the Contractor to attend additional conferences along with any or all of the subcontractors engaged in the Work, and any notice of such conferences shall be duly observed and complied with by the Contractor.

Failure of the Contractor to attend conferences or meetings may result in issuance of a "stop work notice" by the Owner. Delays resulting from the Contractor's non-compliance or non-responsiveness to attend conferences or meetings shall be the responsibility of the Contractor. Time extensions and monetary claims will not be granted or paid for any such delays.

#### **1.13 RIGHT-OF-WAY**

The Owner will provide the right-of-way to the Project site. It shall be the sole responsibility of the Contractor to acquire any additional right-of-way necessary to prosecute the Work. The Contractor will be permitted to occupy only that area that is reasonably needed to complete the Work.

#### **1.14 PERMITS**

The Contractor will be required to obtain an excavation permit (no fee) from the City of South Gate. The Contractor shall notify the City, 48 hours prior to excavation. No water or liquids, except potable water, shall be discharged onto city streets at anytime for any reason without proof of a NPDES permit approving of the discharge. The Contractor will be required to perform self-inspections to evaluate if minimum

appropriate controls to reduce pollutant discharges from entering the storm drain system are being met. The Contractor shall make monthly self-inspections during the dry season and weekly self-inspections during the rainy season, October 1<sup>st</sup> through April 15<sup>th</sup>. Best Management Practices (BMPs) are made a part of this permit from the City. The discharge of liquids from concrete truck washouts into storm drains, streets, gutters or catch basins is strictly **prohibited**.

Paving, street sawcutting and sidewalk sawcutting is prohibited during a storm event of 0.25 inches or greater. Concrete thrust blocks exist at all tees, bends, crosses and other water main fittings. Contractor shall work with caution when excavating in the vicinity of any thrust blocks. Contractor shall not disturb any thrust blocks. Do not disturb local depressions or concrete cross gutters unless shown on the plans. If they are disturbed, the entire structure shall be replaced. Do not disturb decorative/patterned concrete or decorative asphaltic concrete pavement without notifying the City prior to any removal. If disturbed, the entire decorative/patterned portion shall be wholly replaced by the Contractor. Any landscaping or sprinklers disturbed by the construction shall be restored by the Contractor.

All provisions of these permits will apply as though stated in the Plans and Specifications and will have authority over any conditions herein unless the requirements are less stringent than the requirements of these Plans and Specifications.

The Owner has not applied for any other permits or licenses for this Work. The Contractor shall be solely responsible for obtaining and complying with any permits and/or licenses required to execute the Project, at its sole expense. No additional allowance will be made therefor.

#### **1.15 JOINING TO EXISTING PIPELINES**

Field verify the location, size and depth of the existing pipelines to which connections are to be made, by potholing. Contact the Owner to arrange for temporary draining and shutdown of these existing mains. Provide to Owner seven (7) working days notice prior to required shutdown. Make connections to existing pipelines after the new pipelines have been completed, from end to end, including successful hydrostatic testing and disinfection, to the point that the new pipelines are ready to receive flow.

#### **1.16 MINIMUM COVER OVER PIPELINES**

Pipe profile elevations have been established to account for typical pavement sections at finished grade elevations. If varying field conditions are encountered and sufficient cover does not exist, install and maintain steel traffic support plates over the backfilled and compacted trench that is within traffic areas until vehicle traffic is no longer permitted over the pipeline or the final paving is placed. The steel

plates shall conform to the requirements specified in Section 01570: Traffic Regulation of these Specifications.

#### **1.17 ROCK ENCOUNTERED DURING CONSTRUCTION**

It is possible that the Contractor may encounter large rock boulders during excavation. If the rock encountered is larger in any dimension than the trench width being cut, and cannot feasibly be removed by the equipment the Contractor has on-site, then the Contractor shall immediately notify the Owner. The Owner at its sole discretion may choose to have the Contractor remove the rock on a time and materials basis or may choose to have a different contractor perform the removal.

#### **1.18 ASBESTOS CEMENT PIPE**

The Contractor may encounter existing asbestos materials (i.e. asbestos cement pipe) during the Work. The Contractor is warned that asbestos is a known human carcinogen when inhaled and poses serious health risks. Asbestos fibers are easily inhaled and can result in chronic respiratory illness, cancer, and other severe health effects.

Removal of existing asbestos material shall be performed by a contractor or subcontractor registered by CAL/OSHA and certified by the State Contractors Licensing Board for asbestos removal. Submit copies of the certification to the Owner prior to the commencement of any asbestos removal activities. Comply with all Laws and Regulations regarding handling and removal of asbestos materials. Properly identify, remove, and dispose of all asbestos materials.

In the specific instance of making connections to existing asbestos cement pipe, disconnect, at the nearest joints, the length of asbestos cement pipe to be connected to the new pipe. This length of existing asbestos cement pipe will be replaced by the new pipe making the tie-in.

Cut asbestos cement pipe only when absolutely necessary and perform all cutting and handling of asbestos cement pipe in strict conformance with all applicable CAL/OSHA, USEPA and governing health agency requirements. Provide sufficient supervision and monitoring to assure conformance.

#### **1.19 SITE GRADING**

The Contractor is solely responsible for any and all grading necessary to construct the Work to the lines, grades and elevations as shown on the Drawings. It is recommended the Contractor thoroughly familiarize itself with the Project Site prior to submitting its bid. It will be assumed the Contractor has accurately estimated the Work required to grade the site and has included all costs of said Work in the lump sum cost for site grading. No additional allowance shall be made therefor.

## **1.20 CONTRACTOR'S JOBSITE DRAWINGS**

Provide and maintain on the jobsite one complete set of prints of all Drawings which form a part of the contract. Immediately after each portion of the Work is installed, indicate all deviations from the original design shown in the Drawings either by additional sketches or ink thereon. Upon completion of the job, deliver this record set to the Owner's Representative.

## **1.21 OPERATING EXISTING VALVES**

Coordinate all waterline shutdowns and startups with the City Water Division. **Do not operate any valves within the City.** The Contractor shall repair or pay for all damages or other consequential impacts due to the advertent or inadvertent operation of the valves.

## **1.22 MAINTAINING EXISTING SEWER FLOW**

The Contractor is cautioned that the existing sewer mains/laterals are in service and that sewage will be flowing in these lines at all times. Sewage flows from all sewer mains, out of, or around any manhole shall remain uninterrupted at all times under this Contract. All sewage flows shall be conveyed in closed conduits and disposed of in a sanitary sewer system, including pumping if required. Sewage flow shall not be permitted to flow into trenches or be covered by backfill. The Contractor shall submit to the Engineer for review the proposed method of providing continuation of sewer service two weeks prior to the scheduled interruption and/or flow diversion. The submittal shall include the following:

- A. A plot plan showing the existing sewer main and the proposed points of flow interruption and/or flow diversion.
- B. A construction time schedule showing anticipated times of flow interruption and/or flow diversion.
- C. A description of the equipment to be used including size and model of pumps, and the standby equipment that will be provided onsite in case of emergency.

The Contractor will be responsible to determine the daily maximum flow rate in the existing sewer that will need to be diverted. (For the purpose of preparing a bid, the Contractor shall assume the daily maximum flow rate in the existing sewer is when the pipe is flowing 75% full.) Temporary piping can be placed above ground only if it will be in service for no more than one calendar day. Place all other temporary piping in a recessed trench. Temporary resurfacing of recessed trenches shall be flush with the existing grade. When the temporary pipeline crosses a wheelchair ramp or sidewalk, install the pipeline within a recessed trench or provide an asphalt mound ramped at a slope not greater than 1:12.

The Contractor shall provide all pump, pipes and hoses required to maintain uninterrupted flow in all existing sewer mains associated with this Project. The Contractor must also provide an on-site standby pump of equivalent size to the bypass pump in the event of a bypass pump failure. If temporary electrical power is used to run the bypass system, the Contractor must also provide a standby diesel generator of sufficient power to run the bypass system in the event of power failure.

All labor, materials, equipment, and incidentals associated with the temporary controls and diversions required to maintain existing sewer flow shall be borne by the Contractor.

## **PART 2 - PRODUCTS**

### **2.1 ALTERNATIVE EQUIPMENT AND MATERIALS**

Submit data substantiating requests for substitution of "acceptable alternate" items within 35 days after award of Contract. This 35-day period of time is included in the number of days allowed for the completion of the Work set forth in the General Provisions and shall be strictly complied with.

### **2.2 AVAILABILITY OF MATERIALS**

Ensure the availability of all material prior to the start of Work. Unavailability of material will not be sufficient reason to grant an extension of time.

### **2.3 CORRECTION OF DEFECTS**

Without limitation of any other rights or remedies of the Owner, if any defect in the Work in violation of the warranties herein arises after the date of the Certificate of Completion, per the General Condition Article 13 the Contractor and its sureties shall, upon receipt of written notice of such defect and demand to correct any such defective Work, at no cost to the Owner, promptly furnish and provide all design and engineering, labor, equipment, materials and other services at the site necessary to correct such defect and cause the Work to comply fully with the foregoing guarantees. The Contractor shall correct all such defects, whether these defects are discovered before or after the certification of completion. The Contractor shall bear all costs of correcting such rejected and defective Work, including access to the Work and removal and replacement of non-defective Work which is needed in order to correct defective Work, and also including compensation for additional services made necessary thereby.

### **2.4 CONTRACTOR'S FAILURE TO CORRECT**

In the event the Contractor has been notified of any defect in the Work in violation of the Contractor's foregoing guarantees, and in the event the Contractor fails to promptly and adequately correct such defect, the Owner shall have the right to

correct or to have such defects corrected for the Contractor, and the Contractor shall promptly pay the Owner its costs incurred in correcting such defect.

## **PART 3 - EXECUTION**

### **3.1 SAFETY**

Be solely and completely responsible for conditions on the Project Site, including safety of all persons and property during performance of the Work. Fully comply with all Laws and Regulations relating to safety of the public and workers.

The right of the Owner to conduct construction review or observation of the Contractor's performance will not include review or observation of the adequacy of the Contractor's safety measures in, on, or near the site.

In the event the Contractor fails to take corrective action to ensure compliance with said safety regulations and/or removal of rubbish or debris resulting from its Work, the Owner will have the right, but not the duty, to undertake these measures and charge the cost of same to the Contractor without further notice to the Contractor.

Notify the Owner of all Work-related accidents which may occur to persons or property at or near the Project site, and provide the Owner with a copy of all accident reports. Sign all accident reports and submitted to the Owner within twenty-four (24) hours after the accident's occurrence.

All construction tools, equipment, temporary facilities, and other items used in accomplishing the Work, whether purchased, rented, or otherwise provided by the Contractor or provided by others, shall be in a safe, sound, and good condition. All such items must be capable of performing the functions for which they are intended and maintained in conformity with applicable Laws and Regulations.

Guard all machinery and equipment and other physical hazards in accordance with the safety provisions of the Manual of Accident Prevention in Construction of the Associated General Contractors of America unless such provisions are incompatible with Laws or Regulations, in which event such Laws or Regulations shall control.

Maintain workable and harmonious relations among Contractor's employees and between the Contractor's employees and the employees of subcontractors, sub-subcontractors, vendors and material suppliers and the employees of the Owner, and its consultants. Whenever the Contractor has knowledge that any actual or potential labor dispute is delaying or threatens to delay the timely performance of the Work, immediately give notice thereof to the Owner, including all relevant information regarding such dispute.

Enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. Do not permit employment of unfit persons or

persons not skilled in tasks assigned to them. Remove any employee of the Contractor deemed by the Owner, in its sole judgment, to be objectionable from the site immediately upon the Owner's request and promptly replace that employee by the Contractor at no extra expense to the Owner.

### **3.2 EXCAVATION PLANS FOR WORKER PROTECTION REQUIRED BY LABOR CODE SECTION 6705**

Submit to the Owner for acceptance, in advance of excavation, a detailed plan showing the design of shoring, bracing, sloping, or other provisions to be made for worker protection from the hazard of caving ground during the excavation of any trench or trenches 5 feet or more in depth. The plan shall be prepared by a registered civil or structural engineer. As a part of the plan, include a note stating that the registered civil or structural engineer certifies that the plan complies with the CAL-OSHA Construction Safety Orders, or that the registered civil or structural engineer certifies that the plan is not less effective than the shoring, bracing, sloping, or other provisions of the Safety Orders.

The Owner or its consultants may have made investigations of the subsurface conditions in areas where the Work is to be performed. If so, these investigations are identified in Division 1 of the Specifications and the records of such investigations are available for inspection at the office of the Owner. The detailed plan showing the design of shoring, etc., which the Contractor is required to submit to the Owner for acceptance in advance of excavation will not be accepted by the Owner if the plan is based on subsurface conditions which are more favorable than those revealed by the investigations made by the Owner or its consultants; nor will the plan be accepted if it is based on soils related design criteria which is less restrictive than the criteria set forth in the report on the aforesaid investigations of subsurface conditions.

The detailed plan showing the design of shoring, etc., shall include surcharge loads for nearby embankments and structures, for spoil banks, and for construction equipment and other construction loadings. The plan shall indicate for all trench conditions the minimum horizontal distances from the side of the trench at its top to the near side of the surcharge loads.

Nothing contained herein 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.

### **3.3 COORDINATION WITH OTHER CONTRACTORS**

Contact the contractors of any other adjacent projects under construction and coordinate the Work to avoid any delays or inconvenience to this Project or any other project.

### **3.4 ASSIGNMENT AND EXPERIENCE OF SUPERVISORS**

Assign a responsible supervisor and an alternate who shall be identified at the beginning of the Project as required by Article 6.3 of the General Conditions. The Contractor's responsible supervisor shall remain in charge of the Contractor's duties through completion of the Work.

Provide in writing evidence of the responsible supervisor's experience prior to beginning the Work. The supervisor and alternate shall each have a minimum of five (5) years' prior experience in direct construction supervision on the type of project described herein.

If the Contractor's responsible supervisor should be unable to continue with the Work, then the Contractor's alternate responsible supervisor will become the primary responsible supervisor. Any other changes in the responsible supervisor must be approved by the OWNER in advance. The OWNER will have the right to reject proposed changes in responsible supervisor.

The Contractor's responsible supervisor shall have Contractor's complete authority to act on behalf of, and to bind, Contractor in all matters pertaining to the Work and the Contract Documents. The responsible supervisor shall be available to consult with the OWNER and its authorized representatives at all times during the course of the Work.

### **3.5 EXPOSURE OF UTILITIES IN ADVANCE OF WORK**

Determine the true location and depth of all utilities and points of connection. Also determine the type of material and condition of any utility which may be affected by or affect the Work.

The Contract Drawings show the general location of underground pipelines and utilities. The location is based on the information available to the Owner. The Owner does not guarantee the location and it shall be the Contractor's responsibility to find the exact location.

Expose all utilities and services prior to any Work. If the utilities and service connections differ from those shown on the Plans, notify the Owner immediately in writing. Within one week, the Owner may make changes with alignment and grade of Work to obviate the necessity to remove, relocate, protect or temporarily maintain such utility facilities or to reduce the costs of the Work involved in removing, relocating, protecting or temporarily maintaining such utility facilities. All costs of potholing and exposing shall be paid solely by the Contractor.

No payment will be made to the Contractor for the Contractor's work in connection with aboveground or underground utilities, their relocation or negotiation for relocation. Any cost shall be included in other bid items to which the relocation may pertain.



### **3.6 ADVANCED NOTIFICATION**

Determine and notify those agencies requiring advance notification for inspection or other purposes before beginning construction in any area of concern to said agency.

Give a minimum of 48 hours advance notice to various agencies before beginning construction in the area unless specified advance times are stated in the Contract Documents.

Comply with Section 4216 of the California Government Code and notify Underground Service Alert (USA), telephone number 1-800-422-4133 not less than 48 hours before commencing excavation, drilling, potholing or soil sampling.

The Contractor acknowledges that some (or all) of the utility companies with facilities shown on the Drawings may not be members of the USA system and, therefore, not automatically contacted by the above referenced phone number. Become aware of utility company facilities not reported by the USA system. Contractor shall be liable for any and all damages stemming from repair or delay costs or any other expenses resulting from the unanticipated discovery of underground utilities. Notify all utilities at least 48 hours in advance of the commencement of Work at any site to allow the utilities to examine the construction site and mark the location of the utilities' respective facilities. Verify that each utility has responded to such notification.

### **3.7 NOISE MITIGATION**

Contractor shall conform to all noise Laws and Regulations. Immediately address any noise complaints from the residents due to construction activity. Also notify the Owner of the complaint. If the Owner receives a noise complaint, address the complaint to the satisfaction of the complainer at no additional cost to the Owner.

### **3.8 EMERGENCY RESPONSE**

Acknowledge and respond to emergency calls related to the Project within 15 minutes after receipt of call. Also, be at the site of the emergency work and begin action to mitigate damage and correct the emergency situation within 60 minutes after receipt of call. If the Contractor does not respond to call within 15 minutes or is not at the site commencing with the emergency work within 60 minutes, the Owner will dispatch a crew to perform the Work and deduct the amount therefore from the next progress payment due to the Contractor.

Once the Owner's crew is dispatched, the Contractor will pay the costs related to dispatching the crew even if the emergency work is performed solely by the Contractor. The amount therefor will be deducted from the next progress payment due to the Contractor.

#### **PART 4 - PAYMENT**

Payment for the Work in this Section shall be included as part of the lump sum or unit price bid amount for which such Work is appurtenant thereto, and no additional payment will be made specifically for the Work in this Section.

**END OF SECTION**

## **SECTION 01010: COORDINATION OF WORK/CONTRACTOR'S WORK SCHEDULE**

### **PART 1 - GENERAL**

#### **1.1 REASONABLY IMPLIED PARTS OF THE WORK SHALL BE DONE ALTHOUGH ABSENT FROM SPECIFICATIONS**

Perform specific tasks not completely described in these Specifications that are necessary or normally required as part of the Work described, or that are necessary or required to make each installation satisfactorily or legally operable, shall be performed by the Contractor as incidental Work without extra cost to the Owner, as if fully described in these Specifications. The expense of such Work shall be included in the applicable unit prices for the Work described.

#### **1.2 LOCATION**

The Work sites will be located within the limits of the City of South Gate.

#### **1.3 NOTIFICATIONS**

- A. Give to the Owner advance notice prior to performance of specific Work items as specified within individual Sections of these Specifications.

Call Underground Service Alert (USA) – 811 before digging

Notification to Residents:

Hand deliver three written notices to residents. The three notices shall include the Public Notification (handed out 7 days prior to start of construction), the 7-day notice (handed out 7 days prior to a water service disruption), and a 24-hour notice (handed out 24 hours prior to a water service disruption). The notices shall be prepared by the Engineer and furnished to the Contractor for hand delivery.

Overtime Notification:

If Contractor for convenience should desire to carry on Work at night or outside regular working hours, submit written notice to the Engineer for approval and allow ample time for satisfactory arrangements to be made for inspecting Work in progress. For additional requirements, see General Conditions, Paragraph 6.5.2.

#### **1.4 PRE-CONSTRUCTION MEETING**

Attend a pre-construction meeting to discuss the schedule of Work, coordination with other contractors working in the vicinity of the sites, points of contacts for various parties involved, site layout, submittals procedures, and inspection procedures. Have the following people present: a principal of the General Contractor, the General Contractor's Superintendent and Alternate Superintendent, and the owner or superintendent of all subcontractors. Other items that need to be discussed will be provided to the Contractor prior to the pre-construction meeting.

#### **1.5 SITE PROTECTION**

- A. Throughout the period of construction, keep the site(s) free and clean of all rubbish and debris. Provide protective barriers and other safety protection necessary to protect the public and workers. Protect all existing fences, walls, buildings, trees, and landscape during the progress of Work. In the event of damage to such property, immediately restore the property to a condition equal to its original condition and to the satisfaction of the Engineer, at no additional cost to the Owner. This provision includes damage to surface and subsurface utilities. After completion of the Work, remove from the site and Work areas all materials, tools, debris, and solids. At the completion of the construction, clear the site of all materials and leave it in a condition acceptable to the condition to the Engineer.
- B. Secure any excavations at the end of each working day to prevent unauthorized access.
- C. To minimize noise to adjacent residents, acoustical quilted curtains shall be applied or hung on the existing fence as shown on the Drawings.

#### **1.6 CONTAMINATION**

At all times perform operations in such a manner as to prevent the introduction of contaminants into the pipelines or wells. Keep tools, equipment, and other elements clean. Clean and disinfect materials and equipment if, in the Engineer's sole opinion, the operation is introducing contaminants into the pipelines or wells.

#### **1.7 REMOVAL AND SALVAGING**

Remove existing materials as specified herein. Materials salvaged from the sites are the property of the Owner. The Owner may designate certain materials and equipment to become the property of the Contractor and, in such case, remove such materials and equipment from the site(s). Move salvaged equipment not designated by the Owner to become the property of the Contractor to a lay-down area (or areas) within the site(s) as determined by the Owner.

## **1.8 DISPOSAL OF MATERIAL**

Dispose of all materials generated during vault construction, and any associated activities, as specified in the Specifications.

## **1.9 SAFETY REQUIREMENTS**

In accordance with the requirements of the OSHA and California OSHA Regulations for Construction, provide and require the use of personal protective and lifesaving equipment for all persons working at the sites.

## **1.10 LAWS, REGULATIONS, AND PERMITS**

All work required hereunder shall be done in full compliance with all Laws and Regulations. Obtain all permits required by federal, state, county, or other agencies, pay all required fees. Necessary City licenses may be secured after the bids are opened, but must be obtained prior to execution of the Contract.

## **1.11 EXAMINATION OF THE SITE**

All bidders shall inspect the route of the Work, and in submitting a bid are understood to be familiar with all conditions which may affect the conduct of the Work.

## **1.12 INSPECTION AND APPROVAL**

- A. All work and materials required shall be subject to the observation and acceptance of the Engineer, or its authorized representative.
- B. Furnish to the Owner full information as to the progress of the Work in its various parts and give the Owner timely notice of the Contractor's readiness for inspection. When practicable, the Owner will make observation during the manufacture of articles. Furnish, without additional charge to the Owner, all reasonable facilities and assistance for the safe and convenient observation and for the tests required by the Owner.
- C. Final observation and acceptance of the articles or materials may be made after delivery at the site(s) of the Work and at the expense of the Owner. In the event that any material at the site(s) of the Work is rejected because it is defective, non-compliant with these Specifications, or on account of failure to pass testing, the Contractor shall replace same promptly. Final inspection will be made as promptly as practicable but may not in all cases be made prior to construction or final assembly.
- D. The Owner shall have the right at all times and places to reject articles and materials furnished hereunder which, in any respect, fail to meet the requirements or these Specifications, regardless of whether the defects in

such articles or materials are detected at the point of manufacture or after completion of the Work at the sites. If the observer, through an oversight or otherwise, has accepted material or work which is defective or which is contrary to the Specifications, such material, no matter in what stage or condition of manufacture, delivery, or erection may nonetheless be rejected by the Owner. Compliance with the Specifications is solely a duty of the Contractor and shall not be deemed avoided by act or omission on the part of the Owner's observer.

- E. Remove rejected articles and materials promptly after notification to a satisfactory distance from the vicinity of the accepted articles and materials at the sole expense of the Contractor. Pay for any adjustments, corrections or repairs found necessary after the delivery of articles or materials, including all additional handling and shipping.

### **1.13 RELOCATE WORK HEADING/CONTAMINATED SOIL EXCAVATION**

Immediately notify the Engineer if contamination is suspected. If hazardous materials have been encountered, the Engineer will instruct the Contractor to plate the trench and move ahead, beginning a new heading as directed by the Owner.

Coordinate removal of the hazardous materials with the Owner's contaminated soil remediation consultant/contractor (CSRC). Excavate the hazardous materials and place directly into CSRC's trucks. Owner's CSRC will haul away the hazardous material as required by CAL/OSHA and other responsible regulatory agencies.

All costs associated with the coordination, excavation, labor, equipment, tools and training shall be borne by the Contractor as part of the bid item of the original bid. No additional compensation shall be paid for such coordination.

## **PART 2 - MATERIALS**

(Not Used)

## **PART 3 - EXECUTION**

(Not Used)

## **PART 4 - PAYMENT**

Payment for any work done under this Section shall be included in the amount bid for which such Work is appurtenant; no additional payment will be made specifically for the work in this Section.

## **END OF SECTION**

## **SECTION 01045: EXISTING FACILITIES**

### **PART - 1 GENERAL**

#### **1.1 DESCRIPTION**

This Section includes requirements for connection to and abandonment of existing water facilities.

#### **1.2 RELATED WORK SPECIFIED ELSEWHERE**

Refer to the following Specification Section(s) for additional requirements:

- A. Section 02223: Trenching, Backfilling, and Compacting
- B. Section 15041: Chlorination of Water Mains for Disinfection
- C. Section 15044: Pressure Testing of Piping
- D. Section 15100: Control and Check Valves

#### **1.3 LOCATION**

Determine in advance the location of all existing pipelines to which connections are made.

### **PART 2 - MATERIALS**

All materials used in making the connection or removing the facility from service shall conform to the applicable Sections of these Specifications.

### **PART 3 - EXECUTION**

#### **3.1 CONNECTION TO EXISTING WATERLINES**

- A. Notification: Give the Owner a minimum of seven working days notice before the time of any proposed shutdown of existing mains or services.
- B. Notice to Proceed: Make connections only in the presence of the Owner's Representative and do not make any connection until the Owner's Representative has given notice to proceed.
- C. Material: Furnish all pipe and materials including as may be required, labor and equipment necessary to make the connections, all required excavation, backfill, pavement replacement, lights, and barricades, water truck, highline hose, and fittings for making the connections. In addition,

assist the Owner in alleviating any hardship incurred during the shutdown for connections.

- D. Temporary Work: Where connections are made to existing valves, furnish and install all temporary blocking, steel clamps, shackles, and anchors as required by the Owner's Representative. Replace and adjust valve boxes and covers to the proper grade in accordance with Section 15100: Control and Check Valves.
- E. Dewatering: Dewater existing mains, as required, in the presence of the Owner's Representative.
- F. Leakage at Existing Valves: Leakage through existing water valves of up to 5 gallons per minute (gpm) is considered normal and acceptable performance. Provide all necessary means to remove and dispose of water that enters the excavation and/or hinders performance of the Work from leaking water valves at a rate of up to 5 gpm. Leakage rates exceeding 5 gpm will be considered a changed condition.
- G. Inadequate Progress: If progress is inadequate during the connection operations to complete the connection in the time specified, the Owner's Representative shall order necessary corrective measures. All costs for corrective measures shall be paid solely by the Contractor.
- H. Tapping Sleeves and Valves: Install tapping sleeves and valves in accordance with Section 15100: Control and Check Valves.
- I. Connections: Make connections with as little change as possible in the grade of new main. If the grade of the existing pipe is below that of the new pipeline, deepen a sufficient length of the new line so as to prevent the creation of any high spot or abrupt changes in grade of the new line. Where the grade of the existing pipe is above that of the new pipeline, lay the new line at specified depth, except for the first joint adjacent to the connection, which shall be deflected as necessary to meet the grade of the existing pipe. If sufficient change in direction cannot be obtained by the limited deflection of the first joint, install a fitting of the proper angle. Where the connection creates a high or low spot in the line, install a standard air release or blowoff assembly as directed by the Owner's Representative.
- J. Testing: Do not connect the new pipeline to an existing facility until the new pipeline has successfully passed all pressure and disinfection tests in accordance with Sections 15041: Chlorination of Water Mains for Disinfection, and 15044: Pressure Testing of Piping.



### **3.2 REMOVAL FROM SERVICE OF EXISTING MAINS AND APPURTENANCES**

- A. General: Remove existing mains and appurtenances from service at the locations shown on the Plans or as directed by the Owner's Representative.
- B. Method of Abandonment: Existing pipe and appurtenances may be filled with grout or driller's mud, or removed from the ground, in which case all backfill and repair of surface shall be in accordance with Section 02223: Trenching, Backfilling, and Compacting.
- C. Storage of Removed Material: Removed pipe and appurtenances may be temporarily stockpiled on the site in a location that will not disrupt traffic or be a safety hazard, or it may be delivered to the Owner's yard as directed by the Owner's Representative.
- D. Maintenance of Service: Before excavating for laying mains that are to replace existing pipes and/or services, make proper provisions for the maintenance and continuation of service as directed by the Owner's Representative.
- E. Abandoned Water Services: If the meter box is to be removed from an abandoned water service, remove the service line and corporation stop and plug the saddle. If there is no corporation stop on the service, remove the adapter and install a brass plug in the service saddle. If the meter box is to remain after the water service is abandoned, close and lock the angle meter stop. Remove the meter and customer service valve.
- F. Abandoned Valves: Notify the Owner of intent to abandon valve. The Owner will shut off valve. Remove valve box, lid and riser pipe and backfill with 1½ sack cement slurry to bottom of pavement. Replace PCC/AC pavement in accordance with the City of South Gate Standards.

### **PART 4 – PAYMENT**

Payment for the Work in this Section shall be included as part of the lump sum or unit price bid for which such Work is appurtenant thereto, and no additional payment will be made specifically for Work in this Section.

### **END OF SECTION**

## **SECTION 01050: SURVEY CONTROL**

### **PART 1 - GENERAL**

#### **1.1 DESCRIPTION**

This Section describes the survey information that the Owner will provide to the Contractor for the items described herein.

#### **1.2 RELATED WORK SPECIFIED ELSEWHERE (NOT APPLICABLE)**

#### **1.3 SUBMITTALS (NOT APPLICABLE)**

#### **1.4 CONSTRUCTION STAKING PROVIDED BY OWNER**

The Owner will provide one set of each item listed below, of the construction survey controls for the construction of the facilities, pipelines and appurtenances at no charge to the Contractor:

Prior to construction of the facilities (one move-in):

- A. Elevation reference stake.
- B. Stakes for horizontal location for all tie-in locations, at 25-foot intervals for the pipeline and grade including the location of horizontal and vertical bends, fittings and pipeline appurtenances.

#### **1.5 CONDITIONS/REQUESTS FOR SURVEY STAKING**

Owner-furnished construction staking is subject to the following conditions:

- A. That the request for construction stakes be received in writing at least two working days in advance of staking. Survey requests shall be made in writing on forms provided by the Owner.
- B. That the stakes, reference markers, and other survey points be preserved or the Contractor will be charged for their replacement, and the Contractor shall pay, at its sole cost, any expense resulting from their loss or disturbance. Should the Owner be required to reset construction stakes, the cost for such resetting will be at the then current per diem rate. The charges shall be deducted from the progress payments for the Contractor, for the month in which the surveying work is done by the Owner.
- C. Unless otherwise specified, the construction staking provided by the Owner will be only for those items specified to be constructed or

reconstructed on the Drawings or in these Specifications. Any additional construction stakes required by the Contractor shall be provided and paid for by the Contractor.

- D. Do not proceed with Work until construction stakes, which constitute instructions from the Owner, are provided.

## **1.6 CONTRACTOR'S RESPONSIBILITIES**

Provide any and all additional construction staking to do the Work. Preserve reference points and all other survey points. In case of their loss or destruction, the Contractor shall be liable for and charged with the cost of their replacement and of any expense resulting from their loss or disturbance.

The accuracy of all survey staking not provided by the Owner is the responsibility of the Contractor. However, the Owner has the discretionary right to check the Contractor's stakes, alignments, and grades at any time. Where such discretion is to be exercised by the Owner, the Owner will notify the Contractor of the Owner's intention, stating the time at which the checking will commence. Any part of the Work in progress, the results of which are predicted directly upon the Contractor's stakes, alignments, or grades to be checked, shall be held in abeyance until the Owner has notified the Contractor that the checking has been completed.

Coordinate between the Owner's surveyor and the Contractor's surveyor. Unless otherwise specified, the construction staking provided by the Owner will be only for those items specified to be constructed on the Drawings or in the Specifications. Make timely demands of the Owner for construction staking. Field survey parties will be available only on normal working days and hours. In general, a notice to the Owner of not less than two working days will be required.

## **1.7 SURVEY MONUMENTS**

Do not move survey monuments and property marks or otherwise disturb them until an authorized agent of the agency having jurisdiction over the monuments or property marks setting has witnessed or otherwise referenced their location, and only then in accordance with the requirements of the agency having jurisdiction.

## **PART 2 - PRODUCTS**

(Not Used)

## **PART 3 - EXECUTION**

(Not Used)

#### **PART 4 - PAYMENT**

Payment for the Work in this Section shall be included as part of the lump sum or unit price bid amount for which such Work is appurtenant thereto, and no additional payment will be made specifically for the Work in this Section.

**END OF SECTION**

## **SECTION 01092: ABBREVIATIONS**

### **PART 1 – GENERAL**

#### **1.1 SUMMARY**

This Section lists many of the construction industry organizations, professional and technical associations, societies and institutes, and government agencies issuing, promoting, or enforcing standards to which references may be made in the Contract Document, along with the abbreviations commonly used for those references. Also included are certain general requirements for the use of industry standards specified, and for application of the standards in quality control.

#### **1.2 USE OF REFERENCE STANDARDS**

- A. Work specified by reference to the published standard or specification of a government agency, technical association, trade association, professional society or institute, testing agency, or other organization shall conform to or surpass the minimum standards of quality for materials and workmanship established by the designated standard or specification.
- B. Where so specified, products or workmanship shall also conform to the additional prescriptive or performance requirements included within the Contract Document to establish a higher or more stringent standard of quality than that required by the referenced standard.
- C. Where the specific date or issue of the standard is not included with the reference to the standard, the edition, including all amendments published and available on the first published date of the Invitation to Bid, shall apply.
- D. Where two or more standards are specified to establish quality, the product and workmanship shall conform to or surpass the requirements of both.
- E. In case of conflict between referenced standards, the more stringent shall apply.
- F. Copies of Standards:
  - 1. Copies of applicable referenced standards have not been bound in the Contract Documents.
  - 2. Where copies of standards are needed by the Contractor for superintendence and quality control of the work, obtain a copy or copies directly from the publication source and maintain in an

orderly manner at the jobsite, available to the Contractor's personnel, Subcontractors, Owner, and Engineer.

- G. Submittals: Submit for approval the requests to use products conforming to printed standards or publications with a different publication date from that effective hereunder. Clearly indicate the changes in product or workmanship quality involved in the proposed change, if any, and reasons for the request.

### **1.3 ABBREVIATIONS**

Abbreviations for Trade Organizations and Government Agencies: Following is a list of construction industry organizations and government agencies to which references may be made in the Contract Document, with abbreviations used.

- |           |  |
|-----------|--|
| 1. AA     | Aluminum Association   |
| 2. AAMA   | Architectural Aluminum Manufacturers' Association                  |
| 3. AASHTO | American Association of State Highway and Transportation Officials |
| 4. ACI    | American Concrete Institute  |
| 5. AFBMA  | Anti-Friction Bearing Manufacturers' Association                   |
| 6. AGA    | American Gas Association   |
| 7. AGMA   | American Gear Manufacturers' Association                           |
| 8. AISC   | American Institute of Steel Construction                           |
| 9. AISI   | American Iron and Steel Institute                                  |
| 10. AITC  | American Institute of Timber Construction                          |
| 11. ALS   | American Lumber Standards  |
| 12. AMCA  | Air Moving and Conditioning Association                            |
| 13. ANSI  | American National Standards Institute                              |
| 14. APA   | American Plywood Association                                       |
| 15. API   | American Petroleum Institute                                       |
| 16. AREA  | American Railway Engineering Association                           |
| 17. ARI   | Air Conditioning and Refrigeration Institute                       |

18. ASAE	American Society of Agricultural Engineers
19. ASCE	American Society of Civil Engineers
20. ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
21. ASME	American Society of Mechanical Engineers
22. ASTM	American Society for Testing and Materials
23. AWI	Architectural Woodwork Institute
24. AWP	American Wood Preservers' Association
25. AWPB	American Wood Preservers Bureau
26. AWPI	American Wood Preservers' Institute
27. AWS	American Welding Society
28. AWWA	American Water Works Association
29. BHMA	Builders Hardware Manufacturers' Association
30. CBMA	Certified Ballast Manufacturers' Association
31. CDA	Copper Development Association
32. CGA	Compressed Gas Association
33. CISPI	Cast Iron Soil Pipe Institute
34. CMAA	Crane Manufacturers' Association of America
35. CRSI	Concrete Reinforcing Steel Institute
36. FGMA	Flat Glass Marketing Association
37. FM	Factory Mutual
38. Fed. Spec.	Federal Specifications
39. FS	Federal Specification
40. GA	Gypsum Association
41. HI	Hydraulic Institute
42. HMI	Hoist Manufacturers' Institute

43. ICBO	International Conference of Building Officials
44. ICEA	Insulated Cable Engineers' Association
45. IEEE	Institute of Electrical and Electronics Engineers, Inc.
46. IES	Illuminating Engineering Society
47. ISA	Instrument Society of America
48. JIC	Joint Industry Conferences of Hydraulic Manufacturers
49. MIA	Marble Institute of America
50. Mil. Sp.	Military Specification
51. MS	Military Specifications
52. MMA	Monorail Manufacturers' Association
53. NAAMM	National Association of Architectural Metal Manufacturers
54. NBHA	National Builders' Hardware Association
55. NEC	National Electrical Code
56. NEMA	National Electrical Manufacturers' Association
57. NESC	National Electric Safety Code
58. NFPA	National Fire Protection Association
59. NHLA	National Hardwood Lumber Association
60. NLMA	National Lumber Manufacturers' Association
61. NTMA	National Terrazzo and Mosaic Association
62. NWMA	National Woodwork Manufacturers' Association
63. OECl	Overhead Electrical Crane Institute
64. OSHA	Occupational Safety and Health Act (both Federal and State)
65. PEI	Porcelain Enamel Institute
66. PS	Product Standards Section - U.S. Department of Commerce
67. RLM	RLM Standards Institute, Inc.



68. RMA	Rubber Manufacturers' Association
69. SAE	Society of Automotive Engineers
70. SDI	Steel Deck Institute
71. SDI	Steel Door Institute
72. SIGMA	Sealed Insulating Glass Manufacturing Association
73. SJI	Steel Joist Institute
74. SMACNA	Sheet Metal and Air Conditioning Contractors National Association
75. SSPC	Steel Structures Painting Council
76. SWI	Steel Window Institute
77. TEMA	Tubular Exchanger Manufacturers' Association
78. TCA	Tile Council of America
79. UBC	Uniform Building Code
80. UL	Underwriters' Laboratories, Inc.
81. WCLIB	West Coast Lumber Inspection Bureau
82. WWPA	Western Wood Products Association

## **PART 2 -- PRODUCTS**

(Not Used)

## **PART 3 -- EXECUTION**

(Not Used)

## **PART 4 -- PAYMENT**

Payment for the Work in this Section shall be included as part of the lump sum or unit price bid for which such Work is appurtenant thereto, and no additional payment will be made specifically for Work in this Section.

**END OF SECTION**

## **SECTION 01150: MEASUREMENT AND PAYMENT**

### **PART 1 - GENERAL**

The Owner reserves the right to negotiate a lump sum price for any Work or additional Work not covered in these specifications. No additional work shall be done without the written authorization of the Owner.

If a lump sum price for performing emergency on-call Work cannot be agreed prior to commencement of the Work, the Engineer may direct in writing that the Work be done on a Time and Materials (T&M) basis. T&M payment for emergency Work will be based on the cumulative direct costs, with allowable markup, in accordance with Section 1.10 Mark-Ups, Overhead and Profit of this Specification Section. If the Engineer determines that such Work is to be done on a T&M basis, the Contractor shall provide all labor, equipment, and materials necessary to complete the Work in a satisfactory manner, within a reasonable amount of time, in accordance with the provisions of the Specifications, Drawings, and/ or directions provided for the T&M Work.

The costs of all T&M Work performed by the Contractor and/or Subcontractor(s), at any level, shall be determined, and payment made, per these requirements.

The Contractor shall notify the Engineer at the beginning of each day when T&M Work is to be performed. The Contractor shall indicate the T&M Work being performed and the personnel involved, including all Work being performed by Subcontractors at any level. Unless otherwise approved by the Engineer, failure to notify the Engineer prior to start of T&M Work shall serve to waive all claims for compensation for that day.

Payment shall be made for the actual direct cost of T&M Work, with the mark-up described above, in accordance with the following:

#### **1.1 LABOR**

- A. All employees of the Contractor or Subcontractor(s) who are directly assigned to the T&M Work and who physically perform Work, up to and including working foremen, may be charged as labor on T&M Work. These costs shall be the actual cost for wages of workers performing the T&M Work at the time the Work is done, plus the labor burden in accordance with this Specification Section.
- B. The Engineer shall determine allowable personnel to perform the T&M Work.
- C. The Engineer shall determine the allowable hours worked by personnel performing the T&M Work.

- D. The use of a labor classification of higher pay grade than necessary to accomplish the Work, and which would increase the direct cost of T&M Work, is not permitted.
- E. Indirect labor costs of the Contractor and/or Subcontractor(s) shall be considered part of overhead and are not allowed as a direct cost.

## **1.2 EQUIPMENT AND TOOLS**

- A. The cost of Contractor-owned equipment or equipment or tools rented or leased shall be limited to hours actually utilized on the T&M Work.
- B. The Engineer shall determine the allowable hours for equipment utilized in T&M Work.
- C. The Engineer shall determine the allowable “stand-by” or “idle” time for equipment utilized in T&M Work.

## **1.3 MATERIALS**

- A. The allowable cost of materials provided for exclusive use in T&M Work shall include the actual cost of the material plus applicable sales tax, freight, and delivery, as substantiated by the original invoice for said materials.
- B. The Engineer shall determine allowable cost of materials incorporated into T&M Work.

## **1.4 SMALL TOOLS, CONSUMABLES, SAFETY EQUIPMENT, INCIDENTAL COSTS**

- A. No payment will be made for the use of tools owned by Contractor or any Subcontractor which have a replacement value of \$500 or less.
- B. No payment will be made for fuel, lubricants, or other maintenance items.
- C. No payment will be made for consumables.
- D. No payment will be made for incidental job burdens such as, but not limited to, personal safety equipment, personal protective equipment, and conformance to CAL OSHA IIPP requirements.
- E. No payment will be made for drinking water, sanitary facilities, or incidentals.

### **1.5 DELIVERY RECEIPTS, BILLS OF LADING**

- A. Submit delivery receipt(s) and/or bills of lading to the Engineer no later than the Work day after the material or rented equipment was delivered to the Work site, unless otherwise approved by the Engineer.
- B. No payment will be made for materials and/or rented equipment for which no delivery receipt(s) and/or bill(s) of lading are submitted.

### **1.6 RENTAL EQUIPMENT AND MATERIAL INVOICES**

Submit invoice(s) for materials, rented equipment, and other allowable expenditures with the request for payment.

### **1.7 T&M SHEETS**

- A. Submit a Daily Report of Time and Material Work to the Engineer on a form approved by the Owner.
- B. The Engineer shall sign T&M sheets for Work acceptably completed.
- C. No payment will be made for any labor, equipment, or material not included a form approved by the Owner and signed by the Engineer. Payment requests submitted on any other forms or formats other than that is approved by the Owner will be denied.
- D. Include all items of labor, equipment, or material for which Contractor requests compensation on the completed days Work, including any appurtenances added to equipment which would increase the basic rate for said equipment.
- E. Submit the T&M sheet(s) to the Engineer for approval by the close of the next work day, unless otherwise approved by the Engineer. Prepare and submit for approval all T&M sheets for Work done by Subcontractor(s) at any tier. The T&M sheet(s) shall be signed by the Contractor when submitted to the Engineer for approval.
- F. Only with prior approval by the Engineer may the Contractor submit Supplemental T&M Sheet(s) for labor, materials, or equipment for which the Contractor requests compensation and failed to list on the original T&M Sheet(s) for the day's work.
- G. Work that cannot be substantiated by a T&M Sheet, approved and signed by the Engineer is ineligible for payment.

## **1.8 BONDS AND INSURANCE**

Furnish satisfactory Bonds for Performance and Labor and Material per Article 5.1 of the General Conditions. All costs of furnishing such bonds shall be included in the Bid item it is appurtenant to and no additional payment will be made for those costs.

## **1.9 TIME EXTENSION / IMPACT COSTS**

Extensions of time shall be based solely upon the effect of delays to the Work as a whole and shall be determined by the Engineer with final approval of the Engineer.

## **1.10 MARK-UPS, OVERHEAD AND PROFIT**

To the direct costs discussed herein, an added lump sum to provide compensation for overhead and profit on T&M work is allowed to the Contractor and all Subcontractor(s) at any tier. The allowance for overhead and profit shall include full compensation for superintendence, insurance premiums, taxes, field office expense, extended overhead, home office overhead, and all other items of expense or cost not included in the cost of labor, materials, or equipment provided for in this Section. The allowance for overhead and profit shall not exceed the following schedule:

	<u>Overhead</u>	<u>Profit</u>
Labor =	10 percent	10 percent
Materials =	10 percent	5 percent
Equipment =	10 percent	5 percent

Additional mark up of five percent (5%) based on the total direct costs, less mark up, of all Subcontractors, at any tier, directly involved in the work, shall be allowed to the Contractor for additional administrative costs.

## **1.11 PAYMENT OF OVERTIME**

Overtime Rate: Overtime rate shall be no more than, time and one-half, except for hours worked over twelve (12) in a single work day, Sundays, and Holidays, which are double (2) time.

Overtime will be paid under the following conditions:

- A. If hours worked on the job are more than eight (8) hours during a regular shift. Prior approval of the Owner shall be required for the overtime.

- B. For Work performed outside the working hours, if requested by the Owner to report to Work.
- C. For Work performed outside the working hours on an as needed basis, at the request of the Contractor, subject to approval of the Owner.

#### **1.12 TRAVEL TIME**

For unscheduled Work requested by the Owner, travel time will be paid subject to prior approval by the Owner.

#### **1.13 REQUEST FOR PAYMENT**

- A. Submit the request for payment to the Engineer no later than thirty (30) days following completion of the T&M Work, unless otherwise approved by the Engineer.
- B. No payment will be considered for any labor, equipment, or material not included on T&M sheets signed and approved by the Engineer.
- C. Include in the request for payment the Contractor's request for any extension(s) of time or impact costs(s).
- D. Failure to make request for payment within the required time shall constitute a waiver by the Contractor of all rights and claims for compensation for the changed/extra Work completed, unless otherwise approved by the Engineer.
- E. The Engineer, with final approval of the Engineer, will verify allowable time charges, rates, material, additional bond(s) and/or insurance where applicable, time extensions, and/or impact costs for the Work completed.

### **PART 2 - MATERIALS**

(Not Used)

### **PART 3 - EXECUTION**

(Not Used)

### **PART 4 – PAYMENT**

No payment will be made for any labor, equipment, or material not included on T&M sheets signed and approved by the Engineer. There shall be no interim or partial payments for materials for which the Contractor fails to provide an original invoice.

The Engineer shall determine the final direct cost of Work completed, any allowable time extensions and impact costs associated with T&M Work.

The final costs shall be based on allowable hours and/or materials as per T&M sheets signed by the Contractor and approved by the Engineer.

**END OF SECTION**

## **SECTION 01300: SUBMITTALS**

### **PART 1 - GENERAL**

#### **1.1 WORK INCLUDED**

This Section includes the submittals during construction and submittal procedures.

#### **1.2 SUBMITTALS DURING CONSTRUCTION**

- A. Review, acceptance, or approval of substitutions, schedules, Shop Drawings, lists of materials, and procedures submitted or requested by the Contractor shall not add to the Contract Price, and all additional costs which may result therefrom shall be solely the obligation of the Contractor.
- B. The Owner is not precluded, by virtue of review, acceptance, or approval, from obtaining a credit for construction savings resulting from allowed concessions in the work or materials therefor.
- C. It shall not be the responsibility of the Owner or Owner's Representatives to provide engineering or other services to protect the Contractor from additional costs accruing from such approvals.
- D. After checking and verifying all field measurements, submit to Engineer, in accordance with the schedule for submittals for review, submittals which shall bear a stamp or specific written indication that Contractor has satisfied Contractor's responsibilities under the Contract Documents with respect to the review of the submittal. The data shown shall be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to enable the Owner to review the information.
- E. All samples shall have been checked by and accompanied by a specific written indication that Contractor has satisfied Contractor's responsibilities under the Contract Documents with respect to the review of the submission and shall be identified clearly as to material, supplier, pertinent data such as catalog numbers and the use for which intended.
- F. Before submission of each submittal, determine and verify all quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers, and similar data with respect thereto and reviewed or coordinated each submittal with other submittals and with the requirements of the Work and the Contract Documents.



- G. At the time of each submission, give to the Engineer specific written notice of each variation that the submittal may have from the requirements of the Contract Documents, and, in addition, make a specific notation on each shop drawing submitted to Owner for review and approval of each such variation.
- H. Owner's review will be only for general conformance with the design concept and for compliance with the information given in the Contract Documents and shall not extend to means, methods, techniques, sequences, or procedures of construction (except where a specific means, method, technique, sequence, or procedure of construction is indicated in or required by the Contract Documents) or to safety precautions or programs incident thereto. The review of a separate item as such will not indicate review of the assembly in which the item functions.
- I. Engineer's review of submittals shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has in writing called Owner's attention to each such variation at the time of submission and Owner has given written approval of each such variation by a specific written notation thereof incorporated in or accompanying the shop drawing or sample approval; nor will any approval by City relieve Contractor from responsibility for having complied with the provisions herein.
- J. Where a shop drawing or sample is required by the Specifications, any related work performed prior to Engineer's review and acceptance of the pertinent submission shall be the sole expense and responsibility of Contractor.
- K. Furnish a mark-up set of drawings indicating "As-Constructed" conditions, which shall reflect actual construction details in the field.

## **PART 2 - PRODUCTS**

(Not Used)

## **PART 3 - EXECUTION**

### **SUBMITTALS PROCEDURES**

- A. Transmit five copies of each submittal to the City or its representative. A specific submittal address and person will be provided to Contractor upon award of the Contract.
- B. Sequentially number the transmittal forms. Resubmittals shall have original number with unique alphabetic suffix.

- C. Identify Project, Contractor, Project Title, description of the submittal and reference to the Specifications Section and Paragraph number being addressed, including products, units and assemblies, as appropriate.
- D. Apply Contractor's stamp, signed or initialed certifying that review, verifications of products required, field dimensions, adjacent construction work, and coordination of information, is in accordance with the requirements of the Contract Documents.
- E. Submit information documenting the experience of fabricators and manufacturers of materials and equipment to be supplied to the Owner with shop drawing submittals as herein specified.
  - 1. Information for 3 or more projects including the purchaser, size and type of product provided, date of installation, and the name, address and phone number of a contact person knowledgeable of the project shall be included in these submittals. Experience requirements for manufacturers and fabricators shall be in accordance with the Notice to Bidders.
  - 2. The company name, address, phone number and name of a contact person of the local service representative of each manufacturer of equipment to be supplied shall be identified in the shop drawing submittals as herein specified.
  - 3. At a time sufficiently early to allow review as hereinafter specified and to accommodate the rate of construction progress required under the Contract Documents, submit to the Owner for review, complete shop, assembly and layout drawings of the fabricated materials to be furnished and installed under the Contract Documents.
  - 4. Said drawings shall indicate type of steel another metal proposed to be used and five copies shall be submitted prior to manufacture or fabrication of the respective articles.
- F. Transmit submittals in accordance with final schedule of submittals.
- G. Provide space for Owner review stamps.
- H. Revise and resubmit submittals as required; identify all changes made since previous submittal. Revisions shown of said shop, assembly, or layout drawings, equipment drawings or catalogue data necessary to meet the requirements of the Specifications shall not be taken as the basis of claims for extra charges. The Contractor shall accept such revisions or submit others for the Owner to review. When delay is caused by the resubmission of details, the Contractor shall not be entitled to any damages or extensions of time on account of such delay.

- I. Submittals will be acted upon by the Owner promptly and transmitted to the Contractor not later than 15 working days after receipt by the Owner.
- J. As soon as practicable after acceptance by the Owner of any data or shop, assembly, or layout drawing, make a final submittal with all corrections noted by the Engineer incorporated. Clearly note as being a final submittal of accepted drawings or data. Submit 5 clear legible copies of all information or one clear legible transparent print on vellum of all sheets larger than legal size, 8½"x14". Send final submittals to the Owner. No fabrication or other work shall be performed in advance of the receipt of the final accepted drawings and data. Do not deviate in any way from the design, details, or dimensions shown on said final drawings or data without written consent of the Owner.

#### **PART 4 - PAYMENT**

Payment for the Work in this Section shall be included as part of the lump sum or unit price bid amount for which such Work is appurtenant thereto, and no additional payment will be made specifically for the Work in this Section.

#### **END OF SECTION**

## **SECTION 01311: SCHEDULING AND REPORTING**

### **PART 1 - GENERAL**

This item includes the scheduling and reporting requirements.

### **PART 2 - PRODUCTS**

(Not Used)

### **PART 3 - EXECUTION**

#### **3.1 CONTRACT SCHEDULE OF WORK**

Submit to the City the Contract Schedule of Work in the form of a bar chart within 10 calendar days following the Notice to Proceed. Show various elements of the Work in sufficient detail to identify submittals acquisition, manufacture and delivery of project materials, and the various tasks and elements of construction, cleanup and demobilization.

#### **3.2 REPORTING**

Prepare monthly written narrative reports of the status of the Project and submit to the Owner. Written status reports shall include:

- A. The status of major components (including but not limited to percent complete, amount of time ahead or behind schedule) and an explanation of how the Work will be brought back on schedule if delays have occurred.
- B. The progress made on critical activities indicated on the schedule.
- C. Explanations for any lack of work on activities planned to be performed during the last month.
- D. Explanations for any schedule changes, including changes to the schedule logic or sequence, or to activity duration.
- E. A list and schedule of the critical activities to be performed over the next month.
- F. Any delays encountered during the reporting period.
- G. An assessment of inclement weather delays and impacts to the progress of the Work.

- H. Include any other information pertinent to the status of the Project. The Contractor shall also include any additional status information requested by the Owner.
- I. Include an estimate of the amount and value of the Work done up to that time in the performance of the Contract. Such estimates shall include estimated quantities of unit price items of the Bid and the approved itemized breakdown of any Lump Sum items. Partial estimates shall be subject to adjustments and approval of the City as provided in the General Conditions. Partial estimates and partial payments shall also be subject to deductions and withholding as provided in the General Conditions.

#### **PART 4 – PAYMENT**

Work done under this Section shall be included in the amount bid on the Schedule of Bid Items and no additional payment will be made for this Work.

**END OF SECTION**

## **SECTION 01500: CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS**

### **PART 1 – GENERAL**

#### **1.1 DUST CONTROL**

Perform continuous dust control operations to prevent construction operations from producing dust in amounts harmful to persons or causing a nuisance to persons living nearby or occupying buildings in the vicinity of the work. Use water or dust preventative to control dust. Sweep or wash streets affected by the Work, as required by the Owner. Supplying and application of water shall be at the sole expense of the Contractor.

#### **1.2 FIRE DANGER**

Minimize fire danger in the vicinity of and adjacent to the site. Provide labor and equipment to protect the surrounding private property from fire damage resulting from the Work. All costs arising from fire or the prevention of fire shall be at the sole expense of the Contractor.

#### **1.3 ACCESS ROADS AND PARKING AREAS**

Make arrangements for parking of employee's vehicles.

#### **1.4 STORAGE YARDS AND STAGING AREAS**

Acquire at Contractor's sole expense site of adequate size and access to facilitate Contractor's own operations, storing and staging of materials, equipment, and personnel. Meet conditions and requirements of Owner. Include expenses related to storage yards and staging areas in the various items bid; no additional payment will be made therefor.

#### **1.5 COVERING OF PIPE ENDS**

Block ends of any stockpiled pipe to prevent entry of humans and animals.

#### **1.6 VIBRATORY EQUIPMENT**

Do not use equipment capable of causing ground shaking.

#### **1.7 NOISE ORDINANCE**

Do not violate local noise ordinances. Determine any noise requirements and adhere to them at no additional cost to the Owner.

## **1.8 SAFETY SPECIALIST, SUPERINTENDENT EMERGENCY PHONE**

The Contractor's safety specialist and the Project Superintendent shall have immediate access to a cellular telephone for emergency purposes (i.e., calls to 911 for primary response by police and fire departments).

## **1.9 USE OF EXPLOSIVES**

Do not use explosives without the written permission of the Owner. No such permission is given at this time.

## **1.10 GUARANTEE**

- A. Guarantee the materials furnished by Contractor and the workmanship used in the construction of all Work called for under these Specifications to be as herein specified or agreed upon, free from injurious defects, and in all respects satisfactory for the required service, for a period of one (1) year as stated in Paragraph 13.6.2 of the General Conditions. Damage or leaks due to "acts of God" or from sabotage or vandalism are specifically excepted from this guarantee.
- B. When defective materials or workmanship is discovered in a pipeline, backfill, or pavement surfacing which requires repairs to be made under this guarantee, do all such work at Contractor's sole expense within five (5) working days after notice of such leaks, breaks, or settlement has been given by the Owner. Should the Contractor fail to repair such leaks or damage within five (5) working days thereafter, or in an emergency demanding immediate attention, the Owner may make the necessary repairs and charge the Contractor with the actual cost of all labor, equipment, and material required.
- C. The required surety bonds shall extend for a period of one year beyond the filing of the Notice of Completion to cover this guarantee.

## **1.11 RECORD DRAWINGS**

- A. Keep one complete set of prints of the approved construction plans, reserved for use as record drawings, on the site at all times. Maintain on these prints a current updated record of all construction changes and variations from the plans, including all underground and surface improvements found or installed in locations other than those indicated on the plans. Properly dimension and locate all changes and variations to the plans to the satisfaction of the Owner. Enter said record information in red. Where a plan does not exist, submit to the Owner an accurate and detailed sketch which shall become a part of the record set.

- B. Prior to final acceptance of the Work, furnish the above specified record drawing prints to the City.

## **PART 2 - PRODUCTS**

(Not Used)

## **PART 3 - EXECUTION**

(Not Used)

## **PART 4 - PAYMENT**

Payment for the Work in this Section shall be included as part of the lump sum or unit price bid for which such Work is appurtenant thereto, and no additional payment will be made specifically for Work in this Section.

**END OF SECTION**



## **SECTION 01501: TEMPORARY UTILITIES**

### **PART 1 - GENERAL**

#### **1.1 TEMPORARY WATER**

- A. Obtain water and pay all costs associated with obtaining a temporary water supply to conduct the Work at Contractor's sole expense. All water requirements costs shall be included in the Contractor's bid.
- B. Install temporary pipe, valves, and other appurtenances necessary to convey water to the sites from any temporary water service connection obtained by the Contractor.
- C. The Owner will provide a construction meter at the nearest fire hydrant upon request. Water can be obtained from the City by making an application for temporary water service. Charges for this water service will be at the standard established rates of the City.
- D. Do not use water from any fire hydrant unless said water first passes through a meter provided for the Contractor's use. Furthermore, do not, for any purpose, operate any valve in the water system, but request any necessary valve operation be done by authorized City personnel.

#### **1.2 TEMPORARY ELECTRIC POWER**

- A. Electric power is not available at the sites. The Contractor shall meet its own power requirements.
- B. The cost of power shall be included in the appropriate bid items to which it is appurtenant and shall include full compensation for furnishing all labor, materials, tools, and equipment required to obtain and distribute power for construction purposes.

#### **1.3 SANITARY FACILITIES**

Provide and maintain sanitary facilities for Contractor's employees and subcontractors' employees that will comply with all Laws and Regulations. The cost of portable toilets and other appurtenances shall be included in Contractor's bid.

#### **1.4 TELEPHONE**

Telephone service shall be established at the sites prior to conducting Work and until all construction Work is complete. The purpose of this service is to allow the Owner and the Engineer to communicate with the Contractor's representatives or the Engineer's on-site personnel. A temporary telephone service or mobile telephone service are acceptable alternatives. The telephone shall be audible/visual to the field crew at all times and the number shall be provided to Owner and the Engineer. Owner and Engineer shall have unrestricted access to the telephone. All telephone costs, other than charges for toll calls originated by the Owner or Engineer, shall be included as a part of the Contractor's mobilization bid. Toll calls originated by Owner or Engineer shall be billed to the City by the Contractor at the rates charged to it by the telephone company.

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

(Not Used)

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

(Not Used)

#### **PART 4 - PAYMENT**

Payment for the Work in this Section shall be included as part of the lump sum or unit price bid amount for which such Work is appurtenant thereto, and no additional payment will be made specifically for the Work in this Section.

**END OF SECTION**

## **SECTION 01550: BYPASS PUMPING**

### **PART 1 - GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Bypass pumping requirements

#### **1.2 SUBMITTALS**

- A. Bypass Pump Plan:

- 1 Submit to the District for acceptance within 4 weeks of Notice to Proceed.
- 2 Plan shall include, but not limited to, the following topics:
  - a. Number of primary, lag and standby pumps, product data sheets for the proposed pumps, discharge capacities of pumps, all related appurtenances (suction and discharge hoses/piping; valving; sensors or controls);
  - b. Calculation of static lift, friction losses, and flow velocity (include pump operating curves);

- B. Spill Prevention and Emergency Response Plan

- C. Spill Incident Report:

- 1 Submit report within three (3) working days from the occurrence of the spill.
- 2 Report shall include the following information related to the spill: Location, date, time, duration, spill volume, cause, and corrective actions.

#### **1.3 QUALITY ASSURANCE**

- A. Qualifications: The bypass pumping subcontractor shall have at least five (5) verifiable references of projects of a similar size and complexity as the proposed project performed by their firm within the last three years.
- B. Pollution Liability Insurance: The Contractor shall obtain and maintain an additional insurance coverage for Pollution Liability.

## **PART 2 - PRODUCTS**

### **2.1 DESIGN CRITERIA**

#### **A. Flow Rates**

1. The bypass system shall be capable of pumping a minimum of 120 percent of the required peak flow rate after head and friction loss factors are accounted for.
2. Peak Dry Weather Flow may be used for single day bypass activities that will not commence in a rain event.
3. Peak Wet Weather Flow shall be used for rehabilitation activities that will commence in a rain event or for a bypass system that may remain in service overnight.
4. Flow rates may be available from the District. At discretion of the District, the Contractor shall be required to provide flow monitoring to verify flow rates.

#### **B. Sound**

1. The Contractor shall ensure the pumps and generators are “critically silenced” with a maximum allowable sound level of 70 dba at the nearest building façade or as otherwise required by agency having jurisdiction.

### **2.2 SYSTEM**

#### **A. Pumping System:**

1. Provide redundant, identically sized, one hundred-percent backup bypass pumping system.
2. Provide minimum of two pumping units, duty and standby.
3. Each pump, including the backup pumps, shall be a complete unit with its own suction and discharge piping.
4. If electric power driven pumps are used, provide an emergency standby power generator even when the pumps are powered with commercial power.

#### **B. Fuel Tanks:**

1. Provide one (1) dedicated fuel tank for every single pump/generator, if fuel/generator driven pumps are used.
2. The Contractor shall provide a fuel level indicator outside each fuel tank.

3. The Contractor shall take the necessary measures to ensure the fuel supply is protected against contamination. This includes but is not limited to fuel line water traps, fuel line filters, and protecting fuel stores from precipitation.

## **PART 3 - EXECUTION**

### **3.1 BYPASS PUMPING**

- A. Continuous full-time monitoring by a person qualified and trained to operate and maintain the bypass pumps and bypass system shall be provided by the Contractor.
- B. Fully install backup bypass pumping system and ensure it is operational and ready for immediate use.
- C. The Contractor shall demonstrate to the satisfaction of the District that both the primary and backup bypass pumping systems are fully functional and adequate, and shall certify the same, in writing, in a manner acceptable to the District.
- D. Provide traffic ramps where hoses/pipes cross traffic ways.

### **3.2 SPILL PREVENTION AND EMERGENCY RESPONSE**

- A. The Contractor shall comply with the District's policy of zero spills and is responsible for preventing and containing any sewage spillage.
- B. The Contractor shall make every effort to eliminate spill risk by providing containment around bypass system and in the location that the sewer will be opened up.
- C. In case of a sewage spill(s), the Contractor shall act immediately without instructions from the District, to control the spill and take all appropriate steps to contain it.
- D. The Contractor is responsible for the recovery and legal disposal of any spilled sewage and liability arising from negligently causing a sewage spill and shall defend, indemnify, protect, and hold harmless the District, its agents, officers, and employees, from and against all claims asserted, or liability established for damages or injuries to any person or property resulting from any sewage spill caused or claimed to be caused by the Contractor's action or failure to take measures to prevent a spill. The Contractor shall also be responsible for payment of any fines and/or penalties assessed against the District for such sewage spills. The Contractor's duty to indemnify and hold harmless shall not include any

claims or liability arising from the established sole negligence or willful misconduct of the District, its agents, officers or employees.

#### **PART 4 - PAYMENT**

The unit price bid for installation of temporary line stop devices includes full compensation for furnishing the labor, materials, tools and equipment and doing all Work involved to complete the line stop installation, provide traffic control, and remove the line stop and all appurtenances.

**END OF SECTION**

## **SECTION 01570: TRAFFIC REGULATION**

### **PART 1 - GENERAL**

#### **1.1 DESCRIPTION**

This Section describes procedures for traffic regulation during construction.

#### **1.2 STANDARD SPECIFICATIONS AND REFERENCES**

Wherever reference is made to the State Specifications and Plans, such reference shall mean the State of California, Department of Transportation (Caltrans) Standard Specifications and Plans, latest edition. Traffic control devices and signing used for handling traffic and public convenience shall conform to the latest edition of the "Work Area Traffic Control Handbook" (WATCH), published by BNI Books, Division of Building News, Incorporated, 3055 Overland Avenue, Los Angeles, California 90034.

#### **1.3 SUBMITTAL**

Prepare a traffic control plan signed and sealed by a California licensed civil or traffic engineer, and submit to the City of South Gate Public Works Department, Traffic Control Division, for approval, not less than five working days prior to the start of operations involving or requiring traffic control. No Work involving or requiring traffic control shall begin until the City has approved a traffic control plan.

### **PART 2 - MATERIALS**

(Not Used)

### **PART 3 - EXECUTION**

#### **3.1 GENERAL**

- A. Provide safe and continuous passage for pedestrian and vehicular traffic at all times.
- B. Furnish, install, construct, maintain, and remove signs, barricades, fences, miscellaneous traffic devices, flagmen, drainage facilities, paving, and such other items and services as are necessary to adequately safeguard the public from hazard and inconvenience. All such work shall comply with the approved Traffic Control Plan Laws and Regulations of authorities with jurisdiction over the public roads in which the construction takes place and over which detoured traffic is routed by the Contractor.

- C. Maintain and keep all temporary traffic control devices in good repair and working order until no longer required, at the Contractor's sole expense. Also pay the cost of replacing such devices that are lost or damaged, to such an extent as to require replacement, regardless of the cause of such loss or damage.
- D. Prior to the start of construction operations, notify the City, giving the expected starting date and completion date. Notifications on progress to the emergency service agencies shall be in accordance with procedures and channels to be established at the pre-construction meeting.
- E. Provide a minimum of 48 hours prior notice to the appropriated Agency for any Work that may affect signal loops, equipment, or devices. In the event that any underground utilities, traffic devices, pipes, or conduits are damaged and require emergency repair by the appropriate Agency, all costs incurred by that Agency in making such repairs, plus 25 percent for administration costs, shall be paid solely by the Contractor.
- F. Post temporary "No Parking – Tow Away" signs 48 hours prior to work in areas where parking is normally permitted. The police department shall be notified 48 hours prior to the posting of any temporary parking restrictions in the City.
- G. Maintain a 24-hour emergency service to remove, install, relocate, and maintain warning devices and furnish to the authority having jurisdiction the names and telephone numbers of the person(s) responsible for this emergency service. The emergency response service shall be through cellular phones in order to minimize response time to a construction-related emergency. In the event these persons do not promptly respond or the authority having jurisdiction deems it necessary to call out other forces to accomplish emergency service, the Contractor shall pay the cost of such emergency service at no additional cost to the Owner.
- H. In the event the Engineer finds the Work site to be improperly barricaded or delineated and the Contractor is either unavailable or unresponsive to requests for improvement, the Owner will furnish and set up barricades and delineators as required. The Owner will charge the Contractor for each setup event, plus a "use fee" for each barricade or delineator for each day's or partial day's use until such barricades or delineators are returned in good condition by Contractor to the Owner's Operations Services Center.

After devices have been installed, at Contractor's sole expense, maintain and keep them in good repair and working order until no longer required. Also pay the cost of replacing such devices that are lost or damaged, regardless of the cause of such loss or damage.



### **3.2 TRAFFIC CONTROL DEVICES AND SIGNS**

- A. Traffic control devices shall conform to the State Standard Plans and Specifications. Construction signs shall conform to the latest edition of the State of California Sign Specification Sheets.
- B. The placement of construction signing, barricades, and other traffic control devices used for handling traffic and public convenience shall conform to the WATCH.
- C. Signs shall be reflectorized when they are used during hours of darkness. Barricades shall be equipped with flashers if in place during hours of darkness.

### **3.3 TEMPORARY STEEL PLATE BRIDGING, WITH A NONSKID SURFACE**

When backfilling operations of an excavation in the traveled way, whether transverse or longitudinal, cannot be properly completed within a workday, provide steel plate bridging with a nonskid surface and shoring to preserve unobstructed traffic flow. In such cases, the following conditions shall apply:

- A. Steel plates used for bridging shall extend a minimum of 12 inches beyond the edges of the trench.
- B. Install steel plate bridging to operate with minimum noise.
- C. Shore the trench to support the bridging and traffic loads.
- D. Use temporary paving with cold asphalt concrete to feather the edges of the plates if plate installation by Method 2 is used.
- E. Secure bridging against displacement by using adjustable cleats, shims, or other devices.
- F. Attach approach plate(s) and ending plate (if longitudinal placement) to the roadway by a minimum of two dowels predrilled into the corners of the plate and drilled 2 inches into the pavement. Butt subsequent plates to each other. Compact fine graded asphalt concrete to form ramps, maximum slope 8.5% with a minimum 12-inch taper to cover all edges of the steel plates. When steel plates are removed, backfill the dowel holes in the pavement with either graded fines of asphalt concrete mix or concrete slurry.
- G. Maintain the steel plates, shoring, and asphalt concrete ramps.
- H. Leave plates in place for no more than two days before completion of the pipe trench backfill and pavement placement.

- I. The following table shows the required minimal thickness of steel plate bridging required for a given trench width:

<b>Trench Width (feet)</b>	<b>Minimum Plate Thickness (inches)</b>
1	$\frac{1}{2}$
1- $\frac{1}{2}$	$\frac{3}{4}$
2	$\frac{7}{8}$
3	1
4	1- $\frac{1}{4}$

NOTE: For spans greater than 4 feet, prepare a structural design by a registered civil engineer and submit to the Owner for review.

### **3.4 VEHICULAR TRAFFIC CONTROL**

- A. Comply with the general requirements of the referenced Standard Specifications, the WATCH, the approved Traffic Control Plan, the Drawings and the following special requirements, unless otherwise approved or revised by the Owner.

Where traffic is directed around or adjacent to the site, provide, install, maintain and remove delineators, barricades, lights, signs, and other devices required for the control of traffic. The Owner reserves the right to direct the Contractor to relocate traffic control devices.

Use temporary concrete barriers (K-rail) where a traffic line is within five feet of an excavation more than 18 inches deep. Remove K-rail at the end of each day in areas that require that all lanes of traffic be open at the end of each day.

Mark traffic lane transitions from permanent lanes to construction zone patterns in accordance with the requirements for then normal posted speed limit and the approved Traffic Control Plans.

- B. Accomplish construction in phases by detouring traffic from its normal patterns along the route as approved to form the site. Remove traffic control equipment and materials for one stage of construction prior to the installation of equipment and materials for the subsequent work zone area.
- C. Unless otherwise shown in the Drawings, contract documents, or allowed by the agency within whose jurisdiction the work is being performed, limit all construction activities to 7:30 a.m. Monday to 4 p.m. Friday, and return all roadways and sidewalks to unrestricted vehicle and pedestrian usage when construction is not under way.

### **3.5 PEDESTRIAN TRAFFIC CONTROL**

- A. Unless otherwise shown in the Drawings, maintain and delineate a minimum of one 4-foot-wide pedestrian walkway along each public street at all times during construction. Maintain existing pedestrian accesses at intersections at all times. When existing crosswalks are blocked by construction activity, install signs directing pedestrian traffic to the nearest alternative crosswalk.
- B. Erect a fence or provide other means to preclude unauthorized entry to any open excavation during all nonworking hours on a 24-hour basis including weekends and holidays. Said fence shall be a minimum of 7 feet high around the entire excavation, consisting of a minimum of 9-gauge chain link fence fabric and shall be sturdy enough to prohibit toppling by children or adults. There shall be no openings under the wire large enough for any child to crawl through. Lock any gates if no adult is in attendance. Place warning signs spaced on 50-foot centers on the outside of the fence with the statement "DEEP HOLE DANGER."

### **3.6 ACCESS TO ADJACENT PROPERTIES**

Maintain reasonable access from public streets to all adjacent properties at all times during the Work. Prior to restricting normal access from public streets to adjacent properties, notify each resident, informing him or her of the nature of the access restriction, the approximate duration of the restriction, and the best alternate access route for that particular property.

### **3.7 PERMANENT TRAFFIC CONTROL DEVICES**

- A. Existing permanent traffic control signs and devices shall remain in effective operation unless a substitute operation is arranged for and approved under the traffic control plan. Traffic signal restoration work shall be in accordance with the referenced Standard Specifications and Special Provisions.
- B. Traffic control detection loops have not been shown in the Drawings. Completely replace traffic control detection loops which are cut, removed, or otherwise disturbed for pipeline construction to the original position or as directed by the appropriate Agency. Perform all loop replacement work in conformance with the Standard Specifications and Special Provisions.
- C. Replace traffic signal conduits damaged to the nearest pull box, including new wire, back to the terminal, and/or back to the signal controller to the satisfaction of the appropriate Agency before proceeding to the next construction phase. Splicing is not permitted.

Report all such damage immediately to the appropriate Agency.

- D. Do temporary restriping as required by the Owner. Remove any temporary painted striping required for traffic control during construction by wet sandblasting or other method approved the appropriate Agency. Temporary striping includes any striping required on any pavement replaced prior to the final surface course. Reinstall all permanent striping and markings in their original location. Replace any damaged or obliterated raised pavement markers in accordance with City Standards.

Payment for the furnishing, placing and removal of permanent and temporary striping and markings shall be included in the price for which work is appurtenant and no additional payment will be made therefore.

#### **PART 4 – PAYMENT**

Payment for the Work in this Section shall be included as part of the lump sum bid for this item of Work.

**END OF SECTION**

## **SECTION 01700: CLEANING DURING CONSTRUCTION & FINAL CLEANING**

### **PART 1 - GENERAL**

#### **1.1 GENERAL**

- A. Section includes cleaning during construction and final cleaning on completion of the Work.
- B. At all times maintain areas covered by the Contract Documents and adjacent properties and public access roads free from accumulations of waste, debris, and rubbish caused by Contractor's operations.
- C. Conduct cleaning and disposal operations to comply with Laws and Regulations. Do not burn or bury rubbish and waste materials on Project site. Do not dispose of volatile wastes, such as mineral spirits, oil, or paint thinner, in storm or sanitary drains. Do not dispose of wastes into streams or waterways.
- D. Use only cleaning materials recommended by manufacturer of surface to be cleaned.

#### **1.2 CLEANING DURING CONSTRUCTION**

- A. During execution of Work, clean site, adjacent properties, and public access roads and dispose of waste materials, debris, and rubbish to assure that buildings, grounds, and public properties are maintained free from accumulations of waste materials and rubbish.
- B. Wet down dry materials and rubbish to lay dust and prevent blowing dust.
- C. Provide containers for collection and disposal of waste materials, debris, and rubbish.
- D. Cover or wet loads of excavated material leaving the site or of material being imported to prevent blowing dust. Clean the public access roads to the site of any material falling from the haul trucks.

#### **1.3 FINAL CLEANING**

- A. At the completion of Work and immediately prior to final inspection, clean the entire Project as follows.
- B. Clean, sweep, wash, and polish all Work and all equipment including finishes.

- C. Remove grease, dust, dirt, stains, labels, fingerprints, and other foreign materials from sight-exposed interior and exterior finished surfaces; polish surfaces so designated.
- D. Repair, patch, and touch up marred surfaces to specified finish to match adjacent surfaces.
- E. Broom clean paved surfaces; rake clean other surfaces of grounds.
- F. Remove all temporary structures and all materials, equipment, and appurtenances not required as a part of, or appurtenant to, the completed Work.

## **PART 2 - MATERIALS**

(Not Used)

## **PART 3 - EXECUTION**

(Not Used)

## **PART 4 - PAYMENT**

Payment for the Work in this Section shall be included as part of the lump sum or unit price bid for which such Work is appurtenant thereto, and no additional payment will be made specifically for Work in this Section.

**END OF SECTION**

## **SECTION 01720: RECORD DRAWINGS**

### **PART 1 - GENERAL**

#### **1.1 DESCRIPTION**

Keep accurate and legible records on a single set of full size, blue-line prints of the Drawings. Make Record Drawings available for review by the City in Contractor's field office. Maintain Record Drawings on an up-to-date basis with all entries reviewed by Owner's Representative. Protect the Record Drawings from damage or loss.

#### **1.2 DETAILED REQUIREMENTS**

Provide Record Drawings which shall clearly show all differences between the Drawings and as-installed for all concealed construction, as well as construction added to the Contract which is not indicated on the Drawings.

Concealed shall mean construction installed underground or in an area which cannot be readily inspected by use of access panels, inspection plates or other removable features.

Show all changes in the Work, or Work added, on the Record Drawings in a contrasting color.

In showing changes in the Work, or added Work, use the same legends that are used on the Drawings. Indicate exact locations by dimensions and exact elevations. Give dimensions from a permanent point.

Record, by marking on the Drawings, all changes in the Work which occur during construction including adding approved change orders.

Show locations by key dimensions, depths, and elevations of all underground lines, conduit runs, sensor lines, valves, capped ends, branch fittings, pull boxes, etc., whether pre-existing or part of the Work. Show unanticipated subsurface conditions.

Record information on how to maintain and/or service concealed Work.

Make a record of finalized hydraulic and electrical equipment control settings in the tables and spaces provided on the Drawings. If tables have not been provided, the Contractor shall add suitable tables to the Record Drawings.

**PART 2 - PRODUCTS**

(Not used)

**PART 3 - EXECUTION**

Deliver the marked Record Drawings to the City prior to acceptance of the Work.

**PART 4 - PAYMENT**

Payment for the Work in this Section shall be included as part of the lump sum or unit price bid amount for which such Work is appurtenant thereto, and no additional payment will be made specifically for the Work in this Section.

**END OF SECTION**



## **SECTION 02050: REMOVAL OF EXISTING FACILITIES**

### **PART I - GENERAL**

#### **1.1 DESCRIPTION**

This Section describes demolition, removal, replacement, and abandonment of existing pipelines and other facilities interfering with construction of new facilities.

#### **1.2 RELATED WORK SPECIFIED ELSEWHERE**

Refer to the following Specification Sections for additional requirements:

- A. Section 02222: Protecting Existing Underground Utilities
- B. Section 02223: Trenching, Backfilling and Compacting

#### **1.3 SUBMITTALS**

Submit shop drawings for new pipelines and connections to existing pipelines.

Sand for filling abandoned piping shall be in accordance with Section 02223: Trenching, Backfilling and Compacting.

Submit supporting calculations for crossing of critical existing utilities per Section 02222: Protecting Existing Underground Utilities.

### **PART 2 - MATERIALS**

#### **2.1 GENERAL**

Perform removal, replacement, abandonment, and demolition work in accordance with these Specifications and as shown on the drawings. Prepare remaining surfaces to receive new scheduled and specified materials and finishes or to match materials and finishes of adjacent surfaces if none are specified or shown on the drawings.

#### **2.2 REMOVAL AND SALVAGING**

Remove piping and other facilities as shown on the drawings or specified herein. Materials and equipment salvaged from the Project site are the property of the Owner. Unless designated on the construction drawings, materials and equipment to be removed shall become the property of the Contractor and, in such case, remove such materials and equipment from the Project site. Salvaged material and equipment designated by the drawings to become the property of the Owner shall be delivered by the Contractor to a laydown area or areas within

the Project site, as determined by the Owner or to the City's Operations yard.

### **2.3 REPLACEMENT**

Replace, remove or abandon piping with new piping in locations as shown on the Drawings.

### **2.4 ABANDON**

- A. Abandon in place piping shown on the Drawings.
- B. Pipes to be abandoned shall be completely drained of fluid, and completely filled with sand. Properly dispose of all liquids removed from pipeline. Pipes already abandoned in place which are not shown to be removed as part of this Work shall be plugged as shown on the drawings, at the location where existing abandoned pipe is to be removed as part of this Work.

### **2.5 DEMOLITION**

- A. Remove, alter, salvage and dispose of existing structures, boxes, pipes, and other items as specified herein or indicated on the drawings. Remove and dispose of all portions of these items that interfere with the Work. Protect existing facilities that do not directly interfere with the Work unless otherwise shown on the drawings to be abandoned or removed.
- B. Remove facilities to be demolished in their entirety and dispose of offsite including all appurtenances as shown on the drawings or as specified herein. Backfill and compact all site areas disturbed by demolition work with earth backfill material in accordance with Section 02223: Trenching, Backfilling and Compacting.
- C. Perform the Work in a manner that will not damage parts of the structure not intended to be removed or to be salvaged for the City. If, in the opinion of the Engineer, the method of demolition used may endanger or damage parts of the structure or affect the satisfactory operation of the facilities, promptly change the method when so notified by the Engineer. No blasting is permitted.
- D. All equipment, material, and piping, except as specified to be salvaged for the City, or removed by others, within the limits of the demolition, excavations, and backfills, shall become the property of the Contractor and shall be removed by the Contractor from the Project site.
- E. Do not reuse material salvaged from demolition work on this Project, except as specifically shown.

### **PART 3 - EXECUTION**

(Not Used)

### **PART 4 - PAYMENT**

Payment for the Work in this Section shall be included as part of the lump-sum or unit-price bid amount for which such Work is appurtenant thereto, and no additional payment will be made specifically for the Work in this Section.

**END OF SECTION**

## **SECTION 02060: TEMPORARY LINE STOP DEVICES**

### **PART 1 - GENERAL**

#### **1.1 DESCRIPTION**

This Section includes materials and installation of temporary line stop devices in existing water laterals and water mains in order to isolate portions of the existing water laterals and water mains without shutting off water service during construction of new water lines.

### **PART 2 - MATERIALS**

#### **2.1 GENERAL**

Provide manually operated temporary line stop devices complete with tapping sleeve, temporary tapping valve, and line stopping device, as required for installation and operation.

#### **2.2 LINE STOP DEVICE**

Provide line stop devices that are specifically designed as a means of plugging a water pipe. Line stop devices shall provide a watertight seal in fragile, out of round, or cement mortar lined pipes. Line stop devices shall be designed to mount on the tapping valve of a tapped water line and shall be operated by inserting a stopping head through the opened tapping valve and rotating the head in the water line until the water line has been sealed tightly shut. Line stop devices shall be as manufactured by International Flow Technologies, Hydra-Stop, or approved equal.

#### **2.3 TAPPING SLEEVES**

Tapping sleeves shall conform to the requirements described in Section 15100: Control and Check Valves.

#### **2.4 TAPPING VALVES**

Tapping valves shall conform to the requirements described in Section 15100: Control and Check Valves.

## **PART 3 - EXECUTION**

### **3.1 LINE STOP DEVICE INSTALLATION**

Install line stop device in accordance with the manufacturer's instructions. Thoroughly clean flange on tapping valve with a wire brush to provide a smooth surface for gasket. Support the line stop device as necessary to avoid placing stress on the tapping sleeve, tapping valve, and water pipe.

### **3.2 TAPPING SLEEVE INSTALLATION**

Install tapping sleeves in conformance to the requirements described in Section 15100, Control and Check Valves.

### **3.3 TAPPING VALVE INSTALLATION**

Install tapping valves in conformance to the requirements described in Section 15100: Control and Check Valves.

### **3.4 THRUST RESTRAINT**

Provide adequate thrust restraint for tapping valve and line stop to prevent movement and leakage of valve or line stop or connections with valve or line stop in open or closed position. Thrust restraint shall be constructed of concrete, wood, or steel shoring, or bracing as necessary. Install, maintain, and remove thrust restraint for valve for the duration that the valve and line stop is in place.

### **3.5 VALVE AND LINE STOP LEAKAGE TESTING**

Visually observe valve and line stop for leakage following installation.

### **3.6 TEMPORARY LINE STOP DEVICE REMOVAL**

Following completion of the work to install, test, and place into service the new water main, remove all tapping sleeves, tapping valves, fittings, line stop devices, thrust restraint and connection hardware used for installation of the temporary line stop device. Perform backfill, surface repair, and pavement restoration as necessary in accordance with the requirements of Section 02223: Trenching, Backfilling, and Compacting and Section 02513: Asphalt Concrete Paving.

### **3.7 TRAFFIC CONTROL AND ACCESS**

Provide and maintain traffic control and access at the location of each line stop during installation, use, and removal of the line stop in accordance with the traffic control plan and Section 01570: Traffic Regulation.

#### **PART 4 - PAYMENT**

The unit price bid for installation of temporary line stop devices includes full compensation for furnishing the labor, materials, tools and equipment and doing all Work involved to complete the line stop installation, provide traffic control, and remove the line stop and all appurtenances.

**END OF SECTION**

## **SECTION 02100: MOBILIZATION/DEMOBILIZATION/CLEANUP**

### **PART 1 - GENERAL**

#### **1.1 WORK INCLUDED**

This Section includes the Work necessary to mobilize, demobilize, and clean up the Project sites(s).

### **PART 2 - PRODUCTS**

#### **2.1 GENERAL**

Provide all temporary and permanent materials, equipment, and labor required to accomplish the Work as specified.

#### **2.2 SECURITY FENCE**

- A. If requested by the Owner, construct security fences for safety or the protection of materials, tools, and equipment of the Contractor and lower-tier subcontractors. At completion of the Work, remove fence from the sites and restore the area. The security fence(s) shall be constructed at the sole expense of the Contractor.
- B. Provide access at any time and any necessary keys to the Engineer.

#### **2.3 PARKING FACILITIES**

Provide parking facilities for personnel working at the sites.

### **PART 3 - EXECUTION**

#### **3.1 CONSTRUCTION LAYOUT**

- A. Set up construction facilities in a neat and orderly manner within designated area at location of choice. Accomplish all required Work in accordance with applicable portions of these Specifications. Confine operations to work area shown.
- B. Some obstructions may not be shown. The removal and replacement of minor obstructions such as electrical conduits, water piping, waste piping, and similar items shall be anticipated and accomplished, even though not shown or specifically mentioned, at contractor's sole cost.

- C. Major obstructions encountered that are not shown on the Drawings, and could not have been foreseen by visual inspection of the site prior to bidding, shall immediately be brought to the attention of the Engineer. The Engineer will make a determination for proceeding with the Work.

### **3.2 CONTAMINATION PRECAUTIONS**

Avoid contamination of the sites. Do not dump waste oil, rubbish, or other similar materials on the ground.

### **3.3 CLEANUP OF CONSTRUCTION AREAS**

- A. During execution of the Work, the Contractor shall daily clean the sites, adjacent properties, and public access roads and dispose of waste materials, debris, and rubbish to assure that grounds, and public and private properties are maintained free from accumulations of waste materials and rubbish. Daily cleanup shall be performed and completed near end of workday. Contractor shall provide containers for collection and disposal of waste materials, rubbish, and debris.
- B. Upon completion of rehabilitation, remove from the sites all rehabilitation and related equipment, and all debris, unused materials, temporary construction buildings, and other miscellaneous items resulting from or used in the operations. Replace or repair any facility that has been damaged during the construction Work. Restore the sites as nearly as possible to its original condition.
- C. Remove all utility identification and construction-related marking to the satisfaction of the Engineer after completion of Work or when requested by Owner.

## **PART 4 - PAYMENT**

Payment for the Work in this Section shall be included as part of the lump sum or unit price bid amount for which such Work is appurtenant thereto, and no additional payment will be made specifically for the Work in this Section.

Any extension of Contract time that may be granted by the Owner will not of itself constitute a claim for additional payment for the Work under this Section.

## **END OF SECTION**



## **SECTION 02140: DEWATERING**

### **PART I - GENERAL**

#### **1.1 DESCRIPTION**

Provide all labor, equipment, materials and perform all Work of design, construction, operation and maintenance of effective dewatering system(s) to assure a safe and dewatered condition of all cut-and-cover, jacking and receiving pits, and areas on which the Work of this Contract will be performed. Continue operation of systems as required to complete the Contract Work and to protect adjacent property or construction until danger of damage resulting from rise or fall of groundwater and/or inflow of surface water is precluded. Remove or relocate equipment when no longer required, or as approved well-points and like items may be abandoned in place in accordance with all applicable local, City, County, State and Federal requirements.

#### **1.2 RELATED WORK SPECIFIED ELSEWHERE**

Refer to the following Specification Sections for additional requirements:

- A. Section 02222: Protecting Existing Underground Utilities
- B. Section 02223: Trenching, Backfilling and Compacting

#### **1.3 QUALITY ASSURANCE/WARRANTY**

Qualifications. Furnish the services of an experienced, qualified, and equipped Dewatering Subcontractor to design and operate the dewatering system(s) required for the Work. In lieu of the above, implement the dewatering in accordance with a system approved by City and designed by a Civil Engineer who is registered in the State of California and who has proven experience in this type of work.

#### **1.4 SUBMITTAL**

Submit for approval, shop drawings and data showing the intended work plan for dewatering operations. Include locations and capabilities of dewatering wells, well points, pumps, sumps, collection and discharge lines, standby units, water disposal methods, monitoring and settlement measuring equipment, and data collection and dissemination procedures. Submit not less than 30 days prior to start of dewatering.

## **1.5 ALTERNATIVES**

Groundwater may be high, seasonally variable and subject to tidal fluctuations. Dewatering systems shall effectively intercept and remove water from the surrounding strata and thus prevent its entry into the excavation. The employment of available alternatives to achieve this objective may be required. Do not place reliance solely on sheeting to protect Work areas; supplement sheeting with dewatering. The use of a system of interlocking sheet piling with braces, walers, and struts, or other means which may be suitable, will be permitted. Trench boxes, tie-backs and soil anchors are not allowed.

## **1.6 PERMIT REQUIREMENTS**

Obtain an NPDES Permit through the Regional Water Quality Control Board, which regulates the discharge of construction dewatering material into the Alamitos Bay. Comply with these permit conditions, and all other agency permit conditions that may apply to this Work such as the City's existing NPDES Permit. Allow ample time in the construction schedule for obtaining the NPDES Permit.

## **PART 2 – PRODUCTS**

### **2.1 COMPONENTS OF THE DEWATERING SYSTEM**

Provide units of standard manufacture and in good working order. Unserviceable parts and equipment shall be removed from the jobsite. Major equipment for which repair parts are unavailable from local suppliers shall be considered obsolete and therefore not acceptable.

Furnish and maintain all materials, tools, equipment, facilities and services as required for providing the necessary dewatering work and facilities. Dewatering may include the use of well points, sump pumps, temporary pipeline for water disposal, rock or gravel placement, and other means, as approved by the Owner.

Provide sufficient equipment and machinery in good working condition and have available, at all times, competent workmen for the operation of the pumping equipment. Keep adequate standby equipment available at all times to insure efficient dewatering and maintenance of dewatering operation during power failure.

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

- A. Coordination: Lay out and install dewatering installations beyond the limits of the permanent works. Avoid interference with access or other necessary activities.
- B. Barricades, Shelters, and Safety: Provide protections for vital parts from accidental damage, and erect signs and barricades to isolate hazardous areas.

### **3.2 PERFORMANCE**

- A. Dewatering: Perform dewatering operations as required so all underground and below-grade Work is performed or installed in dry excavations, in accordance with recommendations set forth in Section 02223, Trenching, Backfilling and Compacting. Maintain dewatering systems in continuous operation until the involved Work is completed, including the placing and compaction of backfill materials.
- B. Protection of Existing Facilities: Contractor shall provide standby equipment of sufficient size and capacity to insure continuous operation of the dewatering systems. Where any sloped excavation infringes on or potentially endangers any existing facilities or structures, provide shoring, sheeting, and bracing according to shop drawings and calculations signed and stamped by a Structural or Civil Engineer registered in the state of California. File a copy of such plans and calculations with the City for record purposes. At Contractor's expense and to Owner's satisfaction, repair and make good all damage or settlement to the foundation or other portion of any new or any existing facilities or structures caused by permanent or temporary failure or operation of the dewatering or by failure to maintain the existing groundwater level outside the dewatering areas.
- C. Drainage: During the life of this Contract, provide and maintain ample means to promptly and effectively remove water from all areas of Work, to prevent the entry of harmful quantities of water into the excavations and to dispose of the water removed. Avoid environmental damage and nuisance.
- D. Removal: Remove equipment when no longer required for dewatering or water controlling operations. Maintain operation of monitoring and settlement measurement systems until their removal is approved. To the extent approved, well points and like items may be abandoned in place, otherwise remove all temporary works, dewatering and/or recharging facilities in a manner satisfactory to the Owner.

- E. Dewater to a minimum of 2 feet below bottom of excavation and/or Work zone.

### **3.3 TESTING AND FIELD QUALITY CONTROL**

Observe and record the elevation of the groundwater during the period that the dewatering system is in operation.

### **3.4 REPAIR AND CLEANUP**

- A. The dewatering system can be removed when surface water or ground water is no longer encountered in the Work or when the requirements of this Section are met.
- B. Replace or repair any defective equipment or system components prior to commencing construction operations to ensure all dewatering requirements are adhered to.

## **PART 4 - PAYMENT**

Payment for the Work in this Section shall be included as part of the lump-sum or unit-price bid amount for which such Work is appurtenant thereto, and no additional payment will be made specifically for the Work in this Section.

**END OF SECTION**

## **SECTION 02220: STRUCTURE EARTHWORK**

### **PART 1 - GENERAL**

#### **1.1 DESCRIPTION**

This Section describes excavation, backfilling, materials, testing, and shoring for underground structures including tank foundation.

#### **1.2 RELATED WORK SPECIFIED ELSEWHERE**

Refer to the following Specification Section(s) for additional requirements:

- A. Section 01300: Submittals
- B. Section 02223: Trenching, Backfilling, and Compacting

#### **1.3 SUBMITTALS**

Furnish submittals in accordance with the requirements of Section 01300: Shop Drawing Submittals. The following submittals are required:

- A. Drawings of excavation, sloping, and shoring, sheeting or bracing for worker protection in accordance with the General Provisions.
- B. Six copies of a report from a testing laboratory verifying that gravel base and structural backfill conforms to the specified gradations and characteristics.
- C. Test reports on borrow material.
- D. Other tests and material reports as required.

#### **1.4 PROTECTION OF EXISTING UTILITIES AND FACILITIES**

- A. General: Care for and protect all existing sewer pipelines, water pipelines, gas mains, storm drains, culverts, electrical conduit, or other facilities and structures that may be encountered in or near the area of Work.
- B. Notification: Notify each agency having jurisdiction over the Work and make arrangements for locating each agency's facilities prior to beginning construction.
- C. Damage: In the event of damage to any existing facilities during the progress of the Work due to the failure of the Contractor to exercise the proper precautions, pay the cost of all repairs and protection to said

facilities, at Contractor's sole expense. The Contractor's Work may be stopped until repair operations are complete without cost to the Owner.

## **1.5 PROTECTION OF LANDSCAPING**

Protect all trees, shrubs, fences, and other landscape items adjacent to or within the work area, unless directed otherwise on the Drawings. In the event of damage to landscape items, replace the damaged items in a manner satisfactory to the Owner.

## **PART 2 - MATERIALS**

### **2.1 DEFINITION OF ZONES**

- A. Pavement and Street Zones: Pavement and street zones shall be as defined in Section 02223: Trenching, Backfilling and Compacting.
- B. Upper Backfill Zone: The upper backfill zone is defined as the backfill to the full width of the excavation from the top of the structure to the bottom of the street zone in paved areas or to the finished surface in unpaved areas.
- C. Structural Backfill Zone: The structural backfill zone is defined as backfill from the top of the structure to the bottom of the excavation, extending the full width of the excavation.

### **2.2 NATIVE EARTH BACKFILL-UPPER BACKFILL ZONE**

Excavate native earth backfill fine grained non-organic materials free from peat, roots, debris, and rocks larger than 3 inches, and which can be compacted to the specified relative compaction.

### **2.3 STRUCTURAL BACKFILL - STRUCTURAL BACKFILL ZONE**

Structural backfill materials shall consist of hard, durable, and clean sand, gravel, or crushed stone which is free of organic material, clay balls, and other deleterious substances, and shall have the following gradation:

Percent Passing	
<u>Sieve Size</u>	<u>by Weight</u>
2 inches	100
1-1/2 inches	95 to 100
3/4 inch	50 to 100
3/8 inch	15 to 55
No. 4	0 to 25
No. 8	0 to 5
No. 200	0 to 3

## **2.4 CRUSHED AGGREGATE BASE**

Crushed aggregate base shall be as specified in Section 200-2.2 of the Standard Specifications. Durability index shall be at least 40 per California Test Method No. 229.

## **2.5 WATER FOR COMPACTION**

Water used to assist in compaction shall conform to Section 02223: Trenching, Backfilling, and Compacting.

# **PART 3 - EXECUTION**

## **3.1 TESTING FOR COMPACTION**

Testing for compaction shall conform to Section 02223: Trenching, Backfilling, and Compacting.

## **3.2 COMPACTION REQUIREMENTS**

- A. Backfill in Street Zone: 95% relative compaction.
- B. Upper Backfill Zone: 90% relative compaction.
- C. Structural Backfill Zone: 90% relative compaction.
- D. Crushed Rock Base: 80% relative density.

## **3.3 DEWATERING**

- A. General: Dewatering operations shall continuously remove and dispose of all water entering the excavation during construction of the structure and all backfill operations. Dispose of water in a manner to prevent damage to adjacent property and pipe trenches in conformance with all local regulations. Do not allow water to rise in the excavation until backfilling around and above the structure is completed to the finish grade or street zone, as applicable.
- B. Notification: Notify the Owner 48 hours prior to commencement of dewatering operations. Methods employed shall be in conformance with the Owner's existing NPDES permit, a copy of which is available at the office of the Owner.

### 3.4 **STRUCTURE EXCAVATION**

- A. Removal of Material: Structure excavation shall include the removal of all material necessary for the construction of underground structures and foundations.
- B. Clearance: Unless noted otherwise on the Drawings, the sides of excavations for structures shall be sufficient to leave at least a 2-foot clearance, as measured from the extreme outside of formwork or the structure. Excavation side slopes shall be as specified in Section 3.5.
- C. Overdepth Excavations: Correct overdepth excavations by backfilling with crushed rock or concrete, as directed by the Engineer. Do not use native earth backfill to correct overdepth excavation beneath structures.
- D. Surplus Material: Dispose of surplus material in accordance with Section 02223: Trenching, Backfilling, and Compacting.

### 3.5 **SUPPORT FOR EXCAVATIONS FOR STRUCTURES**

- A. Safety: Provide a safe working area for workers. Use the services of a Registered Civil Engineer to design sheeting, shoring and bracing, or side slopes. Use the requirements of CAL/OSHA and of these Specifications as minimum design criteria. Obtain sufficient geotechnical data to provide safe design.
- B. Side Slopes: Minimum side slope shall be per CAL/OSHA but not steeper than (soil descriptions per USDA definitions):
  - 1. Clayey soil up to 12-foot depth--3/4 horizontal to 1 vertical (3/4:1).
  - 2. Clayey soil more than 12-foot depth—vary evenly from 3/4:1 for 12-foot depth to 3:1 for 20-foot depth.
  - 3. Gravelly soil--2:1.
  - 4. Flatten above slopes if groundwater is present.
- C. Traffic Safety: Select methods of support or side slopes to provide sufficient clearance for public traffic safety and convenience.
- D. Design Loads: Consider the characteristics of the soil exposed in the excavation, the groundwater conditions, traffic, and other surcharge loads when selecting lateral pressures to be used for design of soil supporting systems.



- E. Design Criteria: Use the following minimum design criteria for allowable lateral passive soil pressure expressed in pounds per square foot (psf) to calculate depth of penetration of isolated soldier piles or solid sheet piles. Where needed for safety, these values shall be increased.

	<u>Predominant Soil Type</u>	
	<u>Clayey</u>	<u>Granular</u>
Isolated Soldier	$200 Z + 1,870$	$467 Z$
Solid Sheet	$67 Z + 633$	$300 Z$

Where Z = depth in feet below bottom of excavation.

- F. Verification of Soil Types: Prior to design and submittal of support system, verify the type of soil below the bottom of the excavation.

### 3.6 **BACKFILL AGAINST WALLS AND OVER ROOF SLABS**

A. Precautions

1. Backfill over structures in a manner so as to not damage the roof membrane and protective cover.
2. Do not backfill against walls or above buried roof slabs until the concrete has obtained a comprehensive strength equal to the specified 28-day compressive strength. Where backfill is to be placed on both sides of the wall, place it uniformly on both sides. Where backfill is to be placed around a structure, place it at a uniform rate around the structure.
3. Do not backfill against the walls of structures that are laterally restrained or supported by suspended slabs or slabs on grade until the slab is poured and the concrete has reached the specified minimum 28-day compressive strength.
4. When backfill is to be placed before 7-day concrete strength tests have been conducted on concrete arches for VCP sewers or thrust blocks, the concrete shall have achieved 50 percent of the specified minimum 28-day strength. Make an additional test cylinder for this test.

- B. Equipment: Equipment for placing and compacting backfill over structures shall not exceed 15 tons total weight and a maximum wheel load of 10,000 pounds. Do not use equipment weighing more than 10,000 pounds closer to walls and structures than a horizontal distance equal to the depth of fill at the time.

### 3.7 **COMPACTION**

- A. Compaction for Zones: Compact to the percentage of maximum dry density, or relative compaction, specified for each zone.
- B. Moisture Control: Control moisture as follows:
  - 1. Where subgrade or soil material layers must be moisture conditioned before compaction, apply water uniformly to the subgrade surface or soil layer material in order to prevent free water from appearing on the surface during or subsequent to compaction operations. The moisture content of the compacted soil shall be within 2 percentage points of the optimum.
  - 2. Remove and replace or scarify and air-dry soil material that is too wet to permit compaction to specified density.
  - 3. Soil material that has been removed because it is too wet to permit compaction may be stockpiled or spread within an approved area and allowed to dry. Drying may be assisted by discing, harrowing or pulverizing, until moisture content is reduced to satisfactory value.
  - 4. Do not backfill or use fill material on surfaces that are muddy, frozen, or contain frost or ice.
- C. Requirements Prior to Backfilling: Backfill excavations as work permits, but not until completion of the following:
  - 1. Acceptance of construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.
  - 2. Inspection, testing, approval, and recording locations of underground utilities.
  - 3. Removal of concrete formwork.
  - 4. Removal of shoring and bracing, and backfilling of voids with satisfactory materials. Cut off temporary sheet piling driven below bottom of structures and remove in manner to prevent settlement of the structure or utilities, or leave in place, if required.
  - 5. Removal of trash and debris.
  - 6. Permanent or temporary horizontal bracing is in place on horizontally supported walls.

- D. Backfill Layers: Backfill and use fill materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- E. Jetting: Unless specified otherwise, do not use water jetting techniques to densify granular fill materials.
- F. Uniform Backfill Lifts: Backfill and use fill materials evenly adjacent to structures, to required finish elevations. Take care to prevent wedging action of backfill against structures by carrying material uniformly around structure to approximately same elevation in each lift.

#### **PART 4 - PAYMENT**

Payment for the Work in this Section shall be included as part of the lump sum bid amount for which such Work is appurtenant thereto, and no additional payment will be made specifically for the Work in this Section.

#### **END OF SECTION**

## **SECTION 02222: PROTECTING EXISTING UNDERGROUND UTILITIES**

### **PART 1 - GENERAL**

#### **1.1 GENERAL**

This Section describes materials and procedures for protecting existing underground utilities.

#### **1.2 RELATED WORK DESCRIBED ELSEWHERE**

Refer to the following Specification Section(s) for additional requirements:

- A. Section 01300: Submittals
- B. Section 02223: Trenching, Backfilling, and Compacting

#### **1.3 SUBMITTALS**

Furnish submittals in accordance with the requirements of Section 01300: Submittals. The following submittals are required:

Submit drawings and calculations for support and protection at pipeline crossings larger than 36-inch at least 30 days prior to excavation of crossing.

### **PART 2 - PRODUCTS**

#### **2.1 REPLACEMENT IN KIND**

Except as indicated on the Drawings or as specifically authorized by the Engineer, reconstruct utilities with new material of the same size, type, and original quality as that removed.

### **PART 3 - EXECUTION**

#### **3.1 GENERAL**

- A. Replace "in kind" street improvements, such as curbs and gutters, ramps, barricades, traffic islands, signalization, fences, signs, mail boxes, 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 owner 48 hours in advance of the crossing construction and coordinate the construction schedule with the utility owner's requirements. Obtain agency approval before submitting shop drawings.

- 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, and condition of these utilities. Pothole all utilities, except those listed in the Contract Documents as already being potholed, prior to submitting pipe laying drawings. Submit a set of potholing plans to the Engineer prior to submitting laying diagrams. In addition, expose all utilities at least 500 lineal feet in advance of pipeline excavation.

### **3.2 PROCEDURES**

- A. Protect in Place: Protect utilities in place, unless abandoned, and maintain the utility in service, unless otherwise specified on the Drawings or in the Specifications.
- B. Cut and Plug Ends: Cut abandoned utility lines (conduits) and plug the ends. Plug with an 8-inch wall of brick and mortar or 8-inch concrete plug measured from the cut end of the pipe. Dispose of the cut pipe as unsuitable material.
- C. Provide temporary support for all pipelines crossing the proposed trench. All pipelines 18-inches in diameter or larger crossing over the proposed water main with less than 4 feet of clearance shall have a permanent concrete support. Permanently protect all pipelines less than 18-inches in diameter and crossing over the proposed water main with less than 2 feet of clearance by pouring a 1-sack sand/cement slurry from the top of the water main to the bottom of the crossing pipeline.

### **3.3 THRUST BLOCKS ON WATER LINES**

The Contractor's attention is called to existing thrust blocks on water lines throughout the Work whose thrust is toward the trench excavation and, therefore, may be affected by the pipeline construction. Protect thrust blocks in place or shore to resist the thrust by a means acceptable to the Engineer, and reconstruct.

### **3.4 ABANDONED UTILITIES**

Remove and dispose of abandoned utilities within the trench excavation.

#### **PART 4 - PAYMENT**

Payment for the Work in this Section shall be included as part of the lump sum or unit price bid amount for which such Work is appurtenant thereto, and no additional payment will be made specifically for the Work in this Section.

**END OF SECTION**

## **SECTION 02223: TRENCHING, BACKFILLING, AND COMPACTING**

### **PART 1 - GENERAL**

#### **1.1 DESCRIPTION**

This Section describes materials, testing, and performance of trench excavation, backfilling, and compacting.

#### **1.2 RELATED WORK SPECIFIED ELSEWHERE**

Refer to the following Specification Section(s) for additional requirements:

- A. Section 01300: Submittals
- B. Section 02220: Structure Earthwork
- C. Section 02513: Asphalt Concrete Paving
- D. Section 03000: General Concrete Construction
- E. Section 15000: General Piping Requirements

#### **1.3 SUBMITTALS**

Furnish submittals in accordance with the requirements of Section 01300: Submittals. The following submittals are required:

- A. Submit Drawings showing excavation and shoring, bracing, or sloping for worker protection.
- B. Submit six copies of a report from a testing laboratory verifying that backfill material conforms to the specified gradations or characteristics for pea gravel, granular material, imported sand, rock refill for foundation stabilization, and water.

#### **1.4 PROTECTION OF EXISTING UTILITIES AND FACILITIES**

- A. General: Protect all existing sewer pipelines, water pipelines, gas mains, storm drains, culverts, or other facilities and structures that may be encountered in or near the area of Work.
- B. Notification: Notify each agency having jurisdiction and make arrangements for locating each agency's facilities prior to beginning construction.
- C. Damage: In the event of damage to any existing facilities during the progress of the Work due to the failure of the Contractor to exercise proper precautions, pay for the cost of all repairs and protection to said facilities, at Contractor's sole expense. The Contractor's Work may be stopped until repair operations are complete without cost to the Owner.

## **1.5 PROTECTION OF LANDSCAPING**

- A. General: Protect all trees, shrubs, fences, and other landscape items adjacent to or within the site unless directed otherwise in the Drawings. In the event of damage to landscape items, replace the damaged items in a manner satisfactory to the Engineer.
- B. Restoration: After the completion of Work in planted or improved areas within public or private easements, restore such areas to original condition. Restoration shall include regrading, placement of 5 inches of topsoil, reseeding, and replacement of landscaping.

## **PART 2 - MATERIALS**

### **2.1 DEFINITION OF ZONES**

- A. Pavement Zone: The pavement zone shall include the asphaltic concrete (or portland cement concrete) and aggregate base pavement section placed over the street zone.
- B. Street Zone: The street zone shall consist of the top 18 inches of the trench immediately below the pavement zone in paved areas or areas to be paved.
- C. Trench Zone: The trench zone shall include the portion of the trench from the top of the pipe zone to the bottom of the street zone in paved areas or to the final grade in unpaved areas.
- D. Pipe Zone: The pipe zone shall include the full width of trench from the bottom of the pipe or conduit to a horizontal level 12 inches above the top of the pipe. Where multiple pipes or conduits are placed in the same trench, the pipe zone shall extend from the bottom of the lowest pipe(s) to a horizontal level 12 inches above the top of the highest or topmost pipe.
- E. Pipe Base: The pipe base shall be defined as a layer of material immediately below the pipe zone and extending over the full trench width.

### **2.2 NATIVE EARTH BACKFILL--TRENCH ZONE**

Excavated native earth backfill shall be fine-grained non-organic materials free from peat, roots, debris, and rocks larger than 3 inches, and which can be compacted to the specified relative compaction.



### 2.3 **BACKFILL--PIPE ZONE AND PIPE BASE**

Unless otherwise specified or shown on the Drawings, the pipe base and pipe zone backfill material shall be imported sand as specified herein.

### 2.4 **IMPORTED SAND--PIPE ZONE AND PIPE BASE**

Imported sand used in the pipe zone or for the pipe base shall have the following gradation:

<u>Sieve Size</u>	<u>Percent passing by Weight</u>
3/8-inch	100
No. 4	75 - 100
No. 30	12 - 50
No. 100	5 - 20
No. 200	0 - 15

Minimum sand equivalent shall be 30 per ASTM D 2419.

### 2.5 **GRAVEL AND CRUSHED ROCK--PIPE ZONE AND PIPE BASE**

Gravel or crushed rock material shall conform to the Standard Specifications, Section 200-1.2 and shall meet the following gradation:

<u>Sieve Sizes</u>	<u>Designated Material Size</u>			
	<u>1-1/2-Inch Percent Passing</u>	<u>1-Inch Percent Passing</u>	<u>3/4-Inch Percent Passing</u>	<u>3/8-Inch Percent Passing</u>
2-inches	100	---	---	---
1-1/2-inches	90 - 100	100	---	---
1-inch	20 - 55	90 - 100	100	---
3/4-inch	0 - 15	30 - 60	90 - 100	---
1/2-inch	---	0 - 20	30 - 60	100
3/8-inch	0 - 5	---	0 - 20	90 - 100
No. 4	---	0 - 5	0 - 5	30 - 60
No. 8	---	---	---	0 - 10

### 2.6 **REFILL MATERIAL FOR FOUNDATION STABILIZATION**

Refill material below the pipe shall be either material conforming to the 1½-inch size requirement for gravel or crushed rock, or naturally occurring rock having the following gradation:

<u>Sieve Size</u>	<u>Percent Passing By Weight</u>
3 inches	100
1-1/2 inches	70 - 100
¾ inch	60 - 100
No. 4	5 - 55
No. 30	0 - 30
No. 200	0 - 10

## **2.7 SAND-CEMENT SLURRY REFILL MATERIAL FOR FOUNDATION STABILIZATION IN PIPE BASE AND PIPE ZONE**

Sand-cement slurry shall consist of one sack (94 pounds) of portland cement per cubic yard of sand and sufficient moisture for workability.

## **2.8 PEA GRAVEL**

Pea gravel shall be defined as gravel, uniformly graded from coarse to fine with less than 10% passing a No. 200 sieve, less than 50% passing a No. 4 sieve, and having a maximum particle size of ¾ inch.

## **2.9 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 coatings.

# **PART 3 - EXECUTION**

## **3.1 TESTING FOR COMPACTION**

- A. Perform compaction testing as described below.
- B. Methods: Determine the density of soil in place by the sand cone method, (ASTM D 1556), or by the nuclear method (ASTM D 2922 or D 3017).
- C. Soil Moisture-Density Relationship: Determine the laboratory moisture-density relations of soils shall be determined per ASTM D 1557.
- D. Cohesionless Materials: Determine the relative density of cohesionless materials by ASTM D 4253 and D 4254.
- E. Sampling: Sample backfill materials per ASTM D 75.

- F. Relative Compaction: Express "relative compaction" or "relative density" as the ratio, expressed as a percentage, of the in place dry density to the laboratory maximum dry density.
- G. Compaction Compliance: Compaction shall be deemed to comply with the Specifications when none of the tests falls below the specified relative compaction.

### **3.2 COMPACTION REQUIREMENTS**

Unless otherwise shown on the Drawings or otherwise described in the Specifications for the particular type of pipe installed, relative compaction in pipe trenches shall be as follows:

- A. Pipe Base and Pipe Zone: Pipe base and pipe zone--90% relative compaction. Note 95% relative compaction requirement in specific areas shown on the plan and profile Drawings.
- B. Trench Zone - Not Beneath Paving: Backfill in trench zone not beneath paving--90% relative compaction.
- C. Trench Zone - Paved Areas: Backfill in trench zone in paved areas--90% relative compaction.
- D. Street Zone: Backfill in street zone in paved areas--95% relative compaction.
- E. Foundation Stabilization: Rock refill material for foundation stabilization--90% relative density.
- F. Overexcavation: Rock refill for overexcavation--90% relative density.
- G. Test all imported or native materials before the start of compaction operations to determine the moisture density relationship for materials with cohesive components, and the maximum density for cohesionless materials. Variations in imported or native earth materials may require a number of base curves of the moisture-density relationship.
- H. Unless noted otherwise, perform compaction tests at random depths and at 200-foot intervals, and as directed by the Engineer.

### **3.3 MATERIAL REPLACEMENT**

Remove trenching and backfilling material, which does not meet the Specifications and replace at no additional expense to Owner.

### **3.4 SHEETING, SHORING, AND BRACING OF TRENCHES**

Trenches shall have sheeting, shoring, and bracing conforming to CAL/OSHA requirements; Section 02220: Structure Earthwork, Paragraphs 3.5B-C; and General Conditions. Base lateral pressures for design of trench sheeting, shoring, and bracing on type of soil exposed in the trench, groundwater conditions, surcharge loads adjacent to the trench, and type of shoring that will be used in the trench.

### **3.5 TRENCH WIDTHS**

- A. Pipe Diameter 12 inches and Greater: Unless shown otherwise on the Drawings, trench widths in the pipe zone shall be equal to the pipe outside diameter plus 12 inches on each side of the pipe. Trench width at the top of the trench shall not be limited except where width of excavation would undercut adjacent structures and footings. In such cases, width of trench shall be such that there is at least 18 inches between the top edge of the trench and the structure or footing.
- B. Pipe Diameter 10 inches and Under: Excavation and trenching shall be true to line so that a clear space of not more than 8 inches or less than 6 inches in width is provided on each side of the largest outside diameter of the pipe in place measured at a point 12 inches above the top of the pipe. The largest outside diameter shall be the outside diameter of the bell on bell and spigot pipe.
- C. Where the trench width, measured at a point 12 inches above the top of the bell of the pipe, is wider than the maximum set forth above, backfill the trench area around the pipe with crushed rock, Class B concrete, or slurry to form a cradle for the pipe as shown on the Standard Drawing S-8 or S-10, at the discretion of the Engineer.

### **3.6 GRADE**

Excavate trenches to the lines and grades shown on the Drawings with allowance for pipe thickness and for pipe base. If the trench is excavated below the required grade, refill the portion of the trench excavated below the grade with refill material at no additional cost to the Owner. Place the refill material over the full width of trench in compacted layers not exceeding 6 inches deep to the required grade less allowance for the pipe base. Remove hard spots that would prevent a uniform thickness of pipe base. Before laying pipe sections, check the grade with a 10-foot straightedge and correct any irregularities. The trench bottom shall form a continuous and uniform bearing and support for the pipe at every point.

### **3.7 PIPE BASE THICKNESS**

Thickness of the pipe base shall be as shown on the Drawings or as otherwise described in the Specifications for the particular type of pipe installed, but in no case shall the thickness be less than 4 inches.

### **3.8. DEWATERING**

- A. Means and Devices: Provide and maintain suitable and sufficient means and devices to continuously 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, and until the backfill at the pipe zone has been completed. These provisions shall apply during the noon hour as well as overnight. Dispose of water of in a manner to prevent damage to adjacent property. Do not drain trench water through the pipeline under construction. Do not allow groundwater to rise above the bottom of the pipe until jointing compound has firmly set (if any) and the pipe is watertight.
- B. Notification: Notify the City 48 hours prior to commencement of dewatering. Methods employed shall be in conformance with the Owner's existing NPDES permit.

### **3.9 STORAGE OF EXCAVATED MATERIAL**

During trench excavation, store excavated material only within the Work area. Do not obstruct roadways or streets. The safe loading of trenches with excavated material shall conform to Laws and Regulations.

### **3.10 LENGTH OF OPEN TRENCH**

The length of open trench shall be limited to 600 feet in advance of pipe laying, or the amount of pipe installed in one working day, whichever is less. Complete backfilling and temporary or first layer paving so that not more than 500 feet of trench is open in the rear of pipe laying. Backfill or adequately bridge sidewalks, driveways and other traveled ways to provide safe access and egress at the completion of each day's Work.

### **3.11 FOUNDATION STABILIZATION**

After the required excavation has been completed, the Engineer will inspect the exposed trench subgrade to determine the need for any additional excavation. It is the intent that additional excavation shall be conducted in all areas within the influence of the pipeline where unacceptable materials exist at the exposed subgrade. Overexcavation shall include the removal of all such unacceptable material that exists directly beneath the pipe base and to the depth required. The presence of unacceptable material may require excavating a wider trench.

Backfill the overexcavated portion of the trench to the subgrade of the pipe base with refill material for foundation stabilization. Place foundation stabilization material over the full width of the excavation and compacted in layers (lifts) not exceeding 6-inches in compacted depth, to the required grade.

### **3.12 TRENCH BACKFILLING AND COMPACTION**

- A. General: Trench backfilling shall conform to requirements of the detailed piping specification for the particular type of pipe and the following.
- B. Pipe Base: Place the specified thickness of pipe base material over the full width of trench. Grade the top of the pipe base ahead of the pipe laying to provide firm, uniform support along the full length of the barrel of the pipe.
- C. Bell Holes: Excavate holes at each joint to permit proper assembly and inspection of the entire joint.
- D. Pipe Zone: After the pipe has been bedded, place pipe zone material simultaneously on both sides of the pipe, keeping the level of backfill the same on each side. Carefully place material around the pipe so that the pipe barrel is completely supported and that no voids or uncompacted areas are left beneath the pipe. Particular care shall be taken in placing material on the underside of the pipe to prevent lateral movement during subsequent backfilling. Compact material placed within the pipe zone by hand tamping only.
- E. Trench Zone: Carefully deposit backfill material onto the backfill previously placed in the pipe zone. Free fall of the material shall not be permitted until at least 2 feet of cover is provided over the top of the pipe. Do not drop sharp or heavy pieces of material directly onto the pipe or the tamped material around the pipe.
- F. Trench Backfill: Compact trench backfill to the specified relative compaction. Perform compaction by using mechanical compaction or hand tamping equipment. Unless specified otherwise, consolidation by jetting or flooding shall not be permitted. Do not use high impact hammer-type equipment except where the pipe manufacturer warrants in writing that such use will not damage the pipe.
- G. Equipment: Do not use axle-driven or tractor-drawn compaction equipment within 5 feet of walls and structures.
- H. Street Zone Backfill: Street zone backfill shall be done in accordance with the requirements and to the satisfaction of the agency having jurisdiction.

### **3.13 IMPORT OR EXPORT OF BACKFILL MATERIAL**

- A. Excess Material: Remove and dispose of excess excavated soil material off the sites at no additional expense to the Owner. Dispose of excess soil material in accordance with Laws and Regulations.
- B. Imported Material: Import, place and compact any additional backfill material necessary to return all grades to plus or minus 0.2 foot from the grade encountered at the beginning of construction or as shown on the Drawings, at no additional cost to the Owner.

### **3.14 MOISTURE CONTENT OF BACKFILL MATERIAL**

During the compacting operations, maintain optimum feasible moisture content required for compaction purposes in each lift of the backfill material. Maintain moisture content throughout the lift at a uniform level. If placement is discontinued and proper moisture content not maintained, bring the upper layer back to proper moisture content by sprinkling, cultivating and rolling the backfill material before placing new material. At the time of compaction, the water content of the material shall be at optimum water content plus or minus two percentage points. Do not work material, which contains excessive moisture to obtain the required compaction. Material having excessive moisture content may be dried by blading, discing, or harrowing to hasten the drying process.

## **PART 4 - PAYMENT**

Payment for the Work in this Section shall be included as part of the lump sum bid amount for which such Work is appurtenant thereto, and no additional payment will be made specifically for the Work in this Section.

**END OF SECTION**

## **SECTION 02315: JACKED CASING**

### **PART 1 - GENERAL**

#### **1.1 Description**

This section describes tunneling using jacked steel casing for highway, culvert, utility and structure crossings and other shallow depth tunnels less than 500 feet in length. This section also describes carrier pipe installation within the steel casing.

#### **1.2 Related Work Specified Elsewhere**

Refer to the following Specification Section(s) for additional requirements:

- A. Section 01300: Submittals
- B. Section 02223: Trenching, Backfilling, and Compacting
- C. Section 03300: Concrete
- D. Section 15043: Testing of Non-Pressure Sewer Pipelines and Manholes
- E. Section 15044: Pressure Testing of Pipelines
- F. Section 15051: Installation of Pressure Pipelines
- G. Section 15066: Gravity Sewer Pipelines

#### **1.3 Submittals**

- A. Shop drawings shall be submitted in accordance with Section 01300: Submittals and the following.
- B. Submit manufacturer's mill specification sheet listing diameter, thickness, and class of steel used in making the casing, and the mill certification.
- C. Submit drawings showing the location of approach trench, jacking pit, tunnel and receiving pit, and joint type for both casing and carrier pipe.
- D. Submit a tunnel construction schedule which includes casing installation, carrier pipe installation, approach trench backfill, and receiving pit backfill.

#### **1.4 Permits**

All work shall conform to the specifications and requirements of the State of California Department of Transportation, the Orange County Planning & Development Services Department, the City, or the railroad company involved. The Contractor shall secure all required permits for construction of casing pipe installation.



### **1.5 Alternative Methods (For Pipelines having a Pipe Diameter 10-inches and Under)**

The Contractor may present an alternative detailed proposal in lieu of the methods and materials specified herein to jack or bore casing pipe at the locations shown on the plans. Any such proposal shall be presented to the District Representative a minimum of 14 calendar days in advance of the work to allow adequate time for checking, and must be in accordance with all the conditions set forth in the permits.

### **1.6 Scheduling**

If the pipeline is not installed within the casing as a continuous operation following completion of the jacking of the casing, the casing portals shall be bulkheaded and the approach trenches backfilled and later reopened for pipe installation.

## **PART 2 - MATERIALS**

### **2.1. Steel Casing**

- A. Materials: Steel casing pipe shall have a minimum yield strength of 35,000 psi. The minimum inside diameter and wall thickness of the casing shall be as follows, or shall be as shown on the drawings. Greater casing thickness and diameter may be used as convenient for the method of work and loadings involved, as suitable for the site and as limited by possible interferences, but at no additional cost to City.
- B. The Contractor shall choose a size of casing at or above the minimum specified, in order that the jacking may be done with a sufficient degree of accuracy to permit installation of the carrier pipe to the grades shown on the plans.
- C. Joints: Casing sections shall be joined by full circumference butt welding in the field. Prepare ends of casings for welding by providing 1/4-inch X 45- degree chamfer on outside edges.
- D. Wall Thickness: The minimum size and thickness of casing pipes for insertion of various sizes of carrier pipes shall be according to the Standard Drawings, unless a larger or heavier wall casing pipe is required by the agency having jurisdiction over the road or railroad crossings. See Standard Drawings for casings for water mains, and Standard Drawing S-12 for casings for sewer lines.

## **2.2. Casing Seals**

Casing seals shall be 1/8-inch thick, synthetic rubber, designed to fit snugly around pipe and casing. Casing seals may be one piece with no field seams or the wrap-around style to facilitate installation after the casing and carrier pipe are already installed. Bands and hardware for attachment to pipe and casing OD shall be stainless steel.

## **2.3. Grout**

- A. Grout shall consist of one part portland cement, four parts sand, 2% bentonite by weight of the cement, and sufficient water to produce a workable mixture.
- B. Portland cement, water and sand shall conform to the applicable requirements of Section 03300: Concrete, except that sand shall be of such fineness that 100% will pass a standard No. 8 sieve and at least 45%, by weight, will pass a standard No. 40 sieve.
- C. Bentonite shall be a commercially-processed powdered bentonite, Wyoming type, such as Imacco-gel, Black Hills, or for Contracts between District and Contractor, approved equal.

## **2.4. Sand**

Air blown sand used to fill the annular space in the jacked casing shall conform to the requirements for imported sand in Section 02223: Trenching, Backfilling, and Compacting.

## **2.5. Grout Connections**

Two-inch grout connections on the casing pipe shall be provided every four (4) feet at top and bottom of casing, or as shown on the drawings, or as otherwise specified herein. Longitudinal spacing between grout connections may be decreased to provide more frequent grouting, but in no case shall the spacings shown on the drawings or specifications be exceeded.

# **PART 3 - EXECUTION**

## **3.1 Safety**

For contracts between the Contractor and an entity other than the District, the Contractor shall obtain from the Division of Industrial Safety a classification for each bore. For contracts between the Contractor and the District, the District has obtained from the Division of Industrial Safety a classification for each bore

where required. The boring and jacking work shall be done in conformance with the State of California's requirements. It shall be the Contractor's responsibility to call the required safety meeting with representatives from the State Division of Industrial Safety prior to beginning of construction of each bore.

### **3.2 Jacking Pit**

- A. Excavation Protection: The approach trench for jacking or boring operations shall be adequately shored to safeguard existing substructures and surface improvements and to ensure against ground movement in the vicinity of the casing portal.
- B. Structural Support for Jacking Equipment: Heavy guide timbers, structural steel, or concrete cradle of sufficient length shall be placed in the approach trench of the jacking pit and firmly bedded on the required line and grade to provide accurate control of jacking alignment. Adequate space shall be provided to permit the insertion of the lengths of casing to be jacked. The structure of timbers and structural steel sections shall be anchored to ensure action of the jacks in line with the axis of the casing. A bearing block consisting of a timber or structural steel framework shall be inserted between the jacks and the end of the casing to provide uniform end bearing over the perimeter of the casing and distribute the jacking pressure evenly.

### **3.3 Sectional Shield or Jacking Head**

- A. Equipment: A sectional shield or steel jacking head shall be attached to the leading section of the casing to extend around the outer surface of the upper two-thirds of the casing and to project at least 18-inches beyond the driving end of the casing. The sectional shield or jacking head shall not protrude more than 1/2-inch outside of the outer casing surface. The head shall be anchored to prevent any wobble or alignment variation during the jacking operation.
- B. Removal of Excavated Material: To avoid loss of ground outside the casing, excavation shall be restricted to the least clearance necessary to prevent binding, and shall be carried out entirely within the jacking head and not in advance of the head. Excavated material shall be removed from the casing as jacking progresses and no accumulation of excavated material within the casing will be permitted.

### **3.4 Control of Alignment and Grade**

Application of jacking pressure and excavation of material ahead of the casing as it advances shall be controlled to prevent the casing from becoming earthbound or deviating from required line and grade. Do not encroach upon the

minimum annular space detailed.

### 3.5 Grouting

Immediately after completion of the jacking or boring operation, grout shall be injected through the grout connections in such a manner as to completely fill all voids outside the casing pipe resulting from the jacking or boring operation. Where loss of ground outside the casing is suspected, additional grout connections shall be welded to the casing. Grout pressure shall be controlled so as to avoid deformation of the casing and/or avoid movement of the surrounding ground. After completion of grouting, the grout connections shall be closed with cast iron threaded plugs.

### 3.6 Installation of Carrier Pipe

- A. Insertion of Carrier Pipe: After grouting the exterior of the casing pipe, the interior shall be cleaned and the carrier pipe installed. The carrier pipe shall be installed on three (3) skids of sufficient thickness to prevent the pipe bells from touching the casing pipe and to allow for proper alignment of the carrier pipe to meet the specified grade.
- B. Securement: The top of the carrier pipe shall be continuously blocked to prevent flotation. The carrier pipe shall be secured in a manner satisfactory to the District Representative to prevent floating and subsequent change of grade when the annular spacing between the casing pipe and the carrier pipe is filled.
- C. Pipe Skids and Blocking: Skids and blocking shall be manufactured stainless steel casing spacers with composite runner skids. Casing spacer skids and blocking shall be bolt-on style with a shell made of at least two halves. The band material shall be manufactured of a minimum 14 gauge T-304 stainless steel and 10 gauge T-304 stainless steel risers when needed. All welds are to be chemically passivated. The runners shall be at least 11 inches long and shall be manufactured of high abrasion resistant and low coefficient of friction, glass-filled polymer. Fasteners and hardware for securing the spacers and runners shall be stainless steel. Spacers shall be installed at mid-sections if the carrier pipe segment is over 10 feet long. Detailed product submittals showing all dimensions shall be provided. Casing spacers shall have a flexible EPDM liner having a minimum thickness of 0.090 inch with a hardness of Durometer "A" 85-90. The liner shall have a rating of no less than 60,000 VPM and water absorption of 1% maximum.

Casing spacers shall be as manufactured by Advance Products & Systems, Inc., Cascade Waterworks Mfg. Co., Pipeline Seal & Insulator, Inc. or approved equal.

- D. Grade Adjustment: The carrier pipe grade shall be adjusted as required by either changing the height of the casing spacer riser and/or the thickness of the runner pad skids to compensate for any grade variations of the casing pipe or grouting the invert of the casing pipe to attain the proper grade. Care should be taken to ensure that the carrier pipe does not come in contact with and is insulated from the casing pipe.
- E. Failure to Achieve Required Grade: If the alignment of the casing pipe is such that the carrier pipe grade cannot be met, the grade of the casing pipe shall, if required by the District, be adjusted. If realignment is not deemed feasible by the District, another casing pipe meeting the required grade shall be installed. The abandoned casing pipe shall be filled with sand and the ends plugged with twelve (12) inch thick masonry plugs, brick and mortar plugs or pic seals. Realignment or replacement work shall in no way result in extra cost to the City.
- F. Testing: Before backfilling the annular space, the carrier pipe shall have passed an initial pressure or leakage test in accordance with Testing of Non-Pressure Sewer Pipelines and Manholes and Section 15044: Pressure Testing of Pipelines.

### **3.7 Sand Backfill for Annular Space in Jacked Casing**

- A. Fill for Annular Space: Air-blown sand shall be used to fill the annular space between the casing and the carrier pipe.
- B. Equipment: The necessary sand, air compressor, hoses, pressure gages, valves, and fittings shall be furnished for the filling operation.
- C. Sand: Sand shall be free of lumps when put into the hopper. Sand shall be of a consistency to flow unimpeded and completely fill all voids.
- D. Placement of Sand: A bulkhead for retaining the sand shall be placed in the annular space between the casing and the carrier pipe at each end of the jacked casing. At the start of the sand fill operation, the sand discharge pipe shall extend from the placing equipment, through the inside of the casing, and to the bulkhead at the remote end of the casing. The method used to place the sand shall be such to ensure complete filling of the annular space. During placement, the sand discharge pipe shall be so positioned that its discharge end shall be kept well buried in the sand at all times after the sand has been built up over the crown of the pipe at the remote end of the section being filled. A riser pipe suitable for a vent shall be installed in the casing adjacent to the bulkhead at the near end of the casing. The vent pipe shall be plugged with grout upon completion of sand filling.

### **3.8 Closing the Jacking Pit and Receiving Pit**

- A. Closing the Jacking Pit and Receiving Pit: After jacking equipment and muck from the tunnel have been removed from the approach trench of jacking pit, the bottom of the jacking pit shall be prepared as for a pipe foundation. Remove all loose and disturbed material below pipe grade to undisturbed earth.
- B. Backfill: The jacking pit and receiving pit represent overwidth trench conditions. Backfill shall either be Provisions as called for on the contract drawings, in the Special Provisions, or in Section 02223: Trenching, Backfilling, and Compacting.

**END OF SECTION**

## **SECTION 02513: ASPHALT CONCRETE PAVING**

### **PART 1 - GENERAL**

#### **1.1 DESCRIPTION**

This Section includes materials, testing, and installation of asphalt concrete pavement, aggregate base course, herbicide, prime coat, tack coat, and seal coat.

#### **1.2 RELATED WORK SPECIFIED ELSEWHERE**

Refer to the following Specification Section(s) for additional requirements:

A. Section 02223: Trenching, Backfilling and Compacting

#### **1.3 SUBMITTALS**

Submit eight copies of a report from a testing laboratory verifying that aggregate material contains less than 1% asbestos by weight or volume and conforms to the specified gradations and characteristics. Submit batch test results prior to permanent paving.

#### **1.4 TESTING FOR COMPACTION**

Test for subgrade and base compaction as described in Section 02223: Trenching, Backfilling, and Compacting. Test for asphalt concrete compaction per Section 302-5 of the Standard Specifications.

### **PART 2 - MATERIALS**

#### **2.1 ASPHALT CONCRETE PAVING**

Asphalt concrete paving shall conform to III-C2-AR-4000 as listed in Section 400-4 of the Standard Specifications.

#### **2.2 AGGREGATE BASE COURSE**

Aggregate base shall be crushed aggregate base as specified in Section 400-2 of the Standard Specifications. Aggregate shall contain less than 1% asbestos by weight or volume.

### **2.3 PRIME COAT**

Prime coat shall be slow curing (SC-70) in accordance with Section 203-2 of the Standard Specifications.

### **2.4 TACK COAT**

Tack coat shall conform with Section 302-5.4 of the Standard Specifications and shall be either AR 1000 paving asphalt or Grade SS-1h emulsified asphalt.

### **2.5 ASPHALT**

Asphalt shall be viscosity grade AR 4000 or AR 8000. Asphalt content in the asphalt concrete shall be 5.5% to 6.0%.

### **2.6 AGGREGATE FOR ASPHALT CONCRETE**

Aggregate shall be in accordance with Section 400-1.1 and Section 400-1.2 of the Standard Specifications. Aggregate shall contain less than 1% asbestos by weight or volume.

### **2.7. SLURRY SEAL COAT**

Seal slurry shall be Emulsion Aggregate Slurry with Type II grade aggregate per Section 203-5 of the Standard Specifications.

### **2.8. HERBICIDE OR WEED KILLER**

Use Spike 80W, Elanco Products Company; Pramitol 30 WP, CIBA-Geigy, or approved equal.

### **2.9 PAINT FOR TRAFFIC STRIPING AND MARKING**

Provide thermoplastic rapid dry or fast dry paint of the appropriate color per Section 210-1.6 of the Standard Specifications.

### **2.10 SCHEDULE FOR FINAL PAVEMENT**

Backfill, compaction, and the base pavement paving, except for the final asphalt surface course, shall be complete at all times to a point not to exceed 500 feet behind any working heading and within 30 days after trench excavation. Base pavement shall be made flush with the adjacent finished road surface. Grind 1 ½ inches of asphalt to one foot outside of trench width prior to final asphalt surface course. The final asphalt surface shall be 1-1/2 inch thick. Do not place final surface course until at least 30 days, but not more than 60 days, after traffic has been returned to that portion of the street. Place temporary striping after the base course of asphalt concrete pavement has been completed in the same



configuration as the existing permanent striping so that traffic can be returned to normal patterns. This striping shall be considered temporary.

## **PART 3 - EXECUTION**

### **3.1 PAVEMENT REMOVAL**

- A. Initially cut asphalt concrete pavement with pneumatic pavement cutter or other equipment at the limits of the excavation and remove the pavement. After backfilling the excavation, saw cut asphalt concrete pavement to a minimum depth of 12 inches at a point not less than 12 inches outside the limits of the excavation, any broken asphalt or the previous pavement cut, whichever is greater, and remove the additional pavement.
- B. Saw cut concrete pavement, including cross gutters, curbs and gutters, sidewalks, and driveways, to a minimum depth of 1-1/2 inches at a point at least 12 inches beyond the edge of the excavation and remove the pavement. The concrete pavement may initially be cut at the limits of the excavation by other methods prior to removal and the saw cut made after backfilling the excavation. If the saw cut falls within 3 feet of a concrete joint or pavement edge, remove the concrete to the joint or edge.
- C. Make arrangements for and dispose of the removed pavement and concrete.
- D. Final pavement saw cuts shall be straight along both sides of trenches, parallel to the pipeline alignment, and provide clean, solid, vertical faces free from loose material. Saw cut and remove damaged or disturbed adjoining pavement. Saw cuts shall be parallel to the pipeline alignment or the roadway centerline or perpendicular to same.

### **3.2 PAVEMENT REPLACEMENT**

- A. Backfill, compaction, and the pavement paving, except for the final asphalt surface course, shall be complete at all times to a point not to exceed 1,000 feet behind any working heading. The final asphalt surface course shall be minimum 1-1/2 inch thick. Do not place final surface course until at least 30 days after traffic has been returned to that portion of the street. Place temporary striping after the base course of A.C. pavement has been completed in the same configuration as the existing permanent striping so that traffic can be returned to normal patterns. This striping shall be considered temporary and is the Contractor's responsibility to place and maintain.

- B. The total pavement replacement thickness shall be per the City Standard Drawing.

### **3.3 INSTALLATION**

Apply prime coat to all areas to be paved. Producing, hauling, placing, compacting and finishing of asphalt concrete shall conform to Section 302-5 of the Standard Specifications.

### **3.4 CONNECTIONS WITH EXISTING PAVEMENT**

Where new paving joins existing paving, chip the existing surfaces 12 inches back from the join line so that there will be sufficient depth to provide a minimum of 1-1/2 inches asphalt concrete. Dispose of waste material offsite. Tack coat chipped areas prior to placing the asphalt concrete. Meet lines shall be straight and the edges vertical. Paint the edges of meet line cuts with liquid asphalt or emulsified asphalt prior to placing asphalt concrete. After placing the asphalt concrete, seal the meet line by painting with a liquid asphalt or emulsified asphalt and then immediately cover with clean, dry sand.

### **3.5 PREPARATION OF SUBGRADE**

- A. Excavate and shape subgrade to line, grade, and cross section shown in the drawings. The subgrade shall be considered to extend over the full width of the base course.
- B. Compact the top 30 inches of subgrade (street zone) to 90% relative compaction.
- C. The finished subgrade shall be within a tolerance of  $\pm 0.08$  of a foot of the grade and cross section shown and shall be smooth and free from irregularities and at the specified relative compaction.

### **3.6 INSTALLING REDWOOD HEADERS**

Provide redwood header at edges of paving except where paving is adjacent to concrete slabs, gutters, walks, existing paving, or structures.

### **3.7 PLACING AGGREGATE BASE COURSE**

Place replacement aggregate base course to a minimum thickness of existing plus one inch, unless shown otherwise in the Drawings. Compact to 90% relative compaction. Install in accordance with Section 301-2 of the Standard Specifications.

### **3.8. COMPACTION OF AGGREGATE BASE AND LEVELING COURSES**

Begin compaction and rolling at the outer edges of the surfacing and continue toward the center. Apply water uniformly throughout the material to provide moisture for obtaining the specified compaction. Compact each layer to the specified relative compaction before placing the next layer.

### **3.9 APPLYING HERBICIDE OR WEED KILLER**

Apply weed killer or herbicide on base prior to placing pavement. Apply at the rate recommended by the manufacturer to control daisy brome grass, puncture vine, and plaintain. Apply from outside of curb to opposite outside of curb and for the full width of curbless roadways and parking areas.

### **3.10 PLACING PRIME COAT**

Apply prime coat to the surface of the leveling course of aggregate base at the rate of 0.25 gallon per square yard per Section 302-5.3 of the Standard Specifications.

### **3.11 PLACING TACK COAT**

Apply tack coat on surfaces to receive finish pavement per Section 302-5.4 of the Standard Specifications. Apply tack coat to metal or concrete surfaces that will be in contact with the asphalt concrete paving.

### **3.12 PLACING ASPHALT PAVING**

Place asphalt paving to a minimum thickness of 5 inches unless otherwise shown in the Drawings. Install in accordance with Section 302-5 of the Standard Specifications. Maintain existing cross sectional slope and crown of roadway.

### **3.13 COMPACTION OF ASPHALT CONCRETE PAVING**

Compact until roller marks are eliminated and a density of 92% minimum to 98% maximum has been attained per ASTM D 2041.

### **3.14 APPLYING SLURRY SEAL COAT**

After final paving, apply slurry seal coat per Section 302-4 of the Standard Specifications at the rate of 10 to 18 pounds of dry aggregate per square yard to the repaved section and to any area damaged by the Contractor during construction. Replace obliterated striping in kind.

### **3.15 SURFACE TOLERANCE**

After paving has been installed and compacted, spray water over the entire paved area. Correct any areas where water collects and does not drain away.

### **3.16 APPLY PAINT FOR TRAFFIC STRIPING AND MARKING**

Apply temporary and permanent traffic striping in accordance with Section 310-5.6 of the Standard Specifications.

## **PART 4 – PAYMENT**

Payment for the Work in this Section shall be included as part of the unit prices stated in the Bid for pipeline installation.

Include allowances for pavement removal in the unit prices bid for the Work. No extra compensation will be made if the existing pavement sections vary from the conditions as listed or described.

**END OF SECTION**

## **SECTION 02520: CURED-IN-PLACE PIPE**

### **PART 1 - GENERAL**

#### **1.1 GENERAL**

It is the intent of this Section to provide for the reconstruction of pipelines and conduits by the installation of a resin-impregnated flexible tube, which is formed to the original conduit by use of a hydrostatic head. The resin is cured using hot water under hydrostatic pressure within the tube. The Cured-In-Place Pipe (CIPP) shall be continuous and tight-fitting.

#### **1.2 REFERENCED DOCUMENTS**

This Section refers to ASTM F1216 (Rehabilitation of pipelines by the inversion and curing of a resin-impregnated tube), ASTM F1743 (Rehabilitation of pipelines by pulled-in-place installation of a cured-in-place thermosetting resin pipe), and ASTM D790 (Test methods for flexural properties of non-reinforced plastics) which are incorporated by this reference and shall be the latest editions and revisions. In case of conflicting requirements between this Section and these referenced documents, this Section shall govern.

#### **1.3 PRODUCT, MANUFACTURER/INSTALLER QUALIFICATION REQUIREMENTS**

Products and installers must meet the following criteria:

- A. The installer or company must satisfy all insurance, financial, and bonding requirements of the Owner, and must have had at least 5 (five) years active experience in the commercial installation of the product bid under its current license. Acceptable documentation of these minimum requirements must be submitted to the Owner with the Bid.
- B. Sewer rehabilitation products submitted for approval must be accompanied by third party test results supporting the long term performance and structural strength of the product and such data shall be satisfactory to the Owner. Prepare test samples so as to simulate installation methods and trauma of the product. No product will be approved without independent third party testing verification.
- C. The products shall be:
  - 1. Insituform
  - 2. Perma-Liner Industries Inc.
  - 3. American Pipe and Plastics, Inc.
  - 4. Or approved equal.

## **PART 2 - PRODUCTS**

### **2.1 TUBE**

- A. The sewn tube shall consist of one or more layers of absorbent non-woven felt fabric and meet the requirements of ASTM F1216 or ASTM F1743, Section 5. The tube shall be constructed to withstand installation pressures, have sufficient strength to bridge missing pipe, and stretch to fit irregular pipe sections.
- B. The wet out tube shall have a uniform thickness that, when compressed at installation pressures, will meet or exceed the design thickness.
- C. Sew tube to a size that, when installed, will tightly fit the internal circumference and length of the original pipe. Make allowance for circumferential stretching during inversion. Do not use overlapped layers of felt in longitudinal seams that cause lumps in the final product.
- D. The outside layer of the tube (before wet out) shall be coated with an impermeable, flexible membrane that will contain the resin and facilitate monitoring of resin saturation during the resin impregnation (wet out) procedure.
- E. The tube shall be homogeneous across the entire wall thickness containing no intermediate or encapsulated elastomeric layers. No material shall be included in the tube that may cause delamination in the cured CIPP. No dry or unsaturated layers shall be evident.
- F. The wall color of the interior pipe surface of CIPP after installation shall be a light reflective color so that a clear detailed examination with closed circuit television inspection equipment may be made.
- G. Seams in the tube shall be stronger than the non-seamed felt.
- H. The outside of the tube shall be marked for distance at regular intervals along its entire length, not to exceed 5 ft. Such markings shall include the manufacturer's name or identifying symbol.

### **2.2 RESIN**

The resin system shall be a corrosion resistant polyester, vinyl ester, or epoxy and catalyst system that, when properly cured within the tube composite, meets the requirements of ASTM F1216 and ASTM F1743, the physical properties in this Section, and those which are to be utilized in the design of the CIPP for this project. The resin shall produce CIPP which will comply with the structural and chemical resistance requirements of this specification.

## **2.3 STRUCTURAL REQUIREMENTS**

- A. The CIPP shall be designed as per ASTM F1216, Appendix X.1. The CIPP design shall assume no bonding to the original pipe wall.
- B. Perform long-term testing for flexural creep of the CIPP pipe material to be installed. A percentage of the instantaneous flexural modulus value (as measured by ASTM D-790 testing) shall be used in design calculations for external buckling. The percentage, or the long-term creep retention value utilized, shall be verified by this testing. Values in excess of 50% may not be applied unless substantiated by qualified third party test data. The materials utilized for the project shall be of a quality equal to or better than the materials used in the long-term test with respect to the initial flexural modulus used in design.
- C. The Enhancement factor “K” to be used in partially deteriorated design conditions shall be assigned a value of 7. Application of Enhancement factors in excess of 7 shall be substantiated through independent test data.
- D. The layers of the cured CIPP shall be uniformly bonded. It shall not be possible to separate any two layers with a probe or point of a knife blade so that the layers separate cleanly or the probe or knife blade moves freely between the layers. If separation of the layers occurs during testing of field samples, new samples will be cut from the Work. Any reoccurrence may cause rejection of the Work.
- E. The cured pipe material (CIPP) shall conform to the structural properties, as listed below in Table 1.

**Table 1**  
**MINIMUM PHYSICAL PROPERTIES**

Property	Test Method	Min. Per ASTM F1216	Cured Composite (400,000 psi Resin)
Modulus of Elasticity	ASTM D-790 (short term)	250,000 psi	400,000 psi
Flexural Stress	ASTM D-790	4,500 psi	4,000 psi

- F. The required structural CIPP wall thickness shall be based as a minimum, on the physical properties in Section 2.3 E, Table 2 below, and in accordance with the design equations in the appendix of ASTM F 1216, and the following design parameters:

Design Safety Factor = 2.0  
Retention Factor for Long-Term Flexural  
Modulus to be used in Design = 1%-60%  
*(as determined by Long-Term tests described in the Section 2.3 of the Specifications)*

- G. Refer to the attached Dimensional Ratio table for specific pipe section requirements, based on the pipe condition, depth, ovality, etc. as computed for the conditions shown, using ASTM F 1216 design equations.
- H. Any layers of the tube that are not saturated with resin prior to insertion into the existing pipe shall not be included in the structural CIPP wall thickness computation.



**TABLE 2**  
**CIPP WALL THICKNESS FOR FULLY DETERIORATED DESIGN (FD)**

		Required DR (D / t)			
		Ei = 250,000 psi		Ei = 400,000 psi	
		Ground Water Depth			
Ovality	Range of Depth to invert (feet)	50% Depth	Full Depth	50% Depth	Full Depth
2 % *	4 - 8	49	43	58	51
	8 - 12	49	43	58	51
	12 - 16	44	39	52	46
	16 - 20	40	36	47	41
	20 - 24	37	33	44	38
5 %	4 - 8	41	37	48	43
	8 - 12	41	36	48	43
	12 - 16	37	33	44	38
	16 - 20	34	30	40	35
	20 - 24	31	27	37	32
8 %	4 - 8	35	31	40	36
	8 - 12	35	30	41	36
	12 - 16	31	27	37	32
	16 - 20	28	25	33	29
	20 - 24	26	23	31	27

Fully Deteriorated (FD) wall thickness considers groundwater, soil and live loads upon the CIPP pipe. The table assumes two heights of groundwater, 120-lbs/cu. ft. of soil density and an AASHTO H20 highway load. The table represents CIPP pipe wall thickness for a host pipe range of 8 to 48 inches. This is a guideline only. Specific calculations should refer to ASTM F-1216, Appendix X.1.

Design Parameters:

Factor of Safety = 2.0

DR = Dimension Ratio = Diameter / thickness  $\Rightarrow t = D / DR$

Effective reduction of Ei-modulus to approximate effects of creep = 50 %

Soil Modulus = 1,000 psi, assumed for highway loads or depths  $\geq 10$  feet (all others 700 psi).

Ovality % = 100 x (Mean Dia. - Minimum Dia.) / Mean Dia.

- 2% ovality is typically assumed when the host pipe measurements have not been field verified.

## **2.4 TESTING REQUIREMENTS**

- A. Chemical Resistance - The CIPP shall meet the chemical resistance requirements of ASTM F1216, Appendix X2. CIPP samples for testing shall be of tube and resin system similar to that proposed for actual construction. CIPP samples with and without plastic coating shall meet these chemical testing requirements.
- B. Hydraulic Capacity - Overall, the hydraulic profile shall be maintained as large as possible. The CIPP shall have a minimum of the full flow capacity of the original pipe before rehabilitation. Calculated capacities may be derived using a commonly accepted roughness coefficient for the existing pipe material taking into consideration its age and condition.
- C. CIPP Field Samples - When requested by the Owner, the Contractor shall submit test results from field installations in the USA of the same resin system and tube materials as proposed for the actual installation. These test results must verify that the CIPP physical properties specified in Section 2.3 E have been achieved in previous field applications. Samples for this project shall be made and tested as described in Section 3.3 A.

## **2.5 INSTALLATION RESPONSIBILITIES FOR INCIDENTAL ITEMS**

- A. Cleaning of Sewer Lines - Remove all internal debris out of the sewer line that will interfere with the installation of CIPP. Dispose of all debris removed from the sewers during the cleaning operation at a facility in accordance with legal and regulatory requirements.
- B. Bypassing Sewage - Provide for the flow of sewage around the section or sections of pipe designated for repair. The bypass shall be made by plugging the line at an existing upstream manhole and pumping the flow into a downstream manhole or adjacent system. The pump and bypass lines shall be of adequate capacity and size to handle the flow. Submit a detail of the bypass plan.
- C. Inspection of Pipelines - Inspection of pipelines shall be performed by experienced personnel trained in locating breaks, obstacles and service connections by closed circuit television. Inspect the interior of the pipeline carefully to determine the location of any conditions which may prevent proper installation of CIPP into the pipelines, and note these conditions for correction. Keep a videotape and suitable log for later reference by the Owner.
- D. Line Obstructions – Clear the line of obstructions such as solids and roots that will prevent the insertion of CIPP. If pre-installation inspection reveals an obstruction, such as a protruding service connection, dropped joint, or

a collapse that will prevent the inversion process, that was not evident on the video taken earlier and it cannot be removed by conventional sewer cleaning equipment, then make a point repair excavation to uncover and remove or repair the obstruction. Such excavation shall be approved in writing by the Owner's representative prior to the commencement of the Work and shall be considered as a separate pay item.

- E. Public Notification - Make every effort to maintain service usage throughout the duration of the project. In the event that sewer facilities will be out of service, the maximum amount of time of no service shall be 8 hours. Implement notification by contacting each home or business connected to the sanitary sewer and informing them of the Work to be conducted, and when the sewer will be off-line. The Contractor shall also provide the following:
  - 1. Written notice to be delivered to each home or business the day prior to the beginning of Work being conducted on the section, and a local telephone number of the Contractor they can call to discuss the project or any problems which could arise.
  - 2. Personal contact with any home or business which cannot be reconnected within the time stated in the written notice.

- 2.6 Confirm the locations of all branch service connections prior to installing and curing the CIPP.

### **PART 3 - EXECUTION**

- 3.1 CIPP installation shall be in accordance with ASTM F1216, Section 7, or ASTM F1743, Section 6, with the following modifications:

- A. Resin Impregnation - The quantity of resin used for tube impregnation shall be sufficient to fill the volume of air voids in the tube with additional allowances for polymerization shrinkage and the loss of resin through cracks and irregularities in the original pipe wall. A vacuum impregnation process shall be used. To insure thorough resin saturation throughout the length of the felt tube, the point of vacuum shall be no further than 25 feet from the point of initial resin introduction.
- B. After vacuum in the tube is established, a vacuum point shall be no further than 75 feet from the leading edge of the resin. The leading edge of the resin slug shall be as near to perpendicular as possible. A roller system shall be used to uniformly distribute the resin throughout the tube. If the Installer uses an alternate method of resin impregnation, the method must produce the same results. Any alternate resin impregnation method must be proven.

1. Tube Insertion – Position the wet out tube in the pipeline using either inversion or a pull-in method. If pulled into place, utilize a power winch and exercise care not to damage the tube as a result of pull-in friction. Pull-in or invert the tube through an existing manhole or approved access point and fully extend to the next designated manhole or termination point.
2. Place temperature gauges inside the tube at the invert level of each end to monitor the temperatures during the cure cycle.
3. Accomplish curing by utilizing hot water under hydrostatic pressure in accordance with the manufacturer's recommended cure schedule.

### **3.2 REINSTATEMENT OF BRANCH CONNECTIONS**

Re-open branch connections to buildings without excavation, utilizing a remote controlled cutting device, monitored by a video TV camera. Certify that there is a minimum of 2 complete working cutters plus spare key components on the site before each inversion. Unless otherwise directed by the Owner, reinstate all laterals. No additional payment will be made for excavations for the purpose of reopening connections and the Contractor shall pay all costs associated with such excavation and restoration work.

### **3.3 INSPECTION, SAMPLING, AND TESTING**

- A. Prepare CIPP samples and test physical properties in accordance with ASTM F1216 or ASTM F1743, Section 8, using either method proposed. The flexural properties must meet or exceed the values listed in the applicable ASTM.
- B. Determine the wall thickness of samples as described in paragraph 8.1.6 of ASTM F1743. The minimum wall thickness at any point shall not be less than 87½% of the design thickness as calculated in Section 2.3 F of the Specifications.
- C. Visual inspection of the CIPP shall be in accordance with ASTM F1743, Section 8.6.

### **3.4 CLEAN-UP**

Upon acceptance of the installation work and testing, restore the project area affected by the operations to a condition equal to or better than existing prior to the Work.

#### **PART 4 - PAYMENT**

Payment for the Work in this Section shall be included as part of the lump sum or unit price bid amount for which such Work is appurtenant thereto, and no additional payment will be made specifically for the Work in this Section.

**END OF SECTION**

## **SECTION 03000: GENERAL CONCRETE CONSTRUCTION**

### **PART 1 - GENERAL**

#### **1.1 DESCRIPTION**

This Section includes materials, installation, and testing of formwork, reinforcing steel, joints, concrete, and finishing and curing for general concrete construction.

#### **1.2 RELATED WORK SPECIFIED ELSEWHERE**

Refer to the following Specification Sections for additional requirements:

- A. Section 01300: Submittals
- B. Section 02223: Trenching, Backfilling, and Compacting
- C. Section 15076: Cement-Mortar Lined and Coated Steel Pipe

#### **1.3 SUBMITTALS**

Furnish submittals in accordance with the requirements of Section 01300: Submittals. The following submittals are required:

- A. Submit manufacturer's catalog data and descriptive literature for form ties, spreaders, corner formers, form coatings and curing compound, bond breakers, joint sealant, backing rod, joint filler, epoxy bonding compound, and color additive.
- B. Submit mill test certificates identifying chemical and physical analyses of each load of reinforcing steel delivered. If mill test reports are unavailable and the quantity of steel for a structure exceeds 5 tons, provide a laboratory test to prove conformance with the specified ASTM standard.
- C. Submit reinforcing bending lists and placing drawings for all reinforcing. Placing drawings shall indicate all openings (mechanical, electrical, equipment, and architectural) including additional reinforcing at openings and corner bar arrangements at intersecting beams, walls, and footings indicated in the typical detail and structural drawings. Placing drawings shall be coordinated with the concrete placing schedule. Each bending list and placing drawing submitted shall be complete for each major element of a structure (grade slabs, footings, walls, deck, floor, or roof slabs) including dowels and corner bars. Furnishing such lists shall not be construed that the lists will be reviewed for accuracy. The Contractor shall be wholly and completely responsible for the accuracy of the lists and for furnishing and placing reinforcing steel in accordance with the details shown on the plans and as specified.

- D. Submit concrete mix design at least 15 days before placing concrete. Mix designs shall be signed and stamped by a registered civil or structural engineer.
- E. Submit copies of a report from a testing laboratory verifying that aggregate material contains less than 1% asbestos by weight or volume and conforms to the specified gradations or characteristics.
- F. Submit copies of lab compressive test results for a proposed mix design. Tests may be for trial batches or past tests for the same identical mix design for this Work.

## **PART 2 - MATERIALS**

### **2.1 FORMWORK**

- A. Design forms according to ACI 347.
- B. Class I Forms: Use steel forms, ply form, or smooth-surface plywood 3/4 inch minimum thickness for straight surfaces and 1/2 inch minimum thickness for curved surfaces.
- C. Class II Forms: Use plywood in good condition, metal, or smooth-planed boards free from large or loose knots with tongue and groove or ship lap joints. Forms shall be oiled.
- D. Class II forms may be used for exterior concrete surfaces which are 1 foot or more below finished grade. Use Class I forms for all other surfaces.

### **2.2 BOND BREAKER**

Bond breaker shall be a nonstaining type which will provide a positive bond prevention, such as Williams Tilt-Up Compound, as manufactured by Williams Distributors, Inc., Silcoseal 77, as manufactured by SCA Construction Supply Division, Superior Concrete Accessories, or approved equal.

### **2.3 FORM RELEASE AGENT**

- A. Form release agent shall effectively prevent absorption of moisture and prevent bond with the concrete. Agent shall be nonstaining and nontoxic after 30 days.
- B. For steel forms, release agent shall prevent discoloration of the concrete due to rust.

## **2.4 REINFORCING STEEL**

- A. Reinforcement shall conform to ASTM A 615, Grade 60, unless noted otherwise on plans.
- B. Fabricate reinforcing in accordance with the current edition of the Manual of Standard Practice, published by the Concrete Reinforcing Steel Institute. Bend reinforcing steel cold.
- C. Deliver reinforcing steel to the site bundled and tagged with identifying tags.

## **2.5 WELDED WIRE FABRIC**

Welded wire fabric shall conform to ASTM A 185.

## **2.6 TIE WIRE**

Tie wire shall be 16 gauge minimum, black, soft annealed.

## **2.7 BAR SUPPORTS**

Galvanize and coat with plastic bar supports in beams and slabs exposed to view after form stripping. Use concrete supports for reinforcing in concrete placed on grade.

## **2.8 BAR COUPLERS**

Reinforcing steel bar splicing couplers shall be a mechanical type as manufactured by Dayton Barsplice Inc., or Barsplice Products, Inc., or approved equal. Use couplers which do not reduce tensile or ultimate strength of bars.

## **2.9 CEMENT**

Cement shall conform to ASTM C 150, Type II, with maximum tricalcium aluminate not to exceed 8%. The maximum percent alkalis shall not exceed 0.6%.

## **2.10 AGGREGATES**

Aggregates shall comply with ASTM C 33 and shall contain less than 1% asbestos by weight or volume and be free from any substances that will react with the cement alkalis.

## **2.11 CONCRETE ADMIXTURES**

- A. Concrete shall contain an air-entraining admixture. Admixture shall conform to ASTM C 260, except it shall be nontoxic after 30 days and



shall contain no chlorides. Admixtures shall be Master Builders MB-AE-10, Sika AER (Sikamix 104), or approved equal.

- B. Concrete may contain a water-reducing admixture. The admixture shall conform to ASTM C 494, Type A or D, except it shall contain no chlorides, shall be nontoxic after 30 days, and shall be compatible with the air-entraining admixtures. The amount of admixture added to the concrete shall be in accordance with the manufacturer's recommendations. Admixtures shall be Master Builders Pozzolith polymer-type normal setting, Plastocrete (Sikamix 160) Normal Set, Sika Chemical Corporation, or approved equal.
- C. Do not use any admixture that contains chlorides or other corrosive elements in any concrete.

## **2.12 GROUT**

- A. Nonshrink grout shall meet requirements of ASTM C1107. Use a nongas-liberating type, cement base, premixed product requiring only the addition of water for the required consistency. Grout shall be UPCON High Flow, Master Flow 713, or approved equal. Components shall be inorganic.
- B. Ordinary type group (dry pack) shall consist of one part portland cement to two parts sand (100% passing a No. 8 sieve). Add sufficient water to form a damp formable consistency.
- C. Epoxy Grout:
  - 1. Mix the two components of epoxy bonding compound in compliance with the manufacturer's instructions.
  - 2. Use sand that is oven dry and meets the following gradation requirements for epoxy grout:

Sieve Size	No. 8	No. 50	No. 100
% Passing	100	15+/-45	0+/-10

## **2.13 CONCRETE MIX DESIGN**

- A. Conform to ASTM C 94, except as modified by these Specifications.
- B. Air content as determined by ASTM C 231 shall be 3% +/-1%.
- C. Maximum water-cement ratio for Class A concrete = 0.45 by weight.
- D. Use classes of concrete as described in the following table:

<u>Class</u>	<u>Type of Work</u>	<u>28-Day Compressive Strength (in psi)</u>	<u>Minimum Cement Content (in lbs per C.Y.)</u>
A	Concrete for all structures and concrete not otherwise specified. Concrete fill at structure foundations, cradle, supports across pipe trenches.	4,000	564
B	Pavement.	3,000	500
C	Floor grout, miscellaneous unreinforced concrete, mud slabs, lean concrete pipe trench backfill.	2,000	376

E. Measure slump in accordance with ASTM C 143. Slump shall be as follows:

Slab on grade or heavy sections wider (in plan view) than 3 feet	3 inches max.
Footings, walls, suspended slabs, beams, and columns	4 inches max.
Pavement	2 inches max.
Floor grout	4 inches max.

Proportion and produce the concrete to have a maximum slump as shown. A tolerance of up to 1 inch above the indicated maximum shall be allowed for individual batches provided the average for all batches or the most recent 10 batches tested, whichever is fewer, does not exceed the maximum limit. Concrete of lower than usual slump may be used provided it is properly placed and consolidated.

F. Aggregate size shall be 3/4 inch maximum for slabs and sections 8 inches thick and less. Aggregate size shall be 1 inch maximum for slabs and sections greater than 8 inches and smaller than 17 inches. Aggregate size shall be 1-1/2 inches maximum for all larger slabs and sections. Aggregate size for floor grout shall be maximum 3/8 inch.

G. Combined aggregate grading shall be as shown in the following table:

	<u>Maximum Aggregate Size</u>			
	<u>1-1/2"</u>	<u>1"</u>	<u>3/4"</u>	<u>3/8"</u>
Aggregate Grade per ASTM C 33	4	5	7	8

- H. Mix design for pumped concrete shall produce a plastic and workable mix. The percentage of sand in the mix shall be based on the void content of the coarse aggregate.

## 2.14 **CONCRETE TESTS**

- A. Concrete quality testing will be performed on the concrete by the Owner as follows:
1. Frequency of Sampling: Cast four concrete test cylinders from each 50 cubic yards, or fraction thereof, of each class of concrete placed in any one day. Sampling and curing of cylinders shall conform to ASTM C 31.
  2. Strength Testing: Test cylinders in accordance with ASTM C 39. Test one cylinder at 7 days for information; test two cylinders at 28 days for acceptance; and hold one cylinder for verification. Strength acceptance will be based on the average of the strengths of the two cylinders tested at 28 days. If one cylinder of a 28-day test manifests evidence of improper sampling, molding, or testing, other than low strength, discard it and use the fourth cylinder for the test result.
  3. Determine concrete slump by ASTM C 143 with each strength test sampling and as required to establish consistency.
  4. Determine air content of the concrete using ASTM C 231 to verify the percentage of air in the concrete immediately prior to depositing in forms.
  5. The average value of concrete strength tests shall be equal to or greater than the specified 28-day strength. No test shall be less than 90% of the specified 28-day strength.
  6. If the 28-day strength tests fail to meet the specified minimum compressive strength, the concrete will be assumed to be defective and one set of three cores from each area may be taken as selected by the City and in accordance with ASTM C 42. If the average compressive strength of the set of three concrete cores fails to equal 90% of the specified minimum compressive strength or if any single core is less than 75% of the minimum compressive strength, the concrete will be considered defective. The City may

require additional coring, nondestructive load testing, or repair of defective concrete. Costs of coring, testing of cores, load testing, and required repairing pertaining thereto shall be paid by the Contractor at no extra cost to the Owner.

- B. To facilitate concrete sampling and testing:
1. Furnish labor to assist the City in obtaining and handling samples at the Project site.
  2. Advise the City in advance of concrete placing operations to allow for scheduling and completion of quality testing.
  3. Provide and maintain facilities for safe storage and proper curing of concrete test specimens on the Project site, as required by ASTM C31.

## **2.15 CURING COMPOUND**

- A. Curing compound shall conform to ASTM C 309, Type 1, Class B.
- B. Curing compound shall be compatible with required finishes and coatings.

## **2.16 MATS, PAPER AND SHEETING FOR CURING**

- A. Burlap mats shall conform to AASHTO Specification M182.
- B. Sisal-kraft paper and polyethylene sheets shall conform to ASTM C 171.

# **PART 3 - EXECUTION**

## **3.1 FORM TOLERANCES**

- A. Failure of the forms in the opinion of the Owner to produce the specified concrete surface and surface tolerance shall be grounds for rejection of the concrete Work. Repair or replace rejected Work at no additional cost to the Owner.
- B. The following table indicates tolerances or allowable variations from dimensions or positions of structural concrete Work:

	<u>Maximum Tolerance</u>
Sleeves and inserts	+1/4" -1/4"
Projected ends of anchors	+1/4" -0.0"
Anchor bolt setting	+1/4" -1/4"
Finished concrete, all	+1/4" -1/4" in

10 feet Max  $\pm 1"$   
in total length

The planes or axes from which the above tolerances are to be measured shall be as follows:

Sleeves and inserts:	Centerline of sleeve or insert
Projected ends of anchors:	Plane perpendicular to the end of the anchor as located on the Drawings.
Anchor bolt setting:	Centerline of anchor bolt.
Finish concrete:	The concrete surface as located on the Drawings.

Where equipment is to be installed, comply with manufacturer's tolerances if more restrictive than above.

### **3.2 FORM SURFACE PREPARATION**

- A. Clean form surfaces to be in contact with concrete of foreign material prior to installation.
- B. Coat form surfaces in contact with concrete with a release agent prior to form installation.

### **3.3 FORM REUSE**

Reuse only forms, which provide a uniform surface texture on exposed concrete surfaces. Apply light sanding or other surface treatment between uses for uniform texture.

Plug unused tie rod holes with corks, shave flush, and sand the concrete surface side. Do not patch forms other than filling tie rod holes, except in the case of Class II forms. Do not use metal patching discs on Class I forms.

### **3.4 REMOVAL OF FORMS**

- A. Forms and shoring for elevated structural slabs or beams shall remain in place until the concrete has reached a compressive strength equal to the specified 28-day compressive strength as determined by test cylinders. Do not remove supports and reshore. The following table indicates the minimum allowable time after the last cast concrete is placed before forms, shoring, or wall bracing may be removed:

Sides of footings and easements:	24 hours
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Walls, vertical sides of beams, girders, columns, and similar members not support loads:	48 hours
Slabs, beams, and girders:	10 days (forms only)
Shoring for slabs, beams, and girders:	Until concrete strength reaches specified 28-day strength
Wall bracing:	Until top or roof slab concrete reaches specified 28-day strength

- B. Do not remove forms from concrete which has been placed with outside air temperature below 50°F without first determining if the concrete has properly set without regard for time. Do not apply heavy loading on green concrete that has not achieved its required strength. Immediately after forms are removed, carefully examine the surface of the concrete and repair and finish any irregularities in the surface as specified.

### **3.5 FORMED OPENINGS**

Openings shall be of sufficient size to permit final alignment of pipes or other items without deflection or offsets of any kind. Allow space for packing where items pass through the wall to ensure watertightness. Provide openings with continuous keyways and waterstops. Provide a slight flare to facilitate grouting and the escape of entrained air during grouting. Provide formed openings with reinforcement as indicated in the typical structural details. Reinforcing shall be at least 2 inches clear from the opening surfaces and encased items.

### **3.6 EMBEDDED ITEMS**

Set anchor bolts and other embedded items accurately and hold securely in position until the concrete is placed and set. Check all special castings, channels, or other metal parts that are to be embedded in the concrete prior to and again after concreting. Check all nailing blocks, plugs, and strips necessary for the attachment of trim, finish, and similar work prior to concreting.

### **3.7 BEVELED EDGES (CHAMFER)**

Form 3/4-inch beveled edges on exposed concrete edges and corners, beam soffit corners, and where indicated on the Drawings. Re-entrant corners in concrete members shall not have fillets, unless otherwise shown in the Drawings. The top edges of slabs, walkways, beams, and walls may be beveled with an edging trowel in lieu of using chamfer strips.

### **3.8 CONSTRUCTION JOINTS**

- A. Layout of construction joints shall be as shown in the Drawings.
- B. Use formed construction joints for slabs-on-grade that are not subject to hydraulic loading. Maximum size of pour shall be 30 feet each way for slabs with wire mesh reinforcement and 75 feet each way for slabs with bar reinforcement. Allow 24 hours between pours of adjacent slabs. Provide joints as specified or shown. Set continuous expansion joint strips between slabs and abutting vertical surfaces as indicated in the Drawings.
- C. For control joints of nonstructural slabs, provide partial depth plastic strips set flush with finished surface or 1/8-inch-wide joints cut with a diamond saw. Use control joints one-quarter to one-third the depth of the slab unless otherwise indicated.
- D. Construction joints shall be keyed, unless otherwise detailed. Form keyways by beveled strips or boards placed at right angles to the direction of shear. Except where otherwise shown on the Drawings or specified, keyways shall be at least 1-1/2 inches in depth over at least 25% of the area of the section.
- E. When it is necessary to make a joint because of an emergency, furnish and place reinforcing dowels across the joint. Embed dowels 48 bar diameters each side of the joint. Size and number of dowels shall match reinforcing in the member. Furnishing and placing such reinforcing steel shall be at the Contractor's expense.
- F. After concrete placing has been completed to the construction joint and the concrete has hardened, thoroughly clean the entire surface of the joint of surface laitance, loose or defective concrete, and foreign material, and expose clean aggregate by sandblasting the surface of construction joints before placing the new concrete. Cover horizontal construction joints with mortar. Spread uniformly and work thoroughly into all irregularities of the surface. The water-cement ratio of the mortar in place shall not exceed that of the concrete to be placed, and the consistency of the mortar shall be suitable for placing and working.
- G. In case of emergency, place additional construction joints. (An interval of 45 minutes constitute cause for an emergency construction joint.)

### **3.9 EXPANSION JOINTS**

Provide expansion joints with continuous edge reservoirs, which shall be filled with a joint sealant. Leave the material used for forming the reservoirs in place until immediately before the grooves are cleaned and filled with joint sealant. After removing edge forms from the reservoir, remove grout, loose concrete, and fins; then sandblast the slots. Allow the reservoirs to become thoroughly dry; then

blow out the reservoirs and immediately prime and fill with the expansion joint sealant and backup materials. The primer used shall be supplied by the same manufacturer supplying the joint sealant.

### **3.10 TIME BETWEEN POURS**

At least two hours shall elapse after depositing concrete in the columns or walls before depositing in beams, girders, or slabs supported thereon. Place beams, girders, brackets, column capitals, and haunches monolithically as part of the floor or roof system, unless otherwise indicated on the Drawings.

### **3.11 PLACING REINFORCEMENT**

- A. Place reinforcing steel in accordance with the current edition of Recommended Practice for Placing Reinforcing Bars, published by the Concrete Reinforcing Steel Institute.
- B. Place reinforcing in accordance with the following, unless otherwise indicated:
  - 1. Reinforcement indicated on the Drawings is continuous through the structure to the farthest extent possible. Terminate bars 2 inches clear from faces of concrete.
  - 2. Splices may be used to provide continuity due to bar length limitations. Minimum length of bars spliced for this reason is 30 feet. Splicing of reinforcement which is detailed to be continuous on the Drawings is not permitted. Minimum lap splices shall be as shown on the construction plans.
- C. Reinforcing steel, before being positioned and just prior to placing concrete, shall be free from loose mill and rust scale and from any coatings that may destroy or reduce the bond. Clean reinforcing steel by sandblasting or wire brushing and remove mortar, oil, or dirt to remove materials that may reduce the bond.
- D. Do not straighten or rebend reinforcing steel in the field. Do not use reinforcing with bends not shown in the Drawings.
- E. Position reinforcing steel in accordance with the Drawings and secure by using annealed wire ties or clips at intersections and support by concrete or metal supports, spacers, or metal hangers. Do not place metal clips or supports in contact with the forms. Bend tie wires away from the forms to provide the specified concrete coverage. Bars additional to those shown on the Drawings, 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 its sole expense.



- F. Place reinforcement a minimum of 2 inches clear of any metal pipe or fittings.
- G. Secure reinforcing dowels in place prior to placing concrete. Do not press dowels into the concrete after the concrete has been placed.
- H. Roll wire mesh used for reinforcement flat before placing concrete. Support and tie wire mesh to prevent movement during concrete placement. Lap mesh 12-inch minimum at splices.
- I. Position dowels for masonry walls to occur at reinforced block cells.

### **3.12 SITE-MIXED CONCRETE**

Conform to ACI 304.

### **3.13 READY-MIXED CONCRETE**

Conform to ASTM C 94.

### **3.14 PLACING CONCRETE**

Conform to ACI 304.

### **3.15 PUMPING CONCRETE**

Conform to ACI 304.2R-71.

### **3.16 WEATHER REQUIREMENTS**

- A. Conform to ACI 305 for placing during hot weather.
- B. Conform to ACI 306 for placing during cold weather.

### **3.17 BONDING TO OLD CONCRETE**

Coat the contact surfaces with epoxy bonding compound. Conform the method of preparation and application of the bonding compound to the manufacturer's printed instructions and recommendations for specific application for this Project.

### **3.18 BACKFILL AGAINST WALLS**

- A. Do not place backfill against walls until the concrete has obtained a compressive strength equal to the specified 28-day compressive strength. Where backfill is to be placed on both sides of the wall, place the backfill uniformly on both sides.

- B. Do not backfill the walls of structures that are laterally restrained or supported by suspended slabs or slabs on grade until the slab is poured and the concrete has reached the specified compressive strength.

### 3.19 **CONCRETE FINISHES**

- A. Complete concrete surfaces in accordance with the following schedule:

<u>Finish Designation</u>	<u>Area Applied</u>
F-1	Beams, columns, and exterior walls not exposed to view.
F-3	Beams, columns, and walls of structures or buildings exposed to view. Underside of formed floors or slabs.
F-4	Exterior and interior surfaces to be coated.
S-1	Slabs and floors to be covered with concrete or grout.
S-4	Slabs and floors of structures or buildings exposed to view.
S-5	Slabs and floors at slopes greater than 10% and stairs.
E-1	Exposed edges. EXCEPTION: edges normally covered with earth.
E-2	Top of walls, beams, and similar unformed surfaces.

- B. Finish F-1: Repair defective concrete, fill depressions deeper than 1/2 inch, and fill tie holes.

Finish F-3: In addition to Finish F-1, remove fins, fill depressions 1/2 inch or deeper, fill depressions and airholes with mortar. Dampen surfaces and then spread a slurry consisting of one part cement and one and one-half parts sand by damp loose volume, over the surface with clean burlap pads or sponge rubber floats. Remove any surplus by scraping and then rubbing with clean burlap.

Finish F-4: Repair defective concrete, remove fins, fill depressions 1/16 inch or deeper, fill tie holes, remove mortar spatter, and remove bulges higher than 1/16 inch.

Finish S-1: Screed to grade without special finish.

Finish S-4: Steel trowel finish without local depressions or high points and apply a light hair-broom finish. Do not use stiff bristle brooms or brushes. Leave hair-broom lines parallel to the direction of slab drainage.

Finish S-5: Steel trowel finish without local depressions or high points. Apply a stiff bristle broom finish. Leave broom lines parallel to the direction of slope drainage.

Finish E-1: Provide chamfer or beveled edges as shown on construction plans.

Finish E-2: Strike smooth and float to an F-3 or F-4 finish.

### **3.20 CURING CONCRETE**

- A. Conform to ACI 308.
- B. Water cure with burlap mats unless optional curing methods are permitted.
- C. Do not use curing compound on surfaces which are to be coated in accordance with Section 09900: Painting and Coating.
- D. Select the appropriate curing method in response to climatical and site conditions occurring at the time of concrete placement. Take appropriate measure as described in ACI 305 and 306 for protecting and curing concrete during hot and cold weather.

### **3.21 REPAIR OF DEFECTS**

- A. Do not repair defects until concrete has been reviewed by the Owner.
- B. Surface Defects: Repair surface defects that are smaller than 1 foot across in any direction and are less than 1/2 inch in depth.

Repair by removing the honeycombed and other defective concrete down to sound concrete, make the edges perpendicular to the surface and at least 3/8 inch deep, thoroughly dampen the surface, work into the surface a bonding grout (one part cement to one part fine sand), fill the hole with mortar, match the finish on the adjacent concrete, and cure as specified.

- C. Severe Defects: Repair severe defects that are larger than surface defects but do not appear to affect the structural integrity of the structure.

Repair by removing the honeycombed and other defective concrete, make the edges of the hole perpendicular to the surface, sandblast the surface, coat the sandblasted surface with epoxy bonding compound, place nonshrink grout, match the finish on the adjacent concrete, and cure as specified.

- D. Major Defects: If the defects are serious or affect the structural integrity of the structure or if patching does not satisfactorily restore the quality and appearance to the surface, the City may require the concrete to be removed and replaced, complete, in accordance with the provisions of this section.

### **3.22 REPAIR OF CRACKS**

- A. Repair cracks in concrete structures as shown on the construction plans.
- B. If the cracks are serious or affect the structural integrity or function of the element, the City may require the concrete to be removed and replaced, complete, in accordance with the provisions of this section.

## **PART 4 - PAYMENT**

Payment for the Work in this Section shall be included as part of the lump sum or unit price bid for which such Work is appurtenant thereto, and no additional payment will be made specifically for Work in this Section.

**END OF SECTION**

## **SECTION 03461: PRECAST REINFORCED CONCRETE MANHOLES AND MANHOLE BASES**

### **PART 1 - GENERAL**

#### **1.1 DESCRIPTION**

This Section includes materials, testing, and installation of precast concrete manholes, manhole bases, manhole frames and covers.

#### **1.2 RELATED WORK SPECIFIED ELSEWHERE**

Refer to the following Specification Sections for additional requirements:

- A. Section 01300: Submittals
- B. Section 02223: Trenching, Backfilling and Compacting
- C. Section 15043: Testing of Non-Pressure Sewer Pipelines and Manholes
- D. Section 03000: General Concrete Construction

#### **1.3 SUBMITTALS**

- A. Submit shop drawings in accordance with Section 01300: Submittals, and the following.
- B. Submit manufacturer's catalog and test data on precast concrete manholes, frames, and covers along with installation recommendations for inlet and outlet seals and watertight caulking. Show dimensions and materials of construction by ASTM reference and grade. Show manhole cover lettering and pattern.

### **PART 2 - MATERIALS**

#### **2.1 PRECAST CONCRETE MANHOLES**

- A. General: Precast reinforced concrete manholes shall comply with ASTM C 478 and IEUA Standard Sewer Manhole Detail.
- B. Design Load: Design manhole components for H-20 highway loads and site soil conditions.
- C. Concrete: Precast reinforced concrete manhole risers and tops shall be constructed of Class A concrete with Type II or Type V cement per Section 03000: General Concrete Construction.
- D. Manhole Section Configuration: Fabricate manholes only from eccentric taper sections and standard cylinder units of the proper internal diameter.

- E. Manhole Section Dimensions: Unless noted otherwise, minimum diameter and wall thickness of manholes and manhole sections shall be as follows:

<u>Depth of Cover, feet</u>	<u>Manhole Diameter, in</u>	<u>Manhole Section Wall Thickness, in</u>
0-15	48	6
15-22	60	8
22 and greater	72	9

Measure depth of cover from proposed finish surface elevation to the elevation of the top of the manhole base.

- F. Steps: Cast manhole sections without steps.
- G. Manufacturers: Precast reinforced concrete manholes shall be manufactured by Associated Concrete Products, Ameron, Southwest Concrete Products, Inland Concrete Products, Precon Products, or approved equal.
- H. Warning Signs: Fit the entrance to every unventilated manhole with a plastic warning sign, permanently affixed to the wall of the uppermost circular shaft section, with the inscription: "CAUTION-VENTILATE BEFORE ENTERING" in clear large lettering. Attach the sign to the concrete with four Type 316 stainless steel screws and anchors.

## **2.2 MANHOLE FRAMES AND COVERS**

- A. General Requirements: Make manhole frames and covers of ductile iron conforming to ASTM A 536, Class 400, or cast iron conforming to ASTM A 48, Class 30. Casting shall be smooth, clean, and free from blisters, blowholes, and shrinkage. Frames and covers shall be of the traffic type, designed for H-20 loading.
- B. Fit and Matchmarking: Ground or otherwise finish each manhole cover so that it will fit in its frame without rocking. Matchmark frames and covers in sets before shipping to the site.
- C. Cover Inscription: Covers shall have the "SEWER" word cast thereon PER THE City Standard Drawings. No other lettering on the topside is permitted.
- D. Inspection and Coating: Before leaving the foundry, clean castings and subject them to a hammer inspection. Dip castings twice in a preparation of asphalt or coal tar and oil applied at a temperature of not less than 290°F, and more than 310°F, and in such a manner as to form a firm and tenacious coating.

- E. Manufacturers: Manhole frames and covers shall be manufactured by Neenah Foundry, Long Beach Iron Works, Alhambra Foundry, South Bay Foundry, Pont-A-Mousson, or approved equal.

### **2.3 IMPORTED SAND**

Imported sand shall comply with Section 02223: Trenching, Backfilling and Compacting.

### **2.4 CRUSHED ROCK**

Crushed rock shall comply with Section 02223: Trenching, Backfilling and Compacting. Crushed rock shall be the same material as the pipe bedding. If rock is not used for the pipe bedding, use 3/4-inch crushed rock for the manhole. Crushed rock base material shall extend 1 foot beyond the outside edge of the concrete manhole base.

### **2.5 MANHOLE BASES**

Concrete used in pouring the manhole base shall be Class A concrete, Type II or Type V cement per Section 03000: General Concrete Construction.

### **2.6 CEMENT-MORTAR GROUT**

Grout for watertight joints between precast sections shall be composed of one part portland cement to two parts of clean well-graded sand of such size that all pass a No. 8 sieve. Cement, aggregate, and water for mortar shall conform to the applicable provisions of Section 03000: General Concrete Construction.

### **2.7 EPOXY GROUT**

Use epoxy grout in repairing manhole and manhole base surfaces. Make epoxy grout with epoxy and sand. The sand shall be clean, bagged, graded, and kiln dried silica sand. The prepared grout shall wet the contact surface and provide proper adhesion, or a coat of epoxy shall be applied prior to placing the epoxy grout. The epoxy bonding compound shall be as specified in Section 03000: General Concrete Construction.

### **2.8 PLASTIC JOINT SEALING COMPOUND**

Preformed cold-applied ready-to-use plastic joint sealing compound shall be approved by the City.

## **PART 3 - EXECUTION**

### **3.1 WORK WITHIN EXISTING MANHOLES**

Do no work inside an existing manhole that is part of a sewerage system in service until all the tests and safety provisions of Article 4, Section 1532 "Confined Spaces" State of California Construction Safety Orders have been made.

### **3.2 EXCAVATION**

Excavation for the precast concrete manhole shall be in accordance with Section 02223: Trenching, Backfilling and Compaction.

### **3.3 MANHOLE BASE**

- A. General: Pour manhole bases in place against undisturbed soil with Class A concrete having 3/4-inch-maximum size aggregate and a slump of not greater than 2-inches. Pour the manhole base as one monolithic pour. Observe limitations for site-mixed and ready-mixed concrete set forth in Section 03000: General Concrete Construction. If soil conditions are not adequate as determined by the Engineer, place a 12-inch thick base of 3/4-inch crushed rock prior to the placement of concrete.
- B. Manhole Stub Placement: Set the manhole stubs and sewer main before the concrete is placed; recheck them for alignment and grade before the concrete has set. Locate the various sized inlets and outlets to the manhole as indicated on the plans and as detailed in the detail drawings.
- C. Matching Pipe Crown Elevations: Invert elevations of connecting sewers may vary depending upon sizes. The crown elevation of all pipes shall be the same as the crown elevation of the largest pipe unless otherwise indicated on the plans.
- D. Channel Configuration: Form the invert of the manhole base so as to provide smooth channels conforming in size and shape to the lower portions of the inlet and outlet pipes. The channel shall vary uniformly in size and shape from inlet to outlet, and a shelf shall be constructed higher than the pipe as indicated on the drawings. The manhole base shall extend 12-inches below the bottom of the lowest pipe.
- E. Transitions: All transitions shall be smooth and of the proper radius to give an uninterrupted transition of flow.
- F. Finishing: Shape the concrete base with a wood float and give it a hard steel trowel finish before the concrete sets.



- G. Placement of Additional Mortar: In the event additional mortar is required after initial set has taken place, prime the surface to receive the mortar and mix the mortar with "Willhold Concrete Adhesive" or approved equal in the amounts and proportions recommended by the manufacturer and as directed by the Engineer in order to secure as chip-proof a result as possible.
- H. Curing Time Before Further Construction: Unless approved otherwise by Owner, in advance, the bases shall set a minimum of 24 hours before the manhole construction is continued.

### **3.4 INSTALLING MANHOLES**

- A. General: Construct manholes as shown on the plans.
- B. Joints: Set precast concrete manhole units in a bed of grout to make a watertight joint at least 1/2 inch thick with the concrete base or with the preceding unit. Set manhole sections perfectly plumb. Inside joints shall be pointed; wipe off the excess grout. Preformed, cold-applied, ready-to-use, plastic joint sealing compound may be substituted for grout between units and must be used when groundwater is encountered.
- C. Finish Elevation of Manhole Covers: Assemble precast sections so that the cover conforms to the elevation determined by the manhole location as follows, but limited to a maximum of 18-inches of grade ring unless otherwise instructed by the Engineer:
  - 1. In Paved Area: Top of cover shall be flush with the paving surface.
  - 2. In Shoulder Areas: Top of cover shall be flush with existing surface where it is in traveled way or shoulder and 0.1 foot above existing surface where outside limits of traveled way but not in the existing roadside ditch.
  - 3. In Roadside Ditch or Unpaved Open Areas: Top of cover shall be 18-inches above the ground surface. Guard posts or paddle boards may be required adjacent to manholes in open areas.
- D. Manhole Frame and Cover: Bolt the manhole frame to grade ring and secure it with grout and cement mortar fillet. After the frames are securely set, clean the frames and the covers and scrape them free of foreign materials, and ground or otherwise finish as needed so the cover fits in its frame without rocking.
- E. Watertightness: It is the intent of these Specifications that manholes and appurtenances be watertight and free from infiltration. Band all manholes both inside and outside with cement-mortar grout. Where called for in the plans or supplemental Specifications, manholes that are to be given a

protective lining or coating shall be free of any seeping or surface moisture. The adequacy of manholes and appurtenances as to watertightness shall be determined by the Engineer and shall be tested in accordance with Section 15043: Testing of Non-Pressure Sewer Pipelines and Manholes.

- F. Stubs: Furnish and install sewer pipe in manholes at the locations shown and in conformance with the detail drawings and plans. Plug all stubs with stoppers as shown on the plans for various sizes of pipe.
- G. Sealing Before Completion: In order to prevent accidental use of the new sewer before completion and acceptance, seal the inlet to existing tie-in manholes with broken brick and mortar. Installation of these plugs shall be approved by the Engineer. Remove plugs at the time of final inspection or as directed by the Engineer.
- H. Bulkheads: Install brick and mortar bulkheads at the downstream end of all unused stub channels over 5 feet long to prevent the creation of a septic condition resulting from ponding of sewage and debris in the unused channels, and until such time as the manhole stub is connected and normal sewage flow can occur. A plug is required for all downstream stubs.
- I. New Connections to Existing Manholes: Make new connections to existing manholes wherein stubs have not been provided by core drilling through the base, as directed by the Engineer.
- J. Backfill: Backfill around the precast concrete manhole shall be imported sand; place and compact it in accordance with Section 02223: Trenching, Backfilling and Compacting.
- K. Grade Rings: Cast Class B concrete rings around manhole frames that are flush with the surface. Place the ring after final grading or paving together with final cleanup.
- L. Pavement Replacement: Replacement of bituminous or concrete pavement shall be in accordance with the requirements of the Agency having jurisdiction.

### **3.5 MANHOLE AND MANHOLE BASE REPAIRS**

Manhole sections and bases that exhibit defects in the concrete surface may be rejected. Repair defective concrete surfaces of manhole sections and bases not rejected by chipping away unsound or imperfect concrete. Leave edges sharp and square with the surface. Remove loose material and dust remaining after chipping by means of an air jet. Apply epoxy grout to the surface to be repaired in accordance with the manufacturer's instructions. The grout shall wet the contact

surface and provide proper adhesion, or a coat of epoxy shall be applied prior to placing the epoxy grout.

### **3.6 MANHOLE LINERS**

Where called for in the Plans or Supplemental Specifications, provide protective lining to manholes. The requirements for protective lining of manholes shall be as specified in Section 07950: Manhole Rehabilitation.

## **PART 4 – PAYMENT**

Payment for the Work in this Section shall be included as part of the lump sum or unit price bid amount for which such Work is appurtenant thereto, and no additional payment will be made specifically for the Work in this Section.

**END OF SECTION**

## **SECTION 03462: PRECAST CONCRETE VAULTS**

### **PART 1 - GENERAL**

#### **1.1 DESCRIPTION**

This Section includes materials, design, and installation of precast concrete vaults and structures.

#### **1.2 RELATED WORK SPECIFIED ELSEWHERE**

Refer to the following Specification Sections for additional requirements:

- A. Section 01300: Submittals
- B. Section 02220: Structure Earthwork
- C. Section 03000: General Concrete Construction
- D. Section 05530: Access Hatches

#### **1.3 SUBMITTALS**

- A. Submit shop drawings in accordance with Section 01300: Submittals.
- B. Submit manufacturer's catalog data on precast concrete items. Show dimensions of vaults and thicknesses of walls, floors, and top slabs. Show reinforcing wire and steel. Show materials of construction by ASTM reference and grade.
- C. Submit manufacturer's design calculations and certification signed and sealed by a professional civil or structural engineer registered in the state of California that vault design and construction comply with the specified design load conditions and the referenced ASTM specifications (e.g., ASTM C 857 and C 858).

### **PART 2 - MATERIALS**

#### **2.1 MANUFACTURERS**

Precast concrete vaults shall be manufactured by Brooks Products Inc., Associated Concrete Products Inc., Utility Vault, or approved equal.

#### **2.2 PRECAST CONCRETE VAULTS**

- A. Precast concrete vaults shall comply with ASTM C 858 except as modified herein.

- B. Design loads shall be in accordance with ASTM C 857, except as modified herein. Traffic loads, unless otherwise stated, shall conform to load designation A-16 per Table 1. Soil lateral loads shall be as determined by ASTM C 857 or loadings specified in the project soils report, whichever is greater. Alternate design by the strength design method shall include a load factor of 1.7 times the lateral earth or hydrostatic pressures.
- C. Include the following load conditions in the design:
  - 1. Vault roof removed while structure is backfilled to grade and subject to live and dead loads.
  - 2. Vault roof in place and walls subject to simultaneous vertical and horizontal application of all live, impact, and dead loads. Include the case of an A-16 designated load placed directly above the wall.
- D. Design shall also comply with the following restrictions:
  - 1. The maximum reinforcement ratio allowed is one-half the reinforcement ratio that would produce a balanced strain condition.
  - 2. Earth pressure shall be converted to a horizontal pressure using a coefficient of earth pressure at rest of 0.5 and not a coefficient of active earth pressure.
  - 3. Include a live load surcharge of 2 feet of soil in the design of the walls.
- E. Design all vaults to receive the specified traffic loading.
- F. Precast vault construction shall be in the form of monolithic walls or horizontal wall sections; do not use panel walls.
- G. Minimum wall thickness shall be 6 inches. Design knockout wall panels to accommodate loading pressures defined above.
- H. Design and construct vaults to be watertight when subjected to groundwater over the entire height of the vault.
- I. Floor slab shall be precast concrete. Calculations for the floor slab design shall be included in the vault design submittal.

## **2.3 SEALANTS AND MORTAR**

Plastic sealing compound shall comply with Federal Specification SS-S-00210. Mortar shall comply with ASTM C 387, Type S, or use grout complying with Section 03000: General Concrete Construction.

## **2.4 ACCESS HATCHES**

Provide traffic-rated access hatches per Section 05530: Access Hatches.

## **2.5 RUBBER ANNULAR SEALING DEVICES**

Rubber annular sealing devices shall be of the modular mechanical type, utilizing interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and a wall opening. Provide a Type 304 stainless steel pressure plate under each bolthead and nut. Bolts and nuts shall be Type 316 stainless steel. Sealing element shall be EPDM rubber. Product shall be Link Seal by Thunderline Corporation; Interlynx by Advance Products & Systems, or approved equal.

## **2.6 CEMENT**

Cement shall be ASTM C 150, Type II.

## **2.7 ADMIXTURES**

Provide air entraining and water reducing concrete admixtures as specified in Section 03000: General Concrete Construction.

## **2.8 CRUSHED ROCK BASE**

Use crushed aggregate base per Section 02220: Structure Earthwork.

# **PART 3 - EXECUTION**

## **3.1 VAULT BASE**

- A. Excavate for the vault and install a crushed rock base, 12 inches thick.
- B. Crushed rock base material shall extend 1 foot beyond the outside edge of the concrete vault base. Compact to 90% relative density.

## **3.2 SEALING AND GROUTING**

Fill joints between precast sections with either a plastic sealing compound or mortar.

## **3.3 INSTALLING VAULTS**

- A. Set each precast concrete vault section plumb on a bed of sealant or cement mortar at least 1/2-inch thick to make a watertight joint with the concrete base and with the preceding unit. Point the inside joint and wipe off the excess mortar or sealant.

- B. Install the concrete roof such that it slopes at least 1/8 inch per foot toward the drainage channel around the roof hatch.
- C. Install drainpipe from vault roof hatch drainage channel and terminate at the floor level, near the sump.

### **3.4 BACKFILL AROUND VAULTS**

Backfill and compact around the vaults using fill as specified in Section 02220: Structure Earthwork. Compact to 90% relative compaction.

### **PART 4 – PAYMENT**

Payment for the Work in this Section shall be included as part of the lump sum or unit price bid amount for which such Work is appurtenant thereto, and no additional payment will be made specifically for the Work in this Section.

**END OF SECTION**

## **SECTION 03463: GREASE INTERCEPTORS**

### **PART 1 - GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Precast concrete grease interceptors

#### **1.2 RELATED REQUIREMENTS**

Refer to the following Specification Sections for additional requirements:

- A. Section 02220: Structure Earthwork
- B. Section 03461: Precast Reinforced Concrete Manholes and Manhole Bases
- C. Section 03462: Precast Concrete Vaults

#### **1.3 REFERENCED STANDARDS**

- A. ASTM C31: Standard Practice for Making and Curing Concrete Test Specimens in the Field
- B. ASTM C39: Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
- C. ASTM C138: Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
- D. ASTM C143: Standard Test Method for Slump of Hydraulic-Cement Concrete
- E. ASTM C150: Standard Specification for Portland Cement
- F. ASTM C173: Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
- G. ASTM C192: Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory
- H. ASTM C231: Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
- I. ASTM C890: Standard Practice for Minimum Structural Design Loading for Monolithic or Sectional Precast Concrete Water and Wastewater Structures
- J. ASTM C1613: Standard Specification for Precast Concrete Grease Interceptors
- K. Uniform Plumbing Code (UPC)



#### **1.4 SUBMITTALS**

- A. Design calculations and detailed drawings of component sections signed by a registered California Professional Engineer. Show dimensions and materials of construction by ASTM reference and grade.
- B. Shop drawings of grating, grating frame embeds, covers, and all appurtenances.
- C. Shop drawings indicating the installation procedures and dimensions and the location of all joints or welded strips.
- D. Results of testing required per paragraph of this specification entitled "Quality Assurance".
- E. Qualifications of engineer designing the precast concrete structure.
- F. Recommendations for inlet and outlet seals and watertight caulking.

#### **1.5 QUALITY ASSURANCE**

- A. Precast concrete producer shall demonstrate adherence to the standards set forth in the National Precast Concrete Association Quality Control Manual.
- B. The precast concrete producer shall have been in the business of producing precast concrete products similar to those specified, for a minimum of 5 years. The precast concrete producer shall maintain a permanent quality control department or retain an independent testing agency on a continuing basis. The agency shall issue a report, certified by a licensed engineer, detailing the ability of the precast concrete producer to produce quality products consistent with industry standards.
- C. The precast concrete producer shall show that the following tests are performed in accordance with the ASTM standards indicated. Tests shall be performed for each 150 cu. yd. of concrete placed, but not less frequently than once per week.
  - 1. Slump: C143
  - 2. Compressive Strength: C31, C192, C39
  - 3. Air Content (when air-entrained concrete is being used): C231 or C173
  - 4. Unit Weight: C138
- D. The District may place an inspector in the plant when the products covered by this specification are being manufactured.

## **PART 2 PRODUCTS**

### **2.1 GREASE INTERCEPTOR**

- A. Comply with ASTM C1613.
- B. Cement: Type II or V per ASTM C 150
- C. Design loads: Comply with requirements of ASTM C890 using HS-20 live load.
- D. The interior of the precast unit shall be sealed with a protective coating.
- E. Each grease interceptor shall be permanently and legibly marked with the Manufacturer's name or trademark, model number and UPC certification mark.

### **2.2 ACCESSORIES**

- A. Provide cast iron frames and covers per requirements of Section 03461.
- B. Provide joint sealing compound at all joints per requirements of Section 03461.

## **PART 3 - EXECUTION**

### **3.1 EARTHWORK**

- A. Excavation and backfill for precast concrete vaults shall be in accordance with Section 02220 and the requirements herein.
- B. The Contractor shall prepare an excavation large enough to accommodate the structure and permit grouting of openings and backfilling operations.
- C. The bottom of the structure shall be placed on 12 inches of compacted, crushed rock sub-base, graded level and to the proper elevation as shown on the plans.

### **3.2 INSTALLATION**

- A. Grease interceptors shall be installed per Section 03462.

### **3.3 FIELD QUALITY CONTROL**

- A. Vacuum test installed grease interceptor tanks per ASTM C1613.

**END OF SECTION**

## **SECTION 05050: BOLTS, WASHERS, AND DRILLED ANCHORS**

### **PART 1 - GENERAL**

#### **1.1 DESCRIPTION**

This Section describes materials and installation of anchor bolts, connecting bolts, washers, drilled anchors, and stainless-steel fasteners.

#### **1.2 RELATED WORK SPECIFIED ELSEWHERE**

Refer to the following Specification Sections for additional requirements:

Section 01300: Submittals

Section 03000: General Concrete Construction

Section 05100: Structural Steel

#### **1.3 SUBMITTALS**

- A. Submit shop drawings in accordance with Section 01300: Submittals.
- B. Submit manufacturer's catalog data and ICBO reports for bolts, washers, and concrete anchors. Show dimensions and reference materials of construction by ASTM designation and grade.

#### **1.4 DESIGN CRITERIA**

Structural Connections: AISC Specification for Structural Steel Buildings (latest edition).

### **PART 2 - MATERIALS**

#### **2.1 ANCHOR BOLTS**

Steel anchor bolts shall conform to ASTM A 307, Grade A, B, or C.

#### **2.2 CONNECTION BOLTS**

- A. Steel connection bolts shall conform to ASTM A 325, Type 1 or 2. Connection type shall be N per the AISC Specifications.
- B. Provide galvanized bolts where shown in Drawings. Galvanizing of bolts, nuts, and washers shall be by the hot-dipped process.

## **2.3 STAINLESS-STEEL BOLTS**

Stainless-steel bolts shall be ASTM A 193, Grade B8M, or ASTM F 593, Type 316. Nuts shall be ASTM A 194, Grade 8M, or ASTM F 594, Type 316. Use ASTM A 194 nuts with ASTM A 193 bolts; use ASTM F 594 nuts with ASTM F 593 bolts. Provide washer for each nut and bolthead. Provide washers of the same material as the nuts.

## **2.4 WASHERS**

Washers for American Standard beams and channels shall be square or rectangular, tapered in thickness, smooth, hot-dipped galvanized, and conforming to ASTM F 436.

## **2.5 DRILLED ANCHORS**

Drilled anchors shall be Type 316 stainless steel threaded rod adhesive anchors. Epoxy adhesive shall comply with ASTM C 881, Type IV, Grade 3, Class B or C. Adhesive shall be Rawl Power-Fast, Hilti HSE 2411, Simpson Epoxy-tie, or approved equal. Epoxy anchor assemblies shall be ICBO approved.

# **PART 3 – EXECUTION**

## **3.1 STORAGE OF MATERIALS**

Store material, either plain or fabricated, above ground on platforms, skids, or other supports. Keep material free from dirt, grease, and other foreign matter and protect from corrosion.

## **3.2 GALVANIZING**

Zinc coating for bolts, anchor bolts, and threaded parts shall be in accordance with ASTM A 153.

## **3.3 INSTALLING CONNECTION BOLTS**

- A. Use steel bolts to connect structural steel members.
- B. Install ASTM A 325 bolts per the AISC "Specification for Structural Joints using ASTM A 325 or A 490 Bolts."
- C. Install washers per AISC Specification for ASD.
- D. Bolt holes in structural members shall be 1/16 inch in diameter larger than bolt size. Measure cast-in-place bolt locations in the field before drilling companion holes in structural steel beam or assembly.

- E. Slotted holes, if required in the Drawings, shall conform to AISC Specifications, Chapter J, Section J3, Table J3.1.

### **3.4 INSTALLING ANCHOR BOLTS**

- A. Preset bolts and anchors by the use of templates. For mechanical equipment (such as pumps) do not use concrete anchors set in holes drilled in the concrete after the concrete is placed.
- B. After anchor bolts have been embedded, protect projecting threads by applying grease and having the nuts installed until the time of installation of the equipment or metalwork.
- C. Minimum depth of embedment of adhesive anchors shall be as recommended by the manufacturer, but no less than that shown in the Drawings and no less than 12 bolt diameters.
- D. Prepare holes for drilled anchors in accordance with the anchor manufacturer's recommendations prior to installation.

## **PART 4 – PAYMENT**

Payment for the Work in this Section shall be included as part of the lump sum or unit price bid amount for which such Work is appurtenant thereto, and no additional payment will be made specifically for the Work in this Section.

**END OF SECTION**

## **SECTION 05100: STRUCTURAL STEEL**

### **PART 1 - GENERAL**

#### **1.1 DESCRIPTION**

Furnish, fabricate and install all structural steel, and miscellaneous metalwork and bolts as specified and shown. All structural steel shapes, plates, bars and their products shall conform to the "Specifications for Structural Steel" (ASTM A36). All structural tubes shall conform to the "Specifications for Hot Formed Welded and Seamless Carbon Steel Structural Tubing" (ASTM A500). All Structural steel and other miscellaneous metalwork shall be hot-dipped galvanized after fabrication in accordance with Paragraph 2.3.

#### **1.2 RELATED WORK SPECIFIED ELSEWHERE**

Refer to the following Specification Sections for additional requirements:

Section 01300: Submittals

Section 05050: Bolts, Washers, and Drilled Anchors

Section 03000: General Concrete Construction

#### **1.3 SUBMITTALS**

Furnish submittals in accordance with the requirements of Section 01300: Submittals. The following submittals are required: Shop Drawings of all structural steel and miscellaneous metalwork for review prior to fabrication.

#### **1.4 QUALITY ASSURANCE**

All structural steel and miscellaneous metalwork shall conform in physical and chemical properties and manufacturing, with specification for the Design Fabrication and Evaluation of Structural Steel for Building of AISC and ASTM Specifications.

#### **1.5 BOLTS**

- A. Furnish and set all bolts and anchor bolts. Except where otherwise shown or specified, all bolts, anchor bolts, and nuts shall be stainless steel, Type 316.
- B. 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.
- C. Threads on all steel bolts, threaded rods and threaded anchors shall be coated with a non-seizing compound.

## **PART 2 - MATERIALS**

### **2.1 DESCRIPTION**

Except as otherwise shown, the design, fabrication and erection of structural steel shall conform to the requirements of the American Institute of Steel Construction "Manual of Steel Construction".

### **2.2 WELDING**

- A. 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. AWS certification shall be provided to the Engineer upon request.
- B. 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 specified by the AWS code. Upon completion of welding, remove all weld splatter, flux, slag and burrs left by attachments. Repair welds to produce a workman-like appearance, with uniform weld contours and dimensions. Grind all sharp corners of material which is to be painted or coated to a minimum of 1/16-inch on the flat.

### **2.3 GALVANIZING**

All structural steel plates, shapes, bars, and fabricated assemblies required to be galvanized, after the steel has been thoroughly cleaned of rust and scale, shall be galvanized in accordance with the "Specification for Zinc (Hot-Galvanized) Coating on Products Fabricated from Rolled, Pressed and Forged Steel Shapes, Plates, Bars and Strip" (ASTM A123). Straighten any galvanized part that becomes warped during the galvanizing operation. Bolts, anchor bolts, nuts and similar threaded fasteners, after being properly cleaned, shall be galvanized in accordance with the "Specifications for Zinc Coating (Hot-Dip) on Iron and Steel Hardware" (ASTM A153). Field repairs to galvanizing shall be made using "Galvinox", "Galvo-Weld", or approved equal.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. General: Verify all measurements at the site. Punch holes 1/16 inch larger than the nominal size of the bolts, unless otherwise indicated. Whenever needed, because of the thickness of the metal, subpunch and reame or drill holes. No drifting of bolts nor enlargement of holes is allowed to correct misalignment. Correct mismatched holes with new materials.

Protect dissimilar metals from galvanic corrosion by means of pressure tapes, coatings or isolators as approved by the Engineer.

Place metalwork to be embedded in concrete accurately and hold in correct position while the concrete is placed or, if shown or accepted, form recesses or blockouts in the concrete and grout the metalwork in place in accordance with Section 03000: General Concrete Construction. Clean the surface of metalwork in contact with or embedded in concrete thoroughly of all rust, dirt, grease, loose scale, grout, mortar and other foreign matter. If accepted, recesses may be neatly cored in the concrete after it has attained its design strength and the metalwork grouted in place as specified in Section 03000: General Concrete Construction.

Erect Structural metalwork as shown or as directed. Repair or replace metalwork which is bent, broken or otherwise damaged to the satisfaction of the Engineer. Embedding of metalwork shall be in strict conformance with Section 03000: General Concrete Construction.

- B. Welding: Welding shall be done by operators who have been qualified by tests as prescribed by the AWS in Standard Qualification Procedure to perform the type of Work required. The quality of welding shall conform to AWS Code for Arc Welding in Building Construction Section 4, Workmanship.
- C. Bolted Connections: All bolted connections shall conform to AISC Framed Beam Connections and shall be bearing-type connections with threads excluded from shear planes.

### **3.2 CLEANING**

After installation, clean damaged surfaces of shop primed metals and touch them up with the same material used for the shop coat. Clean damaged surfaces of galvanized metals and touch them up with zinc dust-zinc oxide coating conforming to Military Specification MIL-P-21035.

## **PART 4 – PAYMENT**

Payment for the Work in this Section shall be included as part of the lump sum or unit price bid amount for which such Work is appurtenant thereto, and no additional payment will be made specifically for the Work in this Section.

### **END OF SECTION**



## **SECTION 05530: ACCESS HATCHES**

### **PART 1 - GENERAL**

#### **1.1 DESCRIPTION**

This Section describes materials, fabrication, and installation of access hatches.

#### **1.2 RELATED WORK SPECIFIED ELSEWHERE**

Refer to the following Specification Sections for additional requirements:

- A. Section 01300: Submittals
- B. Section 03000: General Concrete Construction
- C. Section 09900: Painting and Coating

#### **1.3 SUBMITTALS**

- A. Submit shop drawings in accordance with Section 01300: Submittals.
- B. Submit drawings of access hatches. Show dimensions and reference materials of construction by ASTM designation and grade. Show design criteria.

### **PART 2 - MATERIALS**

#### **2.1 ACCESS HATCHES**

- A. Access hatches shall be Bilco Type JAL, U.S. Foundry, or approved equal of the size and configuration shown in the Drawings. Aluminum doors shall be anodized. Latch and lifting mechanism assemblies, hold-open arms and guides, and all brackets, hinges, pins, and fasteners shall be Type 316 stainless steel.
- B. Locking and Latching Devices: Recessed hasp covered by a hinged lid flush with the exterior surface.
- C. Provide stainless-steel safety chains across both accessible sides.
- D. Incorporate trough frame, with drain coupling.

#### **2.2 WELDING ELECTRODES**

Welding electrode for aluminum shall be ER4043 filler metal.

## **PART 3 - EXECUTION**

### **3.1 STORAGE OF MATERIALS**

Store structural material, either plain or fabricated, above ground on platforms, skids, or other supports. Keep material free from dirt, grease, and other foreign matter and protect from corrosion.

### **3.2 INSTALLATION**

- A. Clean surfaces of metalwork to be in contact with concrete of dirt, grease and other foreign substances before placing concrete.
- B. Where metalwork is to be installed in recesses in formed concrete, said recesses shall be made, metalwork installed, and recesses filled with dry-pack mortar in conformance with Section 03000: General Concrete Construction.
- C. Extend Schedule 40 PVC piping from frame drain connection down to the sump.

### **3.3 WELDING**

- A. Perform welding on aluminum by the gas metal arc (MIG) or gas tungsten arc (TIG) process. Welding shall conform to the AWS Structural Welding Code-Aluminum, D1.2-90.
- B. Provide a minimum of two passes for metal in excess of 5/16-inch thickness.
- C. Produce weld uniform in width and size throughout its length with each layer of weldment smooth; free of slag, cracks, pinholes, and undercuttings; and completely fused to the adjacent weld beads and base metal. Avoid irregular surface, nonuniform bead pattern, and high crown. Form fillet welds of the indicated size of uniform height and fully penetrating. Accomplish repair, chipping, and grinding of welds in manner that will not gouge, groove, or reduce the base metal thickness.

### **3.4 CORROSION PROTECTION OF ALUMINUM SURFACES**

- A. Coat aluminum surfaces to be embedded or which will be in contact with concrete or masonry per Section 09900: Painting and Coating, System No. E-1 before installation. Allow the coating to dry before the aluminum is placed in contact with the concrete.
- B. Where aluminum surfaces come in contact with dissimilar metals, keep the dissimilar metallic surfaces from direct contact by use of neoprene gaskets or washers.

#### **PART 4 – PAYMENT**

Payment for the Work in this Section shall be included as part of the lump sum or unit price bid amount for which such Work is appurtenant thereto, and no additional payment will be made specifically for the Work in this Section.

**END OF SECTION**

## **SECTION 07950: MANHOLE REHABILITATION**

### **PART 1 - GENERAL**

#### **1.1 DESCRIPTION**

This Section describes the Work including, but not be limited to, the following phases: traffic control, water blasting interior of manholes, removal of manhole steps, application of air-placed concrete "gunite", application of epoxy primer and lining with polyurethane.

#### **1.2 RELATED WORK SPECIFIED ELSEWHERE**

Refer to the following Specification Sections for additional requirements:

- A. Section 01300: Submittals
- B. Section 03000: General Concrete Construction

#### **1.3 RESPONSIBILITY**

Provide complete and in place, ready for use, manhole rehabilitation.

#### **1.4 SUBMITTALS**

Submit the following to the Engineer for approval in accordance with Section 01300: Submittals:

- A. Manufacturer's product data including physical properties, surface preparation, repair application, curing and field quality control.
- B. Manufacturer's qualifications including a list of references for a minimum of five (5) similar rehabilitation installation projects in the United States. The reference list shall include: the names of Agencies and engineering firms under which the work was accomplished, date of completion, contact person(s), and their correct telephone number(s).
- C. Applicator's qualifications including certification stating the applicator is factory trained and approved by the manufacturer in application of the specified products.

#### **1.5 REFERENCE**

Standard Specifications for Public Works Construction, 2003 edition ("Greenbook"), Section 500-2.4.

## **PART 2 - MATERIALS**

Polyurethane Coating: Two-component, 100% solid, non-solvent, non-sag or self-leveling, polyurethane-base material, applicable in horizontal, vertical, and overhead installation:

- A. Coating shall have a shore "D" hardness of 57 at 77 degrees Fahrenheit.
- B. Coating shall pass ASTM D-1737 for flexibility, using cylinder mandrel of 0.5 inch.
- C. Flash point shall be 450 degrees Fahrenheit open Zahn cup.
- D. Lining material shall be per Section 500.2.4.6 and shall meet or exceed the requirements of 210-2.3.3 and 500-2.4.10 of the Greenbook pertaining to Chemical Resistance and Physical Properties.
- E. Primer shall be per Section 500.2.4.6 of the Greenbook.

Coating shall be Sancon 100 polyurethane protective coating system, Raven 405, or approved equal modified as necessary to meet the requirement specified herein.

## **PART 3 - EXECUTION**

### **3.1 GENERAL**

- A. Before use of any product, investigate its compatibility with surfaces, fillers, and joints.
- B. Use only compatible materials.
- C. Install products in accordance with manufacturer's instructions and as specified herein.
- D. Concrete preparation and installation of coating shall be done under the supervision of a manufacturer's representative.

### **3.2 SURFACE PREPARATION**

Perform the preparation of the manholes in the following sequence:

- A. Implement sewage bypassing as necessary. Any flow control is the responsibility of and shall be done by the Contractor.
- B. Water blast the manhole interior to remove deteriorated concrete, oil, grease, or existing coating. Water blast equipment shall be of a minimum

pressure of 5,000 psi and shall not include detergent or other chemical cleaning solvents in the process. For new manholes, eliminate this procedure.

- C. Remove all debris prior to coating. No debris shall be allowed to enter the sewer system.
- D. After surface preparation and prior to concrete repair, eliminate all active structure infiltration prior to liner application. Infiltration control will be treated as extra work. The method of stopping these leaks shall be by injection of chemical grout as approved by the Engineer and in accordance with NASSCO Specifications. For new manholes, this Section can be omitted.
- E. Air-placed concrete gunite application shall conform to Section 303-2 of the Greenbook. Apply gunite to a thickness (minimum one-inch thickness) which will restore the original manhole surface. Allow the gunite to cure for 24 hours prior to the lining application. For new manholes, this Section can be omitted.
- F. As shown on the Construction Drawings, bring back manhole channel and shelf areas to their original dimensions using concrete mortar. Hand-trowel shelves to provide a smooth and uniform surface. Allow concrete to cure seven days prior to coating. For new manholes, this Section can be omitted.
- G. Manufacturer shall field inspect manhole and provide a written statement that the manholes have been prepared properly and is ready for primer coat.

### **3.3 INSPECTION**

Provide to the Engineer safe access to inspect the manholes' structural condition. Notify the Engineer at least two working days prior to inspection.

### **3.4 COATING**

#### **A. Prime Coating**

Prior to application of the lining, all surfaces shall receive a five (5) mil thickness of 100% solids non-solvent, moisture tolerant epoxy primer.

#### **B. Liner Application**

- 1. Lining application shall conform with Section 500.2.4.7 of the Greenbook.

2. The lining application shall be performed only by workmen trained and experienced with the specified material. The Contractor shall provide proof of such experience with the bid documents. Proof shall include a list of similar projects using the specified material. Apply the lining through plural component equipment specifically designed and approved by the manufacturer of the lining material. The equipment shall be in good working order to ensure correct proportioning and mixing of the components.
3. Apply the lining to a thickness of 125 mils (1/8-inch) in one continuous coat, without seams, free from any holes or defects. Terminate manhole lining at the flow line; DO NOT coat manhole channels. During lining application, take wet gauge thickness readings as required to ensure correct lining thickness.
4. The uniform lining shall be free from porosity, without bubbles or pinholes and uniform in color. Remove, rework and patch all areas in question.
5. Application of the lining shall not take place when exposed to rain, or high winds. Protect the Work from the above mentioned conditions.

### **3.5 SPARK TEST**

Perform spark testing upon completion of lining installation and visual inspection. Spark testing voltage will be set at 100 volts per mil of coating thickness specified. Spark testing equipment shall be Tinker and Rasor APW or equivalent. Spark testing shall be witnessed by inspection or other appropriate person(s).

### **3.6 REPAIR**

All areas which do not pass the spark test, have bubbles or other defects, shall be immediately repaired as per Section 500.2.4.9 of the Greenbook.

### **3.7 WARRANTY**

The Contractor and the manufacturer shall provide to the Owner a certificate of warranty which indicates: "The complete manhole concrete rehabilitation was performed properly. We (the Contractor and Manufacturer) warrant all material and workmanship for a period of 3 years starting from the day of final approval from the City. The Contractor and the manufacturer shall provide field response to the Owner's request regarding any defect in the manhole concrete rehabilitation. The Contractor shall repair at its sole cost any areas that fail to meet the requirements of the Contract Documents or are defective. All repair work shall receive a new certificate of warranty of 3 years with the same terms and conditions.

#### **PART 4 - PAYMENT**

Payment for the Work in this Section shall be included as part of the lump-sum or unit-price bid amount for which such Work is appurtenant thereto, and no additional payment will be made specifically for the Work in this Section.

**END OF SECTION**



## **SECTION 09880: POLYVINYL CHLORIDE PLASTIC LINERS**

### **PART 1 - GENERAL**

#### **1.1 DESCRIPTION OF WORK**

- A. This work shall include the furnishing of all labor, materials, and equipment for the rehabilitation of an existing manhole with a cured-in-place PVC composite liner.
- B. The manhole liner shall be manufactured to the shape of the manhole. The fibrous portion of the liner shall be saturated with a modified epoxy resin, then pressurized and cured-in-place.
- C. Fused seams will allow the liner to be inflated and pressurized between ½ - 3 pounds per square inch, with or without an inflation bladder.
- D. The seams of the liner shall be sealed with fusion welding equipment.
- E. The exposed surface of the liner shall be white PVC.

#### **1.2 LINER PERFORMANCE REQUIREMENTS**

- A. Liner shall be of the type that allows rehabilitation of a concentric, eccentric or flat top manhole without removing the manhole ring and top section or corbel.
- B. The liner shall be installed and cured in place via controlled curing by heat and pressurization in the manhole to complete the curing process.
- C. The lining of the manhole shall result in a structure to the shape and contour of the existing manhole. The liner shall be installed and substantially bond to the interior manhole substrate and be watertight, free of any joints or openings other than pipe inlets, outlets and the cover frame opening.
- D. Where indicated on the manhole schedule the lining shall be designed with independent structural hoop strength for full height hydrostatic pressure as if the liner were a secondary vessel inside the existing manhole. The manufacturer shall design adequate liner thickness into the system with or without additional fiberglass layers.
- E. Where indicated on the manhole schedule the inverts shall be lined.

#### **1.3 QUALITY ASSURANCE**

- A. Reference Standards: Comply with applicable provisions and recommendations of the following:
  - 1. ASTM D 695-10 Standard Test Method for Compressive Properties of Rigid Plastics.

## **1.4 SUBMITTALS**

- A. Copies of the manhole dimensions, installation instructions, and manufacturer's product data sheet to be submitted for the Engineer's review.
- B. If required, calculations for the round manhole lining that demonstrate hoop strength under maximum hydrostatic conditions. The calculation shall assume zero liner adhesion to the existing structure, but assume lateral support from the existing wall.

## **1.5 WARRANTY**

- A. The MANUFACTURER shall warrant to the OWNER in writing the performance of the liner for a period of twenty years.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Manhole interior walls and benches shall be patched with cementitious patching/plugging compounds as manufactured by Speed Plug, or approved equal.
- B. Channel reconstruction cement shall be formed cement concrete of 4,000-psi compression strength.
- C. As a minimum the manhole liner systems shall be composed of a multiple layered composite. The primary layer shall be manufactured from 25 mils PVC with 10 ounce per square yard polyester fleece. The surface hairs of the fleece must be embedded in the molten PVC during the manufacturing process of the material. Glued laminates are not allowed. Multiple Layers of fiberglass are added to increase thickness and strength.
- D. The fibrous body will be impregnated with a modified epoxy resin. Add fiberglass and resin, for additional liner thickness.
- E. Liner Thickness: Submit thickness calculations.

### **2.2 APPLICABLE MANUFACTURERS**

- A. Products specified by named manufacturers are specified as a standard of quality.
  - 1. AltLiner manufactured by Alternative Lining Technologies, LLC. or
  - 2. Approved equal.

## **2.3 ACCEPTABLE LINER INSTALLERS.**

The installer shall be approved or certified by the manufacturer.

## **PART 3 – EXECUTION**

### **3.1 MAINTAINING WASTEWATER FLOWS**

- A. Plan work in order to maintain flows and not interrupt sewer service. This may include night work. The cost of any night work required will be included in the contract price of the applicable item. The CONTRACTOR shall not perform work to manholes until plans for bypass pumping or flow restriction have been submitted and accepted by the OWNER. Additionally, no plugging of existing mains will be made without the approval of the OWNER.
- B. Unlined flow channel. Install a bridge or flow through tube and cut the liner bottom near the flow line in the channel to expose the flow channel and give access to the pipes. Plug the pipes entering the manhole through the wall and trim the pipe opening to restore flow.
- C. Lined flow channel. Plug the pipes entering the manhole and line the flow channel to the edge of the pipe. Trim all pipe openings and restore the flow.

### **3.2 PRE-INSPECTION**

- A. Prior to beginning work, visually inspect the manhole and any areas of apparent structural damage shall be reported to the OWNER for restoration.

### **3.3 CLEANING**

- A. All surfaces of the manhole shall be cleaned with a high-pressure water-jet sprayer with an operating pressure of at least 5,000 psi. Pressure wash the manhole to remove all dirt, grease, sand, and surface contaminants on the wall and floor leaving a clean damp surface.
- B. Badly deteriorated and pitted pre-cast manholes and brick manholes, with missing bricks and grout, shall be mudded back to form a smooth compatible surface for the liner.

### **3.4 PLUGGING RECONSTRUCTION**

- A. The stopping of active hydrostatic infiltration shall be accomplished by plugging. Submit products for approved by the Engineer.
- B. Water infiltration can also be stopped using expansion type grouts such as Avanti or equal.

### **3.5 CHANNEL RECONSTRUCTION**

- A. Remove all loose grout and rubble of existing channel. Rebuild channel if required by shaping and repairing slope of shelves or benches. Work shall include alignment of inflow and out flow ports in such manner to prevent the deposition of solids at the transition point. All inverts shall follow the grades of the pipe entering the manhole. Changes in direction of the sewer and entering branch or branches shall have a true curve of as large a radius as the size of the manhole will permit. Channels shall be shaped to allow entrance of maintenance equipment into pipes including TV cameras, etc.
- B. Inverts shall only be lined where indicated on the plans "lined inverts".

### **3.6 LINER INSTALLATION**

- A. Installation shall be by an installer that is qualified by the liner manufacturer. The CONTRACTOR shall include the furnishing of all materials, equipment, tools, and labor as required for the rehabilitation of the manholes selected, including the installation of the interior liner.
- B. The installation of the approved liner system shall be in strict accordance with the manufacturer's instructions. This shall include the preparation, installation, inflation, curing, and finishing operations, required for the completion of the manhole rehabilitation process.
- C. All safety rules and regulations, applicable laws and insurance requirements shall be observed in storing, handling, use and application of the liner materials, resins and any solvents.
- D. Ventilation shall be provided to the workers at all times.

## **PART 4 - PAYMENT**

- A. Payment for the rehabilitation of the structure shall be made at the contract vertical foot price and shall include all necessary labor, material and equipment to clean, seal off any water infiltration, prepare the walls, provide and install the liner completely. The vertical foot measurement is defined as the distance between bottom of invert and top of cover. Payment value is the product of vertical foot price and vertical foot measurement.

**END OF SECTION**

## **SECTION 09900: PAINTING AND COATING**

### **PART 1 - GENERAL**

#### **1.1 DESCRIPTION**

This Section describes materials and application of painting and coating systems for submerged metal surfaces, exposed metal surfaces, buried metal surfaces, and metal surfaces in contact with concrete.

#### **1.2 RELATED WORK SPECIFIED ELSEWHERE**

Refer to the following Specification Sections for additional requirements:

- A. Section 01300: Submittals
- B. Section 15076: Cement-Mortar Lined and Coated Steel Pipe
- C. Section 15100: Control and Check Valves

#### **1.3 SUBMITTALS**

Furnish submittals in accordance with the requirements of Section 01300: Submittals. The following submittals are required:

- A. Submit manufacturer's data sheets showing the following information:
  - 1. Recommended surface preparation.
  - 2. Minimum recommended dry-film thicknesses per coat for prime, intermediate, and finish coats.
  - 3. Percent solids by volume.
  - 4. Recommended thinners.
  - 5. Statement that the selected prime coat is recommended by the manufacturer for use with the selected intermediate and finish coats.
  - 6. Application instructions including recommended application, equipment, humidity, and temperature limitations.
- B. Submit certification that all coatings conform to South Coast Air Quality Management District Rules and Regulations for products and application.

## 1.4 **PRE-SUBMITTAL MEETING**

Conduct a pre-submittal meeting two weeks prior to the submittal of coating shop Drawings, at the discretion of the Engineer. The meeting shall be attended by the painting and coating subcontractors.

## **PART 2 - MATERIALS**

### 2.1 **COLOR SYSTEM FOR COATINGS**

Unless noted otherwise, colors for surfaces that are to be coated shall be defined as follows or approved equal:

COLOR	PANTONE ID No. (closest match in sunlight)	AMERSHIELD DESIGNATION
Light Blue	2925C	1159 Light Blue
Dark Blue	2766C	Newport Coast #33
Purple	512C	PMS 512C
Safety Green	384U	1135 Safety Green
Safety Red	485 C 2X	RO-1 Bright Red
Safety Orange	021 C	OR-2 Safety Orange
Safety Yellow	U2X	Safety Yellow
Olive-lite	451C	PMS 451 C
Factory Finish	N/A	No color coating
Beige	N/A	MWRP Light Beige

### 2.2 **SUBMERGED METAL COATING SYSTEMS**

#### A. **System No. B-1--Submerged Metal, Raw Water or Raw Sewage**

Type: Epoxy having a minimum volume solids of 80%.

Service Conditions: Use on metal structures or pipes (such as tanks, clarifier mechanisms, scum troughs, slide gates and other miscellaneous metal) submerged in raw water or raw sewage.

Surface Preparation: SSPC SP-10

Prime Coat: ICI Devoe Bar-Rust 233H, 8 mils; Tnemec 104-1211, 8mils; or approved equal.

Finish Coat: ICI Devoe Bar-Rust 233H, 8mils; Tnemec 104-ABO5, 8mils; or approved equal."

B. System No. B-2--Submerged Metal, Potable or Nonpotable Water

Type: Epoxy.

Service Conditions: Shall be used on structures, valves, equipment, and piping immersed in potable or nonpotable water.

Surface Preparation: SSPC SP-10

Apply the manufacturer's recommended number of coats to attain a dry-film thickness of 16 mils. Products:

Tnemec 80 or 100;

Carboline Super Hi-Gard 891;

Ameron 395;

International Interline 785 HS;

or approved equal.

Color of topcoat: white. Each coat shall have a different color than the one preceding it.

**2.3 EXPOSED METAL COATING SYSTEMS**

A. System No. C-1--Exposed Metal, Severely Corrosive Environment

Type: Inorganic zinc prime coat with high-build epoxy paint finish coat.

Service Conditions: Use on metal structures, piping, fittings, and appurtenances subjected to continuous water condensation, or occasional immersion or splashing.

Surface Preparation: SSPC SP-10.

Prime Coat: Self-curing, two-component inorganic zinc rich primer recommended by the manufacturer to be coated with a high-build epoxy paint finish coating. Minimum zinc content shall be 12 pounds per gallon. Apply to a dry-film thickness of 3 mils.

Products:

Carboline 11 HS;

Ameron 9HS;

Tnemec 90-96;

International Interzinc 180HS;

or approved equal.

Finish Coat: One coat of 5 mil dry-film thickness:

Carboline 888 or 890;

Ameron 385;

Tnemec 104;

International Interguard 760HS;  
or approved equal.

B. System No. C-2--Exposed Metal, Atmospheric Weathering Environment

Type: Aliphatic or acrylic polyurethane having a minimum volume solids content of 73% with high-build epoxy primer.

Service Conditions: Use on exterior steel and piping, fittings, and appurtenances subject to sunlight and weathering.

Surface Preparation: SSPC SP-10.

Prime Coat: Two-component high-build epoxy. Apply to a dry-film thickness of 8 mils:

Ameron 400;  
Tnemec 104;  
International Interseal 670 HS;  
or approved equal.

Finish Coats: Two-component pigmented high-build polyurethane. Apply one or more coats to a total thickness of 5 mil dry-film thickness:

Ameron Amershield;  
Tnemec Series 1075;  
International Interthane 990HS;  
or approved equal.

C. System No. C-3--Exposed Non-ferrous Metal and Galvanized Steel

Type: Synthetic resin or epoxy primer.

Service Conditions: Use to coat non-ferrous and galvanized steel pipe, fittings, and appurtenances.

Surface Preparation: Galvanized surfaces shall be flat with no protrusions. Remove high spots and tears in the galvanizing with hand and power grinders. Comply with ASTM D 6386, Paragraph 5.2.1. Do not remove the galvanized coating below the specified thickness. Solvent clean galvanized surfaces per ASTM D 6386, Paragraph 5.3.2. Then sweep blast per ASTM D 6386, Paragraph 5.4.1. Use one of the abrasive blast materials that is described.

Solvent clean or steam clean other nonferrous surfaces per SSPC SP-1; do not use alkali cleaning. Then dust blast.

Pre Coat: Apply to a dry-film thickness of 4 mils:



Tnemec 166;  
Ameron 385;  
Carboline Rustbond Penetrating Sealer SG;  
or approved equal.

Finish Coat: Epoxy and polyurethane as described in System No. C-1.

## **2.4 BURIED METAL COATING SYSTEMS**

### **System No. D-1 -- Buried Metal, Corrosive Groundwater Exposure**

Type: High solids epoxy or phenolic epoxy having a minimum volume solids of 89% (ASTM D 2697).

Service Conditions: Buried metal, such as valves, flanges, bolts and nuts, fittings, flexible pipe couplings, structural steel, especially subject to corrosive groundwater (low pH, high sulfate and chloride concentrations.)

Surface Preparation: SSPC SP-10.

Prime Coat: Not required.

Coating System: Apply three or more coats of Ameron 400, Tnemec 104 HS or 80, ICI Devoe Bar-Rust 233H, Carboline 890LT, Sherwin-Williams Tank Clad HS B62-80 series, or approved equal; 30 mils total. Maximum thickness of an individual coating shall not exceed the manufacturer's recommendation."

## **2.5 COATING SYSTEM FOR ALUMINUM IN CONTACT WITH CONCRETE**

### **System No. E-1--Aluminum and Concrete Insulation**

Type: Bituminous paint having a minimum volume solids of 68% coal-tar pitch based.

Service Conditions: Use to coat areas of aluminum grating, gates, stairs, or structural members in contact with concrete.

Surface Preparation: Solvent or steam cleaning per SSPC SP-1; do not use alkali cleaning. Then dust blast.

Prime Coat: Apply synthetic resin or epoxy primer to metal surface before finish coat. Products:

International Intervinix VTA528/529, or approved equal. No primer required for Carboline or Tnemec.

Finish Coat: Two coats of 12 mil dry-film thickness each coat:  
Carboline Super Service Black;

Tnemec 46-465;  
International Intertuf 100;  
or approved equal.

## **2.6 PVC PIPE COATING SYSTEM**

### **System No. F-1--Sunlight Exposed PVC Pipe, CPVC and FRP Pipe**

Type: Epoxy primer with a minimum volume solids of 54% and a pigmented polyurethane enamel having a minimum volume solids of 52%.

Service Conditions: Use to coat exposed PVC, CPVC and FRP piping exposed to sunlight.

Surface Preparation: SSPC SP-1. Then lightly abrade the surface with medium-grain sandpaper.

Prime Coat: One coat of Tnemec Series 166, International 7510, Ameron 385, ICI Devoe Devran 224 HS, Sherwin-Williams Macropoxy 646 B58 series, Carbolite 888 or 890, or approved equal. Apply to a minimum dry-film thickness of 4 mils.

Finish Coat: One coat of Tnemec Series 1075, International Interthane 990HS, Ameron 450 HS, ICI Devoe Devran 379, Carbolite 134 HG, Sherwin-Williams Hi-Solids Polyurethane B65-300 series, or approved equal. Apply to a minimum thickness of 3 mils.

## **2.7 FUSION-BONDED EPOXY COATING SYSTEM**

### **System No. G-1--Ferrous-Metal Surfaces**

Type: Thermosetting powdered epoxy coating.

Service Conditions: Use to coat interior surfaces of ferrous metal valves, excluding seating areas and bronze and stainless steel pieces; pipe; and other ferrous metal surfaces as required.

Surface Preparation: SSPC SP-5. Remove protuberances which may produce pinholes in the coating. Round sharp edges. Remove surface contaminants which may prevent bonding of the coating shall be removed.

Coating: Apply to a dry-film thickness of 12 mils in accordance with manufacturer's recommendation: 3M Scotchkote 134; or approved equal.

## **2.8 AIR QUALITY REQUIREMENTS**

Materials shall comply with South Coast Air Quality Management District's Rule 1107 for shop coating and Rule 1113 for field coating.

## **PART 3 - EXECUTION**

### **3.1 SURFACE PREPARATION**

A. General: Sandblast or prepare only as much surface area as can be coated in one day. Remove all sharp edges, burrs, and weld spatter. Do not sandblast epoxy-coated pipe that has been factory coated.

B. SSPC Specifications: Wherever the words "solvent cleaning," "hand tool cleaning," "wire brushing," "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 (Steel Structures Painting Council, Surfaces Preparation Specifications, ANSI A159.1) Specifications listed below:

SP-1	Solvent Cleaning
SP-2	Hand Tool Cleaning
SP-3	Power Tool Cleaning
SP-5	White Metal Blast Cleaning
SP-6	Commercial Blast Cleaning
SP-7	Brush-Off Blast Cleaning
SP-8	Pickling
SP-10	Near White Blast Cleaning
SP-11-87t	Near-White Power Tool Cleaning

C. Sandblasting: Provide suitable enclosure, exhaust system, and bag house for sandblasting operations to prevent violations of applicable air quality requirements.

### **3.2 PAINTING SYSTEMS**

Deliver all paints to the sites in the original, unopened containers. 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.

### **3.3 PAINT MIXING**

Prepare multiple-component coatings using all the contents of each component container 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 touch-up painting and for painting other small areas. Mix only the components specified and furnished by the paint manufacturer. For reasons of color or otherwise, do not intermix additional components, even within the same generic type of coating.

### **3.4 SURFACES NOT TO BE PAINTED**

Unless noted otherwise, do not paint the following surfaces and fully protect them when adjacent areas are painted:

- A. Mortar-coated pipe and fittings
- B. Stainless Steel
- C. Galvanized Steel
- C. Metal letters
- D. Nameplates and grease fittings
- E. Aluminum grating
- F. Brass and copper tubing, submerged
- G. Buried pipe, unless specifically required in the piping Specifications

### **3.5 PROTECTION OF SURFACES NOT TO BE PAINTED**

Remove, mask, or otherwise protect hardware, lighting fixtures, switch plates, 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, dust, and other materials from entering the motors. Completely remove all masking materials and clean surfaces at completion of painting operations.

### **3.6 SURFACES TO BE COATED**

Coat surfaces as described below unless otherwise indicated on the Drawings, in the Specifications or directed by the City:

- A. Above Ground and Exposed Piping: Coat above ground and exposed piping or piping in vaults and structures as described in the various piping specifications and as specified herein. Color shall be as specified herein or as required by the Engineer.
- B. Valves: Coat valves as described in the various valve specifications. Above-ground valves, or valves in vaults and structures, shall match the color of the connecting piping.
- C. Valve Box Lids: Coat valve box lids per System No. C-1.
- D. Buried Items: Coat buried flanges, nuts and bolts, valves, flexible pipe couplings, exposed rebar from thrust blocks, and valve boxes per System No. D-1, unless otherwise specified in the particular specifications for these items.

- E. Above-Ground Structural Steel and Structural Steel in Vaults: Coat above-ground structural steel or structural steel located in vaults and structures as described in the exposed metal coating system section.
- F. Pipe Supports: Coat pipe supports in vaults the same as the adjacent piping. If pipe is PVC, coat pipe supports per System No. C-1.
- G. Exposed Indoor Galvanized Electrical Conduit: Coat exposed indoor galvanized electrical conduit per System No. C-3. Color of finish coat shall be OSHA Safety Orange.
- H. Mechanical Equipment: Mechanical equipment, such as pumps, shall be coated in accordance with System C-2.
- I. Aluminum in Contact with Concrete: Coat aluminum surfaces in contact with concrete per System No. E-1.

### **3.7 COLOR SCHEDULE**

- A. Color Guidelines: Unless noted otherwise, coat surfaces to match the colors listed below.

- B. Definitions:

At Grade: Facilities that are flush with streets, sidewalks, parking lots, green belts or graded areas.

Above Grade/Exposed: Pipelines and other facilities that are protruding through and are located above finished grade, out of doors and not enclosed by a shelter, cover, vault or housing.

Enclosed: Pipeline and other facilities that are located above or below grade and are enclosed within a building, shelter, covers, or vaults.

N/A: Not Applicable:

I.D. Mark: System identification marker as described herein. The I.D. Mark shall identify the system, of which the facility is a part.

C. Potable Water System:

<b>FACILITY</b>	<b>ENCLOSED</b>	<b>ABOVE GRADE/EXPOSED</b>	<b>AT GRADE</b>
Airvac Assemblies	Dark Blue	Olive-lite w/l.D. Mark	N/A
Airvac Covers	N/A	Olive-lite w/l.D. Mark	N/A
Electric Motors	Dark Blue	Olive-lite w/l.D. Mark	N/A
Electric Enclosures	Factory Finish	Olive-lite or Factory Finish*	N/A
Piping	Dark Blue	Olive-lite w/l.D. Mark	N/A
Pressure Vessels	Dark Blue	Olive-lite w/l.D. Mark	N/A
Pump and Pump Bases	Dark Blue	Olive-lite	N/A
Valves (all types)	Dark Blue	Olive-lite	N/A
Valve Can Lids:			
Normally Open	Dark Blue	N/A	Safety Yellow
Normally Closed (at zone breaks)	Safety Red	N/A	Safety Red
Vault Hatch Lids	Dark Blue or Factory Finish W/l.D. Mark*	N/A	Factory Finish w/l.D. Mark

\* Final color selection shall be determined by the City.

D. Recycled Water System:

<b>FACILITY</b>	<b>ENCLOSED</b>	<b>ABOVE GRADE/EXPOSED</b>	<b>AT GRADE</b>
Airvac Assemblies	Purple	Olive-lite w/l.D. Mark	N/A
Airvac Covers	N/A	Olive-lite w/l.D. Mark	N/A
Electric Motors	Purple	Olive-lite w/l.D. Mark	N/A
Electric Enclosures	Factory Finish	Olive-lite or Factory Finish*	N/A
Piping	Purple	Olive-lite w/l.D. Mark	N/A
Pressure Vessels	Purple	Olive-lite w/l.D. Mark	N/A
Pump & Pump Bases	Purple	Olive-lite	N/A
Valves (all types)	Purple	Olive-lite	N/A
Valve Can Lids:			
Normally Open	Purple	N/A	Purple
Normally Closed (at zone breaks)	Safety Red	N/A	Safety Red
Vault Hatch Lids	Purple or Factory Finish w/l.D. Mark*	N/A	Natural Finish w/l.D. Mark

\* Final color selection shall be determined by the City.

E. Sewer Collection System (Force Mains):

<b>FACILITY</b>	<b>ENCLOSED</b>	<b>ABOVE GRADE/EXPOSED</b>	<b>AT GRADE</b>
Airvac Assemblies	Safety Green	Safety Green	N/A
Airvac Covers	N/A	Safety Green	N/A
Electric Motors	Safety Green	Safety Green	N/A
Electric Enclosures	Factory Finish or Safety Green	Factory Finish or Safety Green	N/A
Piping	Safety Green	Safety Green	N/A
Pump & Pump Bases	Safety Green	Safety Green	N/A
Valves (all types)	Safety Green	Safety Green	N/A
Valve Can Lids	N/A	N/A	Safety Green
Vault Hatch Lids	Safety Green or Factory Finish with I.D. Mark	N/A	Safety Green or Factory Finish w/I.D. Mark

\* Final color selection shall be determined by the City.

F. Raw Water:

<b>FACILITY</b>	<b>ENCLOSED</b>	<b>ABOVE GRADE/EXPOSED</b>	<b>AT GRADE</b>
Airvac Assemblies	Light Blue	Light Blue	N/A
Airvac Covers	N/A	Light Blue	N/A
Electric Motors	Light Blue	Light Blue	N/A
Electric Enclosures	Factory Finish or Light Blue	Factory Finish or Light Blue	N/A
Piping	Light Blue	Light Blue	N/A
Pump & Pump Bases	Light Blue	Light Blue	N/A
Valves (all types)	Light Blue	Light Blue	N/A
Valve Can Lids	N/A	N/A	Light Blue
Vault Hatch Lids	Light Blue or Factory Finish w/I.D. Mark	N/A	Light Blue or Factory Finish w/I.D. Mark

\* Final color selection shall be determined by the City.

G. Identification (I.D.) Mark:

Certain facilities listed above to be coated shall have an identification system applied by the Contractor at the Owner's direction.

Vault hatches (coated or uncoated) shall be identified with the Owner's initials and the system the facility serves (recycled water, raw water, potable water, sewer). The identification mark shall be able to stand up to traffic and not pose a tripping hazard.

Other facilities listed above that are to be coated or provided with an I.D. mark shall receive an identification decal supplied by the City that consists of the Owner's logo, phone number, system identification color, and the system the facility serves.

### **3.8 FIELD TOUCH UP OF SHOP-APPLIED PRIME COATS**

- A. Organic Zinc Primer: Surfaces that are shop primed with inorganic zinc primers shall receive a field touchup of organic zinc primer to cover all scratches or abraded areas. Organic zinc coating system shall have a minimum volume solids of 54% and a minimum zinc content of 14 pounds per gallon. Coating shall be of the converted epoxy, epoxy phenolic, or urethane type and shall be Tnemec 90-97, 3 mils; International Zinc Lock Epoxy 308, 3 mils; or approved equal. Organic zinc primer shall be manufactured by the prime coat and finish coat manufacturer.
- B. Other Surfaces: Other surfaces that are shop primed shall receive a field touchup of the same primer used in the original prime coat.

### **3.9 DRY-FILM THICKNESS TESTING**

- A. Coating Thickness Testing: Measure coating thickness specified for steel surfaces with a magnetic-type dry-film thickness gage. Use dry-film thickness gauge as manufactured by Mikrotest, Elcometer, or approved equal. Each coat shall be checked for the correct dry-film thickness. Measurement shall not be made until a minimum of eight hours after application of the coating. Check non-magnetic surfaces for coating thickness by micrometer measurement of cut and removed coupons. Repair coating at all locations where coupons are removed.
- B. Holiday Testing: Test the finish coat (except zinc primer and galvanizing) for holidays and discontinuities with an electrical holiday detector of the low-voltage, wet-sponge type. Detector shall be manufactured by Tinker and Razor, K-D Bird Dog, or approved equal.
- C. Repair: If the item has an improper finish color, insufficient film thickness, or holidays, clean the surface and top-coat it with the specified paint material to obtain the specified color and coverage. Sand by hand or power visible areas of chipped, peeled, or abraded paint, feather the edges. Prime the areas and finish coat in accordance with the Specifications. Work shall be free of runs, bridges, shiners, laps, or other imperfections.



#### **PART 4 - PAYMENT**

Payment for the Work in this Section shall be included as part of the lump sum bid amount for which such Work is appurtenant thereto, and no additional payment will be made specifically for the Work in this Section.

**END OF SECTION**

## **SECTION 09952: COLD-APPLIED WAX TAPE COATING**

### **PART 1 - GENERAL**

#### **1.1 DESCRIPTION**

This Section includes materials and application of a three-part, cold-applied wax tape coating system for buried piping.

#### **1.2 SUBMITTALS**

- A. Submit shop drawings in accordance with Section 01300: Submittals.
- B. Submit manufacturer's catalog data sheets and application instructions.

### **PART 2 - MATERIALS**

#### **2.1 PRIMER**

- A. Primer shall be a blend of petrolatums, plasticizers, and corrosion inhibitors having a paste-like consistency. The primer shall have the following properties:
  - 1. Pour Point: 100°F to 110°F.
  - 2. Flash Point: 350°F.
  - 3. Coverage: 1 gallon/100 square feet.
- B. Primer shall be Trenton Wax Tape Primer, Denso Paste Primer, or approved equal.

#### **2.2 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:
  - 1. Saturant Pour Point: 115°F to 120°F.
  - 2. Thickness: 50 to 70 mils.
  - 3. Tape Width: 6 inches.
  - 4. Dielectric Strength: 100 volts/mil.

- B. Wax tape shall be Trenton No. 1 Wax Tape, Denso "Densyl Tape," or approved equal.

## **2.3 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:
  - 1. Color: Clear.
  - 2. Thickness: 1.5 mils.
  - 3. Tape Width: 6 inches.
- B. Plastic wrapper shall be Trenton Poly-Ply, Denso Tape PVC Self-Adhesive, or approved equal.

## **2.4 POLYETHYLENE SHEET ENCASEMENT**

The encasement shall consist of low-density polyethylene of at least 8 mils thickness, conforming to AWWA C105. Tape shall consist of polyolefin backing and adhesive which bonds to common pipeline coatings including polyethylene. Minimum width shall be 2 inches. Products: Canusa Wrapid Tape, Tapecoat 35, Polyken 934, or approved equal.

# **PART 3 - EXECUTION**

## **3.1 WAX TAPE COATING APPLICATION**

- A. Surfaces shall be clean and free of all dirt, grease, water, and other foreign material prior to the application of the primer and wax tape.
- B. Apply primer by hand or brush to all surfaces of the fitting. Work the primer into all crevices and completely cover all exposed metal surfaces.
- C. Apply the wax tape immediately after the primer application. Work the tape into the crevices around fittings. Wrap the wax tape spirally around the pipe and across the fitting. Use a minimum overlap of 55% of the tape width. Apply tape to flanges, mechanical and restrained joint bolts, nuts and glands, and grooved-end couplings to 6 inches beyond each side of the item.
- 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. Overwrap the completed wax tape installation with the plastic wrapping material. Wrap spirally around the pipe and across the fitting. Use a minimum overlap of 55% of the tape width and apply two layers or applications of overwrap. Secure plastic wrapper to pipe with adhesive tape.

#### **PART 4 - PAYMENT**

Payment for the Work in this Section shall be included as part of the lump sum or unit price bid amount for which such Work is appurtenant thereto, and no additional payment will be made specifically for the Work in this Section.

**END OF SECTION**

## **SECTION 13110: DISSIMILAR METAL CONNECTIONS**

### **PART 1 - GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Insulating flange kits
- B. Dielectric unions
- C. Insulating bushings
- D. Casing seals and spacers
- E. Wax tape wrap system

#### **1.2 REFERENCED STANDARDS**

- A. American Water Works Association (AWWA)
  - 1. AWWA C210: Liquid-Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines
  - 2. AWWA C213: Standard for Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines
  - 3. AWWA C217: Wax Coating Systems for Underground Piping Systems
- B. NACE International
  - 1. NACE RP0286: Electrical Isolation of Cathodically Protected Pipelines
- C. NSF International
  - 1. NSF 61: Drinking Water Systems Components – Health Effects

#### **1.3 SUBMITTALS**

- A. Manufacturer's catalog cutsheets
- B. Test Results: The following test results shall be submitted to the District:
  - 1. Insulator test results for casing and insulating flange kits

### **PART 2 - PRODUCTS**

#### **2.1 FLANGE INSULATION KITS**

- A. Insulating flange kits shall contain full face gaskets, full length sleeves and

double washers (steel and phenolic) on each end. Flange insulation kits shall consist of:

1. Insulating Gaskets: Gaskets for flanges 16-inches or greater shall be Type E fullfaced Phenolic with Rectangular Nitrile or Viton O-Ring Seal. For flanges less than 16-inches, gaskets shall be Type E fullfaced neoprene faced phenolic.
2. Insulating Stud Sleeves for Bolts: Insulating sleeves shall be 1/32 inch thick, G10 laminated glass tube. For installation on threaded studs use full length sleeves. For installation on threaded bolts, i.e., at butterfly valve flange bonnets and bases, the sleeves shall be half-length.
3. Insulating Washers for Bolts: Insulating washers shall be 1/8-inch G10 laminated glass.
4. Steel Washers Over Insulating Washer: 1/8-inch thick cadmium plated steel to be placed between the nut and the insulating washer.

## **2.2 DIELECTRIC UNIONS**

- A. Union nut, two tailpieces, and a gasket that separates the tailpieces to prevent an electric current from occurring
- B. Threaded or soldered connections
- C. Forged construction, Class 3000 Service

## **2.3 INSULATING BUSHINGS**

- A. Design:
  1. Isolate dissimilar metals
  2. Designed for heavy hex wrenching
- B. Material: Nylon

## **2.4 CASINGS**

- A. Casing seals:
  1. Designed to prevent moisture intrusion into the casing annular space shall be either a rubber link or pull-on sleeve type.
    - a. Rubber link casing seals are made of molded, solid, synthetic rubber and are connected together by corrosion resistant bolts and nuts. After the links are placed in the casing opening, the bolts are turned to create an airtight and watertight seal.
    - b. Sleeve casing seals are made of 1/8-inch thick, synthetic rubber. The sleeve is fastened to the exterior of the casing and carrier pipe using stainless steel strapping.

- B. Casing Spacers: Casing insulators used to prevent contact between the casing and carrier pipe shall be comprised of a fusion coated, 8-inch wide steel band with 2-inch wide glass reinforced plastic runners.

## **2.5 WAX TAPE COATING SYSTEM**

- A. General: Conform to requirements of AWWA C217.
- B. Primer: Blend of petrolatum or petroleum wax that may contain suitable inhibitor. Primer shall be supplied by tape manufacturer and shall protect metal surfaces and promote adhesion.
- C. Wax Tape: Wrap primed surfaces with a synthetic fabric tape saturated with a blend of petrolatum, plasticizers, and corrosion inhibitors that is easily formable over irregular surfaces. A compatible petrolatum filler should be used to smooth over irregular surfaces.
- D. Outer Covering: The primed and wax tape wrapped flange shall be wrapped with a plastic tape covering consisting of three (3) layers of 1.5 mil, polyvinylidene chloride or PVC, high cling membranes wound together as a single sheet.

## **PART 3 - EXECUTION**

### **3.1 FLANGE INSULATION KITS**

- A. Insulating kits shall be installed to isolate any flanged dissimilar metal pipes.
- B. 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. Care shall be taken to prevent any excessive bending or flexing of the gasket.
- C. Alignment pins shall be used to properly align the flange and gasket.
- D. 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.
- E. Neither aluminum, graphite, nor any other electronically conductive pigment shall be used in paints or coatings on the flanges, bolts, or washers of any insulating device.

### **3.2 DIELECTRIC UNIONS**

- A. Install dielectric unions on all threaded or soldered dissimilar metal pipes.
- B. 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.

### **3.3 CASINGS**

- A. The casing end seal shall be installed wherever a metallic pipeline passes through a steel casing in order to restrict water intrusion into the casing annular space. The casing seal shall be installed according to the manufacturer's recommendations.
- B. The encased sections of metallic piping shall be electrically isolated from the casing. Use casing insulators to prevent metallic contact and ensure a minimum amount of standoff between casing and carrier pipe. Distance between spacers shall be small enough to prevent excessive sagging of the line.

### **3.4 COATINGS FOR CONCRETE-ENCASED METALLIC PIPE**

- A. Provide dielectric coating on all metallic pipes, wall sleeves, and conduits encased in cast-in-place concrete structures to prevent pipe contact with the concrete and/or reinforcing steel.
- B. Dielectric coating shall be epoxy material conforming to NSF 61 and AWWA C210 or AWWA C213.

### **3.5 WAX TAPE WRAP**

- A. Install wax tape coating system on all buried insulating flange kits and all joints, valves, and coupling with joint bonding per the requirements of AWWA C217. Where discrepancies exist between current AWWA C217 and this specification, the more stringent requirements shall govern.
- B. Install wax tape tight and without air pockets. Apply three neat and tight outer layers over the flange, valve, or coupling. Individually wrap each bolt or tie-rod.
- C. The edges of flanges 18-inches in diameter and larger shall be wrapped with an additional layer of 10-mil pipe tape (two layers, 50-percent overlap) to protect wax tape during backfilling process.



### **3.6 FIELD QUALITY CONTROL**

- A. Notification for Testing: The Contractor shall notify the District at least five days in advance of testing.
- B. Insulating Flange Kits: Retain certified NACE Cathodic Protection Tester to test and confirm isolation.
  - 1. Method:
    - a. Buried insulators must be tested and accepted by the District's Corrosion Engineer prior to application of wax tape and backfilling.
    - b. The assembled flange shall be tested with a Gas Electronics Model 601 Insulator Checker or equivalent instrument that is specifically designed for the testing of insulating flanges.
    - c. The testing shall be done in accordance with NACE RP0286-97.
    - d. If a short is indicated, each bolt shall be tested to verify the integrity of each insulating sleeve before the flange is disassembled. The Contractor shall find any and all shorts or shorted bolts.
  - 2. Acceptance: The installation of the insulating flange kit shall be considered complete when the testing instrument indicates that no shorts or partial shorts are present. Any deflection of the meter, no matter how small, indicates a short. All disassembly and re-assembly necessary for acceptance shall be done at no additional cost to the District.
- C. Casing Isolation: Retain certified NACE Cathodic Protection Tester to test all casings to verify that they are metallicity isolated from the pipe.
  - 1. Method:
    - a. The casing shall be considered fully isolated if the difference between the structure- to-soil potential of the casing and the pipe is more than 30 millivolts.
    - b. If this potential difference is less than 30 millivolts the casing and the pipe may still be adequately isolated. In this case the Corrosion Engineer shall submit a test approach and test data to verify isolation.
  - 2. Acceptance: A potential difference of 30 millivolts or greater or the District's acceptance of the Corrosion Engineer's test report.

**END OF SECTION**

## **SECTION 15000: GENERAL PIPING REQUIREMENTS**

### **PART 1 - GENERAL**

#### **1.1 DESCRIPTION**

This Section describes the general requirements for selecting piping materials; selecting the associated bolts, nuts, and gaskets for flanges for the various piping services in the Project; and miscellaneous piping items such as flange insulation kits and insulating unions.

#### **1.2 RELATED WORK SPECIFIED ELSEWHERE**

Refer to the following Specification Sections for additional requirements:

- A. Section 02223: Trenching, Backfilling and Compacting
- B. Section 03000: General Concrete Construction
- C. Section 15051: Installation of Pressure Pipelines
- D. Section 15056: Ductile-Iron Pipe and Fittings
- E. Section 15151: Water Facilities Identification

#### **1.3 SUBMITTALS**

Refer to the applicable pipe installation sections.

#### **1.4 DEFINITIONS OF BURIED AND EXPOSED PIPING**

- A. Buried piping is piping buried in the soil, or encased in concrete.
- B. Exposed piping is piping in any of the following conditions or locations:
  - 1. Above ground.
  - 2. Inside buildings, vaults, or other structures.
  - 3. In underground concrete trenches or galleries.

### **PART 2 - PRODUCTS**

#### **2.1 GASKETS FOR BELL AND SPIGOT JOINTS**

- A. The rubber gaskets used to seal pipe joints shall be made of nitrile rubber (Buna-N) of such size and cross section as to fill completely the recess provided for it. The gasket shall have smooth surfaces and shall be extruded or molded to the required diameters within a tolerance of  $\pm 1/64$  inch. The rubber compound shall contain not less than 50% by volume of nitrile rubber (Buna-N). The remainder of the compound shall consist of

pulverized fillers free from rubber substitutes, reclaimed rubber, and deleterious substances. The compound shall meet the following physical requirements when tested in accordance with appropriate sections of "Method of Physical Tests and Chemical Analyses for Rubber Goods" (Federal Specification ZZ-R-601a):

Tensile strength, psi, min.	15,000
Elongation at rupture, percentage min.	350
Shore durometer, Type A	50 to 65
ASTM D 676 - Lock joint only	45 to 50
Compression set, percentage of original deflection, max.	20
Method B (constant deflection; 22 hours at 158°F) ASTM D 3895 - Lock joint only	20
Accelerated aging in air (70 hours at 212°F):	
Tensile strength, percentage of original strength, min.	85
Hardness change, percentage, max.	+15
Water absorption, percent volume change, max.	10
Ozone 2 ppm to 6 ppm, 25% elongation, 2 hours at 100°F max.	No cracking
Specific gravity	1.35 to 1.45
B. The gaskets shall be the product of a manufacturer having a successful experience record in the manufacture of rubber gaskets for pipe joints.	
C. Store the rubber at 70°F or less. Do not expose to the direct rays of the sun. Store the gaskets in such a way to permit free circulation of air around the rubber.	
D. Supply rubber gaskets in accordance with AWWA C900, C905, C303 and C200.	

## **2.2 BOLTS AND NUTS FOR FLANGES FOR STEEL OR DIP**

- A. Bolts and nuts for buried and submerged flanges and flanges located outdoors above ground or in vaults and structures shall be Type 316 stainless steel conforming to ASTM A 193, Grade B8M, for bolts and ASTM A 194, Grade 8 M, for nuts. Fit shall be Classes 2A and 2B per ANSI B1.1 when connecting to cast-iron valves having body bolt holes.
- B. Bolts used in flange insulation kits shall conform to ASTM A 193 (Grade B7). Nuts shall conform to ASTM A 194 (Grade 2H).
- C. Provide washers for each nut. Washers shall be of the same material as the nuts.

## **2.3 FLANGE INSULATION KITS**

- A. Flange insulation kits shall consist of insulating gasket, an insulating stud sleeve for each bolt, insulating washers for each bolt, and a steel washer between each insulating washer and the nut. The sleeves shall be one piece, integral with the insulating washer. Gaskets shall be full face. Provide double sleeve and washers for each bolt.
- B. Gasket material shall be phenolic, 1/8-inch thick. The flange insulating gasket shall be full diameter of the flange with a nitrile O-ring on each side of the gasket. Dielectric strength shall be not less than 500 volts per mil and a compressive strength of not less than 24,000 psi.
- C. Insulating flange bolt sleeves shall be high-density polyethylene or spiral-wrapper mylar. Dielectric strength shall be not less than 1,200 volts per mil.
- D. Insulating flange bolt washers shall be high-strength phenolic with a minimum thickness of 1/8-inch. Dielectric strength shall be not less than 500 volts per mil and a compressive strength of not less than 25,000 psi.
- E. Steel flange bolt washers for placement over the insulating washers shall be a minimum thickness of 1/8-inch and be cadmium plated.
- F. Flange insulating kits shall be as manufactured by Central Plastics Company, Advance Products Systems, or approved equal.

## **2.4 LUBRICANT FOR STAINLESS-STEEL BOLTS AND NUTS**

Lubricant shall be TRX-Synlub by Ramco, Anti-Seize by Ramco, Husk-It Husky Lube O'Seal, or approved equal.

## **2.5 GASKETS FOR FLANGES FOR DUCTILE-IRON PIPING AND FITTINGS IN WATER SERVICE**

Gaskets shall be full face, 1/8-inch thick, cloth-inserted rubber: John Crane Co. Style 777 or acceptable alternate. Gaskets shall be suitable for a water pressure of 200 psi at a temperature of 180°F. Gaskets shall have "nominal" pipe size inside diameters not the inside diameters per ANSI B16.21.

## **2.6 RUBBER ANNULAR HYDROSTATIC SEALING DEVICES**

- A. Rubber annular hydrostatic sealing devices shall be of the modular mechanical type, utilizing interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe sleeve and the passing pipe. Assemble links to form a continuous rubber belt around the pipe, with a pressure plate under each bolthead and nut.
- B. Pressure plate shall be Type 316 stainless steel. Bolts and nuts shall be Type 304 or 316 stainless steel. Sealing element shall be EPDM rubber.
- C. The size of the wall sleeve needed to accommodate the passing pipe shall be as recommended by the rubber seal manufacturer.
- D. Product shall be Link Seal as manufactured by Thunderline Corporation; Innerlynx as manufactured by Advance Products & Systems, Inc.; or approved equal.

## **2.7 COPPER TUBING**

- A. Copper tubing shall conform to ASTM B 88, Type L, hard drawn.
- B. Wrought copper solder joint fittings shall be per ASTM B 75. Material shall be UNS C10200, C12000, or C12200.
- C. Solder shall be 95-5 (95% tin, 5% antimony) conforming to ASTM B 32, Grade Sb5. Flux shall comply with ASTM B 813.

## **2.8 PVC PIPE**

- A. PVC pipe shall be Schedule 80, Type I, Grade 1 (Class 12454-B), conforming to ASTM D 1784 and D 1785.
- B. Fittings shall be Schedule 80, conforming to ASTM D 2467 for socket-type fittings.
- C. Solvent cement shall comply with ASTM D 2564 and F 656.

## **PART 3 - EXECUTION**

### **3.1 INSTALLING PIPE SPOOLS IN CONCRETE**

Install pipes in walls and slabs before placing concrete. See Section 03000: General Concrete Construction.

### **3.2 RAISED FACE AND FLAT FACE FLANGES**

Use only flat faced flanges.

### **3.3 INSTALLING FLANGED PIPING**

- A. 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 pipe, connecting valves or equipment.
- B. Clean flanges by wire brushing before installing flanged fittings. Clean flange bolts and nuts by wire brushing, lubricate carbon steel bolts with oil and graphite, and tighten nuts uniformly and progressively. If flanges leak under pressure testing, loosen or remove the nuts and bolts, reset or replace the gasket, reinstall and retighten the bolts and nuts, and retest the joints. Joints shall be watertight.
- C. Assemble insulating flanges in the shop, not in the field. Hydrostatically test at 200 psi and then electrically test.

### **3.4 INSTALLATION OF STAINLESS-STEEL BOLTS AND NUTS**

Prior to assembly, coat threaded portions of stainless-steel bolts and nuts with lubricant.

### **3.5 INSTALLATION OF RUBBER ANNULAR HYDROSTATIC SEALING DEVICES**

Install in accordance with the manufacturer's instructions.

### **3.6 INSTALLATION OF FLANGE INSULATION KITS**

Install flange insulation kits per NACE RP0286. Prevent moisture, soil, or other foreign matter from contacting any portion of the insulating joint prior to its being sealed. If moisture, soil, or other foreign matter contacts any portion of the insulating joint, disassemble the entire joint, clean with a solvent, and dry prior to reassembly. Follow the manufacturer's recommendations regarding the torquing pattern of the bolts and the amount of torque to be used when installing the flange insulating kit.

For buried joints, wrap the flanged joint with wax tape per Section 09952: Cold-Applied Wax Tape Coating, for two feet on either side of the flange, then wrap with a double thickness of polyethylene per AWWA C105.

### **3.7 WARNING PIPE IDENTIFICATION TAPE**

Provide warning tape and install above each buried pipe as shown on the Drawings and in accordance with Section 15151: Water Facilities Identification.

### **3.8 INSTALLATION OF COPPER TUBING**

- A. Bends shall be long sweep. Shape bends with shaping tools. Form bends without flattening, bucking, or thinning at any point.
- B. Make soldered joints per ASTM B 828. Solder shall penetrate to the full depth of the cup in joints and fittings.

### **3.9 INSTALLATION OF PVC PIPING**

- A. Cut pipe ends square and remove all burrs, chips, and filings before joining pipe or fittings. Bevel pipe ends as recommended by the pipe manufacturer.
- B. Make up solvent welded joints per ASTM D 2855.
- C. Allow at least eight hours of drying time before moving solvent welded joints or subjecting the joints to any internal or external loads or pressures."

## **PART 4 - PAYMENT**

Payment for the Work in this Section shall be included as part of the lump sum or unit price bid amount for which such Work is appurtenant thereto, and no additional payment will be made specifically for the Work in this Section.

**END OF SECTION**

## **SECTION 15041: CHLORINATION OF WATER MAINS**

### **PART 1 - GENERAL**

#### **1.1 DESCRIPTION**

This Section describes the disinfection of potable water mains, appurtenances, and connections by chlorination, in accordance with AWWA C651 and as specified herein.

#### **1.2 RELATED WORK SPECIFIED ELSEWHERE**

Refer to the following Specification Sections for additional requirements:

- A. Section 01300: Submittals
- B. Section 02675: Disinfection of Potable Water Tanks and Piping
- C. Section 15000: General Piping Requirements
- D. Section 15056: Ductile Iron pipe and Fittings
- E. Section 15076: Cement-Mortar Lined and Coated Steel Pipe

#### **1.3 SUBMITTALS**

Discharge Plans including planned location(s) and flow rate(s).

Chlorination Plan including selected disinfection method. (See AWWA C651 and Part 2 below).

#### **1.4 JOB CONDITIONS**

- A. Discharge of chlorinated water into watercourses or surface waters is regulated by the National Pollutant Discharge Elimination System (NPDES). A copy of the City's permit may be examined at the City office. Conform to permit requirements.
- B. The rate of flow and locations of discharges shall be scheduled in advance to permit review and coordination with the City and appropriate agencies:
  - 1. Los Angeles County Flood Control District.
- C. Use potable water for chlorination. See Special Provisions Section for availability of water.
- D. Submit requests for use of water from waterlines of the Owner 48 hours in advance.



- E. Perform chlorination prior to hydrostatic testing for pipelines having a diameter of 12-inches and larger. See Paragraph 3.1-G of this Section for concurrent testing of smaller diameter pipelines.

## **PART 2 - MATERIALS**

### **2.1 LIQUID CHLORINE SOLUTION**

Liquid chlorine solution shall be in accordance with the requirements of ANSI/AWWA B301. Inject it with a solution feed chlorinator and a water booster pump.

### **2.2 CALCIUM HYPOCHLORITE (DRY)**

Calcium hypochlorite shall be in accordance with the requirements of ANSI/AWWA B300. Dissolve it in water to a known concentration in a container and pump it into the pipeline at a measured rate.

### **2.3 SODIUM HYPOCHLORITE (SOLUTION)**

Sodium hypochlorite shall be in accordance with the requirements of ANSI/AWWA B300. Dilute it in water to desired concentration and pump it into the pipeline at a measured rate.

### **2.4 SODIUM HYPOCHLORITE TABLETS AND ADHESIVE**

- A. Chlorine Content: The tablets shall have an average weight of 0.009 pounds each and shall contain not less than 70% of available chlorine. Tablets shall not contain organic chlorine compounds.
- B. Adhesive: Adhesive shall be a type that will not impart taste, odor, or detrimental compounds to the water supply, EPA or NSF approved for potable use.
- C. Storage: Store hypochlorite tablets in tightly closed containers. Take proper care they will not be accessible to children or unauthorized persons.

### **2.5 CHLORINE RESIDUAL TEST KIT**

For measuring chlorine concentration, use a medium range, drop count, titration kit or an orthotolidine indicator comparator with wide range color discs. The kit shall be capable of determining chlorine concentration in the range 1.0 to 25 mg/L. Test kits shall be Hach Chemical, Hellige, or approved equal. Maintain an adequate number of kits in good working order and available for immediate test of residuals at points of sampling.

## PART 3 - EXECUTION

### 3.1 PIPELINES

- A. General: Before being placed into service, chlorinate all pipelines and appurtenances. Disinfect pipelines with a diameter of 10-inches or less by either direct chlorine solution injection or by use of sodium hypochlorite tablets. Disinfect pipelines with a diameter of 12 inches and larger by direct chlorine solution injection. Bacteriological testing after disinfection shall be performed by the City.
- B. Chlorination Contractor: Chlorination shall be performed by a certified chlorination and testing contractor. Chlorination shall be in accordance with the instructions of the chlorinator manufacturer.
- C. Groundwater: In the event groundwater is encountered and it is impossible to prevent its entrance into the mains, or the mains are not free from dirt, thoroughly clean them prior to disinfection and extra flushing effort will be required. Furthermore, disinfection shall be by direct chlorine solution injection only.
- D. Services: Tightly shut off every service connection served by a main being disinfected at the curb stop before water is applied to the main. Care shall be taken to expel all air from the main and services during the filling operation.
- E. Direct Chlorine Solution Injection:
  - 1. Apply chlorine solution at the beginning of the section to be chlorinated and inject through a corporation stop, a hydrant, or other approved connection to ensure treatment of the entire system being disinfected. Install all required corporation stops and other plumbing materials necessary for chlorination and flushing of the main.
  - 2. Introduce potable water into the pipeline at a constant measured rate. Inject chlorine solution into the potable feed water at a measured rate. Proportion the two rates so that the chlorine concentration in the pipeline is maintained at a minimum concentration of 50 mg/L to 100 mg/L, with a minimum chlorine residual of 25 mg/L after 24 hours in the pipe. Check the concentration at points downstream periodically during the filling to ascertain that sufficient chlorine is being added.
- F. Disinfection by Sodium Hypochlorite Tablets: The use of sodium hypochlorite tablets will be permitted in pipe sizes 4 through 10 inches.

Attach the tablets by means of an approved adhesive to the inside top of the lengths of pipe as they are being laid. Limit the amount of adhesive to the smallest practicable amount applied to one side of the tablet only.

The following table shows the number of tablets to be used per length of pipe of various sizes to provide the required chlorine residual:

<u>ID of Pipe (Inches)</u>	<u>No. of Hypochlorite Tablets Per Length of Pipe</u>
4	2
6	2
8	3
10	6

- G. Disinfection of Valves and Appurtenances: During the period that the chlorine solution or slug is in the section of pipeline, open and close valves to obtain a chlorine residual at hydrants and other pipeline appurtenances. Care shall be taken to ensure that no chlorinated water enters any active pipeline.
- H. Concurrent Testing (for Pipelines with Diameters of 10 Inches or Less): Disinfecting mains and appurtenances, and hydrostatic testing may run concurrently for the required 24-hour test period. In the event there is leakage and repairs and retesting are necessary, repeat disinfection of the pipeline, by injection of chlorine solution into the line as provided in this Section.
- I. Confirmation of Residual: After the chlorine solution applied by the continuous feed method has been retained in the pipeline for 24 hours, take samples at air valves and other points of access to confirm that a chlorine residual of 25 mg/L minimum exists along the pipeline.
- J. Bacteriologic Tests: Collect one sample at each air-release valve or for each mile where valve intervals are greater, and delivered to the Engineer within six hours. The City will perform a bacteriologic quality test to demonstrate the absence of coliform organisms in each separate section of the pipeline after chlorination and refilling.
- K. Repetition of Procedure: If the initial chlorination fails to produce required residuals and bacteriologic tests, repeat chlorination and until satisfactory results are obtained.
- L. Pipeline Flushing: After confirming the chlorine residual, flush excess chlorine solution from the pipeline until the total chlorine concentration in the water leaving the pipe is within 0.5 mg/L of the replacement water.

- M. Dechlorination: Dechlorinate water flushed and/or discharged from waterlines to the storm drain system in accordance with the requirements of the Regional Water Quality Control Board NPDES permit and any other discharge permits.
- N. Test Facility Removal: After satisfactory disinfection, replace air valves, restore the pipe coating and remove temporary disinfection and test facilities.
- O. Connections to Existing System: Where connections are to be made to an existing potable water system, swab or spray the interior surfaces of all pipe and fittings used in making the connections with a one percent hypochlorite solution before they are installed. Start thorough flushing as soon as the connection is completed and continue until all discolored water is eliminated.

#### **PART 4 - PAYMENT**

Payment for the Work in this Section shall be included as part of the lump sum or unit price bid amount for which such Work is appurtenant thereto, and no additional payment will be made specifically for the Work in this Section.

#### **END OF SECTION**

## **SECTION 15043: TESTING OF NON-PRESSURE SEWER PIPELINES AND MANHOLES**

### **PART 1 - GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Low-pressure air test of sewer pipelines
- B. Infiltration testing of sewer pipelines
- C. Deflection testing of sewer pipelines
- D. Leakage testing of manholes

#### **1.2 RELATED WORK SPECIFIED ELSEWHERE**

Refer to the following Specification Section(s) for additional requirements:

- A. Section 03461: Precast Reinforced Concrete Manholes
- B. Section 15066: Gravity Sewer Pipelines
- C. Section 15068: Sewer Laterals

#### **1.2 REFERENCED STANDARDS**

- A. ASTM International:
  - 1. ASTM C828: Standard Test Method for Low-Pressure Air Test of Vitrified Clay Pipe Lines
  - 2. ASTM C1244: Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill
  - 3. ASTM F1417: Standard Practice for Installation Acceptance of Plastic Non-pressure Sewer Lines Using Low-Pressure Air

#### **1.3 QUALITY ASSURANCE**

- A. Conform to requirements of the following standards depending on the pipeline material. Where discrepancies exist between the current standards and this specification, the more stringent requirements shall govern.
  - 1. Vitrified Clay Pipe: ASTM C828
  - 2. PVC Pipe: ASTM F1417

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

## **PART 3 - EXECUTION**

### **3.1 GENERAL**

- A. General:
  - 1. The Contractor shall furnish all equipment and materials required for testing.
  - 2. All tests shall be made in the presence of the District. No one shall be allowed in the manholes during testing because of the hazards present.
- B. Leakage: Each section of sewer between two successive manholes shall be tested for leakage and the leakage test shall be made on all sections of sewer.
- C. Infiltration: The infiltration test shall be made where excessive groundwater is encountered.
- D. Retesting: Even though a section may have previously passed the leakage or infiltration test, each section of sewer shall be tested subsequent to the last backfill compacting operation if, in the opinion of the District, heavy compaction equipment or any of the operations of the Contractor or others may have damaged or affected the structural integrity or water tightness of the pipe, structure, and appurtenances.
- E. Other Utilities: Official District tests will not be made until after all the other utilities have been installed and their trench compaction verified.
- F. Excessive Leakage or Infiltration: If the leakage or infiltration rate is greater than the amount specified, the pipe joints shall be repaired or, if necessary, the pipe shall be removed and relaid by the Contractor.
- G. Acceptance: The sewer will not be accepted until the leakage or infiltration rate, as determined by testing, is less than the maximum allowable.
- H. House Laterals: House laterals are not to be connected until after the sewer main has been successfully tested.

### **3.2 LOW-PRESSURE AIR TEST**

- A. Test Section: Each section of sewer between two successive manholes shall be tested by plugging all pipe outlets.

- B. Addition of Air: Air shall be slowly added until the internal pressure is raised to 4.0 pounds per square inch gage (psig). The compressor used to add air to the pipe shall have a blowoff valve set at 5 psig to ensure that at no time the internal pressure in the pipe exceeds 5 psig.
- C. Internal Pressure: The internal pressure of 4 psig shall be maintained for at least two minutes to allow the air temperature to stabilize, after which the air supply shall be disconnected and the pressure allowed to decrease to 3.5 psig.
- D. Pressure Drop: The time in seconds that is required for the internal air pressure to drop from 3.5 psig to 2.5 psig shall be measured and the results compared with the minimum permissible pressure holding times indicated in the following table.
- E. Minimum Pressure Holding Times

1. Vitrified Clay Pipe:

Pipe Diameter (inch)	Time (minutes) per 100 feet of length
6	0.7
8	1.2
10	1.5
12	1.8
15	2.1

2. PVC Pipe:

Pipe Diameter (inch)	Time (minutes) per 100 feet of length
6	5.7
8	7.6
10	9.4
12	11.3
15	14.2

- F. Retest: If the pressure drop from 3.5 psig to 2.5 psig occurs in less time than specified, the pipe shall be repaired and, if necessary, replaced and relaid until the joints and pipe shall hold satisfactorily under this test.

### 3.3 INFILTRATION TEST

- A. Preparation of Test Section: The end of the sewer at the upper structure shall be closed to prevent the entrance of water, and pumping of groundwater shall be discontinued for at least three days, after which the section shall be tested for infiltration.
- B. Allowable Infiltration Rate: The infiltration shall not exceed 0.025 gpm per inch of diameter per 1,000 feet of main line sewer being tested, not including the length of laterals entering that section.
- C. Excessive Infiltration: Where infiltration in excess of the allowable amount is discovered before completion and acceptance of the sewer, the sewer shall be immediately uncovered and the amount of the infiltration reduced to a quantity within the specified amount of infiltration, before the sewer is accepted.
- D. Individual Leaks: Even if the infiltration is less than the allowable amount, any individual leaks that may be observed shall be stopped as directed by the District.
- E. Completion of Tests: All tests must be completed before the street or trench is resurfaced, unless otherwise directed by the District.

### 3.4 DEFLECTION TEST

- A. All PVC main line pipe shall be tested for deflection, joint displacement, or other obstruction by passing a rigid mandrel through the pipe by hand.
- B. Conduct deflection test not less than 30 days after completion of the trench backfill, but prior to permanent resurfacing.
- C. The mandrel shall be a full circle cylinder, accepted by the District as to design and manufacture. The circular cross section of the mandrel shall have a diameter as indicated in the following table:

Pipe Diameter (inch)	Minimum Mandrel Diameter (inches)
6	5.31
8	7.09
10	8.84
12	10.51



### 3.5 NEGATIVE AIR PRESSURE (VACUUM) MANHOLE TEST

- A. Perform test per ASTM C1244 immediately after assembly and prior to backfilling.
1. Draw 10 inches mercury of vacuum on the manhole, close vacuum line valve, and shutoff vacuum pump.
  2. Measure time for the vacuum to drop to 9 inches mercury.
  3. Minimum test times for the vacuum reading to drop from 10 inches to 9 inches mercury are as follows:

Depth (feet)	48-inch Diameter Manhole	60-inch Diameter Manhole	72-inch Diameter Manhole
	Minimum Test Times (seconds)		
<4	10	13	16
6	15	20	25
8	20	26	33
10	25	33	41
12	30	39	49
14	35	46	57
16	40	52	67
18	45	59	73
20	50	65	81
22	55	72	89
24	59	78	97
26	64	85	105
28	69	91	113
30	74	98	121

- B. All manhole inlets and outlets shall be plugged with approved stoppers or plugs.
- C. If the manhole fails the initial test, necessary repairs shall be made with a non-shrink grout while the vacuum is still being drawn. Cracks longer than two-inches shall be cause for rejection of the casting and no patching shall be allowed. Retesting shall proceed until a satisfactory test is obtained.

#### **PART 4 - PAYMENT**

Payment for the Work in this Section shall be included as part of the lump sum or unit price bid amount for which such Work is appurtenant thereto, and no additional payment will be made specifically for the Work in this Section.

**END OF SECTION**

## **SECTION 15044: PRESSURE TESTING OF PIPING**

### **PART 1 - GENERAL**

#### **1.1 DESCRIPTION**

This Section specifies the hydrostatic and leakage testing of water mains.

#### **1.2 RELATED WORK SPECIFIED ELSEWHERE**

Refer to the following Specification Sections for additional requirements:

- A. Section 01300: Submittals
- B. Section 15000: General Piping Requirements
- C. Section 15051: Installation of Pressure Pipelines
- D. Section 15076: Cement-Mortar Lined and Coated Steel Pipe

#### **1.3 SUBMITTALS**

Furnish submittals in accordance with the requirements of Section 01300: Submittals. The following submittals are required:

- A. Submit test bulkhead locations and design calculations, pipe attachment details, and methods to prevent excessive pipe wall stresses.
- B. Submit six copies of the test records to the Engineer upon completion of the testing.

#### **1.4 TEST PRESSURES**

Test pressures for the various services and types of piping are shown below in Section 3.10, Test Pressures.

#### **1.5 TESTING RECORDS**

Provide records of each piping installation during the testing. These records shall include:

- A. Date of test.
- B. Identification of pipeline, or pipeline section, tested or retested.
- C. Identification of pipeline material.
- D. Identification of pipe specification.

- E. Test fluid.
- F. Test pressure.
- G. Remarks: Leaks identified (type and location), types of repairs, or corrections made.
- H. Certification by Contractor that the leakage rate measured conformed to the Specifications.
- I. Test duration.
- J. Allowable losses.
- K. Actual losses.

## **PART 2 - MATERIALS**

### **2.1 VENTS AND DRAINS FOR ABOVEGROUND PIPING**

Install vents on the high points of above ground piping, whether shown on the Drawings or not. Install drains on low points of above ground piping, whether shown on the Drawings or not. Provide a valve at each vent or drain point. Valves shall be 3/4-inch for piping 3 inches and larger and 1/2-inch for piping smaller than 3 inches.

### **2.2 MANUAL AIR-RELEASE VALVES FOR BURIED PIPING**

Provide temporary manual air-release valves for pipeline test. Construct the pipe outlet in the same manner as for a permanent air valve and after use seal with a blind flange, cap, or plug and coat equal to the adjacent pipe.

### **2.3 TEST BULKHEADS**

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. Design pressure shall be at least 2.0 times the specified test pressure for the section of pipe containing the bulkhead. Limit stresses to 70% of yield strength of the bulkhead material at the bulkhead design pressure. Include air-release and water drainage connections.

### **2.4 TESTING FLUID**

- A. Testing fluid shall be potable water.

- B. Submit request for use of water from water lines of Owner 48 hours in advance.
- C. The Contractor may obtain the water from the Owner at no charge for the initial test. If the initial test fails the Contractor will be charged the cost of additional water at the Owner's current rates.

## **2.5 TESTING EQUIPMENT**

Provide new, calibrated, 6-inch-diameter face pressure gauges, pipes, bulkheads, pumps, calibrated meters and chart recorder to perform the hydrostatic testing.

## **PART 3 - EXECUTION**

### **3.1 TESTING PREPARATION**

- A. Pipes shall be in place and anchored to resist thrust forces based on the test pressure being used before commencing pressure testing. Any concrete anchors, thrust blocks and such shall be fully cured before being used to restrain pipeline and appurtenances.
- B. Conduct pressure tests on exposed and aboveground piping after the piping has been installed and attached to the pipe supports, hangers, anchors, expansion joints, valves, and meters. When valves are used as pipe end closures for testing, testing pressures should not exceed pressure limits of said valves.
- C. Conduct pressure tests on buried piping after the trench has been completely backfilled and compacted.
- D. Provide any temporary piping needed to carry the test fluid to the piping that is to be tested. After the test has been completed and demonstrated to comply with the Specifications, disconnect and remove temporary piping. Do not remove the vent and drain valves at the high and low points in the tested piping. Plug or cap taps or connections to the existing piping from which the test fluid was obtained.
- E. Provide temporary drain lines needed to carry testing fluid away from the pipe being tested. Remove such temporary drain lines after completing the pressure testing.

### **3.2 CLEANING**

Before conducting hydrostatic tests, flush pipes with water to remove dirt and debris. Maintain a flushing velocity of at least 2 fps. Flush pipes for the minimum time period as given by the formula below and as required to thoroughly clear the pipeline of dirt and debris.

$$T = 2/3 L$$

in which:

T = flushing time (seconds)

L = pipe length (feet).

In mains 24-inches or larger in diameter, acceptable alternatives to flushing are use of high-pressure water jet, sweeping, and scrubbing, or equally effective means. All water, sediment, dirt, and foreign material accumulated during this cleaning operation shall be discharged, vacuumed, or otherwise removed from the pipe and construction area.

### **3.3 LENGTH OF TEST SECTION FOR BURIED PIPING**

The maximum length of test section for buried pipe shall be 5,000 feet. Provide test bulkheads where required at the Contractor's sole expense. Testing against valves is not permitted.

### **3.4 INITIAL PIPELINE FILLING FOR HYDROSTATIC TESTING**

Maximum rate of filling shall not cause water velocity in pipeline to exceed 1 fps.

### **3.5 TESTING NEW PIPE WHICH CONNECTS TO EXISTING PIPE**

Test new pipelines which are to be connected to existing pipelines by isolating the new line from the existing line by means of pipe caps, spectacle flanges, or blind flanges. After the new line has been successfully tested, remove caps or flanges and connect to the existing piping.

### **3.6 HYDROSTATIC TESTING OF ABOVEGROUND OR EXPOSED PIPING**

Open vents at high points of the piping system to purge air while the pipe is being filled with water. Subject the piping system to the test pressure specified herein.

Maintain the test pressure for a minimum of 24 hours. Examine joints, fittings, valves, and connections for leaks. The piping system shall show zero leakage or weeping. Correct leaks and retest until zero leakage is obtained. Air and vacuum valves shall be in place and working in case of pipe failure during testing.

### 3.7 HYDROSTATIC TESTING OF BURIED PIPING

- A. Where any section of the piping contains concrete thrust blocks or encasement, do not make the pressure test until at least 10 days after the concrete has been poured. When testing mortar-lined or PVC piping, fill the pipe to be tested with water and allow it to soak for at least 48 hours to absorb water before conducting the pressure test.
- B. Apply and maintain the test pressure by means of a hydraulic force pump.
- C. Maintain the test pressure for the following duration by restoring it whenever it falls 5 psi:

<u>Pipe Diameter</u> <u>(inches)</u>	<u>Hours</u>
18 and less	4
20 to 36	8
Greater than 36	24

- D. After the test pressure is first reached, use a meter to measure the additional water added to maintain the pressure. This amount of water is the loss due to the apparent leakage in the piping system. The allowable loss rate is defined by the formula:

$$L = \frac{HND(P)^{0.5}}{C}$$

in which:

H = specified test period (hours)  
L = allowable loss (gallons)  
N = number of rubber-gasketed joints in the pipe test  
D = diameter of the pipe (inches)  
P = specified test pressure (psig)  
C = 7,400

- E. The allowable leakage loss for piping having threaded, brazed, flanged or welded (including solvent welded) joints shall be zero.
- F. Repair and retest any pipes showing leakage rates or losses greater than that allowed in the above criteria.

### **3.8    REPETITION OF TEST**

If the actual leakage or loss exceeds the allowable amounts, locate and correct the faulty work and repeat the test. Restore the work and all damage resulting from the leak and its repair. Eliminate visible leakage.

### **3.9    BULKHEAD AND TEST FACILITY REMOVAL**

After a satisfactory test, remove test bulkheads and other test facilities, and restore the pipe coatings and fill the pipeline section tested with water and maintain it full until disinfection and acceptance of the pipeline at the completion of the contract. The Contractor shall pay all costs for repairing any damage to the pipeline as a result of pressure imposed during operations of filling the pipeline with water and conducting the tests.

### **3.10   TEST PRESSURES**

The field hydrostatic test requirements shall be 150 psi unless shown otherwise in the Drawings.

## **PART 4 - PAYMENT**

Payment for the work in this Section shall be included as part of the lump sum or unit prices bid for pipeline installation, and no additional payment will be made specifically for the Work in this Section.

**END OF SECTION**



## **SECTION 15051: INSTALLATION OF PRESSURE PIPELINES**

### **PART 1 - GENERAL**

#### **1.1 DESCRIPTION**

This Section describes the installation of pressure pipelines fabricated of polyvinyl chloride, ductile iron, welded steel; pipeline closures and connections and pipeline encasement.

#### **1.2 RELATED WORK DESCRIBED ELSEWHERE**

- A. Section 01300: Submittals
- B. Section 02223: Trenching, Backfilling, and Compacting
- C. Section 03000: General Concrete Construction
- D. Section 09900: Painting and Coating
- E. Section 15000: General Piping Requirements
- F. Section 15041: Chlorination of Water Mains for Disinfection
- G. Section 15044: Pressure Testing of Piping
- H. Section 15151: Water Facilities Identification

#### **1.3 SUBMITTALS**

Furnish submittals in accordance with the requirements of Section 01300: Submittals. The following submittals are required:

- A. Submit an installation schedule (tabulated layout) which includes:
  - 1. Order of installation and closures.
  - 2. Pipe centerline station and elevation at each change of grade and alignment.
  - 3. Elements, curves, and bends, both in horizontal and vertical alignment including elements of the resultant true angular deflections in cases of combined curvature.
  - 4. The location, length, size, design designation, and number designation of each pipe section and pipe special.

- 5. Locations of junction structures.
- B. Submit welder qualification certificates.

## **PART 2 - PRODUCTS**

### **INSTALLATION MATERIAL**

Refer to the various referenced Sections on pipe by type for material requirements.

## **PART 3 - EXECUTION**

### **3.1 DELIVERY AND TEMPORARY STORAGE OF PIPE AT SITE**

- A. On-site Storage Limitation: On-site pipe storage shall be limited to a maximum of one week, unless exception is approved in writing by Owner.
- B. Care of Pipe: Take care to avoid cracking of the cement mortar coating and/or lining on steel pipe. If necessary, use plastic sheet caps to close pipe ends and keep coatings and linings moist.

### **3.2 HANDLING OF PIPE**

- A. Moving Pipe: Lift pipes with handling beams or wide belt slings as recommended by the pipe manufacturer. Do not use cable slings. Handle pipe in a manner to avoid damage to the pipe. Do not drop pipe or dump it from trucks or into trenches under any circumstances.
- B. Internal Pipe Braces: Maintain internal braces placed in steel pipes until backfilling is completed.
- C. Pipe Caps: Do not remove plastic caps placed over the ends of steel pipe until the pipe is ready to be placed in the trench. Plastic caps may be opened temporarily to spray water inside the pipe for moisture control.
- D. Inspection of Pipe: Inspect the pipe and accessories for defects prior to lowering into the trench. Repair or replace any defective, damaged or unsound pipe. Remove all foreign matter or dirt from the interior of the pipe before lowering into position in the trench.

### **3.3 PLACEMENT OF PIPE IN TRENCH**

- A. General: Dewatering, excavation, shoring, sheeting, bracing, backfilling material placement, material compaction, compaction testing, and pipe

laying requirements and limitations shall be in accordance with Section 02223: Trenching, Backfilling and Compacting.

- B. Sanitation of Pipe Interior: During laying operations, do not place tools, clothing, or other materials in the pipe.
- C. Prevention of Entry into Pipe: When pipe laying is not in progress, including lunch-hour, close the ends of the pipe using vermin-proof plugs constructed in a manner to also prevent entry by children.
- D. Laying Pipe on Grades over 10 Percent: Pipes shall be laid uphill whenever the grade exceeds 10 percent.
- E. Pipe Base Thickness: Pipe base thickness shall be as specified in Section 02223: Trenching, Backfilling, and Compacting.
- F. Depressions at Joints and Pipe Sling Points: Dig depressions into pipe base material to accommodate the pipe bell and external joint filler form, and to permit removal of the pipe handling slings.
- G. Placement of Pipe on Pipe Base: Lower pipe onto the bedding and install to line and grade its full length on firm uniform bearing except at the bell and at sling depressions. Unless specified otherwise, the tolerance on grade shall be  $\frac{1}{4}$  inch; the tolerance on line shall be 1 inch. Measure grade along the pipe invert.
- H. Pipe Installation: Install pipe without springing, forcing, or stressing the pipe or any adjacent connecting valves or equipment. Prevent pipe from being displaced by water entering trench. Replace damaged or displaced pipe or return it to specified condition and grade.
- I. Trench Curvature and Pipe Deflection: Use the radius of curvature of the trench to determine maximum length of pipe section that can be used without exceeding the allowable deflection at a coupling. Refer to the various referenced sections on pipe by type for allowable deflection. The deflection at any flexible joint shall not exceed that prescribed by the manufacturer of the pipe. Follow the manufacturer's printed installation guide outlining the radius of curvature that can be negotiated with pipe sections of various lengths.
- J. Equipment for Installation of Pipe: Provide and use proper implements, tools, and facilities as recommended by the pipe manufacturer's standard printed installation instructions for safe and efficient execution of the Work. Carefully lower all pipe, fittings, valves, and accessories shall be into the trench using suitable equipment in such a manner as to prevent damage

to pipe and fittings. Do not drop pipe or accessories or dump them into the trench.

- K. Cutting and Machining Pipe: Cut and machine the pipe in accordance with the pipe manufacturer's standard procedures for this operation. Do not cut pipe with a cold chisel, standard iron pipe cutter, nor any other method that may fracture the pipe or produce ragged, uneven edges.

### **3.4 ASSEMBLING RUBBER RING JOINTS**

- A. Cleaning Ends of Pipe: Clean the ends of the pipe to be joined of foreign material.
- B. Lubrication: After placing pipe in trench, apply a non-toxic water soluble vegetable soap solution to the inside of the bell of the pipe in the trench and to the rubber gasket and spigot groove of the pipe to be installed. Stretch the rubber gasket into the groove of the spigot end of the pipe and distribute uniformly around the circumference.
- C. Joint Assembly: Without tilting the pipe to be installed, insert the spigot into the bell of the pipe. Use come-alongs or pipe jacks to drive spigot end home horizontally. Maintain the joint recess recommended by pipe manufacturer for made-up joints. Where deflections at joints are required for curved alignment, do not exceed the allowable joint opening on one side. Use a feeler gauge to verify proper placement of each gasket.

### **3.5 FLANGED CONNECTIONS**

- A. Bolthole Alignment: Set pipe with flange boltholes straddling the pipe's horizontal and vertical centerlines.
- B. Nuts and Bolts: Lubricate nuts and bolts with oil or graphite prior to installation.
- C. Flange Wrapping: Wrap flanges which connect with buried valves or other equipment with sheet polyethylene film as specified for the valves and equipment. The wrap shall extend over the flanges and bolts and be secured around the adjacent pipe circumference with tape.
- D. Coating: Coat flanges and non-stainless steel bolts as specified in Section 09900: Painting and Coating.

### **3.6 INSTALLATION OF BENDS, TEES, AND REDUCERS**

Install fittings utilizing standard installation procedures. Lower fittings into trench by means of rope, cable, chain, or other acceptable means without damage to

the fittings. Attach cable, rope, or other devices used for lowering fitting into trench around exterior of fitting for handling. Do not attach the cable, rope or other device through the fittings interior for handling. Connect fittings to pipe or other facility, and check joint to insure a sound and proper joint.

### **3.7 INSTALLING THREADED PIPING**

Ream, deburr, and clean threaded pipe before making up joints. Apply thread lubricant to threaded pipe ends before installing fittings, couplings, unions, or joints.

### **3.8 COMPLETION OF INTERIOR JOINTS FOR MORTAR-LINED PIPES 20-INCHES IN DIAMETER AND SMALLER**

- A. Preparation: Insert a tight-fitting swab or squeegee in the joint end of the pipe to be joined.
- B. Application of Cement Mortar: When ready to insert the spigot, coat the face of the cement mortar lining at the bell with a sufficient amount of stiff cement mortar to fill the space between adjacent mortar linings of the two pipes to be joined.
- C. Removal of Excess Mortar: Immediately after joining the pipes, draw the swab or squeegee through the pipe to remove all excess mortar and expel it from the open pipe end.

### **3.9 COMPLETION OF INTERIOR JOINTS FOR MORTAR-LINED PIPES 24-INCHES IN DIAMETER AND LARGER**

- A. Backfill Requirement: Backfill the trench before applying mortar at joints.
- B. Cleaning and Application of Cement Mortar: Working inside the pipe, remove foreign substances which adhere to the steel joint rings, clean the surface, and pack stiff cement mortar into each joint. Finish the mortar with a steel trowel to match the lining in the adjoining pipes.
- C. Removal of Excess Mortar: Remove excess mortar and other construction debris from the pipe interior.

### **3.10 PIPELINE CLOSURE ASSEMBLIES**

- A. General: Use pipeline closure assemblies to unite sections of pipeline laid from opposite directions; to adjust the field length of the pipeline to meet structures, other pipelines, and points established by design stations, and to close areas left open to accommodate temporary test bulkheads for

hydrostatic testing. Use either follower ring design or butt strap design. Install follower ring closures as recommended by the pipe manufacturer.

- B. Butt Straps: Center shaped steel butt straps over the ends of the pipe sections they are to join. On pipes 39 inches in diameter and smaller, weld butt straps to the outside of the pipes with complete circumferential fillet welds equal in size to the thinnest part being joined. Refer to the details shown on the Drawings when joining larger pipes.
- C. General Requirements for Cement Mortar Lining for Closure Assemblies: Line closure assemblies with cement-mortar to a mortar thickness at least equal to the adjoining standard pipe sections. Clean the steel with wire brushes and a cement and water wash coat applied prior to applying the cement mortar. Where more than a 4-inch joint strip of mortar is required, place welded wire mesh reinforcement having a 2-inch by 4-inch pattern of No. 13 gauge over the exposed steel. Install the mesh so that the wires on the 2-inch spacing run around the pipe's circumference. Crimp the wires on the 4-inch spacing to support the mesh 3/8-inch from the metal surface. The interior mortar shall have a steel-troweled finish to match adjoining mortar lined pipe sections.
- D. Lining Closure Assemblies for Pipes 20-Inches in Diameter and Smaller: For lining of closure assemblies on pipelines 20-inches in diameter and smaller, provide threaded 4-inch nipples with galvanized plugs around the perimeter of the closure at third-point intervals to facilitate mortar lining of the interior surface.
- E. Mortar Coating Exterior Surfaces of Closure Assemblies: Reinforce the exterior of closure assemblies with wire mesh as described in Paragraph 3 above. Coat the surface with mortar, or a poured concrete encasement to cover all steel to a minimum thickness of 1-1/2 inches. Protect exterior mortar to retard drying while curing. Pour concrete and vibrate it on one side of the closure assembly only, until mortar or concrete is visible on the opposite side, after which the coating can be completed over the top of the assembly.

### **3.11 OPERATIONS INCIDENTAL TO JOINT COMPLETION**

Plan joint completion to accommodate temporary test bulkheads for hydrostatic testing.

### **3.12 COMPLETION OF EXTERIOR PIPE JOINT FOR CEMENT-MORTAR COATED PIPE**

Fill outside joint recess with cement-mortar grout using a fabric form placed around the joint and secured with steel straps. Pour and rod grout from one side

only until it is visible on the opposite side. After approximately one hour, top off the joint with additional grout.

### **3.13 THRUST RESTRAINT AND ANCHOR BLOCKS**

- A. Location: Provide thrust restraint and anchor blocks on all pressure pipelines, and install them as shown on the Drawings and at all rubber-gasketed fittings that are not otherwise restrained. Install thrust restraint blocks or anchor blocks at all valves, tees, crosses, ends of pipelines, and at all changes of direction of the pipeline greater than 10 degrees deflection either vertically or horizontally when joints are not otherwise restrained.
- B. General Requirements: Thrust restraint and anchor blocks shall be of not less than 2,000 psi concrete (Class C) and shall provide a thrust bearing area to resist horizontal or vertical thrust and shall be of sufficient gross weight and area to give bearing against undisturbed vertical earth banks sufficient to absorb the thrust, allowing an earth bearing of 1,500 pounds per square foot maximum.
- C. Thrust Restraint not Called for on the Plans: Size thrust restraint elements, where not called for on the plans, for 150 percent of operating pipeline pressure. Prior to construction, submit sizing and calculations of thrust and anchor block design to the Owner for approval. Pipe clamps, tie-rods, and their assembly shall meet the requirements of the National Fire Protection Association Bulletin No. 24, latest edition.
- D. Concrete Placement: Place concrete against wetted and undisturbed soil, and clean and wet the exterior of the fitting to provide a good bond with the concrete. The concrete interface with the fitting shall be an area of not less than the projected area of the fitting normal to the thrust resultant and centered on the resultant.
- E. Accessibility to Joints and Fittings: Unless otherwise directed by the Owner, place thrust restraint and anchor blocks so that the pipe and fitting joints are accessible for repair. Placement shall include isolation of adjacent utilities and shall ensure that bearing is against undisturbed soil.
- F. Harness and Tie-Rods: Use metal harness or tie-rods and pipe clamps to prevent movement if shown on the Plans or directed by the Owner. Install the rods and clamp harnessing arrangement utilizing flanged harness hold-downs or lugged fittings and pipe with saddle clamps placed to bear against the pipe bells. Saddle clamps around the barrel of the pipe, which depend on friction or setscrews to prevent sliding of the clamp, are not acceptable. The pipe clamps, tie rods and their assembly shall meet the requirements of the National Fire Protection Association Bulletin No. 24,

Latest Edition. Coat all surfaces of exposed and buried steel rods, reinforcing steel, bolts, clamps, and other metal work before installation and touch up after assembly as specified in Section 09900: Painting and Coating.

- G. In-line Valves: Use reinforcing steel tiedown rods on all in-line valves.

### **3.14 BLOWOFF ASSEMBLIES**

- A. General: Install in-line type or end-of-line type blowoff assemblies in accordance with the Drawings at locations noted, and at such additional locations as required by the Owner for removing water or sediment from the pipeline.
- B. Location: Install the assembly in a level section of pipe. The tap for blowoff in the line shall be no closer than 18 inches to a valve, coupling, joint, or fitting unless it is at the end of the main. Do not allow any in any machined section of asbestos cement pipe.
- C. Restrictions: Do not install blowoffs connected to any sewer, submerged in any stream, or installed in any manner that will permit back siphoning into the distribution system.

### **3.15 AIR AND VACUUM RELEASE VALVES**

- A. General: Install air release valve assemblies and combination air and vacuum valves at each point in the pipeline as shown on the Drawings or as specified by the Owner.
- B. Location: The tap for the air valves shall be made in a level section of pipe no closer than 18 inches to a bell, coupling, joint, or fitting. Do not use any tap in any machined section of asbestos cement pipe.

### **3.16 ABOVEGROUND PIPING INSTALLATION/SUPPORT**

- A. General: Installation of aboveground pipeline materials and appurtenances include requirements for buried pipeline materials and appurtenances as applicable.
- B. Supports: Adequately support all exposed pipe with devices of appropriate design. Where details are shown, the supports shall conform thereto and shall be placed as indicated, provided that the support for all piping shall be complete and adequate as herein specified, whether or not supporting devices are specifically called for. Pipe hangers and supports shall conform to the requirements of the latest editions of the MSS-SP58 and SP69 and ANSI/ASME B31.1.



- C. Grooved-End Pipe and Fittings: Install grooved-end pipe and fittings in accordance with the coupling manufacturer's recommendations and the following:
1. Clean loose scale, rust, oil, grease, and dirt from the pipe or fitting groove. Apply the coupling manufacturer's gasket lubricant to the gasket exterior including lips, pipe ends, and housing interiors.
  2. Tighten couplings alternately and evenly until coupling halves are seated.

### **3.17 WARNING AND LOCATOR TAPE**

Install warning and locator tape on all reclaimed water pipelines. Identify the pipe in accordance with Section 15151: Water Facilities Identification.

### **3.18 DISINFECTION**

Disinfect all pipelines in accordance with Section 15041: Chlorination of Water Mains for Disinfection.

### **3.19 TESTING**

All piping shall be hydrostatically pressure-tested in accordance with Section 15044: Pressure Testing of Piping.

## **PART 4 - PAYMENT**

Payment for the Work in this Section shall be included as part of the lump sum or unit price bid amount for which such Work is appurtenant thereto, and no additional payment will be made specifically for the Work in this Section.

**END OF SECTION**

## **SECTION 15056: DUCTILE-IRON PIPE AND FITTINGS**

### **PART 1 - GENERAL**

#### **1.1 DESCRIPTION**

This Section includes materials, installation, and testing of ductile-iron pipe and fittings.

#### **1.2 RELATED WORK SPECIFIED ELSEWHERE**

Refer to the following Specification Sections for additional requirements:

- A. Section 01300: Submittals
- B. Section 02223: Trenching, Backfilling, and Compacting
- C. Section 03000: General Concrete Construction
- D. Section 15000: General Piping Requirements
- E. Section 15041: Chlorination of Water Mains for Disinfection
- F. Section 15044: Pressure Testing of Piping
- G. Section 15051: Installation of Pressure Pipelines

#### **1.3 SUBMITTALS**

Furnish submittals in accordance with the requirements of Section 01300: Submittals. The following submittals are required:

Submit catalogue order sheets for pipe, flanges, flange insulation kits, companion flanges and unions, showing metal composition and conformance to industry standards (ASTM, etc.) specified.

### **PART 2 - PRODUCTS**

#### **2.1 DUCTILE IRON PIPE**

- A. Ductile-iron pipe shall be manufactured in accordance with AWWA C151.
- B. All ductile-iron pipe shall be thickness Class 52. Minimum wall thickness for pipe having threaded flanges shall be Special Class 53.
- C. All ductile-iron pipe shall be cement-mortar lined in accordance with AWWA C104. Lining thickness shall be the double thickness listed in AWWA C104, Section 4.7.
- D. All joints shall be restrained, TR-Flex Joint or approved equal. The restrained joint shall be a boltless restrained push-on joint design and

shall contain a positive axial locking restrained system and be capable of deflection after assembly.

- E. Flanges for ductile-iron pipe shall be flat face and of the "screwed-on" type in accordance with AWWA C115.
- F. Outlets for DIP shall be as follows:
  - 2" or smaller: bronze service saddle
  - 2-1/2" through 3-1/2": tapped tee
  - 4" and larger: flanged tee

## **2.2 DUCTILE-IRON AND GRAY IRON FITTINGS**

- A. Ductile iron and gray iron fittings shall be manufactured in accordance with AWWA C153.
- B. All fittings shall be cement-mortar lined in accordance with AWWA C104.
- C. All fittings for pipe 12" or smaller shall be made with restrained "push-on" joints designed for use with the type of pipe to be joined unless otherwise noted. All fittings for pipe larger than 12" shall be TR-Flex or approved equal.
- D. Exterior surfaces shall be coated with a bituminous material in conformance with ANSI A21.10 (AWWA C110). The coating shall be free from blisters and holes, shall adhere to the metal surface at all temperatures encountered in the field, shall be smooth, not brittle when cold, and shall not become sticky when exposed to the sun. The coating shall be checked by the manufacturer with a suitable electrical holiday detector.
- E. Test each fitting before lining to one and one-half times the working pressure for a duration of 10 seconds. Provide suitable controls and recording devices so that the test pressure and duration may be adequately ascertained. Any fitting that does not withstand the test pressure shall be rejected. Notify the Owner a minimum of 1 working day in advance of the date, time, and place of inspection and testing of the fittings in order that the Owner may be represented at the tests. When specified in the special provisions, the Owner may require a certification of compliance to these Specifications.
- F. The ring grooves and interior surfaces of the bell shall be smooth and free from ridges, notches, or uneven surfaces.

- G. Mechanical joint fittings are allowed only in areas specifically approved by the Owner as a substitute for other types of fittings.
- H. Unless otherwise indicated on the Drawings, all fittings with flanged ends shall comply with ANSI B16.1, "Cast Iron Pipe Flanges and Flanged Fittings, Class 125." The gasket surface shall have a serrated finish of approximately 16 serrations per inch, approximately 1/32- inch deep, with serrations in either a concentric or spiral pattern. In addition, all flanges shall be within the following tolerances:

Bolt circle drilling	$\pm 1/16$ inch
Bolthole spacing	$\pm 1/32$ inch
Eccentricity of both circle and facing with respect to bore	$\pm 1/32$ inch maximum

## **2.3 GASKETS**

Rubber gaskets for push-on joints shall be manufactured in accordance with AWWA C111.

## **2.4 BOLTS, NUTS, AND WASHERS**

Bolts and nuts shall be in accordance with Section 15000: General Piping Requirements.

# **PART 3 - EXECUTION**

## **3.1 GENERAL**

Install ductile-iron pipe and ductile iron fittings in accordance with the applicable sections of AWWA C600 and as specified herein.

## **3.2 TRENCHING, BACKFILLING, AND COMPACTING**

- A. Trenching, backfilling, and compacting shall be in accordance with Section 02223: Trenching, Backfilling, and Compacting, and as specified herein.
- B. Backfill within the pipe zone, including the pipe base, shall be imported sand placed and compacted in accordance with Section 02223: Trenching, Backfilling, and Compacting.
- C. Backfill within the trench zone shall be native earth backfill selected, placed and compacted in accordance with Section 02223: Trenching, Backfilling, and Compacting.

### **3.3 TRANSPORTATION**

- A. Transportation shall be by competent haulers and shall be accomplished in a manner that will avoid damage to the pipe or fitting, its lining or its coating.
- B. Unload by mechanical means such as a crane or backhoe, or by rope and skids, as recommended by manufacturer. In using skids, prevent pipes and fittings from striking one another.
- C. Do not drop or dump pipe and fittings from the truck.

### **3.4 FITTINGS**

Weigh each fitting in the presence of the Owner as it is unloaded from the delivery truck. Any fitting weighing less than 95 percent of the weight listed in AWWA C153 shall be rejected and removed from the project site.

### **3.5 PLACEMENT OF PIPE IN TRENCH**

- A. Lay pipes uphill if the grade exceeds 10%.
- B. Provide and use proper implements, tools, and facilities as recommended by the pipe manufacturer's standard printed installation instructions for safe and efficient execution of the Work. Carefully lower all pipe, fittings, valves and accessories into the trench by means of derrick, ropes, or other suitable equipment in such a manner as to prevent damage to pipe and fittings. Do not drop pipe or accessories or dump them into the trench.

Attach cable, rope, or other devices used for lowering fitting into trench around exterior of fitting for handling. Do not attach cable rope or other device through the fitting's interior for handling.

- C. The radius of curvature of the trench shall determine the maximum length of pipe section that can be used without exceeding the allowable deflection at a joint.

Deflections at rubber gasket or flexible coupling joints shall not exceed 2 degrees or that recommended by the manufacturer, whichever is less.

Follow the manufacturer's printed installation guide outlining the radius of curvature that can be negotiated with pipe sections of various lengths.

- D. Where the grade or alignment of the pipes is obstructed by existing utility structures such as conduits, ducts, pipes, branch connections to main

sewers, or main drains, the obstruction shall be permanently supported, relocated, removed, or reconstructed by the Contractor in cooperation with owners of such utility structures.

- E. Cut and machine the pipe in accordance with the pipe manufacturer's standard procedures for this operation. Do not cut pipe with a cold chisel, standard iron pipe cutter, or any other method that may fracture the pipe or produce ragged, uneven edges.
- F. Inspect the pipe and accessories for defects prior to lowering into the trench. Repair or replace any defective, damaged or unsound pipe. Remove all foreign matter or dirt from the interior of the pipe before lowering into position in the trench.
- G. Clean the ends of the pipe to be jointed of foreign material.
- H. Immediately prior to lowering each section or pipe into the trench, apply a nontoxic water soluble vegetable soap solution to the inside of the bell of the pipe in the trench and to the rubber gasket and spigot groove of the pipe to be installed.
- I. Without tilting the pipe to be installed, enter its spigot into the bell of the pipe in the trench. Use come-a-longs or pipe jacks to drive spigot end home horizontally. Maintain joint recess recommended by pipe manufacturer for made-up joint. Where deflections at joints are required for curved alignment, do not exceed the pipe manufacturer's recommended maximum joint opening on one side.
- J. Lay the pipe true to the line and grade shown on the Drawings within acceptable tolerances. The tolerance on grade is 1 inch. The tolerance on line is 2 inches.
- K. Protect all ductile iron and gray iron pipe and fittings buried underground with plastic film wrap in accordance with AWWA C105. Wrap shall be a loose 8-mil-thick polyethylene tube. Wrap all joints between plastic tubes with 2-inch-wide polyethylene adhesive tape, Polyken 900, Scotch wrap 50, or approved equal. Installation of plastic film shall conform to the following procedure, and wrapping shall be applied to the pipe in the field in the following manner:

Using a sling, pick up pipe with a crane at the side of the trench and raise about 3 feet off the ground. Slip the polyethylene tube, cut approximately 2 feet longer than the length of pipe, over the spigot end of the pipe and bunch it up, accordion fashion, between end of the pipe and the sling.

Lower the pipe into the trench. Seat the spigot into the bell of the adjacent installed pipe, and lower the pipe into the trench bottom. Provide a shallow bell hole in the trench bottom to facilitate the wrapping of the joint. Make the pipe joint in the normal fashion. Ensure uniform bearing of the pipe barrel.

Remove the sling from the center of the pipe and hook into the bell cavity. Raise the bell 3 to 4 inches and slip the tube of polyethylene film along the full length of the pipe barrel. Leave enough of the film bunched up, accordion fashion, at each end of the pipe to overlap the adjoining pipe about 1 foot.

To make the overlapped joint wrap, pull the film over the bell of the pipe, fold it around the adjacent spigot, and wrap it with about three circumferential turns of the plastic adhesive tape in order to seal the tube of film to the pipe. Pull the tube on the adjacent pipe over the first wrap on the pipe bell and seal it in place behind the bell, using about three circumferential turns of the polyethylene adhesive tape.

Pull the resulting loose wrap on the barrel of the pipe snugly around the barrel of pipe, fold the excess material over the top and hold the fold in place by means of short strips of the adhesive tape at intervals 3 feet apart along the pipe barrel.

The Contractor may substitute the use of purple plastic film with proper labeling in place of warning tape.

- L. Support fittings independently of the pipe.
- M. Until thrust blocks and supports are poured, temporarily support fittings by placing wooden skids under the bells so that the pipe is not subjected to the weight of the fitting.
- N. Coat all exposed flanges and other exposed metal surfaces and all damaged coatings after assembly per Section 09900: Painting and Coating, System No. D-1.

### **3.6 ANCHORS AND THRUST BLOCKS**

Pour concrete anchors and thrust blocks against wetted undisturbed soil in accordance with Section 03000: General Concrete Construction, and the Owner's Standard Drawings. Use thrust blocks only on pipe 12" in diameter or smaller.

### **3.7 FLANGED CONNECTIONS**

- A. Bolt holes of flanges shall straddle the horizontal and vertical centerlines of the pipe run.
- B. Clean flanges by wire brushing before installing gasket.
- C. Clean flange bolts and nuts by wire brushing, lubricate threads with oil and graphite, and tighten nuts uniformly and progressively. Bolts shall project through the nut between 1/4 inch and 3/8 inch when drawn tight.
- D. If flanges leak under pressure testing, loosen or remove the nuts and bolts, reseal or replace the gasket, reinstall or retighten the bolts and nuts, and retest the joints. Joints shall be watertight.

### **3.8 PIPE SUPPORT**

Adequately support all exposed pipe with devices of appropriate design. Where details are shown, the supports shall conform thereto and shall be placed as indicated, provided that the support for all piping shall be complete and adequate as herein specified, whether or not supporting devices are specifically called for.

### **3.9 TESTING**

Hydrostatically pressure-test all piping in accordance with Section 15044: Pressure Testing of Piping.

## **PART 4 - PAYMENT**

The unit price for installation of pipe includes full compensation for furnishing the labor, materials, tools and equipment and doing all Work involved to complete the pipeline.

**END OF SECTION**



## **SECTION 15057: COPPER PIPE AND FITTINGS**

### **PART 1 - GENERAL**

#### **1.1 DESCRIPTION**

This Section describes materials, installation, and testing of copper and brass pipe, and copper, brass and bronze fittings and appurtenances.

#### **1.2 RELATED WORK SPECIFIED ELSEWHERE**

Refer to the following Specification Sections for additional requirements:

- A. Section 02223: Trenching, Backfilling, and Compacting
- B. Section 09900: Painting and Coating
- C. Section 15000: Piping Schedule and General Piping Requirements
- D. Section 15044: Pressure Testing of Piping
- E. Section 15051: Installation of Pressure Pipelines
- F. Section 15100: Control and Check Valves

#### **1.3 SUBMITTALS**

- A. Submit shop drawings in accordance with the General Requirements, and Specification Section 01300: Submittals.
- B. Submit detailed layout if pipe runs in copper exceed 50 lineal feet.
- C. Submit catalogue order sheets for materials of pipe, flanges, flange insulation kits, companion flanges and unions, showing metal composition and conformance to industry standards (ASTM, etc.) specified.

### **PART 2 - MATERIALS**

#### **2.1 COPPER PIPE AND TUBING**

Copper piping shall conform to ASTM B 88. Copper pipe and tubing shall be cylindrical, of uniform wall thickness, and shall be free from any cracks, seams, or other defects. Piping located above floors or suspended from ceilings shall be Type L. Piping buried or located beneath floor slabs shall be Type K. Copper pipe shall be as manufactured by Halstead, Mueller, or approved equal.

## **2.2 COPPER FITTINGS**

Copper fittings shall be copper conforming to ASTM B 75 and ANSI B16.22, with solder end joints. Fittings 3/8 inch and smaller may have flared end connections or compression joint connections.

## **2.3 SOLDER**

Solder shall be tin-silver solder conforming to ASTM B 32, Grade SB5. Do not use cored solder. Solder and flux used in joints of potable waterlines shall contain no more than 0.2 percent lead.

## **2.4 BRASS PIPE AND NIPPLES**

Short threaded nipples and brass pipe shall conform to ASTM B 43, regular wall thickness, except that nipples and pipe of sizes 1 inch and smaller shall be extra strong. Threads shall conform to ANSI B1.20.1.

## **2.5 BRONZE APPURTENANCES**

- A. General: All items specified herein shall be manufactured of bronze conforming to ASTM B62, "Composition Brass or Ounce Metal Castings."
- B. Service Saddles: Service saddle bodies shall be manufactured of bronze and shall be tapped for an iron pipe thread. The seal with the pipe shall be either a rubber gasket or an O-ring. Service saddles shall be manufactured by Jones, Mueller, Ford, Rockwell, or approved equal.
  - 1. One-inch service saddles may be the single-strap or double strap type for all sizes of asbestos-cement or ductile iron pipe. Two-inch size service saddles shall be of the double-strap type for all sizes of asbestos-cement or ductile iron pipe. The straps (or bails) shall be flat and shall be manufactured by Everdur, Silnic bronze, or approved equal.
  - 2. Service saddles for C900 PVC pipe shall be manufactured of bronze or type 316 stainless steel, and 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. Secure the sections in place with stainless steel or silicon bronze screws or bolts. Casting sections may be hinged and secured with stainless steel pins. Tap the casting sections to receive the screws or bolts.

- C. Corporation Stops: Corporation stops shall be manufactured of bronze. The inlet fitting shall be a male iron pipe thread when used with saddle and the outlet connection shall be a compression type or iron-pipe thread. Corporation stops shall be as manufactured by Jones, Mueller, Ford, or approved equal.
- D. Angle Meter Stops: 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. Provide a rectangular lug and lock wing on the top of the fitting to operate the shutoff mechanism. Two-inch angle meter stops shall be with "slotted" holes for 1½-inch or 2-inch meters. Angle meter stops shall be as manufactured by Jones, Mueller, Ford, or approved equal.
- E. Customer Service Valve: 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. Customer service valves shall be manufactured by Jones, Ford, or approved equal.

## **2.6 INSULATING UNIONS AND COUPLINGS**

Isolate pipe, fittings, and appurtenances (air vacs, pressure gauges, etc.) made of dissimilar metals from each other by means of insulating unions, or insulating couplings. Insulating unions, and couplings shall be manufactured by Pipeline Coating and Engineering Company, Smith-Blair, Pipe Seal and Insulator Company, Lochinvar, or approved equal. For applications where pipeline pressures exceed 150 psi, and where the pipe tap for the appurtenance into the main is larger than 1-inch in diameter, provide a 2½-inch extra heavy carbon steel coupling as the outlet, and isolate the fitting or appurtenance from the main by means of a 2-inch type 316 stainless steel bushing, 2-inch type 316 stainless steel nipple, and 2-inch type 316 stainless steel ball valve.

## **2.7 FLANGES, GASKETS, BOLTS AND NUTS**

- A. Flanges for Valves and Fittings: Connect copper pipe to flanged valves and fittings with bronze flanges conforming to ANSI B16.24, Class 125 or Class 150, to match the connecting flange. Use solder end companion flanges.
- B. Gaskets: Gaskets for flanged-end fittings shall be made of synthetic rubber binder and shall be fullface, 1/8-inch thick Johns-Manville 60, John Crane Co. "Cranite", or approved equal.

- C. Bronze Flanges Above Ground: When both above ground adjoining flanges are bronze, bronze bolts and nuts shall be used. Bolts shall conform to ASTM F 468, Grade C 65100 or C 63000. Nuts shall conform to ASTM F 467, Grade C 65100 or C 63000 to match the bolt material.
- D. Bronze-Non-Ferrous Flanges Above Ground: When only one of the above ground adjoining flanges is bronze, use Type 316 stainless-steel bolts and nuts conforming to ASTM A 193, Grade B8M, for bolts and ASTM A 194, Grade 8M, for nuts.
- E. Ferrous Flanges: Make connection to ferrous flanges using flange insulation kits. Bolts used in flange insulation kits shall conform to ASTM A 193, Grade B7. Nuts shall comply with ASTM A 194, Grade 2H. If the adjoining flange is bronze, use bronze bolts and nuts as described above, without a flange insulation kit.
- F. Washers: Provide washers for each nut. Washers shall be of the same material as the nuts.

## **2.8 UNION**

Union shall be the same size as the pipe, three part, with copper flared end connections. Unions shall be bronze, conforming to ASTM B 61 or B 62. Use dielectric unions when connecting copper pipe to ferrous metals. Unions shall be Mueller H-15403, Jones J-1528, or approved equal.

## **PART 3 - EXECUTION**

### **3.1 GENERAL**

Install pipe without springing, forcing, or stressing the pipe or any adjacent connecting valves or equipment. Pipe hangers and supports, and pipe penetrations through walls, slabs, and floors shall be as detailed on the Drawings.

### **3.2 INSTALLING FLANGE BOLTS AND NUTS**

- A. Bolt Thread Lubrication: Lubricate bolt threads with graphite and oil prior to installation.
- B. Flange Alignment: Set flanges pipe with the flange boltholes straddling the pipe horizontal and vertical centerlines.

### 3.3 **INSTALLATION**

- A. Related Installation Specification: Install pipe in accordance with the requirements of Section 15051: Installation of Pressure Pipelines.
- B. Pipe/Tubing Preparation: Cut tubing square and remove burrs. Clean both the inside and outside of fitting and pipe ends with steel wool and muriatic acid before soldering. Take care to prevent annealing of fittings and tubing when making connections. Do not use miter joints in lieu of elbows. Do not notch straight runs of pipe in lieu of tees.
- C. Pipe Bends: 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.
- D. Brazing: Brazing procedures shall be in accordance with Articles XII and XIII, Section IX, of the ASME Boiler and Pressure Vessel Code. Solder shall penetrate to the full depth of the cup in joints and fittings. Solders shall comply with ANSI B31.3, paragraph 328.
- E. Pipe Flexibility and Minimum Cover for Service Laterals: Install buried piping with some slack to provide flexibility in the event of a load due to settlement, expansion or contraction. Have a minimum cover of 36-inches below the finished street grade. Imbed and cover the tubing with sand or select material.
- F. Minimum Diameter for Domestic Service Laterals: All domestic service laterals shall be 1-inch minimum size copper tubing. End connections shall be compression type.
- G. Two-inch Service Laterals: Install all 2-inch size services with straight lengths of soft copper water tube Type K. Solder or compression fittings are acceptable on only the corporation stop and angle meter stop. All couplings and adapters shall be silver-soldered.

### 3.4 **SERVICE SADDLES**

- A. Proximity to Valves, Couplings, Joints, and Fittings: Service saddles shall be no closer than 18-inches to valves, couplings, joints, or fittings unless it is at the end of the main. Do not install a service saddle on any machined section of asbestos cement pipe.
- B. Pipe Surface Preparation: File the surface of the pipe to remove all loose material and to provide a hard, clean surface before placing the service saddle.

- C. Installation: Tighten the service saddle firmly to ensure a tight seal; however, take care to prevent damage or distortion of either the corporation stop or service saddle by over tightening.
- D. Pipe Tap: The tap into the pipe shall be made in accordance with the pipe manufacturer's recommendation.

#### **PART 4 – PAYMENT**

Payment for the Work in this Section shall be included as part of the lump sum or unit price bid for which such Work is appurtenant thereto, and no additional payment will be made specifically for Work in this Section.

**END OF SECTION**

## **SECTION 15066: GRAVITY SEWER PIPELINES**

### **PART 1 - GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Gravity sewer pipelines
  - 1. Vitrified clay pipe (VCP)
  - 2. Polyvinyl chloride (PVC) pipe

#### **1.2 RELATED REQUIREMENTS**

Refer to the following Specification Sections for additional requirements:

- A. Section 02223: Trenching, Backfilling, and Compacting
- B. Section 03461: Precast Reinforced Concrete Manholes and Manhole Bases
- C. Section 15043: Testing of Non-Pressure Sewer Pipelines and Manholes
- D. Section 15068: Sewer Laterals

#### **1.3 REFERENCED STANDARDS**

- A. ASTM International
  - 1. ASTM C301: Standard Test Methods for Vitrified Clay Pipe
  - 2. ASTM C425: Standard Specification for Compression Joints for Vitrified Clay Pipe and Fittings
  - 3. ASTM C700: Standard Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated
  - 4. ASTM D395: Standard Test Methods for Rubber Property – Compression Set
  - 5. ASTM D412: Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension
  - 6. ASTM D573: Standard Test Method for Rubber – Deterioration in an Air Oven
  - 7. ASTM D1149: Standard Test Methods for Rubber Deterioration – Cracking in an Ozone Controlled Environment
  - 8. ASTM D1784: Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds
  - 9. ASTM D2240: Standard Test Method for Rubber Property – Durometer Hardness
  - 10. ASTM D3034: Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
- B. National Association of Sewer Service Companies (NASSCO)
  - 1. Pipeline Assessment Certification Program (PACP)

## **1.4 SUBMITTALS**

- A. Vitrified Clay Pipe
  - 1. Provide certificates of compliance with all standards referenced in this section to the City.
  - 2. Provide copies of the manufacturer's required tests of the following conducted on project pipe:
    - a. Crushing test
    - b. Record of retests and rejections
- B. PVC Gravity Sewer Pipe
  - 1. Provide materials list showing material of pipe and fittings with ASTM references and grade.
  - 2. Provide certificates of compliance with all standards referenced in this section to the City.
- C. Installation
  - 1. An installation schedule (tabulated layout) shall be submitted which includes:
    - a. Order of installation and closures
    - b. Pipe centerline station and elevation at each change of grade and alignment
    - c. Locations of manholes

## **1.5 DELIVERY, STORAGE AND HANDLING**

- A. Per manufacturer's recommendations and the following:
  - 1. Onsite Storage Limitation: Onsite pipe storage shall be protected from UV exposure and limited to a maximum of one week, unless exception is accepted by the City.
  - 2. Care of Pipe: At times when the pipe laying is not in progress, the open end of the pipe shall be closed with a tight-fitting cap or plug to prevent the entrance of foreign matter into the pipe. These provisions shall apply at all times. In no event shall the sewers be used as drains for removing water which has infiltrated into the construction trenches.
  - 3. Moving Pipe: Pipes shall be lifted with handling beams or wide belt slings as recommended by the pipe manufacturer. Cable slings shall not be used. Pipe shall be handled in a manner to avoid damage to the pipe. Pipe shall not be dropped or dumped from trucks or into trenches under any circumstances.
  - 4. Inspection of Pipe: The pipe and accessories shall be inspected for defects prior to lowering into the trench. Any defective, damaged or unsound pipe in the City's determination shall be replaced at no additional cost to the City. All foreign matter or dirt shall be removed from the interior of the pipe before lowering into position in the trench.



## **PART 2 - PRODUCTS**

### **2.1 VITRIFIED CLAY PIPE (VCP)**

- A. General: All VCP and fittings shall be of one class; designated extra strength; of the best quality; vitrified; homogenous in structure; thoroughly burned through their entire thickness; impervious to moisture; sound; and free from cracks, checks, blister, broken extremities, or other imperfections. Pipe shall be bell and spigot pipe unless otherwise specified. Pipe ends shall be square with the longitudinal axis, and sockets shall be true, circular, and concentric with the barrel of the pipe. The thickness of the shell, the depth of the socket, and the dimension of the annular space shall be within the limits of permissible variation to dimension standards of the specifications of ASTM C700, for the size of pipe indicated on the plans.
- B. Pipe Marking: All pipe or fittings shall be clearly marked with the name of the manufacturer or with a trademark and with the size and strength of the pipe as shown on the plans and as herein specified.
- C. Source Testing:
  - 1. Perform factory test of pipes per requirements in ASTM C301.
  - 2. Tests shall be witnessed by a reputable testing laboratory. Pipe selected for testing shall be delivered to the place and at the time designated by the testing laboratory. All costs of furnishing, transporting, and handling the pipe for testing and conducting the tests shall be borne by the Contractor.
  - 3. In lieu of witnessing by a testing laboratory, a certified statement from the pipe manufacturer may be furnished stating that all prescribed tests have been made and the pipe to be used on the project has met all requirements of the specifications.
  - 4. The testing laboratory shall select, at random, for testing as herein specified, no less than 0.5-percent of the number of pipe sections in each size of pipe furnished, except that no less than two specimens shall be tested.
  - 5. The specimens selected for testing shall be sound pipe having dimensions consistent with these specifications. The lot or lots from which the tests samples are taken shall be sufficient to fill the entire order for that size of pipe used in the work under the contract and, if they pass the tests, shall be so designated and marked.
  - 6. All pipe shall be subject to inspection at the factory, trench, or other point of delivery by the City. The purpose of the inspection shall be to cull and reject any pipe that, independent of the physical tests herein specified, fails to conform to the requirements of these specifications or that may have been damaged during transportation or in subsequent handling.

7. If all of the minimum designated percentage or number of the specimens tested meet the requirements of the test, then all of the pipe in the lot, shipment, or delivery corresponding to the sizes and classes so tested shall be considered as complying with the test. If, however, 10-percent or more of the specimens tested fail to meet the requirements of the test or if more than one specimen fails to meet the requirements of the test when the number to be tested is less than ten, then a second selection of pipe shall be made for that test. The number of specimens to be tested in the second selection of pipe shall be five for each specimen of the first selection that failed to meet the requirements.
  8. If 90-percent or more of the specimens tested, including those first tested, meet the requirements of the test, all the pipe in the lot, shipment, or delivery corresponding to the sizes and classes so tested shall be considered as complying with that test, otherwise all pipe of these sizes and classes shall be rejected.
  9. Causes for Rejection: The following imperfections in a pipe or special fitting shall be considered injurious and cause for rejection without consideration of the test results specified above.
    - a. A single crack in the barrel of the pipe
    - b. Surface imperfections, such as lumps, blisters, pits or flakes, on the interior surface of a pipe or fitting
    - c. When the bore or socket of the pipe varies from a true circle more than 3-percent of its nominal diameter
    - d. If the pipe or fitting is designated to be straight and it deviates from a straight line more than 1/16-inch per lineal foot. The deviation shall be measured from a straight edge at a point midway between the ends of the pipe
    - e. A joint of pipe with a piece broken from either the socket or spigot end
    - f. Pipe joints that have tramp clays, grog or other foreign matter flushed permanently to the exterior or interior surface of the pipe or fittings
- D. Joints: All VCP fittings shall be furnished with compression joints.
1. The compression joint on the spigot and bell ends of the pipe shall be factory made of plastisol, polyurethane elastomer, or other approved resilient element bonded onto the outside of the spigot and the inside of the bell to the pipe and molded and cured to a uniform hardness and compressibility to form a tight compression coupling when assembled. Materials for compression joints shall conform to ASTM C425.
  2. Where pipe from different manufacturers is to be jointed together, an adapter pipe with the proper matching joint on each end for the respective manufacturer or an adapter with bushing or sleeves and

stainless steel bands, matching each pipe end shall be used. Hot poured joints or concrete encasement of plain end joints shall not be permitted.

- E. Branches: Branches of the type shown on the plans shall be furnished with connections of the sizes specified and shall be securely and completely fastened to the barrel of the pipe in the process of manufacture. Tee branches shall have their axis perpendicular to the longitudinal axis of the pipe. Wye branches shall have their axis approximately 45 degrees (unless otherwise specified on the plans) to the longitudinal axis of the pipe, measured from the socket end. All branches shall terminate in sockets and the barrel of the branch shall be of sufficient length to permit making a proper joint.
- F. Stoppers: The stoppers for all pipe 8-inches in diameter and smaller, in which a sealing component for a flexible compression-type joint is cast, shall be neoprene, polyethylene, or polyurethane. Stoppers in all other cases shall be discs of the same material as the pipe, equal in diameter to the outside of the pipe barrel, and made and installed as accepted by the City.
  - 1. Neoprene stoppers shall be manufactured from a compound containing not less than 50 percent neoprene by volume, which shall be the sole elastomer. Stoppers shall not be adversely affected when exposed to the chemical and bacteriological environments normally found in wastewater.
  - 2. When installed and braced in place in branch spurs, stoppers shall withstand a hydrostatic pressure test of 10 psi with no leakage. When unbraced, stoppers shall remain in place when subjected to a maximum air pressure test of 5 psi.

## **2.2 POLYVINYL CHLORIDE (PVC) PIPE**

- A. Pipe and Fittings
  - 1. ASTM Requirements: Pipe, fittings, couplings, and joints shall be in conformance with the size, material and performance requirements of ASTM D3034, SDR 35, and shall have gasketed joints. Pipe shall be made of PVC plastic having a cell classification of 12364 or 12454 as defined in ASTM D1784. Fittings shall be made of PVC plastic having a cell classification of 12454. All pipe shall be of solid wall construction with smooth interior and exterior surfaces.
  - 2. Manufacturer's Testing Certification: During production of the pipe, the manufacturer shall perform the specified tests for each pipe marking. A certification by the manufacturer indicating compliance with specification requirements shall be delivered with the pipe. The certification shall include the test result data.
  - 3. Pipe Marking: All pipe, fittings, and couplings shall be clearly marked at an interval not to exceed 5-feet as follows:

- a. Nominal pipe diameter
- b. PVC cell classification
- c. Company, plant, shift, ASTM, SDR, and date designation
- d. Service designation or legend

For fittings and couplings, the SDR designation is not required. All pipe shall have a home mark on the spigot end to indicate proper penetration when the joint is made.

4. Additional Pipe Tests Following Delivery: When pipe is delivered to the jobsite, the City may require additional testing to determine conformance with the requirements of pipe flattening, impact resistance, pipe stiffness, and extrusion quality. When testing is required, one test pipe shall be selected at random by the City from each 1,200 feet or fraction thereof of each size of pipe delivered to the jobsite but not less than one test pipe per lot. A lot shall be defined as pipe having the same identification marking. The length of specimen for each selected pipe shall be a minimum of 8-feet.
5. Pipe Retest: Pipe which is not installed within 120 days of the latest test shall not be used without prior acceptance by the City.
6. Fitting and Coupling End Configurations: The socket and spigot configurations for fittings and couplings shall be compatible with those used for the pipe.

**B. Gaskets for PVC Pipe**

1. General: Unless otherwise specified, gaskets shall be manufactured from a synthetic elastomer, and shall be extruded or molded and cured in such a manner as to be dense, homogeneous and of smooth surface, free of pitting, blisters, porosity, and other imperfections. The compound shall contain not less than 50 percent by volume of first- grade synthetic rubber. The remainder of the compound shall consist of pulverized fillers free of rubber substitutes, reclaimed rubber, and deleterious substances. The tolerance for any diameter measured at any cross section shall be  $\leq 1/32$ -inch (.8mm).
2. Gasket Material Requirements: When required by the City, the Contractor shall furnish test samples of gaskets from each batch used in the work. Gasket material shall meet the following requirements:

Property	Value	ASTM Test Method
Tensile Strength (min. psi)	2,000	D412
Elongation at break (% min.)	350	D412
Shore durometer, Type A (Pipe manufacturer shall select value suitable for type of joint)	40 to 65*	D2240

Compression set (constant deflection) max % of original deflection	16	D395
Compression strength after oven aging (96 hours, 158°F {70°C}) % of tensile strength before aging	80	D573
Increase in Shore durometer hardness after oven aging. Maximum increase over original Shore durometer	10	D2240
Physical requirements after exposure to ozone concentration (150 pphm. 70 hours, 140°F {40°C}), 20% strain)	No Cracks	D1149

\*This applies only to the sealing component of the gasket.

## **PART 3 - EXECUTION**

### **3.1 PLACEMENT OF PIPE IN TRENCH**

- A. General:
  - 1. The Contractor shall follow all manufacturer's installation instructions. If conflicts exist between manufacturer's installation instructions and this specification, the more stringent requirements shall be used.
  - 2. All pipe shall be laid to the line and grade given to form a close concentric joint with the adjoining pipe and prevent sudden offsets of the flow line. Pipe shall be laid from the downstream structure to the upstream structure, without grade breaks, with the bell ends of the pipe upstream.
- B. Trench Excavation: Dewatering, excavation, shoring, sheeting, bracing, backfill material placement, material compaction, compaction testing, and pipe laying requirements and limitations shall be in accordance with Section 02223: Trenching, Backfilling, and Compacting.
- C. Subgrade at Joints: At each joint in the pipe, the pipe subgrade shall be recessed in firm bedding material so as to relieve the bell of the pipe of all load and to ensure continuous bearing along the pipe barrel.

- D. Cleaning: The interior of the sewer pipe shall be cleaned of all dirt and superfluous materials as the work progresses.
- E. Joints: The mating surfaces of the pipe to be joined shall be wiped clean of all dirt and foreign matter and a lubricant applied that is approved by the pipe manufacturer. Then, with the surfaces properly lubricated, the spigot end of the pipe shall be positioned inside the bell and the joint shoved home.
- F. For larger diameter pipe where a lever attachment is required, the necessary precautions shall be taken to insure an undamaged pipe installation.
- G. Pipe Alignment: Unless specified otherwise, pipeline line and grade shall be as shown on the plans. Grade shall be measured along the pipe invert.
- H. PVC Pipe Curvature:
  - 1. Construction of curved reaches of PVC pipe shall not be accomplished by deflecting joints or by beveling pipe ends.
  - 2. Longitudinal bending of pipe barrel:
    - a. Limit bend radius to no less than 200-percent of manufacturer's published allowable amount.  
Ensure a constant bend radius is achieved throughout the length of each pipe section and ensure there are no points of a shorter bend radius (i.e. tighter curvature).
    - b. Do not deflect joints when also longitudinally bending the pipe barrel.  
Implement construction measures to prevent any deflection of the joints when longitudinally bending the pipe barrel.
- I. Short Lengths of VCP Pipe: When using VCP, two 1-foot lengths of sewer pipe shall be used to provide curve flexibility and prevent cracking or shearing failures as shown on the plans or as may be required by the City during construction. The use of short lengths of pipe is particularly required, but not necessarily limited to these locations: (1) inlets and outlets to all manholes; (2) ends of steel casing pipe; (3) ends of concrete encasement; (4) vertical and horizontal curvilinear sewers; and (5) deep lateral connections.
- J. Backfill: Backfill shall be placed and compacted in accordance with the requirements of Section 02223: Trenching, Backfilling, and Compacting. Backfill within the pipe zone shall be 3/4-inch crushed rock for PVC pipe and VCP. Wrap rock with filter fabric.

### **3.2 CLEANING**

- A. Before testing, each pipe shall be thoroughly cleaned from manhole to

manhole with a sewer scrubbing ball, and all debris and trash shall be removed from each manhole.

### **3.3 TESTING**

- A. The pipe, manholes, and other appurtenances shall be tested for leakage and infiltration per Section 15043: Testing of Non-Pressure Sewer Pipelines and Manholes.

### **3.4 CLOSED-CIRCUIT TELEVISION INSPECTION**

- A. General: In addition to the regular leakage and infiltration test, the entire length of all new sewer lines shall be inspected using closed-circuit television equipment. The inspection shall be conducted after the line has been successfully tested and prior to paving. The inspection shall be conducted in the presence of the City.
- B. Responsibility: All labor and equipment necessary to conduct this inspection shall be furnished by the Contractor.
- C. Notification: Requests for sewer line inspection shall be made to the City a minimum of five working days in advance of the requested inspection date.
- D. Flushing: Each sewer section shall be flushed with water being introduced at the upstream manhole of each section prior to video recording.
- E. Stationing: The video shall show stationing corresponding to sewer stationing shown on plans for each manhole and wye location.
- F. Sag Gauge: All closed-circuit television equipment shall be installed with a sag gauge visible in the video to determine sag depths.
- G. Submittal: The video shall be MPEG format compatible with the City's current viewer software and shall be submitted to the City with reports showing manhole numbers and stationing, wye stationing, and distance between manholes prior to Final Acceptance of the project by the City. The electronic file and reports shall be labeled with the project name, tract number, street names, and the Contractor's name and shall list the station of any defects, dirt, sags, etc. in the pipe. Reports and videos shall include defect coding in accordance with the National Association of Sewer Service Companies (NASSCO) Pipeline Assessment Certification Program (PACP).
- H. Repair of Defects: Even though the sewer line may have successfully passed the leakage and infiltration tests, any defects or sags in the line shall be repaired to the satisfaction of the City.
- I. Acceptance: Any sewer section having sags or defects shall be repaired by

the Contractor prior to Final Acceptance of the project by the City. Sags in the line will not be allowed.

### **3.5 FINAL INSPECTION**

- A. After paving has been completed and all manholes raised to grade, a final visual inspection shall be made. The necessary labor shall be furnished to assist the City in making the final inspection. Additional cleaning may be required if the lines are dirty, even though lines were previously cleaned. The Contractor shall furnish a responsible person or supervisor for the final inspection to remove manhole covers and to note any corrections required by the City in order to obtain final acceptance. Final City inspection shall be requested through the City by giving at least five days of notice.

### **PART 4 - PAYMENT**

Payment for the Work in this Section shall be included as part of the lump sum or unit price bid amount for which such Work is appurtenant thereto, and no additional payment will be made specifically for the Work in this Section.

**END OF SECTION**



## **SECTION 15068: SEWER LATERALS**

### **PART 1 - GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Vitrified clay pipe (VCP) sewer laterals
- B. Polyvinyl chloride (PVC) pipe sewer laterals
- C. Flexible saddles

#### **1.2 RELATED REQUIREMENTS**

Refer to the following Specification Sections for additional requirements:

- A. Section 02223: Trenching, Backfilling, and Compacting
- B. Section 15043: Testing of Non-Pressure Sewer Pipelines and Manholes
- C. Section 15066: Gravity Sewer Pipelines

#### **1.3 REFERENCE STANDARDS**

- A. ASTM International
- 1. ASTM D5926: Standard Specification for Poly (Vinyl Chloride) (PVC) Gaskets for Drain, Waste, and Vent (DWV), Sewer, Sanitary, and Storm Plumbing Systems

#### **1.4 SUBMITTALS**

- A. Shop drawings shall be submitted in accordance with the General Provisions and as specified herein.
- B. An installation schedule (tabulated layout) shall be submitted which includes:
  - 1. Order of installation and closures.
  - 2. Pipe centerline station and elevation at each change of grade and alignment.
- C. Lateral elevation certification.

### **PART 2 - PRODUCTS**

#### **2.1 PIPE AND FITTINGS**

- A. Refer to Section 15066: Gravity Sewer Pipelines for product requirements.

## **2.2 SADDLES**

- A. Banded flexible saddle wye
  - 1. Conform to ASTM D5926
  - 2. High durometer PVC
  - 3. Groove bands for straps
  - 4. Root-proof and leak-proof
- B. Straps and hardware shall be 316 Stainless Steel.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Installation of pipe, fittings, and saddles shall be in accordance with manufacturer's recommendations and these specifications.

### **3.2 LATERALS**

- A. General: VCP and PVC wyes, and other types of branches shall be furnished and installed along with the VCP or PVC sewer. Wyes sized as specified on the plans shall be installed for all sewer house connections and for future sewer house connections as shown on the plans. The longitudinal barrel of branch fittings, to be placed in line and grade with the sewer mains, shall be of the same diameter, quality, and type as specified herein for sewer installations. Earthwork and bedding for branches shall conform to the applicable provisions set forth in the specification for each pipe material. Unless otherwise specified, the branch of wye fittings shall be inclined upward at an angle not greater than 45 degrees from a horizontal line. The Contractor shall place a support of graded crushed rock under every wye branch when installed.
- B. Sequencing: Laterals shall be installed after mass grading is finished and before other utilities are installed.
- C. Lateral Elevation Certification: Certify the elevation of the house lateral and connection point.
- D. Locations: House laterals and wye branch fittings of the size indicated on the plans shall be installed at the locations shown on the plans or at the location furnished by the City.
- E. Plugged Branches: All branch fittings that are to be left unconnected shall be plugged or capped.

- F. Fittings: House laterals shall be joined to wye branch fittings at the sewer main as set forth above by eighth bends. All eighth bends and sixteenth bends are considered part of house lateral sewer line.
- G. Alignment: Where possible, all house laterals shall run perpendicular to the sewer main from the main to the property line, and all house laterals shall be bedded the same as the sewer main into which they connect.
- H. Plugged House Laterals: All house laterals shall be plugged with an approved stopper in the socket of the last joint of each house lateral so that it will withstand the internal pressure during the test for leakage, but also in such a manner that it may be removed without injury to the socket.
- I. Marking: The Contractor shall mark the location of each sewer lateral at its upper end by chiseling a letter "S" 2-inches high on the face of the curb.
- J. Chimney Connections: Chimney connections are not allowed.
- D. Mainline Testing: The mainline sewer shall have passed final testing per Section 15043: Testing of Non-Pressure Sewer Pipelines and Manholes before the laterals may be connected to the main.
- K. Inspection: The City shall be notified at least five days in advance of and be present to inspect all connections to the public sewer mains.

### **3.3 SADDLE CONNECTIONS**

- A. Scoring and Tapping: The sewer line to be saddled shall be scored to the approximate shape of the wye and shall be cut with a hole cutter. The tap holes shall be cleanly machined and may be further worked by hand to provide a true and neat opening for the saddle wye. Pipe damaged during this operation shall be repaired or replaced, using a method that is acceptable to the City.
- B. Installation: Install banded flexible saddle wye per manufacturer's instructions.
- C. Encasement: After installation of the saddle, the City will inspect the connection and, if satisfactory, the Contractor shall encase the saddle with 3/4-inch crushed rock. Vibrate crushed rock to compact.
- D. Cleaning: The saddling operation shall be carried out in a workmanlike manner. Chips, dirt, concrete, and other debris shall be kept out of the sewer line being saddled. If directed by the City, the reach of sewer main saddled shall be flushed and cleaned using a hydrocleaner or vacuum truck.

- E. Cut-in Wye: Where lateral connection is size-on-size, a wye connection shall be made by installing a cut-in wye.

#### **PART 4 - PAYMENT**

Payment for the Work in this Section shall be included as part of the lump sum or unit price bid amount for which such Work is appurtenant thereto, and no additional payment will be made specifically for the Work in this Section.

**END OF SECTION**

## **SECTION 15072: DISPOSAL OF ASBESTOS CEMENT PIPE**

### **PART 1 - GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Connection to and disposal of existing asbestos cement distribution pipe (ACP)

#### **1.2 RELATED REQUIREMENTS**

Refer to the following Specification Sections for additional requirements:

- A. Section 15064: PVC Pressure Distribution Pipe
- B. Section 15162: Pipe Couplings and Adapters

#### **1.3 REFERENCED STANDARDS**

- A. California Code of Regulations (CCR), Title 8, Section 1529, Asbestos
- B. ASTM D4397: Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications

#### **1.4 SUBMITTAL**

- A. Copies of the Contractor's certification from the Contractors State Licensing Board for asbestos removal shall be submitted to the City prior to the commencement of any asbestos removal activities.
- B. The Contractor is to provide manifests/disposal records to the City.

#### **1.5 QUALITY ASSURANCE**

- A. Cutting, removal, handling, and disposal of ACP shall be performed by a Contractor registered by the California Division of Occupational Safety and Health (Cal/OSHA) and certified by the Contractors State Licensing Board for asbestos removal.
- B. The Contractor or subcontractor shall comply with all State and Federal laws regarding handling and removal of asbestos materials. The Contractor shall provide sufficient supervision and monitoring to assure said conformance.
- C. Workers handling ACP shall be trained in accordance with applicable State regulations.

- D. Comply with requirements of CCR Title 8, Section 1529.

## **1.6 HEALTH HAZARD**

- A. The Contractor is warned that asbestos is a known human carcinogen and poses serious health risks. Asbestos fibers are easily inhaled and can result in chronic respiratory illness, cancer, and other severe health effects.

## **PART 2 - PRODUCTS**

### **2.1 CONTAINMENT**

- A. 6 mil (150-micron) polyethylene sheeting or bags and appropriate tape, in accordance with ASTM D4397-16

### **2.2 TRANSITION COUPLINGS**

Refer to requirements of Section 15162: Pipe Couplings and Adapters.

## **PART 3 - EXECUTION**

### **3.1 CUTTING, REMOVAL, AND HANDLING**

- A. Adequate care shall be taken to maintain the materials in a non-friable state.
- B. Pipe cutting will be permitted only when repairing or joining existing ACP, as determined by the City.
- C. All cutting of ACP shall be by snap-cut method.
- D. ACP shall be wrapped in 6 mil (150-micron) polyethylene sheeting or bags sealed with appropriate tape, and properly labeled and removed away from the construction area to prevent damage.

### **3.2 DISPOSAL**

- A. Asbestos materials are considered hazardous materials regulated as a hazardous waste in California.
- B. The Contractor shall be responsible for the proper identification, removal and disposal of all asbestos materials.

### **3.3 CONNECTING TO EXISTING ACP**

- A. Connect to existing ACP with a transition coupling.
- B. Provide minimum 3-foot length PVC pipe spool between the transition coupling and new valve, fitting, or piping.

### **PART 4 - PAYMENT**

Payment for the Work in this Section shall be included as part of the lump sum or unit price bid amount for which such Work is appurtenant thereto, and no additional payment will be made specifically for the Work in this Section.

**END OF SECTION**

## **SECTION 15076: CEMENT-MORTAR LINED AND COATED STEEL PIPE**

### **PART 1 - GENERAL**

#### **1.1 DESCRIPTION**

This Section designates the requirements for steel pipe fabrication, test in shop, installation of steel pipe, fabrication of steel sheet or plate, mill-manufactured steel pipe, bends, special pipes with outlets, pass holes, flanges and all other fittings. Steel pipe shall conform to the following except as modified by this Specification:

AWWA C200	Steel Water Pipe 6 inches and larger
AWWA C205	Cement-mortar protective lining and coating
AWWA C207	Steel Pipe Flanges
AWWA C210	Coal-tar epoxy coating system for interior and exterior of steel water pipelines
AWWA C213	Fusion-Bonded epoxy coating for the interior and exterior of steel water pipelines
AWS	Standard Qualification Procedure for Manual Welding Operators
ASME	Boiler and Pressure Vessel Code

#### **1.2 RELATED WORK DESCRIBED ELSEWHERE**

Refer to the following Specification Section(s) for additional requirements:

- A. Section 01300: Submittals
- B. Section 02223: Trenching, Backfilling, and Compacting
- C. Section 03000: General Concrete Construction
- D. Section 15000: General Piping Requirements
- E. Section 15044: Pressure Testing of Piping
- F. Section 15041: Chlorination of Water Mains for Disinfection
- F. Section 15051: Installation of Pressure Pipelines

#### **1.3 SUBMITTALS**

Furnish submittals in accordance with Section 01300: Submittals. Submittals are required for the following:

- A. Submit Shop drawings, material lists, manufacturer's literature and catalog cuts of, but not limited to, the following:

Shop Drawings  
Layout Schedule  
Manufacturer's tests

Fabrication Details  
Dimensional Checks  
Protective Coatings



Shop drawings shall be submitted and approved prior to manufacture of pipe. The layout schedule shall indicate the order of installation, the length and location of each pipe section and special, the station and elevation of the pipe invert at all changes in grade, and all data on curves and bends for both horizontal and vertical alignment.

- B. Submit data used by the Contractor in manufacture and quality control.
- C. Submit test reports showing the physical properties of the rubber used in gaskets.

## **PART 2 - MATERIALS**

### **2.1 PIPE DESIGN REQUIREMENTS**

Pipe, lining and coating shall be the product of one company in the business of designing and manufacturing cement-mortar lined and coated steel pipe. Use of subcontractors or subcontracts to apply the lining and coating of the steel pipe is not allowed.

The pipe shall consist of the following components:

A welded steel cylinder with joints formed integrally with the steel cylinder or with steel joint rings welded to the ends; a centrifugally-cast cement-mortar lining; a self-centering bell and spigot joint with a circular preformed elastomeric gasket, so designed that the joint will be watertight under all conditions of service; a dense, concentric, steel reinforced exterior cement-mortar coating.

The Drawings indicate the elevations and alignment of the pipeline, the nominal inside diameter of the lined pipe, and the minimum steel cylinder thickness or design pressure (adjusted to satisfy transient conditions). Design soil cover shall be as stated on the Drawings or Specifications or, if none is stated, the amount of cover shall be scaled from the Drawings, with a minimum of 36 inches.

Minimum thickness of the steel cylinder shall be 0.375 inch.

### **2.2 STEEL CYLINDERS**

Materials used in fabricating steel cylinders shall be hot rolled carbon steel sheets conforming to the requirements of ASTM A53, Grade B, ASTM A570 Grade 36 or Grade 33, or steel plates conforming to the requirements of ASTM A36. The method of testing shall conform to the requirements of ASTM A570.

Full penetration welds are required. Welds may be straight or spiral seam. The circumferential stress in the steel shall not exceed 16,500 psi at the design pressure.

### **2.3 GASKETS FOR JOINTS**

Rubber gaskets for sealing the joints shall meet the requirements of AWWA C200, subsection 3.6.6.

### **2.4 CEMENT**

Cement for mortar lining and coating shall be Portland Cement Type II and conform to ASTM C150, unless otherwise specified. Do not use admixtures containing chlorides.

### **2.5 STEEL BAR OR WIRE REINFORCEMENT**

Circumferential steel bar or wire reinforcement shall conform to ASTM A615, Grade 40, "Specifications for Billet-Steel Bars for Concrete Reinforcement". Wire fabric reinforcing for cement-mortar coatings and linings of fittings shall conform to ASTM A185, "Specifications for Welded Steel Wire Fabric," or ASTM A497, "Specifications for Welded Deformed Steel Wire Fabric." Spiral-wire reinforcement for cement-mortar coatings shall conform to ASTM A82.

### **2.6 STEEL FOR JOINT RINGS**

Steel for bell rings shall conform to ASTM A575, "Specification for Merchant Quality Hot Rolled Carbon Steel Bars." Steel for spigot rings shall conform to ASTM A576, "Specification for Special Quality Hot-Rolled Carbon Steel Bars."

### **2.7 DIMENSIONS**

The steel pipe sizes shown on the Drawings or otherwise referred to shall be the nominal inside diameter. Unless otherwise specified, the nominal diameter shown on the Drawings shall be considered to be the inside diameter after lining.

### **2.8 MANUFACTURER'S TESTS**

Hydrostatically test each steel cylinder with joint rings attached and cylinders for specials to a circumferential stress of at least 22,000 psi, but not more than 25,000 psi. If leaks develop during testing, repair the cylinder by welding and retest until all leaks are eliminated.

Test the seams in short-radius bends and special fittings by the air-soap method using air at a pressure of 5 psi or by the dye-check method. However, if the fitting is

fabricated from cylinders that have been previously hydrostatically tested, no further test will be required on seams so tested.

Hydrostatic testing of fittings to 150% of the design pressure may replace the tests described above. Repair any defects revealed by any of the alternate test methods by welding and retest the fitting until all defects have been eliminated.

## **2.9 FABRICATION DETAILS**

Mark each special and each length of straight pipe plainly at the bell end to identify the design pressure and the proper location of the pipe or special by reference to layout schedule.

Protect exposed portion of joint rings from corrosion by the manufacturer's standard coating.

Fit the pipe with devices shown on the Drawings to permit continuous electrical bonding of the various joints following field installation.

## **2.10 PROTECTIVE COATINGS AND LININGS**

Paint or coat all exposed metal surfaces as specified in Section 09900: Painting and Coating, except where painting and galvanizing is specified elsewhere and in this Section.

All steel pipe and fittings shall be cement-mortar lined in accordance with AWWA C205 and C602. Linings shall have a minimum thickness of 1/4-inch.

All steel pipe and fittings for underground service shall be cement-mortar lined and cement-mortar coated in accordance with AWWA C205 and C602 unless otherwise specified on the Drawings.

For the following nominal inside diameters, the lining thickness and minimum cement-mortar coating thickness shall be as follows:

Nominal Pipe Size (inches)	<u>LINING</u>		<u>COATING</u>	
	Thickness (inches)	Tolerance (inches)	Thickness (inches)	Tolerance (inches)
4 – 10	1/4	-1/32+1/32	1/2	+1/8
12 – 18	3/8	-1/16+1/8	5/8	+1/8
20 – 44	1/2	-1/16+1/8	3/4	+1/8
45 – 58	3/4	-1/16+1/8	1	+1/8

60 and over	$\frac{3}{4}$	$-1/16+1/8$	$1\ 1/4$	$+1/8$
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## 2.12 **CEMENT-MORTAR CURING**

Cure the pipe by water curing, steam curing or a combination of both. Water curing and steam curing may be used interchangeably on a time ratio basis of four hours water curing to one hour of steam curing. Where steam curing is used, keep the pipe in a warm, moist environment maintained at a temperature of 100°F and 100% to 150°F for the specified period and, where water curing is used, keep the pipe continually moist by spraying or other means for the specified periods. Do not allow the pipe to dry either on the inside or outside surfaces during the curing period.

Where water curing is used, keep the pipe continuously moist for seven days at a temperature of not less than 40°F before being moved to the trench site.

Cement-mortar lining and coating of special pipe and fittings may be cured in accordance with the above provisions or by prompt application of a white-pigmented sealing compound conforming to ASTM C309. Do not apply sealing compound at joint ends where compound will interfere with the bond of joint mortar.

## 2.13 **SPECIAL PIPE AND FITTINGS**

The manufacturer shall furnish all fittings and special pieces required for closures, curves, bends, branches, manholes, outlets, connections for mainline valves, and other specials required by the Drawings.

Special fittings shall be fabricated of welded steel sheet or plate, lined and coated with cement mortar of the same type as the adjoining pipe and applied as specified for lining and coating of specials in AWWA C205 and as modified herein. Use butt welding, unless otherwise indicated on the Drawings.

The maximum deflection at a mitered girth seam shall be 22-1/2 degrees. Minimum centerline radius of an elbow or bend shall be as follows:

Pipe Size (Inches)	Minimum Centerline Radius
30 – 48	2-1/2 times ID
51 – 60	10-feet
Over 60	2 times ID

The circumferential stress in the sheet or plate shall not exceed 13,500 psi at the design pressure. The minimum thickness of sheet or plate shall be as follows:

<u>Fitting Diameter Range (Inches)</u>	<u>Minimum Thickness of Sheet or Plate</u>
24 and under	3/16"
26 – 36	1/4"
38 – 45	5/16"
48 – 54	3/8"
57 – 60	7/16"
63 – 72	1/2"
75 – 84	5/8"

Outlets at special fittings shall be reinforced with collars or crotch plates. If collar reinforcement is used, the outlet diameter shall not exceed 69% of the ID of the fitting. The diameter of outlets reinforced with crotch plates may equal the fitting diameter.

The effective shoulder width "W" of collars from the inside surface of the steel outlet to the outside edge of the collar measured on the surface of the cylinder shall be not less than one-third or more than one-half the ID of steel outlet. The thickness of the collar shall be not less than "T" as determined by:

$$T = \frac{P_w \times \text{ID cyl.} \times \text{ID outlet}}{36,000 \times W}$$

where  $P_w$  is the design pressure in pounds per square inch, and all other dimensions are in inches. Collars may be oval in shape or rectangular with well-rounded corners. Outlets 3 inches in diameter and smaller may be installed without collars.

The design of crotch plates shall be based upon the paper by Swanson, Chapton, Wilkinson, King, and Nelson, originally published in June 1955 issue of the Journal of the American Water Works Association.

## **2.14 GROOVED-END COUPLINGS**

- A. Grooved-end couplings shall be ductile iron, ASTM A 536, Grade 60-40-18 or 65-45-12. Gaskets shall be EPDM, and conform to ASTM D 2000.
- B. Couplings for pipe smaller than 20 inches shall be flexible type, square cut groove, per AWWA C606: Victaulic Style 77, Gustin-Bacon figure 100, or approved equal.
- C. Bolts in exposed service shall conform to ASTM A 183, 110,000 psi tensile strength. Bolts in buried service shall be ASTM A 193, Grade B8M, Class 2.

## **2.14 HANDLING AND SHIPMENT**

Handle pipe and special fittings carefully. Use blocking and holddowns during shipment to prevent movement or shifting. Bulkhead or cover both ends of pipe and fittings on trucks or rail cars in order to prevent excessive drying of the interior lining.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Trench Preparation: Perform earthwork in accordance with Section 02223: Trenching, Backfilling and Compacting. Schedule pipe laying so that the bell end of the pipe faces in the direction of laying. Lay pipe on slopes steeper than 20% in an uphill direction. Prior to laying the pipe, grade the bottom of the trench and prepare it to provide uniform bearing throughout the entire length of each joint of pipe. Excavate suitable bell holes at each joint and scoop out a shallow lateral depression half a pipe length from the last pipe laid to allow for easy removal of the belt pipe sling and thus avoid any movement of the pipe after it is placed on proper line and grade.
- B. Rubber-Ring Joints: All field joints shall be rubber-gasketed carnegie joints, except where welded joints are shown on the Drawings or at locations approved by the Owner. The pipe should be picked up well balanced, then lowered into the trench so that the spigot end may be entered into the bell end of the last pipe laid. Prior to placing the spigot into the bell, clean and lubricate the spigot groove, the rubber gasket, and the first two inches of the bell with a soft, vegetable soap compound. Uniformly stretch the gasket, when placing it in the spigot groove so that there is a uniform tension and volume of rubber distributed around the circumference. Place metal or wooden spacers against the inside shoulder of the bell of 24-inch and larger pipe to provide the proper space between abutting ends of the pipe.

For pipe sizes smaller than 24 inches, butter the bell end with cement mortar in a manner and quantity that will completely fill the recess between the respective linings of the two joined sections of pipe. The spigot end shall

then be entered into the bell end of the adjacent pipe section the distance shown on the Shop drawings. Immediately after joining, swab the pipe interior to remove all excess mortar by drawing a swab or squeegee through the pipe.

For pipe sizes 24 inches and larger, the joint recess shall be pointed from the inside with cement mortar after the backfill has been placed and compacted and the pipe permitted to take any normal settlement. The mortar shall be mixed of one part cement to one and one-half parts of sand, with water-cement ratio within 5 percent of the plant-applied mortar. Point in two or more lifts and finish off flush by troweling.

After the joint is assembled, insert a thin metal feeler gauge from the exterior between the bell and the spigot and check the position of the rubber gasket around the complete circumference of the pipe. If the gasket is not in the proper position, withdraw the pipe, check the gasket to see that it is not cut or damaged, relay the pipe, and check the gasket position again.

Bond each pipe joint to provide electrical continuity along the entire pipeline. The bond shall be made by welding a jumper in the pipe joint as shown on the Drawings.

Grout the outside joint recess with cement mortar after a diaper has first been placed around the joint and tightened securely to prevent leakage while the mortar is being poured. The diaper shall be made of moisture resisting paper or heavy-duty sailcloth of sufficiently close weave to prevent cement loss from the mortar. Hem the diapers on each edge and provide a metal strap within each hem sufficiently longer than the circumference of the pipe to allow a secure attachment of the diaper to the pipe. The diaper width will depend upon pipe size and design and shall be the width recommended by the manufacturer. Following installation of the diapers, pour the joints and rod from one side only until the mortar comes up to the top of the diaper on the opposite side. Approximately one hour subsequent to the pouring of the joint, check the joint and, if any settlement, leakage or shrinkage has taken place, refill the joint with mortar.

Outside joints may be grouted before or after the placement of bedding and backfill materials if those materials are to be mechanically compacted. If bedding and backfill materials are to be hydraulically densified, pour grout and allow to set before applying water. In any case, joints shall be grouted before backfill is placed over the top of the pipe.

- C. Butt-Strap Closure Joints: Butt-strap closure joints shall be completed in the trench after the pipe has been laid to the alignment and grade shown on the Drawings. They shall be field welded by full-circumferential fillet welds or one

of the edges may be shop welded and the other field welded. Welding shall be done in the same manner as specified for welded joints.

Fill the interior of the joints with stiff plastic mortar and finish off smoothly with the inside of the pipe. Apply wire mesh, 2" x 4" x No. 13 gauge, clean, and free from rust, to the interior of the joints so that the wires on the 2-inch spacing run circumferentially around the pipe. Crimp the wires on the 4-inch spacing in such a manner that the mesh will be held 3/8-inch from the metal joint surface. Lap the mesh a minimum of 8 inches and securely wire in position.

Coat the joint exterior with mortar to a minimum thickness of 1-1/2 inches. Immediately prior to applying mortar to the interior or exterior of the joints, apply a cement wash to the metal to be coated.

- D. Welded Joints: Complete welded joints after the pipe is in final position. Welded joints shall be either a welded carnegie joint or a lap-welded slip joint as shown on the Drawings. Caulk any recess between the bell and spigot with a rod to facilitate the welding. Pipe of 30 inches in diameter or more may be welded from the inside. Welders assigned to the Work shall be qualified under the AWS standard qualification procedure.

Clean joints to be welded, preferably prior to placing the pipe in the trench, of all loose scale, heavy rust, paint, cement, and grease. Provide at least a 1/2-inch recess between adjacent mortar-covered surfaces to place the weld. In all hand welding, deposit the metal in successive layers. The minimum number of passes or beads in the completed weld shall be as follows:

<u>Steel Cylinder Thickness</u> <u>(Inches)</u>	<u>Fillet Weld Minimum Number of</u> <u>Passes</u>
Smaller than 3/16	1
3/16 and 1/4	2
5/16 and 3/8	3

After the joints have been welded, the joint shall be grouted with cement mortar in the same manner as specified for rubber-ring joints.



### **3.2 PREVENTING FOREIGN MATTER FROM ENTERING THE PIPE**

At all times when pipe laying is not in progress, close the open end of the pipe with a tight-fitting cap or plug to prevent the entrance of foreign matter into the pipe. These provisions shall apply during the noon hour as well as overnight. In no event shall the pipeline be used as a drain for removing water, which has infiltrated into the trench. Maintain the inside of the pipe free from foreign materials and in a clean and sanitary condition until its acceptance by the Owner.

### **3.3 INSTALLING GROOVED-END PIPING**

- A. Install grooved-end pipe and fittings in accordance with the coupling manufacturer's recommendations and the following.
- B. Clean loose scale, rust, oil, grease and dirt from the pipe or fitting groove before installing coupling. Apply the coupling manufacturer's gasket lubricant to the gasket exterior including lips, pipe ends, and housing interiors.
- C. Fasten couplings alternately and evenly until coupling halves are seated. Use torques as recommended by the coupling manufacturer.

### **3.4 LEAKAGE TEST**

- A. General: Test all pipelines in accordance with Section 15044: Pressure Testing of Piping, and the applicable provisions of AWWA C600, except as modified herein.
- B. Allowable Leakage: Notwithstanding 15044: Pressure Testing of Piping, Section 3.8, no pipeline installation will be accepted if the leakage is greater than that of 10 gallons per inch of pipe diameter per mile of pipe per 24 hours. Unless otherwise specified on the Drawings, the test pressure shall be the average observed test pressure of the pipe being tested, equal to at least 125 percent of the working pressure, in pounds per square inch gauge, based on the lowest point in the line or section under test and corrected to the elevation of the test gauge.

No leakage will be allowed for welded joints. The length of pipe with welded joints will be deducted from the total length in computing the allowable leakage. All visible leaks must be eliminated regardless of the results of the leakage allowance measurements.

### **3.5 DISINFECTION**

Disinfection shall be in accordance with Section 15041: Chlorination of Water Mains for Disinfection.

#### **PART 4 – PAYMENT**

Payment for the Work in this Section shall be included as part of the lump sum or unit price bid for which such Work is appurtenant thereto, and no additional payment will be made specifically for Work in this Section.

**END OF SECTION**

## **SECTION 15098: BYPASS PIPING AND TEMPORARY SERVICE CONNECTIONS**

### **PART 1 - GENERAL**

#### **1.1 DESCRIPTION**

This Section describes the requirements for temporary bypass piping and appurtenances and temporary service connections required to maintain water supply service during construction operations.

#### **1.2 RELATED WORK SPECIFIED ELSEWHERE**

Refer to the following Specification Section(s) for additional requirements:

- A. Section 01300: Submittals
- B. Section 02223: Trenching, Backfilling, and Compacting
- C. Section 15000: Piping Schedule and General Piping Requirements
- D. Section 15041: Chlorination of Water Mains for Disinfection
- E. Section 15044: Pressure Testing of Piping
- F. Section 15051: Installation of Pressure Pipelines

#### **1.3 SUBMITTALS**

Furnish submittals in accordance with the requirements of Section 01300: Submittals. Submit bypass pipeline design for the complete Project.

#### **1.4 AVAILABLE INFORMATION**

The Project Plans and City Water Atlas maps will provide the basic information for design and will include, but not be limited to, approximate location and size of water mains, approximate location of services, location of fire hydrants and line valves.

To aid in design, additional copies of the Water Atlas maps will be made available by contacting the City.

### **PART 2 - MATERIALS**

#### **2.1 GENERAL**

Pipe and fittings employed in the bypass pipelines and temporary service connections shall be subject to approval by the City for use. Pipe and fittings shall be clean, free of rust, dirt, debris, and foreign material and shall consist of materials capable of withstanding the maximum system pressure. Pipe and fittings shall not impart any objectionable taste, odor, or color to the water being supplied. Plastic pipe or hose, when employed, shall bear the imprint of the

National Sanitary Foundation approval for potable water, NSF-PW, or shall be capable of meeting the standards established by the NSF for this use. Where "lever" or "toggle" type couplings are employed for joining lengths of pipe for the bypass pipelines, the couplings shall be installed in the inverted position to prevent accidental uncoupling of the pipelines. Each run of bypass pipeline shall terminate with a 2-inch minimum size valve for flushing and chlorination. There shall be no services supplied downstream of the terminal valve.

## **PART 3 - EXECUTION**

### **3.1 GENERAL**

- A. Maintain continuity of water service to the customers during installation, maintenance, and removal of the bypass pipelines. Upon commencement of operation of the bypass pipelines, furnish to the Owner the names and telephone numbers of the personnel designated to perform emergency repairs to the bypass pipelines and service connections.
- B. Changes or modifications to the bypass pipeline configuration may be made by the Contractor subject to the approval of the Owner.
- C. When a bypass pipeline crosses a wheelchair ramp or sidewalk and there is less than a 4-foot wide unobstructed passageway, install the pipeline in a recessed trench or provide a ramp at a slope not greater than 1:12. At all street crossings, install the bypass pipeline in a recessed trench. In all cases, temporary resurfacing of recessed trenches shall be flush with the existing grade. If the bypass pipeline crosses a driveway, provide an asphalt mound over that portion of the pipeline.
- D. After service has been restored to a section of the water main, remove the bypass pipeline and related facilities. Leave the streets, sidewalks, and adjacent areas in a clean and orderly condition and restore to near original condition.

### **3.2 DISINFECTION**

Disinfection of the bypass pipelines shall be performed by the Contractor in accordance with Section 15041: Chlorination of Water Mains for Disinfection. Prior to disinfection, thoroughly flush each run of bypass pipeline to clear the pipe of dirt, debris, or foreign objects. Dechlorinate water that is flushed to the street or storm drain system.

### **3.3 FLUSHING**

When directed by the Owner, provide periodic daily flushing of bypass pipelines to lower water temperatures. Flushing may also be required on weekends and holidays, depending on weather conditions. Flush the bypass pipelines when the

temperature of the water is at or above 80 degrees F. Dechlorinate water that is flushed to the street or storm drain system.

### **3.4 TEMPORARY SERVICE CONNECTIONS**

#### **A. General**

Following disinfection of the bypass pipeline and before shutdown of the water main to be replaced, furnish, install, and maintain temporary service connections from the bypass pipeline to the outlet side of the Owner's water meters, including fire and large domestic services. Remove each water meter from the meter vault and reconnect to the temporary bypass pipeline above ground. Provide shut off valves at each service connection to the temporary bypass piping so that each customer is out of service for a minimum amount of time during reinstallation. Protect the meters, meter vaults and temporary service lines with barricades and warning signs. Notify the Owner of any damage to the meter, meter vault or customer side of the service line.

1. Any movement or temporary relocation of water meters to facilitate the temporary connection shall be made only with approval of City. In the City Water System, the water meter is the terminal unit of City ownership. Any relocations or modifications downstream of the water meter shall be made with approval of the Owner's customer. Since the condition of the customer's piping is unknown to the Owner, prevent any damage or leakage in the customer's piping resulting from movement of the Owner's water meter or the customer's piping. If any damage or leakage should occur, repair the customer's piping in a timely manner at the Contractor's sole expense.
2. Notify customers not less than 48 hours prior to shutdown of the water main and notify Owner of any conflicts.
3. Maintenance, protection, and removal of the connections shall be under the same conditions as Subsection 3.1 of this Section.
4. Notify the Owner 48 hours prior to restoration of service to a water main that meters can be reconnected. The City will reinstall all bypassed meters in the meter box. Install the new service lines from the main only when the meter is in the meter box. Disconnect the temporary service connections after service has been restored to a section of the water main. Prior to reconnection of the water meter, flush each service lateral for not less than 30 seconds to clear the lateral of any debris from the construction operation. Should the flow through the lateral appear to be impaired, make the necessary repairs to restore full flow or request that the City

perform the repairs. The expense of such repairs performed by the Owner will be charged solely to the Contractor.

5. In locations where the service lateral was unable to be flushed prior to connecting the service lateral to the meter, immediately distribute notices furnished by Owner to all service locations.

B. Temporary Connections for Water Supply to 2-inch Bypass Pipelines

1. Install, maintain, and remove 1-1/2-inch service taps at locations deemed necessary to provide water supply to the 2-inch bypass pipelines. Make the 1-1/2-inch taps to existing cast iron pipelines, or new ductile iron pipelines, as appropriate, and install them with the pipelines in service and operating under normal pressure. All bypass pipelines shall withstand maximum system pressure of 90 psi.
2. Make the taps at 60 degrees below the top of the pipe on the side of the pipeline to which the supply for bypass pipeline is required. Space dual taps not less than 12 inches apart. The tapping machine shall be capable of cutting 1-7/16-inch outlet holes through Contractor-furnished 1-1/2-inch service clamps and inserting Contractor-furnished 1-1/2-inch bronze corporation valves with 4-7/8-inch outside diameter. Furnish and permanently install one service clamp and one 1-1/2-inch corporation valve at each location.
3. Furnish, install, and remove fittings for each temporary connection. Fittings shall conform to City standards. Provide submittals for proposed fittings to the City for review a minimum of 14 calendar days prior to use.
4. Following installation of the temporary connection assembly, temporarily backfill or cover the excavation in a manner suitable for traffic use. When the bypass pipeline is in service, the 2-inch curb valve shall be readily accessible at all times to perform repairs to the bypass pipeline.
5. Following removal of the connected bypass pipelines and temporary fittings, cap each corporation valve with a Contractor-furnished, 1-1/2-inch, bronze coupling, B&S x IPT-female, and a Contractor-furnished, 1-1/2-inch, bronze plug, IPT. With the approval of the Owner, the Contractor may plug the service clamp with a Contractor-furnished, 1-1/2-inch, c.c. bronze plug and recover the corporation valve. Following installation of the cap or plug, place the sand-cement slurry backfill in the excavation and shall place the permanent paving over the excavation as soon as practicable.

6. The Work for each temporary connection shall include, but not be limited to, pavement removal, excavation, installation and removal of the connection assembly, capping the corporation valve, sand-cement slurry backfill, and permanent paving, all in accordance with these Specifications.
  7. Include all Work associated with the installation, removal, and maintenance of temporary connections for water supply in the unit price for pipeline construction.
- C. Temporary Connections for Water Supply to 4-inch through 6-inch Bypass Pipelines
1. Install, maintain, and remove 4-inch through 6-inch temporary bulkheads at locations determined by the Owner to provide water supply to 4-inch through 6-inch bypass pipelines. Install the 4-inch through 6-inch temporary bulkheads on existing 4-inch, 6-inch, 8-inch, 10-inch, and 12-inch, cast iron pipelines and install them with the pipelines temporarily out of service.
  2. Attach a 4-inch through 6-inch diameter hose to the temporary bulkhead to supply the bypass pipelines. Lay the hose in a trench and cover it with a temporary asphalt material to a depth flush to the existing grade. The hose shall connect to the 4-inch through 6-inch bypass pipelines at the curb. The hose will be subject to approval by the Owner in accordance with Subsection 2.1 of this Section.
  3. The Work for each temporary bulkhead shall include, but not be limited to, pavement removal, excavation, removal and reinstallation of the nipple, and installation and removal of the temporary bulkhead. Reinstall the nipple in accordance with the details shown on the Plans and as specified in the Specifications.

#### **PART 4 - PAYMENT**

All Work associated with the design, installation, maintenance, and removal of bypass pipelines and temporary service connections shall be included in the unit price bid for pipeline construction.

#### **END OF SECTION**

## **SECTION 15100: CONTROL AND CHECK VALVES**

### **PART 1 - GENERAL**

#### **1.1 DESCRIPTION**

This Section includes materials, testing, and installation of manually and electric actuated valves and check valves.

#### **1.2 RELATED WORK SPECIFIED ELSEWHERE**

Refer to the following Specification Sections for additional requirements:

- A. Section 01300: Submittals
- B. Section 02223: Trenching, Backfilling and Compacting
- C. Section 09900: Painting and Coating
- D. Section 15000: General Piping Requirements
- E. Section 15044: Pressure Testing of Piping
- F. Section 15056: Ductile-Iron Pipe and Fittings
- G. Section 15076: Cement-Mortar Lined and Coated Steel Pipe
- H. Section 15112: Backflow Preventers
- I. Section 15119: Electric Motor Actuators

#### **1.3 SUBMITTALS**

Furnish the following submittals in accordance with the requirements of Section 01300: Submittals:

- A. Manufacturer's catalog data and detail construction sheets showing all valve parts and describing material of construction by material and specification (such as AISI, ASTM, SAE, or CDA).
- B. Valve dimensions including laying lengths. Show dimensions and orientation of valve operators, as installed on the valves.
- C. Valve linings and coatings.

### **PART 2 - MATERIALS**

#### **2.1 GENERAL**

Provide valves complete with operating handwheels, levers, chainwheels, extension stems, floor stands, worm gear operators, operating nuts, chains, and wrenches required for operation. Valves shall have the name of the



manufacturer and the size of the valve cast or molded onto the valve body or bonnet or shown on a permanently attached plate.

Where called out in the Drawings provide valves with electric motor actuators per Section 15119: Electric Motor Actuators.

## **2.2 VALVE OPERATORS**

- A. Operators for Exposed Valves Smaller Than 6 Inches: Provide lever or wrench operators having adjustable, open stop memory positions for exposed valves smaller than 6 inches.
- B. Operators for Buried or Submerged Valves
  - 1. Provide direct acting 2-inch square AWWA operating nuts for all buried or submerged valves less than 6 inches, and for buried and submerged gate valves less than 24 inches.
  - 2. Provide watertight shaft seals and watertight valve and actuator cover gaskets. Provide totally enclosed operators designed for buried or submerged service.
- C. Operators for Valves 6 Inches and Larger
  - 1. Provide gear operators on butterfly, plug, and ball valves 6-inches and larger. Gear operators for valves 8 inches through 20 inches shall be of the worm and gear, or of the traveling nut type. Gear operators for valves 24 inches and larger shall be of the worm and gear type.
  - 2. Enclose gear operators, suitable for running in oil with seals provided on shafts to prevent entry of dirt and water into the operator. Gear operators for valves located above ground or in vaults and structures shall have handwheels. Minimum handwheel diameter shall be 12 inches.
  - 3. Gear operators shall be of the totally enclosed design, proportioned to permit operation of the valve under full operating head with a maximum pull of 80 pounds on the handwheel or crank. Operators shall be provided with open and closed position stop limiting devices. Operators shall be of the self-locking type to prevent the disc, ball or plug from creeping. Operator components shall be designed to withstand a pull of 200 pounds for handwheel or chainwheel operators between the input and stop limiting devices without damage, and an input torque of 300-foot-pounds for operating nuts when operating against the stops.

4. Self-locking worm gears shall be a one-piece design of gear bronze material (ASTM B 427), accurately machine cut. The worm shall be hardened alloy steel (ASTM A 322, Grade G 41500; or ASTM A 148, Grade 105-85), with threads ground and polished. The reduction gearing shall run in a proper lubricant. Operators shall be Limatorque Model T Series, EIM Model MG or approved equal.
  5. Gear operators shall be able to rotate the valve element (disc, plug, or ball) from the fully closed position to fully open in a number of turns of the operator not exceeding two times the valve diameter in inches (e.g., for a 12-inch valve, the number of turns of the operator shall not exceed 24).
- D. Operating Torque Requirement for Buried Valves: Design operators on buried valves to produce the required torque on the operating nut with a maximum input of 150-foot pounds.
  - E. Opening Direction: Valve operators, handwheels or levers shall open by turning counterclockwise.
  - F. Position Indicators: Provide valve position indicators for all above ground valves.

### **2.3 VALVE BOXES FOR BURIED VALVES**

- A. General: Valve boxes shall be 8 inch Schedule 40 PVC pipe, or 8 inch ASTM D-3034 sewer pipe. Valve boxes shall conform to the City Standard Drawings.
- B. Valve Box Caps: Valve box caps shall be cast-iron, and shall be designed to rest without a frame on a cast-in-place concrete ring surrounding the valve extension pipe. Taper the cap skirt for a close fit inside the upper sleeve portion of the valve box. Minimum weight of nominal 10-inch cap shall be 40 pounds. Caps for potable water valve boxes shall be circular with the word WATER cast on the cap. Caps for reclaimed water valve boxes shall be triangular with the word "IRRIG" cast on the cap. Coat caps per Section 09900: Painting and Coating, System No. C-1. Color for potable waterlines shall be OSHA-ANSI safety yellow.

### **2.4 EXTENSION STEMS FOR BURIED VALVE OPERATORS**

Where the depth of the valve is such that its operating nut is more than 3 feet below grade, provide operating extension stems to bring the operating nut to a point between 24 to 36 inches below the surface of the ground and/or box cover. Extension stems shall be steel, and shall be complete with 2-inch-square

operating nut. Provide stem with a 1/8-inch center guide to keep stem centered in box. Do not use pinned couplings. Extension stems shall conform to the City Standard Drawings.

## **2.5 BOLTS, NUTS, AND GASKETS FOR FLANGED VALVES**

Bolts and nuts for flanged valves are described in Section 15000: General Piping Requirements, and the individual piping specifications.

## **2.6 PAINTING AND COATING**

- A. Above Ground Valves or Valves in Vaults: Coat metal valves (except bronze and stainless-steel valves) located above ground or in vaults and structures in accordance with Section 09900: Painting and Coating, System No. C-1. Apply the specified prime coat at the place of manufacture. Apply intermediate and finish coats in field. Finish coat shall match the color of the adjacent piping. Handwheels shall receive the same coating as the valves.
- B. Buried Valves: Coat buried metal valves and extension stems at the place of manufacture per Section 09900: Painting and Coating, System No. D-1.
- C. Interior Coating: Coat metal valves 4-inches and larger on the interior metal parts, excluding seating areas and bronze and stainless-steel pieces, per Section 09900: Painting and Coating, System No. B-2. Coating shall be applied at the factory by the valve manufacturer.
- D. Alternative: As an alternative to the coating systems specified above, valves may be lined and coated at the place of manufacture per Section 09900: Painting and Coating, System No. G-1.

## **2.7 VALVES**

- A. Butterfly Valves 4 Inches and Larger, Class 150B: Butterfly valves shall be short body, flanged type, conforming to AWWA C504, Class 150B. Do not use wafer style valves. Unless otherwise noted, minimum working differential pressure across the valve disc shall be 150 psi. Valve ends shall be as shown on the Drawings; flanged ends shall be Class 125, ANSI B16.1. Valve shafts shall be Type 304 or 316 stainless-steel, or carbon steel with Type 304 or 316 stainless-steel journals and static seals. Valve shafts shall be stub shaft or one-piece units extending completely through the valve disc. Test valve bodies at a pressure equal to twice the design working pressure. Materials of construction shall be as follows:

<u>Component</u>	<u>Material</u>	<u>Specification</u>
Body	Cast iron or ductile iron	ASTM A48, Class 40; ASTM A126, Class B; or ASTM A536, Grade 65-45-12
Exposed body capscrews, and bolts and nuts	Stainless-steel	ASTM A276, Type 304 or 316
Discs	Cast iron, ductile iron, or Ni-Resist	ASTM A48, Class 40; ASTM A536, Grade 65-45-12; or ASTM A436, Type 1

The rubber seat shall be an integral part of the valve body. Rubber seats fastened to the disc by any means shall not be allowed. Valves shall be Pratt Groundhog, Dezurik BAW, Kennedy AWWA butterfly valve, or approved equal.

- B. Stainless-Steel Ball Valves 2 Inches and Smaller: Ball valves, 2 inches and smaller, for water service shall be stainless steel, and shall be rated at a pressure of 300 psi WOG at a temperature of 150°F. Valves shall have plastic-coated lever operators. Valves shall have full-bore ports, screwed ends, and non-blowout stems. Materials of construction shall be as follows:

<u>Component</u>	<u>Material</u>	<u>Specification</u>
Body, ball, stem	Stainless-steel	Type 316, ASTM A276
Seat, seals	Teflon	

Valves shall be Stockham Figure S-217, Worcester Controls Series 48, or approved equal.

- C. Bronze Ball Valves 2 Inches and Smaller: Ball Valves, 2 inches and smaller, for air or water service shall have bronze (ASTM B 62 or ASTM B 584, Alloy C83600 or C84400) body and plug ball retainer. Ball and stem shall be bronze (as specified for the body) or Type 316 stainless steel. Provide chrome-plated ball, if ball is bronze. Valves shall have screwed ends (ANSI B1.20.1), nonblowout stems, reinforced Teflon seats, and have plastic-coated lever operators. Valves shall have pressure rating of at least 600 psi WOG at a temperature of 150°F. Valves shall be Stockham S-206, Apollo 77-100 Series, or approved equal.

- D. Ball Valves 6 Inches through 12 Inches: Ball valves shall be flanged, conforming to AWWA C507, and the following. The minimum rated working pressure shall be 150 psi. Flanged ends shall be flat-faced Class 125, ANSI B16. Valve shall be of the rubber seat design. Valves shall be double-seated to allow closure in two directions. Manufacturer: Henry Pratt Co., Golden Anderson, or approved equal. Materials of construction shall be as follows:

<u>Item</u>	<u>Material</u>	<u>Specification</u>
Valve body	Cast iron or	ASTM A 126, Class B or ASTM A 48, Class 35
	Ductile iron	ASTM A 536, Grade 65-45-12
Ball or rotor	Cast iron or	ASTM A 48, Class 35 (minimum)
	Ductile iron	ASTM A 536, Grade 65-45-12
Ball shaft	Alloy steel	ASTM A 564, UNS S17400, Condition H1150
Shaft and taper pins	Stainless steel	ASTM A 276, Type 304 or 316
Body bolts, studs, and nuts	Stainless steel	AISI Type 304
Capscrews (internal and external) and lockwashers	Stainless steel	AISI Type 316
Seats (rubber)	Buna-N	--

Lubricant for stainless-steel body bolts and nuts shall be TRX-Synlube by Ramco, Anti-Seize by Ramco, Husk-It Husky Lube O-Seal, or approved equal.

Packing, O-rings, and gaskets shall be one of the following nonasbestos materials: Teflon, Kevlar, or approved equal, aramid fiber, acrylic or aramid fiber bound by nitrile. (Products: Garlock "Bluegard," Klinger "Klingersil C4400," or approved equal), Buna-N (nitrile), or cotton impregnated with Buna-N.

- E. Lubricated Plug Valves 4-Inches and Smaller: Lubricated plug valves of sizes 4-inches and smaller shall have carbon steel bodies and plugs and shall be short pattern with bolted glands and resilient packing. Plug coating shall be Teflon, permanently bonded to the plug. Unless noted otherwise on the drawings, valve ends shall be flanged, with face-to-face

dimensions conforming to ANSI B16.1, Class 125. Valves shall have a pressure rating of 200 psi WOG. Lubricate valves with manufacturer's recommended lubricant for cold water service. Valves shall be Nordstrom Figure 1925, or approved equal.

- F. Lubricated Plug Valves 6-Inches Through 20-Inches Class 125: Lubricated plug valves of sizes 4-inches through 20-inches shall have cast iron (ASTM A126, Class B) bodies and plugs. Valves shall be of the regular pattern with bolted glands and resilient packing. Plug coating shall be Teflon, permanently bonded to the plug. Unless noted otherwise on the drawings, valve ends shall be flanged, with face-to-face dimensions conforming to ANSI B16.1, Class 125. Valve shall have a pressure rating of 200-psi WOG. Valves shall be enclosed worm gear operated and watertight for submerged service. Lubricate valves with the manufacturer's recommended lubricant for cold-water service. Valves shall be Rockwell Figure 169, Powell, or approved equal.
- G. Eccentric Plug Valves, 4-Inches Through 12-Inches: Eccentric plug valves, 4-inches through 12-inches, shall be of the non-lubricated type. Minimum pressure rating shall be 175 psi. Unless noted otherwise on the drawings, ends shall be flanged, Class 125 per ANSI B16.1. Materials of construction shall be as follows:

<u>Component</u>	<u>Material</u>	<u>Specification</u>
Body	Cast iron	ASTM A126, Class B
Plug Ductile Iron	Cast Iron	ASTM A126, Class B ASTM A536, Grade 65- Ni-Resist 45-12 ASTM A436

Plugs shall have neoprene facing to provide drip-tight shutoff. Valve body seats shall have a raised welded-in overlay of not less than 90 percent nickel. Packing shall be replaceable with valve body under full pressure and with valve in the fully open position. Plug shall be of the one piece design. Valves shall be DeZurik Series 100, Figure 118, or approved equal.

- H. Resilient Wedge Gate Valves, 3 Inches Through 12 Inches: Resilient wedge gate valves shall conform to AWWA 509 and the following requirements. Valves shall be designed for a minimum working pressure of 200 psi, and shall be bubble-tight at that pressure. Valves shall have non-rising stems. Stem nuts shall be independent of the gate and shall be made of solid bronze. All internal working parts, including the stem, shall be all bronze containing not more than 2 percent aluminum or more than 7 percent zinc. Bronze shall be ASTM B62 (85-5-5-5) bronze, except that stem bronze shall have a minimum tensile strength of 60,000 psi, a

minimum yield strength of 30,000 psi, and a minimum of 10 percent elongation in 2-inches before failure. Materials of construction shall be as follows:

<u>Component</u>	<u>Material</u>	<u>Specification</u>
Body Operating Nut, Bonnet, Seal Plate	Cast Iron	ASTM A126, Class B
Gate	Cast Iron Ductile Iron	ASTM A126, Class B ASTM A536, Grade 65-45-12
Bonnet and Seal Plate Nuts and Bolts	Stainless-Steel	ASTM A276, Type 316
O-Rings	Synthetic Rubber	ASTM D2000

Provide low friction, torque reduction thrust bearings both above and below the stem collar. Stuffing boxes shall be O-ring seal type with two rings located in stem above thrust collar. Each valve shall have a smooth unobstructed waterway free from any sediment pockets. Encapsulate gates in Buna-S rubber or nitrile elastomer. Valves shall be Clow RW, Mueller A2360, American AVK, American Flow Control AFC500, M&H Style 4067, or approved equal.

- I. Cast-Iron Swing Check Valves 4 Inches and Larger: Swing check valves shall conform to AWWA C508, and shall be iron-body, bronze-mounted with the following materials of construction:

<u>Component</u>	<u>Material</u>	<u>Specification</u>
Disc or clapper, seat ring, valve body seat ring	Bronze or brass	ASTM B62, B16, or B584 (alloys C84400 or C87600)
Body and Cap	Cast iron	ASTM A126, Class B
Disc and Hinge or Arm	Cast iron or bronze	ASTM A126, Class B ASTM B62
Hinge Pin	Stainless-steel	ASTM A276, Type 303, 304 or 410
Cover Bolts and Nuts	Stainless-steel	ASTM A193, Grade B8M; ASTM A194, Grade 8M

Internal fasteners	Bronze or Type
And accessories	304 or 316 sst

Ends shall be flanged, Class 125, ANSI B16.1. Design valves for a minimum working pressure of 150 psi. Equip valve with outside lever and spring. Valves shall be Clow F-5340, M&H Style 259, or approved equal.

- J. Bronze Check Valves 3 Inches and Smaller: Check valves 3 inches and smaller shall be Class 125, wye pattern, bronze, ASTM B 61, B 62, or B 584 (Alloy C83600). Ends shall be female threaded, ANSI B1.20.1. Disc shall be bronze, swing type. Minimum working pressure shall be 200 psi WOG at a temperature of 150°F. Valves shall be Crane No. 37, Nibco T-413-B, Stockham B-139, or approved equal.
- K. Stainless-Steel Gate Valves: Stainless-steel gate valves, 1/2 inch through 2 inches, shall be of the single wedge type with rising stem and handwheel. Minimum working pressure shall be 200 psig. Bonnet shall be of the screwed type. Ends shall be threaded, ANSI B1.20.1. Materials of construction shall be as follows:

<u>Component</u>	<u>Material</u>	<u>Specification</u>
Body, bonnet, plug, disc, and follower	Stainless steel	ASTM A 351, Grade CF8M
Packing gland, nut, retainer ring and stem	Stainless steel	ASTM A 276, Type 316
Handwheel	Malleable iron	ASTM A 47, A 197
Stuffing box packing	Teflon	--

Valves shall be Powell Figure 1832, Crane/Alloyco Figure 90, or approved equal.

- L. Solenoid Valves 1-1/2-Inches and Smaller: Solenoid valves of sizes 1/4-inch through 1-1/2-inches for water and air service shall have forged brass (Alloy C23000) or bronze (ASTM B 62) bodies with Teflon main seats. Internal plunger, core tube, plunger spring, and cage assembly shall be stainless steel (Types 302, 304, or 305). Solenoid enclosures shall be NEMA Type IV. Valve actuators shall be 120-volt AC. Seals shall be Teflon. Valves shall have a maximum operating pressure and a maximum differential pressure of 250 psi. Energize solenoid valves to open or close, as required. Valves shall be ASCO "Red Hat," or approved equal.
- M. Tapping Valves: Tapping valves shall conform with the requirements for gate valves 3-inches and larger. Valve ends shall be flanged, and the flange at one end shall have slotted boltholes to fit standard tapping machines. Seat rings shall be oversized to permit the use of full-size cutters. Tapping valves shall be Mueller, Kennedy, or approved equal.



- N. Tapping Sleeves: Tapping sleeves shall be full circumference band 18-8 type 304 stainless steel. The flanged outlet shall be AWWA C-207 Class D ANSI 150 lb. Drilling. Gaskets shall be Buna-N rubber with a wide cross-section. Bolts, nuts, and washers shall be type 316 stainless steel. Tapping sleeves shall be Smith Blair No. 623, Ford Style Fast or approved equal.
- O. Detector Check Valves: Detector check valves shall have flanged ends conforming to ANSI B16.1, Class 125. Pressure test valves to twice design working pressure. Valve casing shall be hot-dipped galvanized and body shall be tapped to accept by-pass meter piping. Materials of construction shall be as follows:

<u>Component</u>	<u>Material</u>	<u>Specification</u>
Body, bonnet	Cast iron	ASTM B126 Class B
Bonnet bolts	Stainless steel	ASTM A276 Type 304
Hinge pin (shaft)	Stainless steel	ASTM A276 Type 304 or 316
Clapper	Bronze	ASTM B62
Clapper seat ring	Bronze (tinned)	ASTM B62
Clapper seal	Rubber	
Weight	Lead	

The mainline valve shall automatically open, permitting unrestricted flow, when the pressure loss through the by-pass meter is approximately 1.5 psi. Valves shall confirm to Section 15112: Backflow Preventers.

- P. Reduced Pressure Backflow Device: These devices shall be as shown on the Drawings and as approved by the Los Angeles County Department of Health and Human Services-Environmental Health Bureau.
- Q. Pressure-Reducing Valve 3 Inches and Larger: Hydraulically operated, diaphragm actuated, pilot controlled globe valve, cast iron, ductile iron, or steel body, ANSI B16.1 flanged ends, rated 175 psi, bronze or stainless steel trim, stainless steel stem, externally mounted strainers with cocks, and maintain a constant downstream pressure regardless of fluctuations in flow or upstream pressure. FDA approved fusion bonded epoxy lining and

coating installed in accordance with AWWA C550. Size/Rating: PRV-12 inch, maximum of 4,000 gpm with inlet pressure of 90 psig. Outlet pressure set at 25 psig. Manufacturers and Products:

- 1) Cla-Val; 90-01 Series.
  - 2) Singer; Model 106PR.
  - 3) Or approved equal.
- R. Corporation Stops: Corporation stops shall be manufactured of bronze conforming to ASTM B62. The inlet fitting shall be a male iron pipe thread when used with a saddle and the outlet connection shall be a flare type unless otherwise specified.
- S. Globe Valves: Angle Pattern Valve 2 Inches and Smaller: All bronze, screwed ends, union bonnet, inside screw, rising stem, TFE disc, rated 150-pound SWP, 300-pound WOG. Valves shall be Stockham B-222T, or Crane 17TF, or approved equal.
- T. Gauge Cock: 1/4-inch bronze body, hexagon end pattern, tee head, male ends, rated 125-pound SWP. Valve shall be United Brass Works, Ford Meter Box Co., Mueller Co., or approved equal.

## 2.8 **BRONZE AND BRASS**

Bronze or brass valve components in contact with water shall comply with the following requirements:

<u>Constituent</u>	<u>Content</u>
Zinc	7% maximum
Aluminum	2% maximum
Lead	8% maximum
Copper + Nickel + Silicon	83% minimum

## **PART 3 - EXECUTION**

### **3.1 JOINTS**

- A. Flanged Joints: Boltholes of flanged valves shall straddle the horizontal and vertical centerlines of the pipe run to which the valves are attached. Clean flanges by wire brushing before installing flanged valves. Clean flange bolts and nuts by wire brushing; lubricate threads with oil and graphite, and tighten nuts uniformly and progressively. If flanges leak under pressure testing, loosen or remove nuts and bolts, reseal or replace the gasket; reinstall and re-tighten the bolts and nuts; and re-test the joint. Joints shall be watertight.

- B. Threaded Joints: Clean threaded joints by wire brushing or swabbing. Apply joint compound or tape to pipe threads before installing threaded valves. Joints shall be watertight.

### **3.2 VALVE INSTALLATION**

- A. Valves in Horizontal Piping: Unless otherwise indicated on the Drawings, install valves in horizontal runs of pipe having centerline elevations 4'-6", or less, above the floor, with their operating stems vertical. Install valves in horizontal runs of pipe having centerline elevations between 4'-6" and 6'-9" above the floor with their operating stems horizontal.
- B. Valves in Vertical Piping: Install valves on vertical runs of pipe that are next to walls with their stems horizontal, away from the wall. Install valves on vertical runs of pipe that are not located next to walls with their stems horizontal, oriented to facilitate valve operation.
- C. Buried Valves: Wrap buried valves with two layers of 8-mil polyethylene wrap per AWWA C105.
- D. Valve Supports: Anchor valves in concrete as shown on the City Standard Drawings or on the valve detail drawings. Concrete supports are not required for valves bolted to flanged pipe or fittings.
- E. Backfill: Backfill within 24-inches of valves shall be clean washed sand in accordance with the requirements of Section 02223: Trenching, Backfilling, and Compacting.

### **3.3 VALVE BOXES**

Firmly support valve boxes and keep them centered within 1/2" and plumb within 5° over the operating nut of the valve. Do not use beveled sections of pipe at the top of the valve extension pipe. The top cut shall be square and machine made. In new tracts, and where pavement has not been placed, the valve extension risers for "key valves" shall extend well above the ground level to permit ease of location in case of emergency shutoffs. The final valve box elevation shall be flush with the finished pavement surface, or at the level shown on the City Standard Drawings.

### **3.4 TAPPING SLEEVES**

Install tapping sleeves in accordance with the manufacturer's instructions. Thoroughly clean the pipe barrel with a wire brush to provide a smooth, hard surface for the sleeve. Support the sleeve independently of the pipe during the tapping operation. The sleeve shall be pressure-tested in the presence of the Engineer prior to tapping. Provide thrust blocks at the tapping sleeve.

### **3.5 VALVE LEAKAGE TESTING**

Test valves for leakage at the same time that the connecting pipelines are tested. See Section 15044: Pressure Testing of Piping, for pressure testing requirements.

## **PART 4 - PAYMENT**

Payment for the Work in this Section shall be included as part of the lump sum or unit price bid amount for which such Work is appurtenant thereto, and no additional payment will be made specifically for the Work in this Section.

**END OF SECTION**

## **SECTION 15108: AIR-RELEASE AND VACUUM-RELIEF VALVES**

### **PART 1 - GENERAL**

#### **1.1 DESCRIPTION**

This Section includes materials and installation of air and vacuum valves for water service.

#### **1.2 RELATED WORK SPECIFIED ELSEWHERE**

Refer to the following Specification Section(s) for additional requirements:

- A. Section 09900: Painting and Coating
- B. Section 15044: Pressure Testing of Piping
- C. Section 15000: General Piping Requirements
- D. Section 15100: Control and Check Valves

#### **1.3 SUBMITTALS**

- A. Submit shop drawings in accordance with Section 01300: Submittals.
- B. Submit manufacturer's catalog data and detail drawings showing all valve parts and describe by material of construction, specification (such as AISI, ASTM, SAE, or CDA), and grade or type. Show linings and coatings.

### **PART 2 - MATERIALS**

#### **2.1 VALVE DESIGN AND OPERATION**

- A. Valve design shall comply with AWWA C512, except as modified herein. Class 150 valves shall have a maximum working pressure of at least 150 psi.
- B. Air-release valves for water service 3/4 inch and smaller shall be of the direct-acting type or lever type.
- C. Air and vacuum valves for water service shall have a body with a flanged top containing the air-release orifice. The float shall rise with the water level in the valve body to close the orifice by sealing against a synthetic rubber seat.

Air and vacuum valves 3 inches and smaller shall have 1/2-inch threaded ports with bronze plugs in the top cover and near the bottom of the valve body. Air and vacuum valves larger than 3 inches shall have a 1-inch

threaded drain outlet with bronze plug near the bottom of the valve body and a 1-inch threaded port with bronze plug on the side of the valve body above the minimum water level in the valve which forces the float against the valve seat.

- D. Combination air valves 3 inches and smaller shall have a float with lever arm to actuate a poppet valve. A needle shall be attached to the float arm. The poppet valve shall serve to admit large quantities of air when the pipeline drains. The needle shall serve to release small quantities of air as the pipeline fills or as air accumulates in the pipeline.
- E. Air and vacuum valves for vertical turbine pump service (3 inches and smaller) shall have a float assembly. The discharge orifice shall have a double-acting throttling device to restrict air venting; it shall fully open to allow unrestricted air entry when the pump is shut down. Valve shall have a body with flanged top containing the air-release orifice. The float shall rise with the water level in the valve body to close the orifice by sealing against a synthetic rubber seat.

Valves 3 inches and smaller shall include the following features:

1. Water diffuser around the float to break up the incoming water column before contacting the float.
2. Double-acting throttling device, which restricts airflow when the pump is started and opens fully when the pump is stopped.

## 2.2 **MATERIALS OF CONSTRUCTION**

- A. Materials of construction for air release, air and vacuum, and combination air valves for water service shall be as follows:

Item	Material	Specification
Body and cover	Cast iron	ASTM A 48, Class 35; or ASTM A 126, Class B
	Stainless steel	AISI Type 316
Float, lever or linkage, air release mechanism, poppet, guide rod, guide bushings, fasteners, other internal metal parts	Stainless steel	AISI Type 316
Plugs	Bronze	
Seat, plunger, needle	Buna-N	--

B. Seating

Valves shall seat driptight at a pressure of 2 psi.

C. Valve End Connections

1. Valves 2 inches and smaller shall have threaded ends. Valves 3 inches and larger shall have flanged ends.
2. Flanges for Class 150 valves shall comply with ANSI B16.1, Class 125.
3. Threaded ends shall comply with ANSI B1.20.1.

D. Valves

1. Air-Release Valves,  $\frac{3}{4}$  Inch and Smaller:  
Valves shall have an operating pressure of 150 psi. Orifice sizes shall be:  $\frac{1}{8}$  or  $\frac{3}{32}$  inch for  $\frac{1}{2}$ -inch valves and  $\frac{1}{8}$  inch for  $\frac{3}{4}$ -inch valves. Valves shall be APSO 55 or 65; Val-Matic Model 22; Crispin M3, M5, or M8; or approved equal.
2. Combination Air Valves, 1 Inch Through 3 Inches:  
Valves shall have a maximum working pressure of 300 psi. Valves shall be APCO 143C, 145C, or 147C; Val-Matic Model 201C, 202C, or 203C; Crispin UL10, UL20, or UL30; or approved equal.
3. Air and Vacuum Valves for Vertical Turbine Pump Service, 3 Inches and Smaller:  
Valves shall be APCO Series 140 DAT, Val-Matic Series 100WST, Crispin Series DL-D/DBL, or approved equal.  
Valve shall incorporate an air-release valve.

## PART 3 – EXECUTION

### 3.1 LINING AND COATING

- A. Coat cast-iron valves located above ground or in vaults and structures the same as the adjacent piping. Apply the specified prime and intermediate coats at the place of manufacture. Apply finish coats in field. Finish coat shall match the color of the adjacent piping.
- B. Coat interior surfaces of cast-iron valves at the place of manufacture per Section 09900: Painting and Coating, System No. B-2. Do not coat seating areas and plastic, bronze, stainless steel, or other high alloy parts.
- C. Alternatively, line and coat cast-iron valves with fusion-bonded epoxy per Section 09900: Painting and Coating, System No. G-1. Do not coat seating areas and plastic, bronze, stainless-steel, or other high alloy parts.

### **3.2 INSTALLATION**

Clean threaded joints by wire brushing or swabbing. Apply Teflon joint compound or Teflon tape to pipe threads before installing threaded valves. Joints shall be watertight.

### **3.3 VALVE PRESSURE TESTING**

Test valves at the same time that the connecting pipelines are pressure tested. See Section 15044: Pressure Testing of Piping, for pressure testing requirements. Protect or isolate any parts of valves, operators, or control and instrumentation systems whose pressure rating is less than the test pressure.

## **PART 4 – PAYMENT**

Payment for the Work in this Section shall be included as part of the lump sum or unit price bid amount for which such Work is appurtenant thereto, and no additional payment will be made specifically for the Work in this Section.

**END OF SECTION**



## **SECTION 15110: DIAPHRAGM-ACTUATED CONTROL VALVES**

### **PART 1 - GENERAL**

#### **1.1 DESCRIPTION**

- A. This section includes materials and installation of diaphragm-actuated control valves (altitude valve, pressure reducing valve, pressure relief valve and surge anticipating valve, and deep well pump control valve).

#### **1.2 RELATED WORK SPECIFIED ELSEWHERE**

Refer to the following Specification Section(s) for additional requirements:

- A. Section 01300: Submittals
- B. Section 09900: Painting and Coating
- C. Section 15057: Copper Piping and Fittings
- D. Section 15100: Valves

#### **1.3 SUBMITTALS**

- A. Submit manufacturer's catalog data. Show dimensions for each size and type of valve provided.
- B. Provide listing of materials of construction, with ASTM reference and grade. Show valve lining and paint primer coating with coating manufacturer and coating system number or designation.
- C. Submit electrical drawings, showing wire and terminal connections, for valves that are electrically controlled.

### **PART 2 - PRODUCTS**

#### **2.1 VALVE DESIGN**

- A. Valves shall be hydraulically actuated diaphragm type. The body shall contain a removable seat insert. A resilient rubber disc shall form a drip-tight seal with the valve seat when pressure is applied above the diaphragm. The diaphragm assembly shall form a sealed chamber in the upper portion of the valve, separating operating pressure from line pressure.
- B. The pilot control system shall include a fixed or variable orifice, and all major components of this system, except solenoid pilots, shall be manufactured by the same company that manufactures the main valve. Elastomers shall be EPDM rubber material. The diaphragm shall not be used as a seating surface. The valve stem shall be center guided or top and bottom guided. For top and bottom stem guides, bearings in the valve cover and in the valve seat shall

be provided. For center guided valve stems, a bearing in the valve cover shall be provided. Stem sleeves or bearings shall have an anti-scale treatment or shall be Delrin. A valve position indicator shall be provided. Repairs and modification other than the replacement of the main valve body shall be possible without removing the main valve from the line.

## **2.2 MATERIALS OF CONSTRUCTION**

- A. Materials of construction for Class 125 valves larger than 1 inch in size shall be as follows:

Item	Material
Main valve body and cover	Ductile iron, ASTM A-536
Main valve trim and seat steel, ASTM A 276, or A 351	Type 303 stainless
Pilot control system With Type 303 stainless-steel trim	Cast bronze, ASTM B 62,
Piping and tubing (ASTM B 43)	Copper (ASTM B 75 and B 88) and brass
Bonnet Studs	Type 304 Stainless Steel
Bonnet Nuts & Body Plugs	Type 316 Stainless Steel

## **2.3 VALVE END CONNECTIONS**

- A. Valves 2-inches and smaller shall have threaded ends. Valves larger than 2-inches shall have flanged ends.
- B. Flanges for ductile iron valves shall be ductile iron, ASTM A-536 and shall meet B16.42.
- C. Threaded ends shall comply with ANSI B1.20.1.

## **2.4 INTERIOR VALVE LINING**

- A. Interior surfaces of the valve shall be coated in accordance with Section 09900: Painting and Coating, System No. G-1.

## **2.5 COATING**

- A. Coating of exterior surfaces shall be in accordance with Section 15100: Valves; General.

## 2.6 **VALVES**

- A. Class 150 Altitude Valve: Altitude valve shall control the high water level in the reservoir hydraulically. It shall be a non-throttling valve that remains fully open until the shut-off point is reached. The valve shall permit one-way flow only. The valve shall be hydraulically operated and pilot controlled.

The pilot control shall operate on the differential in forces between the spring load and the water level in the reservoir. The spring load in the pilot shall be adjustable in order to adjust to the desired high water level in the reservoir. The pilot control shall sense the reservoir head through a sensing line, provided and installed by the Contractor, connected to the downstream (reservoir) side of the valve.

The pilot control shall be furnished with isolation valves, opening speed control, closing speed control and y-strainer. The altitude control spring shall range from 5 to 40 feet.

The altitude valve shall be furnished anti-cavitation trim constructed of stainless steel. The valve shall contain the cavitation at low and full flow without carry over. Downstream orifice plates are not acceptable.

The altitude valve shall be furnished with a valve position indicator and limit switch assembly.

Valves shall be 150 lb pressure class and shall be provided with a Delrin Stem.

A direct factory representative shall be made available for start-up service, inspection and necessary adjustments.

The 10-inch valve shall be a Model No. 210G-09BCSYKCOX D/S 150 LB Flanged Altitude Valve One Way Flow with X105L2W as manufactured by CLA-VAL, Singer Valve or Approved Equal.

- B. Class 150 Pressure Reducing Valve: The pressure reducing valve shall consist of a globe valve with the appropriate pilot system.

The pilot control shall be a direct-acting, spring-loaded diaphragm valve, designed to permit flow when controlled pressure is less than the spring setting. The control system shall include a fixed orifice.

The pilot valve system shall have a direct-acting, adjustable, spring-loaded pilot, solenoid activated valve, designed to permit flow in the pilot valve system whenever the controlling pressure exceeds the spring setting. The pilot valve system shall also contain a strainer needle valve assembly that shall control the opening on the main valve.

The pilot control shall be furnished with isolation valves, opening speed control, closing speed control and y-strainer.

The pressure reducing valve shall be furnished with a valve position indicator and limit switch assembly.

Valves shall be 150 lb pressure class and shall be provided with a Delrin Stem.

A direct factory representative shall be made available for start-up service, inspection and necessary adjustments.

The 12-inch valve shall be a Model No. 93G-01BCSYKCX D/S 150 LB Pressure Reducing Valve with Solenoid with CRD Range 30-300 and with X105L2W as manufactured by CLA-VAL, Singer Valve or Approved Equal.

- C. Class 150 Pressure Relief and Surge Anticipator Valve: The pressure relief and surge anticipator valve shall consist of a globe valve with the appropriate pilot system.

The pilot valve system shall have a direct acting, adjustable, spring-loaded pilot, diaphragm actuated valve, designed to permit flow in the pilot valve system whenever the controlling pressure exceeds the spring setting. The pilot valve system shall also contain a strainer needle valve assembly that shall control that closing of the main valve.

The pilot control shall be furnished with isolation valves, opening speed control, closing speed control and y-strainer.

The pressure reducing valve shall be furnished with a valve position indicator and limit switch assembly.

Valves shall be 150 lb pressure class and shall be provided with a Delrin Stem.

A direct factory representative shall be made available for start-up service, inspection and necessary adjustments.

The 8-inch valve shall be a Model No. 52G-01BYKCX D/S 150 LB Flanged Pressure Relief and Surge Anticipator Valve with CRD Range 30-300 and CRA 30- 300 and with X105L2W as manufactured by CLA-VAL, Singer Valve or Approved Equal.

- D. Class 150 Deep Well Pump Control Valve: Deep well booster pump control valve shall be designed to protect pipelines from surges caused by the starting and stopping of deep well pumps. This is a hydraulically operated diaphragm valve which is controlled by a solenoid pilot valve. Separate

adjustable flow control valves in the pilot system regulate the opening and closing rates. A limit switch on the valve stem serves as an electrical interlock between the valve and the pump motor.

The operation of the valve is completely automatic and controlled by the solenoid valve. With the pump off, the valve is wide open. When the pump is started, the solenoid is energized and the valve begins to close slowly, discharging air and the initial rush of sand and water from the pump column to atmosphere. As the valve closes the pump output is gradually diverted into the main line preventing the development of a starting surge.

When it is time to shut off the pump the solenoid is de-energized. The pump continues to run while the pump control valve opens slowly diverting pump output to atmosphere. As pump pressure gradually decreases the main line check valve closes slowly, preventing shock or slam during the pump stopping cycle. When the pump control valve is wide open the limit switch assembly releases the pump starter and the pump stops.

The solenoid shall be designed to operate on either AC or DC current and have a manual operator installed. Check construction plans for electrical requirements for the solenoid. Pilot system includes: four-way solenoid pilot valve, opening and closing speed controls, shut off valves, strainers and micro switch assembly. Valves shall utilize downstream line pressure for operation. An adjustable limit switch assembly shall be mounted on the main valve, connected to the main valve stem. It shall be actuated by opening or closing of the valve and easily adjusted to operate at any point of the valve's travel. The limit switch will be used to complete the pump off cycle. The actuating point of the limit switch shall be adjustable. The limit switch assembly shall be double pole double throw switch X105LOW as manufactured by Cla-Val Co or approved equal. The valve shall be fusion boned epoxy lined and coated.

A direct factory representative shall be made available for start-up service, inspection and necessary adjustments.

The valve shall be a Cla-Val Co. Model No. 61G-02 KC D/S 150 LB Flanged Deep Well Pump Control Valve with CSM11-A2-2, four-way solenoid, energized to open as manufactured by Cla-Val Company or approved equal.

- E. Orifice Plate: The orifice plate shall be a minimum of 3/8-inch thick fabricated from stainless steel per ASTM A 240, Type 316. Edges shall be square and sharp, free from either burrs or rounding. Orifice plates shall be mounted between flanges as shown on the construction plans. The design criteria for the orifice plate is specified on the construction plans. The bore opening shown on the plans is preliminary and for information purposes only. The manufacturer of the orifice plate shall confirm the size of the opening for the application taking into consideration the characteristics of the orifice plate

being provided.

## **PART 3 - EXECUTION**

### **3.1 VALVE INSTALLATION**

- A. Boltholes of flanged valves shall straddle the horizontal and vertical centerlines of the pipe run to which the valves are attached. Flanges shall be cleaned by wire brushing before installing flanged valves. Flange bolts and nuts shall be cleaned by wire brushing, threads lubricated with oil and graphite, and nuts tightened uniformly and progressively. If flanges leak under pressure testing, the nuts and bolts shall be loosened or removed, the gasket reseated or replaced, bolts and nuts reinstalled or retightened and the joints retested. Joints shall be watertight.
- B. Threaded joints shall be cleaned by wire brushing or swabbing. Teflon joint compound or Teflon tape shall be applied to pipe threads before installing threaded valves. Joints shall be watertight.

### **3.2 VALVE PRESSURE TESTING**

- A. Valves shall be tested at the same time that the connecting pipelines are pressure tested.

## **PART 4 - PAYMENT**

Payment for the Work in this Section shall be included as part of the lump sum or unit price bid amount for which such Work is appurtenant thereto, and no additional payment will be made specifically for the Work in this Section.

**END OF SECTION**

## **SECTION 15112: BACKFLOW PREVENTERS**

### **PART 1 - GENERAL**

#### **1.1. SECTION INCLUDES**

- A. Backflow prevention assemblies

#### **1.2. RELATED REQUIREMENTS**

Refer to the following Specification Section(s) for additional requirements:

- A. Section 15056: Ductile-Iron Pipe and Fittings
- B. Section 15057: Copper, Brass and Bronze Pipe Fittings and Appurtenances
- C. Section 15100: Control and Check Valves
- D. Section 15150: Meters

#### **1.3. REFERENCED STANDARDS**

- A. Foundation for Cross-Connection Control and Hydraulic Research, University of Southern California, School of Engineering
  - 1. "Manual of Cross-Connection Control"
- B. American Water Works Association (AWWA)
  - 1. AWWA C510: Double Check Valve Backflow Prevention Assembly
  - 2. AWWA C511: Reduced-Pressure Principle Backflow Prevention Assembly

#### **1.4. SUBMITTALS**

- A. Product Data Sheet and Drawings.
- B. Certification of approved device per the California State Water Resources Control Board.
- C. Field testing certificate.

### **PART 2 - MATERIALS**

#### **2.1. BACKFLOW PREVENTION ASSEMBLY**

- A. All backflow prevention assemblies shall conform to the latest edition of AWWA C510 or C511.

- B. Backflow prevention assemblies shall be on the latest approved list of backflow prevention devices from the U.S.C./F.C.C.C. & H.R. Institute and comply with the California State Water Resources Control Board.

## **2.2. SHUT-OFF VALVES**

- A. The shut-off valves for assemblies 3-inch and larger shall be resilient seat gate valves. Ball valves shall be used on assemblies smaller than 3-inch. Shut-off valves shall conform to Section 15100: Control and Check Valves.
- B. Shut-off valves shall have outside stems and yokes.

## **2.3. BYPASS PIPING**

- A. Bypass piping shall be copper or brass conforming to Section 15057: Copper, Brass and Bronze Pipe Fittings and Appurtenances.

## **2.4. FIRE SERVICE BYPASS METER**

- A. The bypass meter shall conform to the requirements of Section 15150: Meters and shall be compatible with the backflow device on which it is installed. The backflow prevention assembly and the bypass meter shall be furnished as one complete unit. All bypass meters shall be 3/4-inch, with registers reading in cubic feet.

# **PART 3 - EXECUTION**

## **3.1 INSTALLATION**

- A. Installation shall comply with the requirements of the latest edition of the Manual of Cross- Connection Control.

## **3.2 TESTING**

- A. Upon completion of the installation of the device, a test shall be performed and a certificate of the adequacy and operational compliance shall be furnished to the District. The tests shall be performed by a testing agency approved by the Orange County Health Department.

# **PART 4 - PAYMENT**

Payment for the Work in this Section shall be included as part of the lump sum or unit price bid amount for which such Work is appurtenant thereto, and no additional payment will be made specifically for the Work in this Section.

**END OF SECTION**



## **SECTION 15119: ELECTRIC MOTOR ACTUATORS**

### **PART 1 - GENERAL**

#### **1.1 DESCRIPTION**

This section includes materials and installation of electric motor actuators in accordance with AWWA C540, except as modified below.

#### **1.2 RELATED WORK SPECIFIED ELSEWHERE**

Refer to the following Specification Section(s) for additional requirements:

- A. Section 09900: Painting and Coating
- B. Section 15100: Control and Check Valves

#### **1.3 SUBMITTALS**

- A. Submit shop drawings in accordance with Section 01300: Submittals.
- B. Submit manufacturer's catalog data showing motor actuator parts and materials of construction, referenced by AISI, ASTM, SAE, or CDA specification and grade. Show motor actuator dimensions and weights. Show coatings.
- C. Show the maximum torque required to open and close each motor actuated valve.
- D. Submit certified factory performance test records.
- E. Submit motor data including nameplate data, insulation type, duty rating, and torque output at duty rating.
- F. Submit electrical schematic drawings and physical wiring diagrams showing all components.

### **PART 2 - MATERIALS**

#### **2.1 MANUFACTURERS**

Electric motor actuators shall be Limitorque Model SMB or L120, Rotork "Syncopak" or "IQ", AUMA Series SA, or equal.

## **2.2 ACTUATOR IDENTIFICATION**

Motor actuators shall have the name of the manufacturer cast or molded onto the actuator body or shown on a permanently attached plate in raised letters.

## **2.3 MOTORS FOR ELECTRIC ACTUATORS**

- A. Motors shall be totally enclosed, nonventilated, 480 volts, 3 phase and specifically designed for high torque, low inertia duty. Motors for open/close actuators shall also be specifically designed, rated for 15-minute duty operation and Class 1 throttling/modulating service (60 starts/hour) per AWWA C540. Motors for modulating service shall be continuous duty and Class 3 throttling/modulating service (600 starts/hour) per AWWA C540.
- B. Output capacity shall be sufficient to open or close the valve against the maximum differential pressure when the voltage is 10% above or below normal at the specified service conditions. Motors shall have Class F or H insulation system. Provide motor with torque output (at duty rating) that exceeds the requirements of paragraph 2.5 below including safety factor.

## **2.4 ACTUATOR TORQUE REQUIREMENTS**

- A. The rated output torque of the motor actuator shall be at least 1.5 times the maximum torque required to open or close the valve at any position including seating and unseating conditions when subjected to the most severe operating condition including any mechanical friction and/or other restrictive conditions that are inherent in the valve assembly. Do not include hammer-blow effect in sizing the actuator to comply with this torque requirement. Coordinate with the valve manufacturer to assure that the motor actuator stall torque output does not exceed the torque limits of the valve operating stem or shaft.
- B. Maximum torque shall include seating or unseating torque, bearing torque, dynamic torque, and hydrostatic torque. Assume that the differential pressure across the valve is equal to the pressure or head rating of the valve.
- C. Assume a maximum pipeline fluid velocity of 16 feet per second with the valve fully open, unless a higher velocity is specified in the detailed valve specification.

## 2.5 **DESIGN OF ELECTRIC MOTOR ACTUATORS**

Design the actuator to move valves from fully closed to fully open in 60 seconds. Design actuators for the injection ball valve for modulating service; design the others for open/close operation.

- A. Each electric actuator shall contain a reversing starter, three overloads (one in each ungrounded leg) or two motor thermal cutouts, 480/120-volt control power transformer, local-off-remote selector switch with auxiliary contact for remote position, stop-open-close push buttons, and open and closed indicator lights. Provide magnetic starters in actuators for open/close operation and solid-state starters in actuators for modulating operation. The control housings shall be NEMA 4 construction with threaded hubs for conduit entry.
- B. Do not use external conduit for wiring any components within the actuator.
- C. Design actuator housings, supports, and connections to the valve with a minimum safety factor of five based on the ultimate strength or three based on the yield strength of the material used.
- D. Gear actuators shall be totally enclosed and factory-grease packed or oil lubricated. The power gearing shall consist of helical gears of heat-treated steel. Worm gears shall be alloy bronze accurately cut with a hobbing machine. Worm shall be hardened steel alloy. Design gears for 24-hour continuous service with an AGMA rating of 1.50.
- E. Position switches shall be integrally geared to the actuator and shall be adjustable and capable of actuation at any point between fully opened and fully closed positions. The position switches shall operate while the actuator is either in manual or in motor operation. Provide motor actuators with position switches capable of being separately used to provide remote indication of end of travel in each direction and to stop motion at the end of travel in each direction.
- F. Each control shall have two individually adjustable torque switches to protect the valve and motor against overload in the opening and closing directions. To prevent hammering, the torque switch shall not reclose until the valve is made to travel in the opposite direction.
- G. The actuators shall have a manually operated handwheel which shall not rotate during electrical operation. In the event electrical power is interrupted, handwheel operation shall be activated by a hand lever attached to the mechanism. While the valve is being operated manually, the motor shall not rotate. Upon restoration of electrical power, the handwheel shall

automatically disengage. Design the handwheel diameter such that hand operation will not damage the valve.

- H. The position switch and torque switch contacts shall be capable of interrupting at least 0.2-ampere inductive load at 125-volt d-c or 6-ampere inductive load at 120-volt a-c.
- I. Provide a lost motion device for open/close operation in each actuator to permit the motor to reach full speed before the load is applied. Provide lost motion action for manual operation also. Do not provide lost motion device for modulating applications.
- J. Provide minimum 10-watt space heater mounted in the actuator housing to prevent condensation and maintain the temperature in the actuator housing 5 degrees above the ambient temperature in the structure. Heater shall be on at all times.
- K. For open/close service: Actuator shall be controlled in the remote mode of operation using remote dry contacts.
- L. For modulating service: Controls shall also include feedback potentiometer and integral electronic positioner/comparator circuit to maintain valve position; 4- to 20-mA d-c input signal to control valve in remote position; valve position transmitter that generates 4- to 20-mA d-c signal proportional to valve position and is capable of driving into loads up to 1,000 ohms at 24-volt d-c.
- M. Motor shall de-energize in the event of a stall when attempting to unseat a jammed valve.
- N. Provide a time delay to prevent instant reversal of the actuator motor.
- O. Provide terminal connections for external remote controls fed from an internal 24-volt or 120-volt supply.

## **2.6 FACTORY TESTING OF MOTOR ACTUATOR**

Test each actuator prior to shipment in accordance with AWWA C540. The application torque shall be the maximum torque required to open or close the valve at any position including seating and unseating conditions.

## **PART 3 - EXECUTION**

### **3.1 ATTACHING ELECTRIC ACTUATORS**

The valve manufacturer shall mount the electric motor actuator and accessories on each valve and stroke the valve prior to shipment. Adjust limit switch positions and torque switches.

### **3.2 PAINTING AND COATING**

Coat electric motor actuator the same as the valve to which it is attached. Apply the specified prime and intermediate coats at the place of manufacture. Apply finish coats in field. Color of finish coat shall match the color of the valve to which the actuator is attached.

### **3.3 FIELD INSTALLATION**

Install the valve and actuator as indicated in the drawings in accordance with the manufacturer's instructions. Keep units dry, closed, and sealed to prevent internal moisture damage during construction. Provide additional hangers and supports for actuators which are not mounted vertically over the valve or which may impose an eccentric load on the piping system.

### **3.4 FIELD TESTING OF MOTOR ACTUATORS**

- A. Test motor actuators as installed by measuring the current drawn (in amperes) by each motor for unseating, seating, and running conditions. The measured current shall not exceed the current measurement recorded during the factory performance test.
- B. If the measured current drawn exceeds the above value, provide a larger motor or gear drive or adjust the actuator so that the measured amperage does not exceed the above value.
- C. Assure that limit switches are placed at their correct settings. Open and close valves twice and assure that limit switches function.

## **PART 4 – PAYMENT**

Payment for the Work in this section shall be included as part of the lump sum or unit price bid amount for which such Work is appurtenant thereto, and no additional payment will be made specifically for the Work in this Section.

**END OF SECTION**

## **SECTION 15120: SERVICE LATERAL REPLACEMENTS**

### **PART 1 - GENERAL**

#### **1.1 DESCRIPTION**

This Section describes the requirements for replacing existing water service connections and/or installation of new water service connections.

#### **1.2 RELATED WORK SPECIFIED ELSEWHERE**

Refer to the following Specification Sections for additional requirements:

- A. Section 01300: Submittals
- B. Section 02223: Trenching, Backfilling, and Compacting
- C. Section 15000: Piping Schedule and General Piping Requirements
- D. Section 15041: Chlorination of Water Mains for Disinfection
- E. Section 15044: Pressure Testing of Piping
- F. Section 15051: Installation of Pressure Pipelines
- G. Section 15057: Copper Pipe and Fittings
- H. Section 15100: Control and Check Valves

#### **1.3 SUBMITTALS**

Furnish submittals in accordance with the requirements of Section 01300: Submittals. The following submittals are required:

- A. List of materials for use in the service lateral replacements for approval by the City prior to ordering materials.
- B. Manufacturer's cut sheets and specifications.

### **PART 2 - MATERIALS**

#### **2.1 GENERAL**

Replace the existing laterals with 3/4", 1", 1-1/2", and 2" copper service laterals as described in this Section. Each service lateral shall consist of the materials listed on the City Standard Drawings. The services to be replaced are identified on the Drawings.

## **PART 3 - EXECUTION**

### **3.1 GENERAL**

- A. Replace all existing plastic, cast iron and galvanized service laterals with copper services where indicated. On plastic services, replace the service saddle and corporation stop. In alleys, where the service lines are short and where bulk heads are used for multiple services, install a new tap into the main and cut and cap the existing tap in-place.

Plastic pipe space may be used to install copper pipe by bursting plastic and pulling copper tubing through space.

Where one water main tap serves two or more customers, provide new taps for each customer, and cut and cap the existing tap.

- B. Maintain all services during construction.
- C. Excavations made for tapping the main shall completely expose the main for the tap. Shut-off and disconnect the existing service lateral and remove the existing curb valve. New service laterals shall terminate at and be connected to the existing water meters. New, one-inch taps shall be made at 60 degrees below the top of the pipe and may be made either when the main is shut down or when the main is in service. Flush taps made when the main is in service while tapping to dispose of cuttings.
- D. Installation of service laterals shall be as shown on the City Standard Drawings. The materials to be used by the Contractor in these installations shall be approved by the Owner before the purchase of such materials.
- E. Excavation, backfilling, and resurfacing shall be in accordance with these Specifications.
- F. The Work for each service lateral shall be in accordance with these Specifications and include, but not be limited to, the following:
  - 1. Pavement removal.
  - 2. Excavation.
  - 3. Installation of the service lateral.
  - 4. Disconnection of the existing service lateral and removal of the existing curb valve.

5. Excavation of a "pothole" above the gas main at the location the new lateral is to cross the gas main, oil line, or gasoline line.
6. Boring or pushing of the service lateral and connection of the service lateral to the water meter.
7. Backfilling and permanent resurfacing.

### **3.2 DISINFECTION**

Disinfect the service laterals in accordance with Section 15041: Chlorination of Water Mains for Disinfection. Prior to disinfection, thoroughly flush each service lateral to clear the pipe of dirt, debris, or foreign objects.

### **PART 4 - PAYMENT**

All Work associated with the installation of replacement service laterals shall be included in the unit price bid for installation of copper service laterals.

**END OF SECTION**



## **SECTION 15139: FIRE HYDRANTS**

### **PART 1 - GENERAL**

#### **1.1 DESCRIPTION**

This section includes materials, installation, and testing of California wet-barrel type fire hydrants.

#### **1.2 RELATED WORK SPECIFIED ELSEWHERE**

Refer to the following Specification Section(s) for additional requirements:

- A. Section 01300: Submittals
- B. Section 02223: Trenching, Backfilling, and Compacting
- C. Section 09900: Painting and Coating
- D. Section 15044: Pressure Testing of Piping
- E. Section 15056: Ductile Iron Pipe and Fittings
- F. Section 15100: Control and Check Valves

#### **1.3 SUBMITTALS**

Submit shop drawings in accordance with Section 01300: Submittals.

### **PART 2 - MATERIALS**

#### **2.1 HYDRANT TOP SECTION**

- A. General: Fire hydrants shall be of the California wet barrel type, with individual valves for each outlet, and shall conform with the requirements of AWWA C503.
- B. Outlets: Hydrants for residential shall have one 2½-inch outlet and one 4-inch outlet. Hydrants for industrial or commercial shall have one 2½-inch inch outlet and two 4-inch outlets. All outlets shall have National Standard Hose Threads.
- C. Materials of Construction: The hydrant top section shall be manufactured of bronze conforming to ASTM B 62. All interior working parts, including stems, shall be of bronze containing no more than 7% zinc or 2% aluminum.

- D. Operating Nuts: Supply hydrants with 1½-inch sized pentagon-shaped operating nut, and 1½-inch capnuts.
- E. Outlet Caps: Provide plastic outlet nozzle caps for all outlets. Securely chain caps to the barrel with non-kinking metal chain in a manner to permit free rotation of the cap.
- F. Flanges: Drill hydrant flanges with a 6-hole pattern. Drill the flange with ¾-inch diameter holes located on a 9-3/8-inch bolt circle.
- G. Manufacturer Identification: All fire hydrants shall have the name of the manufacturer cast or welded onto the fire hydrant body or shown on a permanently attached plate.

## **2.2 BURY SECTION**

- A. Materials: The bury section shall be ductile iron and shall be cement lined in conformance with Section 15056, Ductile Iron Pipe and Fittings.
- B. Inlet Connection: Inlet size shall be a 6-inch ring-groove connection for asbestos cement pipe, unless otherwise specified on the Plans.
- C. Bury Depth: Bury depth will normally be 48-inches for distribution mains and 54-inches for transmission mains, but different depth buries on fire hydrant buries may be required to fit abnormal pipe depths depending upon field conditions.
- D. Flanges: Drill hydrant flanges with ¾-inch diameter holes in a 6-hole pattern with a 9-3/8-inch bolt circle.
- E. Approved Manufacturers: Bury and extension sections shall be as manufactured by Clow, Tyler, South Bay Foundry or approved equal.

## **2.3 BREAK-AWAY BOLTS**

Use cadmium plated break-away bolts to join the bury section to the hydrant top section.

## **2.4 SHUT-OFF VALVE**

The shut-off valve shall be a gate or resilient-seated gate valve per Section 15100: Control and Check Valves.

## **2.5 GASKETS**

Gaskets shall be full face, and of rubber composition, 1/8-inch thick.

## **2.6 MANUFACTURERS**

- A. Residential Use: For residential applications, fire hydrants shall be James Jones, Clow or approved equal.
- B. Commercial and Industrial Use: For commercial and industrial applications, fire hydrants shall be James Jones, Clow or approved equal. Unless otherwise approved by the City, breakaway check valve is required for commercial and industrial use.

# **PART 3 - EXECUTION**

## **3.1 GENERAL**

Install fire hydrant assemblies in accordance with the City Standard Drawings, detail drawings, and as specified herein, and include the connection to the main, the fire hydrant, hydrant bury, shutoff valve, valve well and valve box, connection piping, concrete thrust blocks, and appurtenances.

## **3.2 LOCATION**

Locate fire hydrant assemblies as shown on the City Standard Drawing and on Contract drawings, or as approved by the Owner. Spools less than 6-inches in length are not permitted when correcting the flange elevation.

## **3.3 VALVE AND VALVE BOX**

Install the valve and valve box in accordance with Section 15100: Control and Check Valves.

## **3.4 BREAK-AWAY BOLTS**

Install break-away bolts with the threads toward the top of the hydrant. Pack bolts with silicon sealant or heavy grease.

## **3.5 CONCRETE**

The concrete pad and thrust blocks shall be Class C concrete placed per Section 03000: General Concrete Construction.

### **3.6 PAINING**

Paint all above ground portions of the fire hydrant and bury with one prime coat and two finish coats of yellow paint in the field, after the fire hydrant has been installed, in accordance with Section 09900: Painting and Coating. Apply the second finish coat just prior to the final inspection.

### **3.7 TESTING**

Test hydrants at the same time that the connecting pipeline is pressure tested. See Section 15044: Pressure Testing of Piping, for pressure testing requirements.

## **PART 4 - PAYMENT**

Payment for the Work in this Section shall be included as part of the lump sum or unit price bid for which such Work is appurtenant thereto, and no additional payment will be made specifically for Work in this Section.

**END OF SECTION**

## **SECTION 15142: WALL PIPES, SEEP RINGS, AND PENETRATIONS**

### **PART 1 – GENERAL**

#### **1.1 DESCRIPTION**

- A. This section includes materials, installation, and testing of steel and cast-iron wall pipes and sleeves (including wall collars and seepage rings), and penetrations.

#### **1.2 SUBMITTALS**

- A. Submit detail drawings for fabricated steel or cast-iron wall and floor pipes and sleeves, wall flanges, seep rings, and sealing materials. Show dimensions and wall thickness.
- B. Show flange sizes and the appropriate ANSI or AWWA flange dimensional standard where flanged end wall pipes or penetrations are used.
- C. Show grooved-end dimensions and AWWA grooved-end dimensional standard where grooved-end wall pipes or penetrations are used.
- D. List coating systems to be applied, manufacturer, and dry thickness of coatings. Call out coatings where coatings are to be applied.
- E. List materials of construction, with ASTM material reference and grade.
- F. Submit manufacturer's instructions for installing rubber annular hydrostatic sealing devices.
- G. Submit six copies of the results of the leakage test for cast-iron sleeves having shrink-fit steel collars or collar halves bottomed in a groove and steel sleeves having welded steel collars.

### **PART 2 – PRODUCTS**

#### **2.1 FABRICATED STEEL WALL FLANGES, ANCHORS AND SLEEVES**

- A. Provide fabricated steel wall pipes with ends as shown on the drawings for connection to adjacent steel pipes, or for containing pipes, where they pass through concrete walls. Provide seepage ring or wall flange on wall pipes and sleeves passing through concrete walls and slabs which are to be watertight. Wall thickness shall be the same as the pipe wall thickness when connecting

to steel pipe. Wall thickness for sleeves containing pipes shall be standard weight per ANSI B36.10.

- B. Wall flanges shall be in the form of a steel wall collar welded to the steel sleeve or penetration. Cut welded wall collars from a steel ring of the size indicated on the drawings. Attach the collar to a steel wall pipe or sleeve with full circle fillet welds. Welding procedures shall be in accordance with ANSI B31.3, Chapter V.
- C. Steel pipe used in fabricating wall sleeves containing pipes shall comply with ASTM A 53 (Type E or S), Grade B; ASTM A 135, Grade B; ASTM A 139, Grade B; or API 5L or 5LX. Wall sleeves connecting to steel pipe shall be of the same material as the connecting pipe. Wall collar material shall comply with ASTM A 105, A 181, or A 182.
- D. Pressure test at least one of each size of fabricated steel wall sleeve or penetration and collar assemblies at the place of fabrication to demonstrate watertightness of the seal between the collar and the sleeve. The test shall be at a pressure of 20 psig for four hours' duration and shall show zero water leakage.

## **2.2 RUBBER ANNULAR HYDROSTATIC SEALING DEVICES**

- A. Rubber annular hydrostatic sealing devices shall be of the modular mechanical type, utilizing interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe sleeve and the passing pipe. Assemble links to form a continuous rubber belt around the pipe, with a pressure plate under each bolthead and nut.
- B. Materials of construction shall be as follows:

<u>Compound</u>	<u>Material</u>
Pressure plate	Carbon steel
Bolts and nuts for links	Type 303 or 316 stainless steel
Sealing element	EPDM rubber

- C. The size of the wall sleeve needed to accommodate the passing pipe shall be as recommended by the rubber annular seal manufacturer.

## **2.3 POLYETHYLENE FOAM FILLER FOR PIPE PENETRATIONS**

- A. Packing foam shall be an extruded closed-cell polyethylene foam rod, such

as Minicel baker rod, manufactured by Industrial Systems Department, Plastic Products Group of Hercules, Inc., Middletown, Delaware; Ethaform, as manufactured by Dow Chemical Company, Midland, Michigan; or equal. The rod shall be 1/2 inch larger in diameter than the annular space.

## **PART 3 – EXECUTION**

### **3.1 LOCATION OF PIPES AND SLEEVES**

- A. Provide a wall or floor pipe where shown on the drawings.
- B. Provide a floor sleeve where shown on the drawings and wherever plastic pipe, carbon steel or stainless steel pipe 3 inches and smaller or copper tubing passes through a floor or slab. Provide a rubber annular sealing device in the annular space between the sleeve and the passing pipe or tubing.
- C. Provide wall sleeves where shown on the drawings and wherever plastic pipe, steel or stainless-steel pipe 3 inches and smaller, or stainless-steel or copper tubing passes through a wall. Provide a single rubber annular seal when the wall is 8 inches thick or less. Provide two rubber annular seals (one at each end of the sleeve) when the wall is more than 8 inches thick. Pack the annular space with polyethylene foam filler and fill the ends of the penetration with 2 inches of elastomeric sealant on both sides of the structure.
- D. Where sleeves are installed in which water or soil is on one or both sides of the channel or wall, provide two rubber annular seals (one at each end of the sleeve).
- E. Where pipes pass through walls or slabs and no sleeves or wall or floor pipe with seep ring is provided, pack the annular space with polyethylene foam filler and fill the ends of the penetration with 2 inches of elastomeric sealant on both sides of the structure.

### **3.2 INSTALLATION IN EXISTING CONCRETE WALLS AND SLABS**

- A. Core drill holes 2 inches larger in diameter than the diameter of the wall flange or collar. Install wall pipe and collar assembly axially aligned with the piping to which it will be connected or will contain. Pack the void space between the sleeve and concrete with grout. See Section 03600 for grouting specification.

### **3.3 INSTALLATION IN NEW CONCRETE WALLS AND SLABS**

- A. Install wall pipes in walls before placing concrete. Do not allow any portion

of the sleeve to touch any of the reinforcing steel. Install wall sleeve and collar assembly axially aligned with the piping to which it will be attached or will contain.

### **3.4 INSTALLATION OF WALL PIPES HAVING FLANGED END CONNECTIONS**

- A. Check alignment before grouting in place or pouring concrete. Realign if the sleeve is not properly aligned. Install flanged end wall sleeves or penetrations with bolt holes of the end flanges straddling the horizontal and vertical centerlines of the sleeve. Lubricate flange bolts with oil and graphite prior to installation.

### **3.5 QUALIFICATIONS OF WELDERS**

- A. Welder qualifications shall be in accordance with AWS B3.0.

### **3.6 INSTALLATION OF RUBBER ANNULAR HYDROSTATIC SEALING DEVICES**

- A. Install in accordance with the manufacturer's instructions.

### **3.7 FIELD TESTING**

- A. Check each wall penetration for leakage at the time the hydraulic structure is tested for leakage. Penetrations shall show zero leakage.

## **PART 4 - PAYMENT**

All Work associated with the installation of replacement service laterals shall be included in the unit price bid for installation of copper service laterals.

**END OF SECTION**



## **SECTION 15150: METERS**

### **PART 1 - GENERAL**

#### **3.1. DESCRIPTION**

This section describes the purchase, materials, installation and testing of meter assemblies.

#### **3.2. RELATED WORK SPECIFIED ELSEWHERE**

Refer to the following Specification Sections for additional requirements:

- A. Section 02223: Painting and Coating
- B. Section 15076: Cement-Mortar Lined and Coated Steel Pipe
- C. Section 15100: Control and Check Valves

#### **3.3. APPROVED MANUFACTURERS**

Size	Brand	Make
3/4"	Badger	Model 35
1"	Badger	Model 70
1.5"	Badger	Model M120
2"	Badger	Model M170

### **PART 2 - MATERIALS**

#### **3.1. GENERAL**

- A. All meters shall be new and of current manufacture design.

#### **3.2. RADIO STANDARD**

- A. ITRON ERW-1300-403 100W+, Encoder with Integral Connector and Integral Connectors for Leak Sensor & Antenna. Integral connector shall be protected with metal shield.

- B. All meters must be equipped with an "Itron 100W+ Inline Connector" to plug in to endpoints in order to be read by Automatic Meter Read (AMR) system. Contractor installs the meter, and attaches meter connector and the End Point Transmitter in the existing meter box.

### **3.3. METER STANDARD**

- A. All meters and appurtenances must comply with the California "No Lead" plumbing law. <http://www.noleadbrass.com/educate.html>.
- B. Each meter must have Itron 100W+ cable connect ports.
- C. For the residential meters, they must read 6 digits, (9999.99). One Billing Unit is for every 100 cubic feet, however, the Itron 100W+ cable connect port must be set up to record up to each cubic foot of water consumed.
- D. For the commercial meters, they must read 8 digits, (999999.99). One Billing Unit is for every 100 cubic feet, but the Itron 100W+ cable connect port must be set up to record up to each cubic foot of water consumed.

## **PART 3 - EXECUTION**

### **3.1. METER INSTALLATIONS**

- A. Meter shall be installed per construction plans and these specifications, and in accordance with the manufacturer's written instructions and approved submittals.

## **PART 4 - PAYMENT**

The unit price for installation of pipe includes full compensation for furnishing the labor, materials, tools and equipment and doing all work involved to complete the pipeline.

**END OF SECTION**

## **SECTION 15151: WATER FACILITIES IDENTIFICATION**

### **PART 1 - GENERAL**

#### **1.1 DESCRIPTION**

This Section describes materials and installation of potable and reclaimed water facilities identification for pipe, valves, valve boxes, and other pipeline appurtenances.

#### **1.2 RELATED WORK SPECIFIED ELSEWHERE**

- A. Submittals: Section 01300
- B. Painting and Coating: Section 09900
- C. General Piping Requirements: Section 15000
- D. Control and Check Valves: Section 15100

#### **1.3 SUBMITTALS**

Furnish submittals in accordance with the requirements of Section 01300: Submittals. The following submittals are required:

- A. Submit material samples of warning tape.
- B. Submit drawings showing location and size of warning labels and signs.

### **PART 2 - PRODUCTS**

#### **2.1 BURIED PIPING WARNING AND LOCATOR TAPE**

Plastic warning tape shall be an inert plastic film specifically formulated for prolonged underground use. The minimum thickness shall be 4 mils and the overall width of the tape shall be 12 inches (for 8-inch diameter pipe and larger) or 6 inches (for 6-inch diameter and smaller pipe). Install locator tape over non-metallic pipe. It shall be similar to warning tape, and include a metallic substance that can be registered by a magnetic field location device. Locator tape shall be 3 inches wide and 4 mils thick, minimum. Warning tape and locator tape shall be as supplied by Griffolyn Co., Inc., Terra Tape, Division of Reef Industries, or approved equal.

- A. Potable Water Pipelines: Blue warning and locator tape with white lettering identifying the potable waterline may be used as an alternate to blue or stenciled pipe. Lettering shall be a minimum of 2 inches high with the wording: "CAUTION: WATERLINE BURIED BELOW".
- B. Reclaimed Water Pipelines: Purple warning and locator tape with black lettering identifying the reclaimed waterline may be used as an alternate to purple or stenciled pipe. Lettering shall be a minimum of 2-inch letters with the wording: "CAUTION: RECLAIMED WATER - DO NOT DRINK" for warning tape and: "CAUTION: RECLAIMED WATER LINE BURIED BELOW - DO NOT DRINK" for locator tape.

## **2.2 STENCILED PIPE - UNDERGROUND USE**

Pipe may be stenciled or colored for identification as an alternate to warning tape. Unless noted otherwise, letters shall be a minimum of 2 inches high and identification shall be stenciled on both sides of pipe at a maximum of 5-foot intervals.

- A. Potable Water Pipelines: Lettering shall be of a color that contrasts with the background color of the pipe, and shall be marked: "POTABLE WATER". For PVC piping, pipe shall either be blue, or shall be white with blue stenciling and the marking "POTABLE WATER" in 5/8-inch letters repeated at 1-foot intervals.
- B. Reclaimed Water Pipelines: Lettering shall be purple and worded: "CAUTION: RECLAIMED WATER - DO NOT DRINK" in 5/8-inch letters repeated at 1-foot intervals. Pipe color shall contrast with lettering. For PVC pipe see below.

## **2.3 PURPLE PVC PIPE FOR RECLAIMED WATER PIPELINES**

PVC pipe shall be purple, and shall be marked on both sides of the pipe with the wording: "CAUTION: RECLAIMED WATER - DO NOT DRINK." Lettering shall be a minimum of 1/2-inch high black letters, and shall be repeated every 12 inches. The purple pipe color shall be achieved by adding pigment to the PVC material as the pipe is being manufactured.

## **2.4 WARNING LABELS AND TAGS**

Labels shall be inert plastic film specifically formulated for prolonged exposure. The minimum thickness shall be 4 mils for adhesive backed labels and 10 mils for tag type labels. Tag type labels shall have reinforced tie holes and shall be attached with heavy-duty nylon fasteners. The size, type of label and location shall be dictated by each individual application and subject to acceptance by the Engineer.

- A. Potable Water Identification: Prepare labels on a blue field, and shall have the words: "POTABLE WATER" printed on the field in black letters. Minimum letter height shall be 1/2 inch.
- B. Reclaimed Water Identification: Prepare labels on a purple field, and shall have the words: "CAUTION: RECLAIMED WATER - DO NOT DRINK" printed on the field in black letters. Minimum letter height shall be 1/2 inch.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION OF PIPE WARNING TAPE AND LOCATOR TAPE**

- A. Warning Tape: Install warning tapes directly on the top of the pipe longitudinally and center. Install the warning tape continuously for the entire length of the pipe and fasten to each pipe length by plastic adhesive tape banded around the pipe and warning tape at no more than 5-foot intervals. Taping attached to the sections of pipe before laying in the trench shall have 5-foot minimum overlap for continuous coverage. Install all risers between the main line and control valves with warning tape. Do not allow backfilling to move tape more than 2 inches.
- B. Locator Tape: Over non-metallic pipelines, install locator tape directly on top of the pipe zone backfill layer, and center. Do not allow further backfilling to move tape more than 2 inches.

### **3.2 INSTALLATION OF WARNING LABELS AND SIGNS**

- A. Method of Attachment: Firmly attach warning labels using heavy-duty nylon fasteners, and size and install them at locations as shown on the Drawings.
- B. Equipment Requiring Labels or Tags: Install warning labels on all appurtenances in vaults, such as, but not limited to, air release valves, blowoffs, and meters, and on designated facilities, such as, but not limited to, controller panels and wash down or blowoff hydrants on water trucks and temporary construction services. Identify pumps and pipe with a painted label. Within a fenced area, post at least one sign on the fence which can be readily seen.
- C. Painted Labels: Painted labels may, at the Engineer's discretion, be acceptable in lieu of plastic labels.

#### **PART 4 - PAYMENT**

The unit price for installation of pipe includes full compensation for furnishing the labor, materials, tools and equipment and doing all Work involved to complete the pipeline, including the Work in this Section. Work in this Section not appurtenant to pipe installation will be compensated in the lump sum or unit price bid amount for the item the Work is appurtenant to, and no additional compensation will be made.

**END OF SECTION**

## **SECTION 15154: METER BOXES**

### **PART 1 - GENERAL**

#### **1.1 DESCRIPTION**

This Section describes the materials and installation of meter boxes.

#### **1.2 RELATED WORK SPECIFIED ELSEWHERE**

Refer to the following Specification Section(s) for additional requirements:

- A. Section 01300: Submittals
- B. Section 15150: Meters

#### **1.3 SUBMITTALS**

Furnish submittals in accordance with the requirements of Section 01300: Submittals. The following submittals are required:

Submit Shop Drawings, manufacturer's catalog data and detail construction sheets showing all meter box parts and describing material of construction by material and specification (such as AISI, ASTM, SAE, or CDA). Submittal shall include meter box dimensions including laying lengths and dimensions. Submittals shall also indicate lid materials of construction and load ratings.

### **PART 2 - MATERIALS**

#### **2.1 GENERAL**

The meter boxes will be used to house and protect the underground installation of water meters from  $\frac{3}{4}$ -inch to 2-inch size and other water appurtenances, as may be required.

#### **2.2 Meter Boxes and Covers**

- A. Materials: Meter boxes and covers shall be manufactured of reinforced polymer/plastic mortar.
- B. Meter Box Covers: Meter box covers with reading lid shall be manufactured of reinforced polymer/plastic mortar in two separate rectangular pieces.
- C. Traffic Covers: Meter box covers within roadways or driveways shall be one lipped cast-iron or steel lid piece, designed to withstand H-20 highway

loading, and may only be used where specifically specified on the plan or approved by the City.

D. Meter Box Size:

Meter Size(s) and Nominal Inside Dimensions shall be per the applicable City Standard Drawings.

E. Manufacturers: Meter boxes shall be manufactured of reinforced polymer/plastic mortar by J&R, Inc. or Armorcast Products Company.

## **2.4 METER BOX COVERS AND LIDS**

Meter box covers and lids for use in areas not subject to traffic loads shall be concrete with a hinged self-closing cast iron or checkered steel plate reading lid. Meter box covers and lids for traffic areas shall be H-20 load "traffic-rated" cast iron or checkered steel covers with cast iron or checkered steel lids. If required, the lid shall be equipped for antenna mount.

Include standard "water" labeling on the top of the meter box lid.

Supply meter box lids from the same manufacturer as each meter box delivered. Meter box lids shall be designed to fit the meter boxes delivered, and as manufactured by Eisel Enterprises, Inc., or Brooks Products. For interchangeability of existing meter boxes no exceptions allowed.

## **PART 3 - EXECUTION**

### **3.1 INSPECTION**

Inspection and acceptance of the meter boxes shall be made after installation. Neither inspection, waiving of inspection or City acceptance shall relieve the Contractor of the obligation to furnish the products according to these Specifications.

### **3.2 GUARANTEE**

Guarantee the materials and workmanship of the products from defects. Make repairs and modifications to the products, as necessary, within 30 calendar days after notification by Owner or shall replace promptly, without cost to Owner, all products developing defects within a period of one year after delivery and acceptance by the City.



### **3.3 REMOVAL AND INSTALLATION**

Remove and dispose of existing meter boxes and install new meter boxes at the locations directed by the Owner in the field in accordance with City Standard Drawings. Perform surface repair as necessary to repair damage to adjacent asphalt concrete, Portland cement concrete, lawn, landscaping, or other improvements damaged as a result of the Work to remove a existing meter box and install a new meter box.

### **PART 4 - PAYMENT**

Payment for the Work in this Section shall be included as part of the lump sum or unit price bid for which such Work is appurtenant thereto, and no additional payment will be made specifically for Work in this Section. The Contractor pays for the cost of soil compaction testing.

**END OF SECTION**

## **SECTION 15170: WALL AND SLAB PENETRATIONS**

### **PART 1 - GENERAL**

#### **1.1 SECTION INCLUDES**

- A. Wall Pipe Modular Seals
- B. Wall Pipes and Sleeves

#### **1.2 REFERENCED STANDARDS**

- A. American Iron and Steel Institute (AISI)
- B. American Water Works Association (AWWA):
  - 1. AWWA C115: Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges
  - 2. AWWA C210: Liquid-Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines
  - 3. AWWA C116: Protective Fusion-Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings

#### **1.3 SUBMITTALS**

- A. Submit the following for each type of product specified:
  - 1. Product data including dimensions, materials, and pressure ratings
  - 2. Shop Drawings
  - 3. Certifications

### **PART 2 - PRODUCTS**

#### **2.1 WALL PIPE MODULAR SEALS**

- A. Description
  - 1. Inter-locking synthetic rubber links shaped to continuously fill the annular space between the pipe and the wall opening
  - 2. Sized and selected per the manufacturer's recommendations
- B. Performance Criteria
  - 1. Seal pressure rating: 20 psig
- C. Materials
  - 1. Links: Nitrile rubber
  - 2. Hardware: AISI Type 316 Stainless Steel
  - 3. Pressure Plates: Reinforced nylon polymer

## **2.2 WALL PIPES AND SLEEVES**

- A. Description
  - 1. General:
    - a. Pipes or sleeves cast into concrete wall
    - b. Provide integral wall collar, continuously welded to pipe or sleeve, to control water seepage along the outside of the pipe or sleeve through the concrete wall.
    - c. Wall collar size per AWWA C115
    - d. Center wall collar in wall to avoid wall reinforcement.
  - 2. Wall pipes:
    - a. Connected to adjacent pipe per plans
    - b. Size per plan; match connecting piping.
  - 3. Wall sleeves:
    - a. Allow a carrier pipe to pass through wall sleeve.
    - b. Sleeve diameter per wall pipe modular seal manufacturer
    - c. Schedule 40 thickness (minimum)
- B. Materials
  - 1. Wall Pipes: Match connecting piping, except provide ductile iron wall pipe for plastic connecting pipes.
  - 2. Wall Sleeves: AISI Type 316L Stainless Steel.
- C. Finishes:
  - 1. Wall Pipes (interior and exterior): Conform to AWWA C210 or AWWA C116.
  - 2. Wall Sleeves: None.

## **PART 3 - EXECUTION**

### **3.1 WALL PIPE MODULAR SEALS**

- A. Install according to the manufacturer's written instructions and recommendations.
- B. Install on all pipes passing through wall sleeves in concrete walls.

### **3.2 WALL PIPES AND SLEEVES**

- A. Provide wall pipes for all pipes passing through concrete walls or slabs, unless otherwise noted.
- B. Position wall pipes and sleeves in place with temporary, external supports. Prevent contact with reinforcement or other embedments.

- C. Inspect coatings prior to concrete placement. Repair any damage to the coating system in accordance with the manufacturer's written recommendations.
- D. Cast wall pipes and sleeves directly into concrete wall or slab. Wall blockouts are not allowed.

#### **PART 4 - PAYMENT**

Payment for the Work in this Section shall be included as part of the lump sum or unit price bid for which such Work is appurtenant thereto, and no additional payment will be made specifically for Work in this Section. The Contractor pays for the cost of soil compaction testing.

**END OF SECTION**