

SECTION 03 30 00
CONCRETE

PART 1 General

1.01 Description

This section includes materials, testing and installation methods for concrete work including formwork, reinforcement, mixing, placement, curing, repairs of concrete, concrete, mortar, grout, thrust and anchor blocks, valve support blocks, manhole bases, finish, and do all other work as required to produce finished concrete, in accordance with the requirements of these Specifications.

1.02 Applications

The following materials, referenced in other sections, shall be provided and installed in accordance with this specification for the applications noted below:

- A. Concrete for thrust and anchor blocks for horizontal and vertical bends, ductile-iron or steel fittings, fire hydrant bury ells, support blocks for valves 4-inch and larger, collars, cradles, curbs, gutters, sidewalks, encasements, manhole bases, protection posts, splash pads, and other miscellaneous cast-in-place items, all in accordance with the Approved Standard Drawings.
- B. Hand-mixed concrete is permitted when the volume of concrete required is less than 1.00 cubic yards.
- C. Mortar for filling and finishing the joints between manhole and vault sections and setting manhole grade rings and cover frames. Mortar may also be used for repairs of minor surface defects of no more than 6-inch in depth or 6-inch in width on nonstructural, cast-in-place items such as splash pads or concrete rings around manholes. (Note that large voids, structural concrete and pipe penetrations into vaults shall be repaired with non-shrink grout; repairs to precast manholes and vaults and cast-in-place manhole bases shall be repaired with an epoxy bonding agent and repair mortar, as outlined below.)
- D. Epoxy bonding agent for bonding repair mortar to concrete on repairs to damaged surfaces of precast or cast-in-place concrete manholes and vaults.
- E. Repair mortar for repair to damaged surfaces of precast or cast-in-place concrete manholes and vaults. An epoxy-bonding agent shall be used in conjunction with repair mortar.
- F. Non-shrink grout for general-purpose repair of large construction voids, pipe penetrations into vaults and grouting of base plates for equipment or structural members.

- G. Epoxy adhesives for grouting of anchor bolts shall conform to page 51 in the Greenbook Subsections 304-1.7.
- H. Protective epoxy coating for application to reinforcing steel within existing concrete structures exposed during construction.
- I. Damp-proofing for application to the exterior surfaces of concrete manholes and vaults located at or below the water table or where showing evidence of moisture or seepage, and as directed by the Owner's Representative.

1.03 *Delivery, Storage, and Handling*

Deliver reinforcing steel to the site bundled and tagged with identification. Store all reinforcing steel on skids to keep bars clean and free of mud and debris. If contaminated, all bars shall be cleaned by wire brushing, sand blasting or other means prior to being set in forms.

Where ready-mix concrete is used, the Contractor shall provide certified load tickets at the time of delivery of each load of concrete. Each load ticket certificate shall contain the following:

- A. Name of vendor
- B. Name of Contractor
- C. Project location
- D. Mix designation number
- E. Load total quantity, by weight of cement, sand, and each class of aggregate
- F. Amount of water added at the batch plant (including water in aggregate)
- G. Maximum allowable water to be added at the site for specific design mix
- H. Time and Date (to nearest minute, corresponding to when the batch was dispatched, when it left the plant, when it arrived at the job, the time that unloading began, and the time that unloading was finished)
- I. Brand and type of cement
- J. Brand type and amount of admixture
- K. Number of revolutions of the drum or blades (batching to discharge)

When a truck mixer or agitator is used for transporting concrete to the delivery point, discharge shall be completed within 1.5 hours or before 300 revolutions of the drum or blades, whichever occurs first, after the introduction of the cement to the aggregates. Under conditions contributing to quick stiffening of the concrete, or when the temperature of the concrete is 85° F or above, the time allowed may be less than 1.5 hours (see page 357).

PART 2 Products

2.01 General

- A. All Portland cement concrete, mortar and grout shall conform to the provisions of Sections 201, 202 and 303 of the Greenbook.
- B. In certain circumstances, rapid-setting concrete may be required. Accelerating admixtures shall conform to Greenbook Subsections 201-1.2.4, ASTM C-494 and may be used in the concrete mix as permitted by the Owner's Representative. Calcium chloride shall not be used in concrete.
- C. Hand mixed concrete materials type and proportions shall be submitted and approved by the Owner's Representative prior to application on site. The maximum slump shall be 6-inch.

2.02 Reinforcing Steel

- A. Unless specified elsewhere all reinforcing steel shall conform to ASTM A 615, Grade 60.
- B. Reinforcing steel shall be fabricated in accordance with the current edition of the Manual of Standard Practice, published by the Concrete Reinforcing Steel Institute.

2.03 Welded Wire Reinforcement

Welded wire reinforcement shall conform to ASTM A 185.

2.04 Tie Wire

Tie wire shall be 16-gage minimum, black, soft annealed. 16 gauge wire ties, manufactured by American Wire Tie, Inc., or equal. When epoxy coated reinforcing steel is shown on the drawings, PVC coated wire ties shall be used. The minimum PVC coating shall be 0.7 mils.

2.05 *Forms*

- A. Forms shall be accurately constructed of clean lumber. The surface of forms against which concrete is placed shall be smooth and free from irregularities, dents, sags or holes.
- B. Metal form systems may be used upon approval of the Owner's Representative. Include manufacturer's data for materials and installation with the request to use a metal form system.
- C. Form release compound shall be non-staining clear coating free from oil, silicone, wax, and not grain rising. Form compound shall be VOC compliant.

2.06 *Epoxy Bonding Agent*

The epoxy bonding agent shall be an epoxy-resin-based product intended for bonding new mortar to hardened concrete and shall conform to ASTM C 881. The bonding agent shall be selected from the Approved Materials List found on the CVWD website.

2.07 *Repair Mortar*

Repair mortar shall be a two-component, cement-based product specifically designed for structurally repairing damaged concrete surfaces. The repair mortar shall exhibit the properties of high compressive and bond strengths and low shrinkage. A medium slump repair mortar shall be used on horizontal surfaces, and a non-sag, low-slump repair mortar shall be used on vertical or overhead surfaces. Repair mortar shall be selected from the Approved Materials List.

2.08 *Non-Shrink Grout*

Non-shrink grout shall be a non-metallic cement-based product intended for filling general construction voids or grouting of base plates for equipment or structural members. The non-shrink grout shall exhibit the properties of high compressive and bond strengths and zero shrinkage, and shall be capable of mixing to a variable viscosity ranging from a dry pack to a fluid consistency as required for the application. The non-shrink grout shall be selected from the Approved Materials List.

2.09 *Epoxy Adhesive*

Epoxy adhesive shall be a high-modulus epoxy-resin-based product intended for structural grouting of anchor bolts and dowels to concrete. The epoxy adhesives shall conform to ASTM C 881. A pourable, medium-viscosity epoxy shall be used on horizontal surfaces, and a heavy-bodied, non-sag epoxy gel shall be used on vertical surfaces. The epoxy adhesives shall be selected from the Approved Materials List.

2.10 *Protective Epoxy Coating*

The protective epoxy coating shall be an epoxy-resin-based product exhibiting high bond strength to steel and concrete surfaces, and shall conform to ASTM C 881. The protective epoxy coating shall be selected from the Approved Materials List.

2.11 *Damp-Proofing For Concrete Structures*

Damp-proofing material shall consist of two coats of a single-component self-priming, heavy-duty cold-applied coal-tar selected from the Approved Materials List.

PART 3 Execution

3.01 *General*

The placement of concrete shall conform to the provisions of Section 303 of the Greenbook and as described below.

3.02 *Formwork*

- A. The Contractor shall notify the Owner's Representative a minimum of one working day in advance of intended placement of concrete to allow for checking the form lines, grades, and other required items before placement of concrete.
- B. The form surfaces shall be cleaned and coated with a form release compound prior to installation. The form surfaces shall leave uniform form marks conforming to the general lines of the structure.
- C. The forms shall be braced to provide sufficient strength and rigidity to hold the concrete and to withstand the necessary fluid pressure and consolidation pressures without deflection from the prescribed lines.
- D. Unless otherwise indicated on the drawings, all exposed sharp concrete edges shall be $\frac{3}{4}$ inch chamfered.

3.02 *Reinforcement*

The following procedures apply to all cast-in-place concrete with the exception of thrust blocks and valve support blocks. No reinforcement is required for concrete thrust blocks or concrete valve support blocks.

- 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. All reinforcing steel shall be of the required sizes and shapes and placed where shown on the drawings or as directed by the Owner's Representative.
- C. Do not straighten or re-bend reinforcing steel in a manner that will damage the material. Do not use bars with bends not shown on the drawings. All steel shall be cold bent - do not use heat.
- D. All bars shall be free from rust, scale, oil, or any other coating that would reduce or destroy the bond between concrete and steel.
- E. Position reinforcing steel in accordance with the Approved Drawings and secure by using annealed wire ties or clips at intersections and support by concrete or metal supports, chairs, slab bolsters, concrete blocks, spacers, or metal hangers. Do not place metal clips or supports in contact with the forms. Bend tie wires away from the forms in order to provide the concrete coverage equal to that required of the bars. If required by the Owner's Representative, the Contractor shall install bars additional to those shown on the drawings for the purpose of securing reinforcement in position.
- F. Concrete blocks (dobies), used to support and position reinforcement steel, shall have the same or higher compressive strength as specified for the concrete in which it is located. Where the concrete blocks are used on concrete surfaces exposed to view, the color and texture of the concrete blocks shall match that required for the finished surface. Wire ties shall be embedded in concrete block bar supports.
- G. Place reinforcement a minimum of 2-inch clear of any metal pipe, fittings, or exposed surfaces.
- H. The reinforcement shall be so secured in position that it will not be displaced during the placement of concrete.
- I. All reinforcing steel, welded wire reinforcement, and tie wire shall be completely encased in concrete.
- J. Reinforcing steel shall not be welded unless specifically required by the Approved Drawings or otherwise directed by the Owner's Representative.
- K. Secure reinforcing dowels in place prior to placing concrete. Do not press dowels into the concrete after the concrete has been placed.
- L. Minimum lap for all reinforcement shall be 40 bar diameters unless otherwise specified on the Approved Drawings.

- M. Place additional reinforcement around pipe penetrations or openings 6-inch diameter or larger. Replace cut bars with a minimum of one-half of the number of cut bars at each side of the opening, each face, each way, same size. Lap with the uncut bars a minimum of 40 bar diameters past the opening dimension. Place one same size diagonal bar at the four diagonals of the opening at 45 degree to the cut bars, each face. Extend each diagonal bar a minimum of 40 bar diameters past the opening dimension.
- N. Welded wire reinforcement is to be rolled flat before being placed in the form. Support and tie welded wire reinforcement to prevent movement during concrete placement.
- O. Extend welded wire reinforcement to within 2-inch of the edges of slabs. Lap splices at least 1-1/2 courses of the reinforcement and a minimum of 6-inch. Tie laps and splices securely at ends and at least every 24 inches with 16-gage black annealed steel wire. Pull the welded wire reinforcement into position as the concrete is placed by means of hooks, and work concrete under the reinforcement to ensure that it is at the proper distance above the bottom of the slab.
- P. Reinforcing steel as specified herein may be used in place of welded wire reinforcement shown in the Approved Standard Drawings or on the Approved Drawings with the approval of the Owner's Representative.
- Q. During form construction provide slots, openings, chases, recesses, grounds, nailers and screeds required by other trades and subsequent work. Ensure that conduits, pipes, sleeves, anchors, hangers and ties are secured in forms before concrete is placed.

3.03 *Embedded Items*

All embedded items, including bolts, dowels and anchors, shall be accurately set, and shall be maintained in position by templates while being embedded in concrete. Accuracy of placement is the responsibility of the Contractor.

3.04 *Mortar Mixing*

The quantity of water to be used in the preparation of mortar shall be only that required to produce a mixture sufficiently workable for the purpose intended. Mortar shall be used as soon as possible after mixing and shall show no visible sign of setting prior to use. Remixing of mortar by the addition of water after signs of setting are evident shall not be permitted.

3.05 *Mixing And Placing Concrete*

- A. Hand mixed concrete mixing method shall be in accordance with Greenbook 201-1.4.4.
- B. All concrete shall be placed in forms before taking its initial set.
- C. No concrete shall be placed in water except with permission of the Owner's Representative.
- D. As the concrete is placed in forms, or in rough excavations (i.e. thrust or anchor blocks), it shall be thoroughly settled and compacted throughout the entire layer by internal vibration and tamping bars.
- E. All existing concrete surfaces upon which or against which new concrete is to be placed shall be roughened, thoroughly cleaned, wetted, and grouted before the new concrete is deposited.
- F. Non-Conforming Work or Materials: Concrete which upon or before placing is found not to conform to the requirements specified herein shall be rejected and immediately removed from the work. Concrete which is not placed in accordance with these Specifications, or which is of inferior quality, shall be removed and replaced by and at the expense of the Contractor.
- G. No concrete shall be placed except in the presence of CVWD's Inspector. The Contractor shall notify the Inspector at least 48 hours in advance of placement of any concrete.
- H. The placement of concrete during adverse weather conditions shall be in accordance with Greenbook 303-1.8.8. The temperature of concrete when it is being placed shall not be more than 90° F.

3.06 *Concrete Finishing*

- A. Concrete shall be placed and consolidated by methods that will not cause segregation of the aggregates and will result in a dense homogeneous concrete which is free of voids and rock pockets.
- B. The surfaces of concrete exposed to view shall be smooth and free from projections or depressions.
- C. Exposed surfaces of concrete not poured against forms, such as horizontal or sloping surfaces, shall be screeded to a uniform surface, steel-toweled to density the surface, and finished to a light broom finish.

- D. If rock pockets, in the opinion of the Owners representative, are of such an extent or character as to affect the strength of the structure materially or to endanger the life of the steel reinforcement, the Owner's Representative may declare the concrete defective and require the removal and replacement of the portions of the structure affected.

3.07 *Protection and Curing Of Concrete*

The Contractor shall protect all concrete against damage. Exposed surfaces of new concrete shall be protected from the direct rays of the sun by covering them with plastic film wrap and by keeping them damp for at least 7 days after the concrete has been placed, or by using an approved curing process. Exposed surfaces shall be protected from frost by covering with tarps for at least 5 days after pouring.

3.08 *Repairs to Damaged Concrete Surfaces*

Minor surface damage to hardened cast-in-place or precast concrete may be repaired, at the discretion of the Owner's Representative, using the specified materials in accordance with the manufacturer's recommendations and the following procedures:

- A. Cast-in-place or precast concrete for manholes and vaults: Remove loose or deteriorated concrete to expose a fractured aggregate surface with an edge cut to a ninety degree angle to the existing surface. Clean all debris from the area, apply a 20 mil coat of epoxy bonding agent to the prepared surface, and place repair mortar while the epoxy is still wet and tacky. On horizontal surfaces, for repair depths greater than 2 inches, add aggregate to the repair mortar as recommended by the manufacturer. On vertical or overhead surfaces, for repair depths greater than 2 inches, apply the repair mortar in successive lifts, scarifying the lifts, allowing them to harden, and applying a scrub coat of the material prior to proceeding with the next lift. Cure the material as for concrete in accordance with this specification.
- B. General Purpose: Remove loose and deteriorated concrete by mechanical means, sandblasting or high-pressure water blasting. Clean all debris from the area and apply non-shrink grout in a 1/4-inch minimum thickness, at the desired consistency, ranging from a dry pack, to a fluid-poured into a formed area, according to the application. Cure the material as for concrete in accordance with this specification.

3.09 *Epoxy Adhesives for Anchor Bolt Installation*

Anchor bolts grouted in place with an epoxy adhesive shall be installed using the specified materials in accordance with the manufacturer's recommendations and the following general procedures: Drill the hole with a rotary percussion drill to produce a rough, unpolished hole surface. The hole shall be sized to the manufacturer's recommendations and should be approximately 1/4-inch wider than the diameter of the bolt, with a depth equal to 10 to 15 times the bolt diameter. Remove debris and dust

with a stiff bristle brush and clean using compressed air. Utilizing a medium-viscosity epoxy for horizontal surfaces, and a gel-type non-sag epoxy for vertical surfaces, apply the material to fill the hole to approximately half its depth. Insert the bolt, forcing it down until the required embedment depth and projection length are attained and then twist the bolt to establish a bond. Secure the bolt firmly in place in the permanent position until the epoxy sets.

3.10 *Protective Epoxy Coating*

Following core drilling at existing concrete structures, clean the exposed concrete surface and ends of reinforcing steel and apply two coats of protective epoxy coating for a total dry film thickness of 10-15 mils. Allow the material to cure between coats and prior to continuing the installation through the penetration.

3.11 *Damp-Proofing for the Exterior of Concrete Structures*

Following completion of the exterior surfaces of manholes and vaults, including necessary repairs and piping penetrations into the structure, apply the specified material to prepared concrete surfaces in accordance with the manufacturer's recommendations. The surfaces to be coated shall be fully cured and free of laitance and contamination. The material shall be applied to all exterior surfaces below a point 12 inches above the water table or indications of seepage or moisture as directed by the Owner's Representative. Apply two 15 mil coats, curing between coats, prior to backfill and/or immersion in accordance with the manufacturer's recommendations.

3.12 *Thrust and Anchor Blocks*

Thrust blocks and anchor blocks shall be installed as shown on the Approved Drawings, Approved Standard Drawings or as directed by the Owner's Representative.

- A. **Thrust Block Placement:** Thrust blocks shall be located at all unrestrained pipe fittings and shall bear against firm, undisturbed soil. The thrust blocks shall be centered on the fitting so that the bearing area is exactly opposite the resultant direction of the thrust (refer to the Approved Standard Drawings). Thrust block concrete shall not hinder maintenance access to the valve operators. The shape and location of all thrust block excavations shall be approved by the Owners Representative prior to pouring concrete. Prior to filling the pipeline with water, concrete thrust blocks shall cure for a minimum of three (3) days unless an approved accelerating admixture, as described earlier in this section, is used.
- B. **Anchor Block Placement:** For all vertical bends in pipelines (downward bends) that do not have restrained joints, the fittings shall be retained in place by means of an anchor block. Prior to filling the pipeline with water, concrete anchor blocks shall cure for a minimum of seven (7) days. Accelerating admixtures shall not be used in concrete anchor blocks.

3.13 *Valve Support Blocks*

Valve support blocks shall be installed as described below and in accordance with the Approved Standard Drawings:

- A. Support blocks below valves shall be cut into the side of the trench a minimum of 12 inch.
- B. Support blocks shall extend up to the horizontal centerline height (springline) of the adjoining pipe and shall have a minimum depth below the valve of 12 inch.
- C. Support blocks shall be installed so that the valves will be accessible for repairs.

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PIPE SLOPE PROTECTION

PART 1 General

1.01 Description

This section includes materials, testing and installation for pipe slope protection as shown on the Approved Plans.

1.02 Service Application

Pipe slope protection is required wherever the profile of the ground surface above the pipeline exceeds 15 percent and where no pavement or bituminous road surfacing is to be laid over the exposure of the pipe after backfill.

- A. Slopes – 15 to 50 Percent: Where the profile lies between 15 and 50 percent, cut-off walls shall be constructed as shown on the Approved Standard Plans.
- B. Slopes – More than 50 Percent: Where the profile exceeds 50 percent, cut-walls shall be provided on a horizontal spacing of 10 feet, center to center, and surface slope protection shall be provided between walls.

PART 2 Products

2.01 Cut-Off Walls

Cut-off walls shall be one of two types according to the Approved Standard Drawings. The following materials are acceptable for the various configurations in the construction of the cut-off walls, as shown on the Approved Plans:

- A. Portland Cement: Cement shall be Type II ASTM C 150
- B. Concrete: Concrete shall be class 560-C-3250 with a 4-inch maximum slump.
- C. Masonry: All masonry block units shall conform to ASTM C 90, with a minimum compression strength of 1,500 pounds per square inch (psi) @ 28 days. Masonry units shall be 8x8x16 standard block.
- D. Mortar and Grout: Mortar and grout shall conform to Section 202-2.2 Mortar, Grout and Water in accordance with the latest edition of the Standard Specifications for Public Works Construction (SSPWC).
 - a. Mortar compressive strength shall be 1,800 psi @ 28 days.
- E. Grout compressive strength shall be 2,000 psi @ 28 days.

Reinforcing Steel: Reinforcing steel shall be per ASTM A 615 Grade 40 and shall be installed in accordance with the Approved Standard Drawings.

2.02 *Concrete Surface Slope Protection*

The following materials are acceptable for the construction of concrete surface slope protection, as shown on the Approved Plans:

- A. Portland Cement: Cement shall be Type II ASTM C 150
- B. Concrete: Concrete shall be class 520-C-2500 with a 4-inch maximum slump.
- C. Welded wire reinforcement shall be per ASTM A 185 and shall be installed in accordance with the Approved Standard Drawings.

PART 3 Execution

3.01 *Construction Installation*

- A. Cut-off Walls:
- B. Reinforced concrete and masonry cut-off walls for pipe slope protection shall be constructed after pipe trench backfill and trench compaction has been completed and accepted by the Owner's Representative.

Reinforced concrete cut-off walls shall have forms in-place with all reinforcing bars steel wire tied and secured. The Owner's Representative shall approve steel reinforcing prior to pouring concrete.

Masonry block cut-off walls shall be placed on an 8-inch thick concrete footing. Masonry block cut-off wall shall have No. 4 reinforcing steel bars placed 8 inches on center and centered in each cell with a horizontal No. 4 bar placed every 8 inches on center. The Owner's Representative shall approve all steel reinforcement prior to filling all of the masonry cells with cement mortar.

- C. Concrete Surface Slope Protection:

Concrete surface for pipe slope protection shall be placed after pipe trench backfill and trench compaction has been completed and accepted by the Owner's Representative.

Reinforcement shall be 6-inch square No. 10 gage welded wire which shall be placed and secured with the Owner's Representative approval prior to pouring concrete.

END OF SECTION 03 30 00.10

SECTION 10 10 10
UTILITY MARKER POST

PART 1 General

1.01 *Description*

This section includes furnishing all materials and equipment and performing all operations necessary to furnish, fabricate and install utility markers as shown on the Drawings.

The utility marker post shall provide daytime and nighttime delineation of CVWD facilities. Utility marker post shall be vehicle impact resistant and provide long-term desert environment durability.

Utility marker post shall be a single piece marker capable of permanent installation by one person using a manual driving tool.

PART 2 Products

2.01 *General*

Utility marker posts shall be constructed of a durable, UV resistant, continuous glass fiber and resin reinforced, thermosetting composite material which is resistant to impact, ozone, and hydrocarbons within a service temperature range of -40°F to +140°F. Utility marker posts shall be selected from the Approved Materials List.

Marker shall be permanently identified with the manufacturer's name and the month and year of fabrication. The letters shall be a minimum of 3/8 inch in height, and permanently affixed to the rear of the marker. A black line or indicator mark shall be stamped horizontally across the front of the marker near the bottom to indicate proper burial depth.

2.02 *Color*

Marker shall be pigmented throughout the entire cross section so as to produce a uniform *color*, which is an integral part of the material. Ultraviolet resistant materials shall be incorporated in the construction to inhibit fading or cracking of the delineator upon field exposure.

Color of a utility maker post shall be consistent with ANSI standard Z535.1 Safety Colors for temporary marking and facility identification

A. General

1. BLUE - Potable Water

2. PURPLE - Non-potable Water and Slurry Lines
3. GREEN - Sewers and Drain Lines
4. WHITE – Irrigation Water

2.03 *Offset Distance Brass Tag*

A brass tag shall be affixed to the utility marker post with a 1/8 inch aluminum pop-rivet. The brass tag shall be a minimum of 1-inch in diameter and stamped with the offset distance in feet to the facility (centerline of pipe or center of manhole etc.) from the post. The tag shall face the facility or indicate the direction of offset with an arrow.

2.04 *Printed Graphics, Lettering and Reflective Sheeting*

Printed graphic and lettering shall be printed directly on posts at the factory. Ink shall not fade, flake, smear or peel on delivery or when exposed in a high heat environment.

Decals or sticker will not be allowed as they do not withstand the harsh desert environment.

Reflective sheeting shall be three inches wide across the top of the utility marker post and provide adequate nighttime delineation. Reflective sheeting shall be white High Intensity Grade and shall meet ASTM D4956-09 Type III/V.

PART 3 Execution

3.01 *General*

Utility marker posts shall be installed where shown on the Drawings in accordance with Approved Standard Drawing I-27. Unless otherwise specified, Utility Marker Posts are required if valves, combination air valve assemblies, blowoff assemblies, cathodic protection vaults, PRV vaults or other CVWD facility installed outside the paved roadway, or as directed by the Owner's Representative.

3.02 *Location*

Utility Marker Posts shall be located inside the public right-of-way or easement in such a position as to minimize the probability of damage from vehicle impact. Unless otherwise specified, Utility Marker Posts shall be located at a point two (2) feet inside the public right of-way. If the distance between the facility and the right-of-way is excessive, the utility marker post shall be placed 15 feet off the facility or as directed by the Owner's Representative.

Utility marker posts shall be placed facing the direction of vehicle travel unless otherwise directed by the Owner's Representative.

END OF SECTION 10 10 10

SECTION 31 23 17
TRENCHING, EXCAVATION, BACKFILL AND COMPACTION

PART 1 General

1.01 *Description*

This section includes materials, testing and installation for trenching, excavation, loading, transporting, backfilling and compaction for piping, water system appurtenances, structures, manholes and vaults as shown on the Drawings.

1.02 *Geotechnical Testing*

The Developer or Contractor shall engage in the services of a geotechnical engineering firm or individual licensed in the State of California to monitor soil conditions during earthwork, trenching, bedding, backfill and compaction operations. Sampling and testing procedures shall be performed in accordance with the latest Edition of the Greenbook and as follows:

- A. The soils technician shall be present at the site during all backfill and compaction operations. Failure to have the soils technician present will subject such operations to rejection.
- B. Determine laboratory moisture density relations of existing soil.
- C. Sand equivalent testing shall be run in accordance with Calif. Test 217 or ASTM D 2419.
- D. Sample backfill material and perform sieve analysis in accordance with ASTM C 136.
- E. Express "relative compaction" as a percentage of the ratio of the in-place dry density to the laboratory maximum dry density.

A report of all soils tests performed shall be stamped and signed by the soils firm or individual and shall be submitted by the Contractor prior to the filing of the Notice of Completion by CVWD. The report shall document the sampling and testing of materials, the location and results of all tests performed, and shall certify that materials and work are in compliance with this specification.

1.03 *Verification of Existing Conditions*

It shall be the responsibility of the Contractor to examine the site of the work and to make all investigation necessary, both surface and sub-surface, to determine the character of materials to be encountered and all other existing conditions affecting the work.

1.04 *Regulation Compliance*

The contractor shall become familiar and comply with all federal, state, county and municipal rules and regulations pertaining to the work to be performed.

1.05 *Safety and Compliance Submittals*

A. Emergency Contact Information:

The Contractor shall file with CVWD a written list giving names, addresses, and telephone numbers of at least two (2) representatives who can be contacted at any time (24 hours a day/7 days a week) in case of emergency. The representatives shall be fully authorized and equipped to correct unsafe or inconvenient conditions on short notice. The Contractor shall promptly notify CVWD of all changes in the listing.

B. Safeguarding Trenching, Excavations, Earthwork and Preservation of Property:

All trenching and excavations activities shall be adequately shored and braced so that the earth will not slide or settle and so that all existing improvements of any kind will be fully protected from damage. Any damage resulting from a lack of adequate shoring and bracing shall be the responsibility of the Contractor. The Contractor shall make all necessary repairs or reconstructions at the Contractor's expense as directed by the Owner's Representative and shall bear all other expenses resulting from such damage.

C. Trenching, Excavation and Earthwork Safety Measure:

The appropriate safety measures for the construction of a pipeline, sewer, non-potable water, storm drains, boring and jacking pits, or similar trenches or open excavations, or the use of such a trench or open excavation, shall include in the appropriate bid items for such work the costs necessary to provide adequate sheeting, shoring, and bracing, or equivalent method for the protection of all personnel entering the trench or excavation, which shall conform to all applicable safety orders, including the Construction Safety Orders of the California Division of Industrial Safety, in accordance with the requirements of the California Occupational Safety and Health Act (Cal/OSHA). Protection of workers within the trenches shall also be as required by California Labor Code, Section 6705 and Title 8, California Code of Regulations, Sections 1539 -1543.

D. Excavation 5 Feet or More In Depth:

As required by State Regulations and Codes the Contractor shall SUBMIT detailed drawings showing the design and calculations for all shoring, bracing, sloping of the sides of excavation, or other provisions for worker protection against the hazard of caving ground during the excavation of trenches or structure excavation. The Contractor's detailed plan shall include a description of the methods, schedule and equipment, including trench shields, to be used for earthwork operations. The Contractor's plan shall identify the locations of temporary soil stockpiles. The Contractor's detailed plan shall be submitted before starting any trench or structure excavation 5 feet or more in depth. The Contractor shall be in possession of CVWD's written acceptance of the detailed plan before starting any trench or structure excavation 5 feet or more in depth. If the Contractor's detailed drawings vary from the shoring system standards established in the Construction Safety Orders of the State of California, the Contractor's detailed plan shall be prepared and signed by a civil or structural engineer licensed in the State of California.

E. Excavation Permit – Cal/OSHA.

For all trench or structure excavations 5 feet or more in depth the Contractor shall provide a copy of the excavation permit issued by Cal/OSHA.

1.06 *Construction Water*

Construction water is a limited resource and is subject to availability. It will be provided by CVWD at the most current acceptable rate per acre-foot when construction occurs in CVWD's water service area. Construction water consumption charges will be billed to and paid for by the Contractor on a monthly basis. The Contractor is not required to pay a monthly service charge or to provide a meter deposit. The Contractor is required to pay the required fee for relocation of any construction meter and must provide a minimum of three (3) working days advance notice. Unless otherwise approved by the Owner's Representative, only one construction meter will be provided per construction site. Additional meters will be subject to meter deposits and monthly service charges. All construction meter and consumption charges are listed in the most current revision of the Regulations Governing Domestic Water Service available at CVWD.

Contractor must apply for the construction meter in person at CVWD's customer service counter. CVWD shall install a construction meter at or adjacent to the construction site on the nearest available fire hydrant within four working days of receipt of the Contractor's meter application. Installation may be expedited at the Owner's Representatives discretion.

CVWD reserves the right to remove Contractor's construction meter without prior notice for Contractor's failure to pay consumption fees, for water shortages, and for any unforeseeable circumstances which could negatively impact water service. Contractor shall be fully responsible for total water consumption through the meter and for security of the construction meter.

1.07 *Pipe Zone*

The pipe zone includes the full width of the trench from 6 inches below the bottom of the pipe to 12 inches above the top of the pipe and extends into manhole or vault excavations to the point of connection to or penetration of such structure.

1.08 *Trench Zone*

The trench zone includes the portion of the trench from the top of the pipe zone to the bottom of the pavement zone in paved areas, or to the existing surface in unpaved areas, and extends into manhole or vault excavations above the pipe zone.

1.09 *Pavement Zone*

The pavement zone includes the concrete or asphalt concrete pavement and aggregate base section placed over the trench zone and extends into manhole or vault excavations above the trench zone.

1.10 *Protection of Existing Utilities and Facilities*

Operations under or adjacent to existing facilities or appurtenances thereto, shall be performed in such a manner as not to interfere with the safe operation or use of such facilities and structures, and proper precautions shall be taken to prevent damage to such facilities. In the event that any damage does occur to existing facilities, all necessary repairs shall be by and at the expense of the Contractor.

1.11 *Protection of Existing Landscaping*

Contractor shall preserve and protect all cultivated and planted areas, and vegetation such as trees, plants, shrubs and grass on or adjacent to the Site, which as determined by the Owner's Representative, do not unreasonably interfere with the performance of the Contract. Contractor shall be responsible for damage to any such areas and vegetation and unauthorized cutting of trees and vegetation, including, without limitation, damage arising from the performance of its work through operation of equipment or stockpiling of materials. All costs in connection with any repairs or restoration necessary or required by reason of any such damage or unauthorized cutting shall be borne by the Contractor.

1.12 Access

The Contractor shall provide continuous, unobstructed access to all driveways, water valves, hydrants, manholes or other property or facilities within or adjacent to the work areas.

1.13 Excess Excavated Materials

- A. The Contractor shall remove and legally dispose of all excess excavated material, clearing and grubbing debris and demolition materials and any other materials deemed necessary to facilitate the project in accordance with all State and Federal Regulations.
- B. It is the intent of these specifications that all surplus material shall be legally disposed of by the Contractor. Before acceptance of the work by CVWD, the Contractor shall provide CVWD with written releases signed by all property owners with whom the Contractor has entered into agreements for disposing of excess excavated material, absolving CVWD from any liability connected therewith.

1.14 Changes in Line and Grade

If conflicts are encountered that are not shown on the drawings during the construction that may require revisions to the drawings, the Owner's Representative shall be notified immediately. The Contractor shall not deviate from the specified line and grade without prior written approval by the Owner's Representative.

1.15 Hydrostatic Testing

Pre-testing of the piping system may be performed by the Contractor for his own convenience and at his own expense. Final hydrostatic pressure testing shall be conducted as specified in Section 331400.

PART 2 Products

2.01 General

Fill and backfill material shall consist of select material obtained from the excavation, imported material, bedding material, or unclassified material. All materials used in and above the pipe zone shall be capable of attaining the required relative density as shown on the Drawings. The Contractor shall import at their expense materials in excess of the approved material obtained from excavation as required to complete the fill, backfill, and grading work as indicated.

2.02 *Pipe Bedding*

Bedding material shall be sand, gravel, crushed aggregate or free draining material in accordance with the trench details shown on the Drawings.

2.03 *Backfill - Pipe Zone*

Pipe bedding material shall be sand, gravel, crushed aggregate, or native free-draining granular material having a sand equivalent of not less than 30 per ASTM 02419, or having a co-efficient of permeability greater than 1.4 inch per hour, as shown in the trench details on the Drawings. In addition, pipe bedding material shall conform to Greenbook Subsection 306-1.2.1.

2.04 *Backfill-Trench Zone*

Backfill material for use within the Trench Zone shall conform in all ways to backfill material for use in the Pipe Zone.

Native materials may not be used in lieu of backfill material within the Trench Zone unless such native materials meet all of the requirements specified for backfill material within the Pipe Zone as shown in the trench detail on the Drawings.

PART 3 Execution

3.01 *Clearing and Grubbing*

- A. Areas where work is to be performed shall be cleared of all trees, shrubs, rubbish, and other objectionable material of any kind, which, if left in place, would interfere with the proper performance or completion of the contemplated work, would impair its subsequent use, or would form obstructions therein.
- B. Organic material from clearing and grubbing operations will not be incorporated in the trench backfill and shall be removed from the project site or retained and incorporated into the topsoil.

3.02 *Pavement and Concrete. Removal*

Bituminous or concrete pavements, curbs, and sidewalks shall be removed and replaced in accordance with Greenbook Section 300-1.3.2.

3.03 *Shoring, Shielding and Bracing*

- A. The Contractor's design and installation of shoring shall be consistent with the rules, orders, and regulations of CAL-OSHA.

- B. Excavations shall be shored, sheeted, braced and supported such that the walls of the excavation will not slide or settle and all existing improvements of any kind, either on public or private property, will be fully protected from damage.
- C. The shoring and sheeting shall be arranged so as not to place any stress on portions of the completed work until the general construction has proceeded far enough to provide ample strength.
- D. Care shall be exercised in the moving or removal of trench shields, sheeting, and shoring to prevent the caving or collapse of the excavation faces being supported.

3.04 *Excavation and Placement of Pipe Bedding*

In areas where the pipe trench is in granular material suitable for bedding, the bottom of the trench shall be excavated and trimmed so that the pipe will be uniformly bedded on the required grade. In all other materials, the pipe trench shall be over-excavated below the established grade line of the outside bottom of pipe as shown on the Drawings.

In areas where the pipe trench encounters unsuitable material (clay, non-granular material etc.), the unsuitable material shall be over-excavated to a minimum depth of 6 inches below the established grade line of the outside bottom of the pipe or as determined necessary in the field by the Engineer of Record and approved by the Owner's Representative.

In areas where the pipe trench excavation encounters rock, hardpan, shale or similar hard and unyielding materials, the trench shall be over-excavated to a minimum depth of 4 inches below the established grade line of the outside bottom of the pipe or as determined by the Engineer of Record and approved by the Owner's Representative.

The over-excavation shall be placed to the required grade with compacted pipe bedding material as shown on the Drawings and approved by the Owner's Representative.

In the event that excessively wet, soft, spongy, or similarly unstable material is encountered at the surface upon which the bedding or base material is to be placed, the unsuitable material shall be removed to the necessary depth determined by the Engineer of Record, and as acceptable to the Owner's Representative. Restore the trench with crushed rock enclosed in geotextile filter fabric as shown on the Drawings or as directed by the Owner's Representative. Larger size rocks, up to 3 inches, with appropriate gradation, may be used if recommended by the Geotechnical Engineer and Engineer of Record. Place the appropriate bedding or base material on this restored foundation.

3.05 *Correction of Over-Excavation*

Should the excavation for the pipeline be carried below the grade without instruction from the Owner's Representative, it shall be refilled to proper grade with pipe zone material compacted to 90 percent relative compaction or crushed rock, at the expense of the Contractor. If compaction tests are required by the Owner's Representative, they shall be at the expense of the Contractor.

3.06 *Structures, Manholes and Vaults*

- A. The Contractor shall prepare an excavation large enough to accommodate the structure and permit grouting of openings and backfilling operations. The walls of the excavation shall be sloped or shored per the requirements of CAL-OSHA.
- B. Manholes and vaults shall be placed at the location and elevation as shown on the Drawings.
- C. Manhole and vault excavations shall be backfilled with the materials and methods as specified for the Pipe Zone, Trench Zone and Pavement Zone.

3.07 *Pipe Zone Backfill*

- A. Care shall be taken in placing the imported granular backfill material simultaneously around the main pipeline and appurtenance pipes so that the pipe barrel is completely supported and that no voids or un-compacted areas are left beneath the pipe or on the sides of the pipe. Care shall be taken to place material simultaneously on both sides of the pipe to prevent lateral movement. This area shall be mechanically compacted to attain 85 percent relative density as shown on the Drawings. Care shall be taken when compacting near water service lines to prevent the crushing or denting of the copper water service lines. Additional lifts of 12-inch or less thickness may be required on 16-inch or larger diameter pipe to attain complete support of the pipe haunch area. Soils tests may be taken on this layer of backfill.
- B. After the spring line backfill has been satisfactorily compacted, backfill of the remainder of the Pipe Zone may proceed. Do not drop sharp, heavy pieces of material directly onto the pipe or the tamped material around the pipe.
- C. Place and compact the backfill material at a maximum of 12-inch lifts. Compact all material placed in the Pipe Zone by mechanical methods. Sand cone tests shall be taken on this layer of backfill.
- D. The use of a backhoe-mounted compaction wheel is prohibited within the pipe zone to 12-inch above the top of the pipe.

- E. Under no circumstances shall consolidation by water settling or water-setting methods (i.e. jetting, diking, etc.) be permitted.

3.08 *Trench Zone Backfill*

- A. After the Pipe Zone material has been placed, compacted, approved by the Geotechnical Engineer and accepted by the Owner's Representative, backfill in the Trench Zone may proceed.
- B. Compaction using vibratory equipment, tamping rollers, pneumatic tire rollers, or other mechanical tampers shall be performed with the type and size of equipment necessary to accomplish the work. The backfill shall be placed in horizontal layers of such depths as are considered proper for the type of compacting equipment being used in relation to the backfill material being placed. Each layer shall be evenly spread, properly moistened, and compacted to the specified relative density. The Contractor shall repair or replace any pipe, fitting, manhole, or structure damaged by the installation operations as directed by the Owner's Representative.

3.09 *Compaction Requirements*

- A. Compaction shall be accomplished by mechanical means. Consolidation by water settling methods such as jetting or flooding is prohibited.
- B. If the backfill fails to meet the specified relative compaction requirements; the backfill shall be reworked until the requirements are met. All necessary excavations for density tests shall be made as directed by the Owner's Representative.
- C. Compaction tests shall be performed at random depths, and at random intervals not to exceed 300 feet, as directed by the Owners Representative.
- D. Relative compaction shall be determined by the impact or field compaction test made in accordance with ASTM D 1557 Procedure C.
- E. Unless otherwise shown on the drawings or otherwise described in the specifications for the particular type of pipe installed, minimum relative compaction in pipe trenches shall be as follows:
 - 1. Pipe zone – 85 percent relative compaction.
 - 2. Trench zone – 90 percent relative compaction.
 - 3. Structural section in paved areas - per agency requirements, 95 percent minimum.

4. Backfill Material for over-excavation or foundation stabilization – 90 percent relative density.

F. All excavations are subject to compaction tests.

3.10 *Restoration of Existing Improvements*

A. After the Trench Zone material has been placed and satisfactorily compacted and accepted by the Owner's Representative, the restoration of the Pavement Zone may proceed.

END OF SECTION 31 23 17

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STABILIZATION FABRIC

PART 1 General

1.01 *Description*

This section consists of furnishing and placing woven stabilization fabric for subgrade enhancement in construction of structures and trenches as shown on the Approved Plans.

1.02 *Submittals*

Submittals shall be provided by the Contractor for the following:

- A. Manufacturer's materials specification and product literature.
- B. Contractor responsible for submitting samples.
- C. Manufacturer's certificate shall be provided to the Owner's Representative in accordance with SSPWC Subsection 213-1.3.

1.03 *Protection and Identification*

Each roll of geotextiles shall be protected and marked to identify the manufacture, type, length, width, and production identification number in accordance ASTM D 4873 and SSPWC Subsection 213-2.3. Treat geotextiles to resist degradation from exposure to sunlight. Furnish geotextiles in covers to protect against damage from moisture, sunlight, shipping and storage.

1.04 *Storage and Handling*

Storage and handling shall comply with SSPWC Subsection 213-1.4.

PART 2 Materials

2.01 General

Woven stabilization fabric shall meet the following minimum requirements.

Property (1)	Test Method	Requirements (1)
Wide Width Tensile Strength	ASTM D 4595	225 lbs/in
Grab Tensile Strength	ASTM D 4632	370 lbs
Grab Tensile Elongation	ASTM D 4632	15%
Trapezoid Tear Strength	ASTM D 4533	100 lbs
CBR Puncture Strength	ASTM D 6241	950 lbs
Apparent Opening Size (ASO) ¹	ASTM D 4751	70 US Sieve
Percent Open Area	COE-02215	4%
Permittivity	ASTM D 4491	0.28 sec ⁻¹
Permeability	ASTM D 4491	0.01 cm/sec
Thickness	ASTM D5199	15 mil
Flow Rate	ASTM D 4491	18 gal/min/ft ² 18 gal/min/ft ²
UV Resistance (at 500 hours)	ASTM D 4355	90% strength retained

(1) Minimum average roll values.

¹ ASTM D 4751: AOS is a Maximum Opening Diameter Value

PART 3 Execution

3.01 General

The Contractor shall notify CVWD before stabilization fabrics are placed. Stabilization fabric shall only be placed after verifying that conditions are satisfactory for installation.

3.02 Preparation

During grading or trenching the Contractor shall take care not to disturb the subgrade. This may require use of lightweight dozers for low strength soils such as saturated, cohesionless or low cohesion soils.

Prior to placing stabilization fabric, the surface shall be prepared to a smooth condition free of debris, depressions, or obstructions that may damage the fabric.

3.03 *Installation*

The Contractor shall place the stabilization fabric per the manufacture's instructions, as shown on the Approved Plans, or as recommended by the Geotechnical Engineer and Approved by the Owner's Representative. Stabilization fabric shall be placed free of tension, folds, wrinkles, or creases. Use special care when placing the stabilization fabric in contact with the soil so that no void spaces occur between the stabilization fabric and the prepared surface. Overlap the parallel rolls and ends of rolls a minimum of 24 inch and not less than recommended by the manufacture. Do not drag stabilization fabric across subgrade. Make overlaps at ends of roll in direction of the aggregate placement with the previous roll on top. Use lightweight dozers if necessary. Do not allow equipment directly on stabilization fabric.

Prior to backfill operations the condition of the fabric shall be observed by the CVWD Inspector to determine that no holes or rips exist in the fabric. Repair all holes or rips by placing a new layer of fabric extending beyond the defect in all directions a distance equal to the minimum overlap required for adjacent rolls. Twenty-four inch shall be the minimal overlap.

END OF SECTION 31 23 17.10

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GEOGRID REINFORCEMENT

PART 1 General

1.01 *Description*

This section consists of furnishing and placing Geogrid reinforcement material for subgrade enhancement in construction of structures and trenches as shown on the Approved Plans.

1.02 *Submittals*

Submittals shall be provided by the Contractor for the following:

- A. Manufacturer materials specification and product literature.
- B. Manufacturer's certificate shall be provided to the Owner's Representative in accordance with SSPWC Subsection 213-1.3.

1.03 *Protection and identification*

Each roll of geogrid shall be protected and marked to identify the manufacture, type, length, width, and production identification number in accordance with ASTM D 4873 and SSPWC Subsection 213-2.3. Treat geogrid to resist degradation from exposure to sunlight. Furnish geogrid in covers to protect against damage from moisture, sunlight, and shipping and storage.

1.04 *Storage and Handling*

Storage and handling shall comply with SSPWC Subsection 213-1.4.

PART 2 Materials

2.01 *General*

Geogrid is a biaxial polymeric grid formed by a regular network of integrally connected tensile elements with apertures of sufficient size to allow interlocking with surrounding soil, rock, or earth to function primarily as reinforcement.

2.02 Geogrid

Structural Soil Reinforcement Geogrid - The geogrid shall be integrally formed and deployed as a single layer having the following characteristics:

Property (1)	Test Method	Requirements (1)
Aperture Stability Modulus at 20 cm-kg (2.0 m-N)	Kinney (2001)	.65 m-N/deg
Rib Shape	Observation	Rectangular or Square
Rib Thickness	Callipered	0.05 in.
Nominal Aperture Size	I.D. Callipered	1.0 to 1.5 in.
Junction Efficiency	GRI-GG2-87	93%
Flexural Rigidity	ASTM D1388-96	750,000 mg-cm
Minimum True Initial Modulus In Use	ASTM D6637-01	
Machine Direction (MD)		27,420 lb./ft.
Cross Machine Direction (CMD)		44,550 lb./ft.
(1) Minimum average roll values unless a range or characteristic is indicated.		

Alternate Structural Soil Reinforcement Materials - Alternate structural soil reinforcement materials will be considered in accordance with the following conditions:

Geotextile materials shall not be considered as an alternate to geogrid materials for subgrade improvement or base/sub-base reinforcement applications. A geotextile may be used in the cross-section to provide separation, filtration, or drainage; however, no structural contribution shall be attributed to the geotextile.

Alternate geogrid materials shall not be used unless recommended by the Geotechnical Engineer and approved by the Owner's Representative.

PART 3 Execution

3.01 General

The Contractor shall notify CVWD before geogrid are placed. Geogrid shall only be placed after verifying that conditions are satisfactory for the installation of Geogrid.

3.02 Preparation

During grading or trenching the Contractor shall take care not to disturb the subgrade. This may require use of lightweight dozers for low strength soils such as saturated, cohesionless, or low cohesion soils.

Prior to placing geogrid, the surface shall be prepared to a smooth condition free of debris, depressions, or obstructions that may damage the geogrid.

3.03 *Installation*

Geogrid shall be laid to the proper elevation and alignment as shown on the Approved Plans, or as recommended by the Geotechnical Engineer and approved by the Owner's Representative.

The geogrid shall be installed in accordance with the installation guidelines provided by the manufacturer, or as recommended by the Geotechnical Engineer and approved by the Owner's Representative.

The geogrid may be temporarily secured in place with ties, staples, pins, sand bags or backfill as required by fill properties, fill placement procedures or weather conditions or as recommended by the Geotechnical Engineer and approved by the Owner's Representative.

3.04 *Granular Fill Placement over Geogrid*

Prior to backfill operations the condition of the geogrid may be observed by the CVWD Inspector to determine that geogrid is not damaged. Any damaged or defective geogrid (i.e. frayed coating, separated junctions, separated layers, tears, etc.) will be removed and replaced.

Granular fill material shall be placed in lifts and compacted as directed per the Contract Documents, or as recommended by the Geotechnical Engineer and approved by the Owner's Representative. Granular fill material shall be placed, spread, and compacted in such a manner that minimizes the development of wrinkles in the geogrid and/or movement of the geogrid.

A minimum loose fill thickness of 6 inches is required prior to operation of tracked vehicles over the geogrid. Turning of tracked vehicles should be kept to a minimum to prevent tracks from displacing the fill and damaging the geogrid. When underlying substrate is trafficable with minimal rutting, rubber-tired equipment may pass over the geogrid reinforcement at slow speeds (less than 10 mph) when integrally-formed geogrids are used. When woven, multi-layer, or welded-strip geogrids are used, rubber-tired equipment shall not be allowed to pass directly on the geogrid. Sudden braking and sharp turning movements shall be avoided.

END OF SECTION 31 23 17.20

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SECTION 31 23 19
DEWATERING

PART 1 General

1.01 *Description*

- A. Design, furnish, install, operate, monitor, maintain and remove a temporary dewatering system as required to lower and control water levels at least 5 feet below subgrades of excavations and to permit construction to proceed in-the-dry.
- B. Furnish and maintain temporary surface water runoff control measures adequate to capture and remove surface water entering excavations.
- C. Retain the services of a professional engineer registered in the State of California to prepare dewatering system designs and submittals described herein.
- D. Work shall include the design, equipment, materials, installation, protection, and monitoring of the performance of the dewatering system as required herein.
- E. Collect and properly dispose of all discharge water from the dewatering systems in accordance with all State, County, and Local requirements and applicable water quality standards. Under no circumstances shall water from dewatering systems be discharged into the existing or new sanitary sewer systems.
- F. Obtain and pay for all permits required for dewatering systems.
- G. Repair damage caused by dewatering system operations.
- H. Remove temporary surface water runoff control measures after the completion of the excavation and backfilling work, and when approved by the Owner's Representative.

1.02 *Related Work*

Not used.

1.03 *Submittals*

- A. Dewatering system designs shall be prepared by a licensed professional engineer ("Dewatering Engineer") retained by the Contractor and shall, as a minimum, comply with recommendations and/or requirements in the project's Geotechnical Investigation Report. The Contractor is responsible for investigating the soil and groundwater conditions at the site prior to submitting a dewatering plan. The Contractor shall submit the Dewatering Engineer's and the dewatering subcontractor's qualifications for review and approval by CVWD's Representative and the Engineer of Record (CVWD/Engineer).
- B. The Contractor shall submit a dewatering system design plan developed and signed and sealed by the Dewatering Engineer. The plan shall include a description of the proposed dewatering system and include the proposed installation methods to be used for dewatering system elements and for observation wells. The plan shall include equipment, drilling methods, hole sizes, filter sand placement techniques, sealing materials, development techniques, the number and location of dewatering points and observations wells, headers, sumps, ditches, size and location of discharge lines, capacities of pumps and standby units, and detailed description of dewatering methods to be employed to convey the water away from the site to an adequate disposal area, etc. Include the dewatering system design calculations in the plan.
- C. The plan shall identify the anticipated area influenced by the dewatering system and address impacts to adjacent existing and proposed structures.
- D. Coordinate dewatering submittals with the excavation and support of excavation submittals. The dewatering submittal shall show the areas and depths of excavation to be dewatered.
- E. Submit drawings and data showing the method to be employed in dewatering excavated areas 30 days before commencement of excavation. Do not proceed with any excavation or dewatering activities until the dewatering submittal has been reviewed and accepted in writing by the CVWD/Engineer.
- F. Prior to excavation activities, the Dewatering Engineer shall certify in writing that the dewatering system has been installed according to the accepted plan and that it is functioning properly. However, acceptance by the CVWD/Engineer shall not relieve the Contractor of the responsibility for the adequacy of the dewatering system to achieve the required results.
- G. Include a written report outlining control procedures to be adopted if dewatering problems arise.

- H. Materials submitted shall be in a format acceptable for inclusion in required permit applications to any and all regulatory agencies for which permits for discharge water from the dewatering system are required due to the discharge reaching regulated bodies of water.
- I. Insure compliance with all conditions of regulating permits and provide such information to the CVWD/Engineer. Obtain written approval from the CVWD/Engineer before discontinuing operation of the dewatering system.

1.04 *References*

Not used.

1.05 *Quality Assurances*

- A Regulations: Perform all work in accordance with current applicable regulations and codes of all Federal, State and local agencies.
- B. The Contractor shall have at least 5 years of experience with work compatible to the Work shown and specified, employing labor and supervisory personnel who are similarly experienced in this type of work.
- C. The Contractor's Dewatering Engineer shall be registered in the State of California and have a minimum of five (5) years of professional experience in the design and construction of dewatering systems and shall have completed not less than five (5) successful dewatering projects of equal type, size, and complexity that is required for the work.

1.06 *Design Requirements*

- A. The Contractor is responsible for the proper design and implementation of methods for controlling surface water and groundwater.
- B. Prior to excavation, the Contractor shall lower the groundwater to at least 5 feet below the lowest excavation subgrade elevation. Additional groundwater lowering may be necessary beyond the 5-foot requirement, depending on construction methods and equipment used and the prevailing groundwater and soil conditions. The Contractor is responsible for lowering the groundwater as necessary to complete construction in accordance with the plans and specifications at no additional cost to CVWD.
- C. Design wells, well points and sumps, and all other groundwater control system components to prevent loss of fines from surrounding soils. Sand filters shall be used with all dewatering installations unless screens are properly sized by the Contractor's Dewatering Engineer to prevent passage of fines from surrounding soils.

- D. The Contractor shall be responsible for damage to properties, buildings or structures, wet wells, sewers and other utility installations, pavements and work that may result from dewatering or surface water control operations.
- E. Design review and field monitoring activities by CVWD/Engineer shall not relieve the Contractor of his/her responsibilities for the work.
- F. Plan the wells to meet the requirements of Section 1.06.B in the transverse and the longitudinal directions. Submit dewatering plan and calculations to identify the wells to be kept operational in front of, behind, and sides of the active excavation zone.
- G. The dewatering duration should be adequate to allow for soil to be exposed within the excavation bottom to adequately drain and attain stable moisture content prior to excavation.
- H The groundwater level should be maintained an adequate distance ahead and behind the working area to prevent water from migrating into the excavation during pipeline installation.

1.07 *Definitions*

- A. Where the phrase "in-the-dry" is used in this Section, it shall be defined as an excavation subgrade where the groundwater level has been lowered to at least 5 feet below the lowest level of the excavation, is stable with no ponded water, mud, or muck, is able to support construction equipment without rutting or disturbance and is suitable for the placement and compaction of fill material and pipe.

PART 2 Products

2.01 *Piping and Equipment*

- A. Pipe for observation wells shall consist of a minimum 1-inch I.D., Schedule 40 PVC pipe and machine slotted PVC wellpoints, maximum slot size 0.020 inch or as shown on the dewatering Drawings.
- B. Piping, pumping equipment and all other materials required to provide control of surface water and groundwater in excavations shall be suitable for the intended purpose.
- C. Standby pumping systems and a source of standby power shall be maintained at all sites.

PART 3 Execution

3.01 General

- A. Control surface water and groundwater such that excavation to final subgrade is made in-the-dry, the natural undisturbed condition of the subgrade soils are maintained, and softening and/or instability or disturbance due to the presence or seepage of water does not occur. All construction and backfilling shall proceed in-the-dry and flotation of completed portions of work shall be prohibited.
- B. The method and timing of groundwater control shall be such that the groundwater shall be lowered to the required levels starting at a minimum of 48 hours prior to excavation. Achieving the required dewatering level only after excavation (e.g. sump pumping inside an initially wet trench bottom) is not permitted.
- C. Where groundwater levels are above the proposed bottom of the excavation level, a pumped dewatering system will be required prior to excavation, and for maintaining the lowered groundwater level until construction has been completed to such an extent that the structure, pipeline or fill will not be floated or otherwise damaged.
- D. It is expected that the type of system, spacing of dewatering units and other details of the work will have to be varied depending on soil/water conditions at a particular location. Any such field changes or deviations shall be approved in writing by the Dewatering Engineer and CVWD/Engineer.
- E. All work included in this section shall be done in a manner which will protect adjacent structures and utilities and shall not cause loss of ground or disturbance to the pipe bearing soils, lateral pipe support soils, or to soils which support overlying or adjacent structures.
- F. Install, monitor and report data from observation wells. Evaluate the collected data relative to groundwater control system performance and modify systems as necessary to dewater the site in accordance with the Contract requirements.
- G. Locate groundwater control system components where they will not interfere with construction activities adjacent to the work area or interfere with the installation and monitoring of observation wells. Excavations for sumps or drainage ditches shall not be made within or below slopes extending downward and out from the edges of existing or proposed foundation elements or from the downward vertical footprint of the pipe.

3.02 *Surface Water Runoff Control*

- A. Construct surface water runoff control measures, including dikes, ditches, sumps and other methods to prevent, as necessary, flow of surface water runoff into excavations and to allow construction to proceed without delay.

3.03 *Excavation Dewatering*

- A. At all times during construction, provide and maintain proper equipment and facilities to promptly remove and properly dispose of all water entering excavations. Excavations shall be maintained in-the-dry. Groundwater levels shall be kept at least 5 feet below the lowest *excavation* level.
- B. Excavation dewatering shall maintain the subgrade in a natural undisturbed condition and until the fill, structure or pipes to be built thereon have been completed to such extent that they will not be floated or otherwise damaged by allowing water levels to return to natural elevations.
- C. Pipe, fabric, bedding, Controlled Low Strength Material (CLSM), Controlled Density Fill (CDF), or concrete shall not be placed in water or water shall not flow over them, or any unbalanced water pressure exerted over them for a minimum of two (2) days after their placement.
- D. Dewatering shall at all times be conducted in such a manner as to preserve the in place condition of the subgrade soils at the proposed bottom of excavation.
- E. If the subgrade of the trench or excavation bottom becomes disturbed due to inadequate dewatering or drainage, excavate below normal grade as directed by the CVWD/Engineer and refill with structural fill, CLSM, CDF or other material as approved by CVWD/Engineer at the Contractor's expense.
- F. The *initial* dewatering plan may have to be modified to suit the variable soil/water conditions to be encountered during construction. This modification shall be designed by the Dewatering Engineer and shall be accepted by CVWD/Engineer. Dewater and excavate, at all times, in a manner which does not cause loss of ground or disturbance to the pipe bearing soil or soil which supports overlying or adjacent structures.
- G. If the method of dewatering does not properly dewater the excavation as specified. install additional wells as required and do not place any pipe or structure until the readings obtained from the observation wells indicate that the groundwater has been lowered a minimum of 5 feet below the bottom of the final excavation within the excavation limits.

- H. Dewatering units used in the work shall be surrounded by suitable filter sand and no fines shall be removed by pumping. Pumping from the dewatering system shall be continuous until pipe or structure is adequately backfilled. Stand-by pumps shall be provided.
- I. Water entering the excavation shall be drained to a sump and pumped from the excavation to maintain a bottom free from standing water. Surface runoff water shall be collected in shallow ditches around the excavation and prevented from entering the excavated area.
- J. Prior to any excavation below the ground water table, place the dewatering system into operation to lower the ground water table as required and provide CVWD/Engineer proof that the dewatering system is operating as required. The dewatering system shall operate continuously 24 hours a day, 7 days a week until utilities and structures have been satisfactorily constructed, which includes the placement of backfill materials and dewatering is no longer required.
- K. The Contractor shall provide complete standby equipment, installed and available for immediate operation. as may be required to adequately maintain dewatering on a continuous basis and in the event that all or any part of the system may become inadequate or fail.
- L. Water removed from dewatering operations shall be disposed of in an approved area in accordance' with local, state and federal requirements related to the discharge of dewatering water. Existing or new sanitary sewers shall not be used to dispose of dewatering.

3.04 *Well Point Systems*

- A. Where necessary, install a vacuum wellpoint system around the excavation to dewater the excavation. Each wellpoint and riser pipe shall be surrounded by a sand filter. Sand shall be of such a gradation that, after initial development of the wellpoints, the quantity and size of soil particles discharged shall be negligible. Wellpoint systems shall be capable of operating continuously under the highest possible vacuum.
- B. Installation of well point systems shall be in accordance with the accepted submittal in the presence of the CVWD/Engineer. The installation shall be certified in writing by the Dewatering Engineer that it complies with the design and that it is functioning properly.

3.05 *Deep Wells*

- A. Where necessary, install a deep well system around the excavation to dewater the excavation. Each well shall be surrounded by a sand or gravel filter with adequate gradation such that after development, the quantity and size of soil particles discharged are negligible. A sufficient number of wells shall be installed to lower the groundwater level to allow excavation to proceed in-the-dry.
- B. Installation of a deep well shall be in accordance with the accepted dewatering system design plan submittal. The installation shall be certified in writing by the Dewatering Engineer that it complies with the design and that it is functioning properly.

3.06 *Observation Wells*

- A. Install observation wells to monitor and measure the success of the dewatering prior to commencement of excavations. The number and location of the monitoring wells should be adequate to demonstrate that the water table has been lowered to the required level as required under this Section or in accordance with the accepted dewatering system design plan submittal. Monitor and verify adequately low groundwater levels beneath and around the excavated area until pipelines are completed and backfilled.
- B. Observation Well Locations and Depths:
 - 1. A minimum of one well every 500 feet of pipe shall be installed within approximately 5 feet (+ 1 foot) of the pipe centerline, staggered in an alternating fashion on either side of the pipe to monitor performance of dewatering systems designed by the Contractor's Dewatering Engineer.
 - 2. Observation wells required shall be installed to a depth of at least 10 feet below the deepest level of excavation, unless otherwise approved by the CVWD/Engineer, and to whatever depth is necessary to indicate that the groundwater control system designed by the Contractor's Dewatering Engineer is performing as intended. Additional observation wells may be required by the CVWD/Engineer if deemed necessary to monitor the performance of the Contractor's groundwater control system.
 - 3. Locations and depths of observation wells are subject to approval by CVWD/Engineer.
- C. Protect the observation wells at the ground surface by providing a lockable box or outer protective casing with lockable top and padlock. Design the surface protection to prevent damage by vandalism or construction operations and to prevent surface water from infiltrating.

1. Provide two copies of keys for each padlock to the CVWD/Engineer for access to each well.
2. Observation wells shall be developed so as to provide a reliable indication of groundwater levels. Wells shall be re-developed if well clogging is observed, in the event of apparent erroneous readings, or as directed by the CVWD/Engineer.
3. Submit observation well installation logs, top of casing elevation, and well locations to CVWD/Engineer within 24 hours of completion of well installation.

D. Observation Well Maintenance:

1. The Contractor shall maintain each observation well until pipelines are completed and backfilled. Clean out or replace any observation well which ceases to be operable before adjacent work is completed.
2. It is the Contractor's obligation to maintain observation wells and repair or replace them at no additional cost to CVWD, whether or not the observation wells are damaged by the Contractor's operations or by third parties.

E. Monitoring and Reporting of Observation Well Data:

1. The Contractor shall begin daily monitoring of groundwater levels in work areas prior to initial operation of the dewatering system. Daily monitoring in areas where groundwater control is in operation shall continue until the time that adjacent pipelines are completed and backfilled and until the time that groundwater control systems are turned off.
2. The Contractor is responsible for processing and reporting observation well data to the CVWD/Engineer on a daily basis. Data shall be provided to the CVWD/Engineer on a form that includes the following information: observation well number, depth to groundwater, total depth of well, top of casing elevation, groundwater level elevation and date and time of reading.

3.07 *Removal of Systems*

- A At the completion of the excavation and backfilling work, and when approved by CVWD/Engineer, all pipe, deep wells, wellpoints, pumps, generators, observation wells, other equipment and accessories used for the groundwater and surface water control systems shall be removed from the site. All materials and equipment shall become the property of the Contractor. All areas disturbed by the installation and removal of groundwater control systems and observation wells shall be restored to their original condition.

- B. Leave in place any casings for deep wells, wellpoints or observation wells located within the plan limits of pipelines or within the zone below 1 H:1 V planes extending downward and out from the downward vertical footprint of the pipe, or where removal would otherwise result in ground movements causing adverse settlement to adjacent ground surface, utilities installed pipe, or existing structures.
- C. Where casings are pulled, holes shall be filled with sand or cement slurry. Where left in place, casings shall be filled with cement grout and cut off a minimum of 3 feet below finished ground level.
- D. When directed by the CVWD/Engineer, observation wells shall be left in place for continued monitoring. When so directed, cut casings flush with final ground level and provide protective lockable boxes with locking devices. The protective boxes shall be suitable for traffic and for any other conditions to which the observation wells will be exposed.
- E. Well abandonment or removal shall comply with all conditions of permits required for the dewatering systems and the County well abandonment requirements.

3.08 *Water Disposal*

- A. The Contractor shall be responsible to dispose of water removed from the excavations in such a manner that will
 - 1. Not endanger portions of work under construction or completed.
 - 2. Not cause any inconvenience to others working or residing near site.
 - 3. Not cause or contribute to a violation of water quality standards.
 - 4. Comply with the stipulations of required permits for disposal of water.
 - 5. Control runoff in all work areas including, but not limited to, excavations, access roads, parking areas, laydown, and staging areas. The Contractor shall provide, operate, and maintain all ditches, basins, sumps, culverts, site grading, and pumping facilities to divert, collect, and remove all water from the work areas. All water shall be removed from the immediate work areas and shall be disposed of in accordance with applicable permits.
- B. Excavation Dewatering:
 - 1. The Contractor shall be responsible for providing all facilities required to divert, collect, control, and remove water from all construction work areas and excavations.

2. Drainage features shall have sufficient capacity to avoid flooding of work areas.
 3. Drainage features shall be arranged and altered as required to avoid degradation of the final excavated surface(s).
 4. The Contractor shall utilize all necessary erosion and sediment control measures as described herein to avoid construction related degradation of the natural water quality.
- C. The Contractor shall comply with best management practices as described in the storm water pollution prevention plan for the project. Dewatering fluids shall be disposed of in an approved area in accordance with local, state and federal requirements. Existing or new sanitary sewers shall not be used to dispose of dewatering water or surface runoff water.
- D. Water removed from the dewatering operation and conveyed to a municipal separate storm sewer system or receiving water shall not cause or contribute to an exceedance of the current Colorado River Basin Water Quality Control Plan. The Contractor will be responsible for obtaining appropriate local, state and federal permits related to the discharge of dewatering water.

3.09 *Corrective Action*

- A. If dewatering requirements are not satisfied due to inadequacy or failure of the dewatering system (loosening of the foundation strata, or instability of slopes, or damage to foundations or structures), the Contractor shall be responsible to perform the necessary work for remediation, repair or strengthening of foundation soil and damaged structure resulting from such inadequacy or failure by Contractor, at no additional cost to CVWD.
- B. As the Contractor obtains information about the soil and groundwater conditions in the field, the Contractor is responsible to update and revise the dewatering plan and dewatering system to continue to meet the requirements of this specification.
- C. All corrective actions and applicable repairs of damages caused by dewatering operations shall be completed immediately, at no cost to CVWD.

END OF SECTION 31 23 19

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33 05 23
JACKED PIPE CASING

PART 1 General

1.01 *Description*

This section includes materials, and all equipment to perform all operations necessary for the installation of jacked pipe casing.

1.02 *Service Application*

Generally, pipe casings are used for the protection of CVWD facilities (carrier pipes) and may also be installed for future utility purposes. Pipe casings shall be used for the installation of potable water, non-potable water, sewer mains, agriculture irrigation line, agricultural drain line and where shown on the Approved Drawings or as required by CVWD.

1.03 *Design Requirements*

Pipe casings shall be provided for carrier piping where shown on the Approved Drawings or as required by CVWD. The sizes and material type for pipe casing shall be as detailed in Part 2 of this Section.

The Owner's Representative may select a greater steel thickness and diameter as appropriate for the intended application.

1.04 *Submittals*

If required by the Owner's Representative, the following items shall be submitted to CVWD for review and approval prior to the start of the casing work:

Configuration of the jacking pits and jacking pit bracing or shoring. Pit excavations deeper than 20 feet require the shoring system to be certified by a Registered Civil Engineer.

The pipe casing material to be used include casing material type, thickness, and welding details.

Casing spacers and end seals.

Jacking plan and profile drawing detailing the placement of the jacked casing.

The jacking machinery and jacking head proposed to be used.

Installation procedure and summary of backfilling method.

Welding procedure.

Epoxy coating repair procedure as recommended by the manufacture.
Manufactures recommendation of an epoxy accelerant to reduce curing time during jacking operations.

Workers Protection and Safety Plan.

Cathodic Protection.

PART 2 Materials

2.01 Steel Pipe Casing

Steel pipe casing diameter and casing wall thickness shall be in accordance with the Approved Standard Drawings.

Steel pipe casings, unless otherwise approved by CVWD, shall be butt welded sheets (spiral welding of pipe not allowed) conforming to ASTM A 36/A 36M, ASTM A 283/ A 283M, Grade D, or ASTM A 568/A 568M, Grade 33. Other steel grades may be used upon approval of the Engineer.

2.02 Epoxy Coating for Steel Casing

This specification covers the requirements for the plant application of fusion bonded epoxy coatings to steel pipe casings. The fusion bonded epoxy coated steel pipe casing shall be used in locations where both open trench excavation and jack and bore operations are utilized for construction. The coating shall be placed on the outside and inside of the steel casings.

Epoxy coating for steel pipe casing shall be selected from the Approved Materials List. Standard products of manufacturers other than those shown on the Approved Materials List will only be accepted when it is proved to the satisfaction of the Owner's Representative they are equal in composition, durability, and usefulness for the purpose intended.

The Contractor shall perform the work in accordance with the latest editions of the following Steel Structures Painting Council (SSPC) publications.

2.03 Surface Preparations

Prior to blast cleaning, surfaces shall be inspected and pre-cleaned according to SSPC-SP1 to remove oil, grease and loosely adhering deposits.

The exterior pipe surface shall be blast cleaned to SSPC-SP10 near-white finish using steel grit or steel grit-shot mixture after pre-heating of pipe to sufficient temperature to remove all moisture.

The abrasive cleaning media shall be selected to achieve an anchor profile of not less than 1.5 mils or more than 4.0 mils.

Any raised slivers, scabs, laminations or bristles of steel remaining on the newly cleaned surfaces, including on welds, shall be removed using abrasive grinders or hand filing. Care shall be taken not to destroy the anchor pattern.

Prior to coating, the cleaned pipe shall be inspected to ensure that all cleaning steps have been adequately performed. Presence of contaminants shall be cause for rejection of the surface preparation.

2.04 *Coating Materials*

The coating shall be comprised of 100 percent pure thermosetting epoxy coating powder. The coating shall be applied in a multi-step process to a common maximum of three coats. The first and second coats (undercoat) shall consist of a one part Epoxy Coating, heat curable, coating designed for corrosion protection of pipe. The third coat (topcoat) shall consist of Epoxy Coating.

The steel casings that will be jacked shall include a three coat epoxy system. The steel casings installed by trench excavation shall include a two coat epoxy system with no topcoat. On the inside of both steel casing applications, the Contractor shall apply the two coat epoxy system.

The undercoat material shall be selected from the Approved Materials List and applied to the prepared steel surfaces in two coats to a maximum of 12 to 16 mils by electro-static spray in strict accordance with the manufacturer's written instructions.

The topcoat material shall be selected from the Approved Materials List and applied over the gel coat cycle of the undercoating (206N) in one coat to a maximum of 15 to 30 mils by electro-static spray in strict accordance with the manufacturer's written instructions.

After the electro-static application, the coatings shall be cured in accordance with the written instructions of the manufacturer.

2.05 *Casing Spacers*

The casing spacers shall be stainless steel insulator to be selected from the Approved Materials List. The spacers shall have 2-inch wide runners and the height shall provide a 1-inch clearance above the mechanical pipe joint restraint system.

2.06 Casing End Seals

An 8-inch thick brick and mortar bulkhead shall be constructed unless shown otherwise on the plans. Where indicated on the plans, all end seals shall be a minimum 1/8 inch thick synthetic rubber with stainless steel bands for securing the end seal to the steel casing. The end seal shall be selected from the Approved Materials List. In areas where groundwater is present in the pipe zone, a concrete thrust block will be installed around the end seal.

A polyethylene sleeve shall be placed around the steel casing that will be placed under the open trenching method to serve as additional protection against corrosion. Polyethylene sleeves shall be a minimum 8 mil (0.008 inch) thick in accordance with AWWA 105.

PART 3 Execution

3.01 *Excavation, Trenching, Backfill and Compaction*

All excavation, trenching, bedding, backfilling and compaction operations shall be performed in accordance with Section 31 23 17.

3.02 *Dewatering*

The Contractor shall provide and maintain at all times during construction ample means and devices to promptly remove and dispose all water from any source entering trench excavations or other parts of the work in accordance with Section 31 23 19. Any damage caused by flooding of the trench shall be the Contractor's responsibility.

Dewatering shall be performed by methods that will maintain a dry excavation, preservation of the final lines, and grades and protection of all utilities. If flooding of the trench does occur, the Contractor shall immediately dewater and restore the trench. Damaged or altered pipeline appurtenances or trench materials shall be repaired or replaced as directed by the Owner's Representative.

3.03 *Jacking and Receiving Pits*

The approach trench, jacking and receiving pit excavations shall be adequately shored and comply with Section 31 23 17, Subsection 1.03 "Regulation Compliance". At all times the Contractor shall safeguard existing subgrade facilities and surface improvements against ground movement in the vicinity of jacking and boring operations.

Placement of equipment in the approach trench and jacking pit shall be firmly bedded on the required line and grade to accurately control the jacking alignment and grade. Adequate space shall be provided to insert the casing lengths to be jacked. Jacking equipment shall be properly anchored during jacking operations to maintain the lines and grades shown on the Approved Plans.

After jacking operations have been completed and all equipment, cuttings, and debris have been removed from the approach trench, jacking and receiving pits, the excavated areas shall be completed in accordance with Section 31 23 17.

3.04 *Jacked Pipe Casing Installation*

Installation of jacked pipe casings shall be as described below and in accordance with SSPWC Section 306-2.3 and the Approved Standard Drawings. Only workers experienced in jacking operations shall be used in performing the work of jacking and boring.

Jacked casing for gravity flow pipelines shall be installed to the lines and grade as shown on the Approved Plans. The Contractor's attention is directed to casings for gravity pipelines as they are designed to grades that rarely permit variances from the line and grade that are shown on the Approved Plans.

The leading section of casing shall be equipped with a jacking head to prevent variation in alignment during jacking operations.

Steel casing sections shall be joined by full-circumference butt welding in the field. Steel casing shall have all areas of damaged coating repaired.

Ductile-iron carrier pipe joints shall be restrained.

Upstream and downstream elevations of the carrier pipe shall be verified prior to sealing the casing ends.

The portion of carrier pipes installed within casings shall have pressure, leakage, and infiltration testing completed in accordance with Section 33 14 00 prior to sealing the casing ends.

3.05 *Carrier Pipe Installation*

The installation of carrier pipe shall be as described below.

Carrier pipe shall be pushed into the casing incorporating the use of casing spacers as described below.

Ductile-iron carrier pipe joints shall be fully restrained.

Upstream and downstream elevations of the carrier pipe shall be verified prior to sealing the casing ends.

The portion of carrier pipes installed within casings shall have pressure, leakage, and infiltration testing completed in accordance with Sections 33 14 00 prior to sealing the casing ends.

The annular space between the carrier pipe and casing for domestic water, non-potable force mains that carry product shall be filled with sand unless otherwise noted on the Approved Plans. The annular space between the carrier pipe and casing for gravity flow pipe systems when constructed below the water table shall be backfilled with gunite sand as approved by the Owner's Representative.

3.06 *Casing Spacers*

Casing spacers shall be used to prevent the carrier pipe bell from touching the casing and to maintain a uniform space between the carrier pipe and casing interior. A minimum of three casing spacers shall be installed, equally spaced, on each carrier pipe section at intervals recommended by the manufacturer.

3.07 *Casing End Seals*

Brick and mortar bulkheads shall be constructed in accordance with the SSPWC. Where indicated on the Approved Plans, casing end seals shall be installed in accordance with the manufacturer's recommendations.

Carrier pipe shall pass hydrostatic or leakage tests in accordance with Sections 33 14 00 prior to the installation of casing end seals, brick and mortar bulkheads or backfilling operations.

END OF SECTION 33 05 23

33 05 23.10
OPEN TRENCH PIPE CASING

PART 1 General

1.01 *Description*

This section includes materials for and installation of open trench pipe casings.

1.02 *Service Application*

Generally, pipe casings are used for the protection of CVWD facilities (carrier pipes) and may also be installed for future utility purposes. Pipe casings shall be used for the installation of potable water, non-potable water, sewer mains, agriculture irrigation line, agricultural drain line and where shown on the Approved Drawings or as required by CVWD.

1.03 *Design Requirements*

Pipe casings shall be provided for carrier piping where shown on the Approved Drawings or as required by CVWD. The sizes and material type for pipe casing shall be as detailed in Part 2 of this Section.

The Owner's Representative may select a greater steel thickness and diameter as appropriate for the intended application.

1.04 *Submittals*

If required by the Owner's Representative, the following items shall be submitted to CVWD for review and approval prior to the start of the casing work:

The pipe casing material to be used include casing material type, thickness, and welding details.

Casing spacers and end seals.

Installation procedure.

Welding procedure.

Epoxy coating repair procedure as recommended by manufacturer.

Cathodic Protection.

PART 2 Materials

2.01 Steel Pipe Casing

Steel pipe casing diameter and casing wall thickness shall be in accordance with the Approved Standard Drawings.

Steel pipe casings, unless otherwise approved by CVWD, shall be butt welded sheets (spiral welding of pipe not allowed) conforming to ASTM A 36/A 36M, ASTM A 283/ A 283M, Grade D, or ASTM A 568/A 568M, Grade 33. Other steel grades may be used upon approval of the Engineer.

2.02 Epoxy Coating for Steel Casing

This specification covers the requirements for the plant application of fusion bonded epoxy coatings to steel pipe casings. The epoxy coated steel pipe casing shall be used in locations where both open trench excavation and jack and bore operations are utilized for construction. The coating shall be placed on the outside and inside of the steel casings.

Epoxy coating for steel pipe casing shall be selected from the Approved Materials List. Standard products of manufacturers other than those shown on the Approved Materials List will only be accepted when it is proved to the satisfaction of the Owner's Representative they are equal in composition, durability, and usefulness for the purpose intended.

The Contractor shall perform the work in accordance with the latest editions of the following Steel Structures Painting Council (SSPC) publications.

2.03 Surface Preparations

Prior to blast cleaning, surfaces shall be inspected and pre-cleaned according to SSPC-SP1 to remove oil, grease and loosely adhering deposits.

The exterior pipe surface shall be blast cleaned to SSPC-SP10 near-white finish using steel grit or steel grit-shot mixture after pre-heating of pipe to sufficient temperature to remove all moisture.

The abrasive cleaning media shall be selected to achieve an anchor profile of not less than 1.5 mils or more than 4.0 mils.

Any raised slivers, scabs, laminations or bristles of steel remaining on the newly cleaned surfaces, including on welds, shall be removed using abrasive grinders or hand filing. Care shall be taken not to destroy the anchor pattern.

Prior to coating, the cleaned pipe shall be inspected to ensure that all cleaning steps have been adequately performed. Presence of contaminants shall be cause for rejection of the surface preparation.

2.04 *Coating Materials*

The coating shall be comprised of 100 percent pure thermosetting epoxy coating powder. The coating shall be applied in a multi-step process to a common maximum of three coats. The first and second coats (undercoat) shall consist of a one part Epoxy Coating, heat curable, coating designed for corrosion protection of pipe. The third coat (topcoat) shall consist of Epoxy Coating.

The steel casings that will be jacked shall include a three coat epoxy system. The steel casings installed by trench excavation shall include a two coat epoxy system with no topcoat. On the inside of both steel casing applications, the Contractor shall apply the two coat epoxy system.

The undercoat material shall be selected from the Approved Materials List and applied to the prepared steel surfaces in two coats to a maximum of 12 to 16 mils by electro-static spray in strict accordance with the manufacturer's written instructions.

The topcoat material shall be selected from the Approved Materials List and applied over the gel coat cycle of the undercoating in one coat to a maximum of 15 to 30 mils by electro-static spray in strict accordance with the manufacturer's written instructions.

After the electro-static application, the coatings shall be cured in accordance with the written instructions of the manufacturer.

2.05 *Casing Spacers*

The casing spacers shall be stainless steel insulator selected from the Approve Materials List. The spacers shall have 2-inch wide runners and the height shall provide a 1-inch clearance above the mechanical pipe joint restraint system.

2.06 *Casing End Seals*

The end seals should be 1/8 inch thick synthetic rubber with stainless steel bands for securing the end seal to the steel casing and PVC pipe. The end seal shall be selected from the Approved Materials List. In areas where groundwater is present in the pipe zone, a concrete thrust block will be installed around the end seal. An 8-inch thick brick and mortar bulkhead may be substituted for the synthetic rubber end seal when approved by the Owner's Representative.

2.07 *Polyethylene Materials*

A polyethylene sleeve shall be placed around the steel casing that will be placed under the open trenching method to serve as additional protection against corrosion. Polyethylene sleeves shall be a minimum 8 mil (0.008 inches) thick in accordance with AWWA 105.

PART 3 Execution

3.01 Trench Excavation, Backfill and Compaction

Trenching, bedding, backfilling and compaction operations shall be performed in accordance with Section 31 23 17.

3.02 Dewatering

The Contractor shall provide and maintain at all times during construction ample means and devices to promptly remove and dispose all water from any source entering trench excavations or other parts of the work in accordance with Section 31 23 19. Any damage caused by flooding of the trench shall be the Contractor's responsibility.

Dewatering shall be performed by methods that will maintain a dry excavation, preservation of the final lines and grades and protection of all utilities. If flooding of the trench does occur, the Contractor shall immediately dewater and restore the trench. Damaged or altered pipeline appurtenances or trench materials shall be repaired or replaced as directed by the Owner's Representative.

3.03 Pipe Casing Installation

Installation of pipe casing and carrier pipe shall be as described below and in accordance with the Approved Standard Drawings.

Pipe casing shall be installed in an open trench type excavation.

Pipe casings shall be lowered onto the bedding of the proper lines and grades called for on the Approved Plans.

Pipe casings shall have firm bearing along their full length.

Steel casing sections shall be joined by full-circumference butt welding in the field. Steel casing shall have all areas of damaged coating repaired.

Carrier pipe shall be pushed into the casing incorporating the use of casing spacers as described below.

Ductile-iron carrier pipe joints shall be fully restrained.

Upstream and downstream elevations of the carrier pipe shall be verified prior to installing the end seals.

The portion of carrier pipes installed within casings shall have pressure, leakage, and infiltration testing completed in accordance with Section 33 14 00 prior to installation of the end seals.

The annular space between the carrier pipe and casing for domestic water non-potable force mains that carry product shall not be filled with any material unless otherwise noted on the Approved Plans. The annular space between the carrier pipe and casing for gravity flow pipe systems, when constructed below the water table, shall be backfilled with gunite sand as approved by the Owner's Representative.

3.04 *Casing Spacers*

Casing spacers shall be used to prevent the carrier pipe bell from touching the casing and to maintain a uniform space between the carrier pipe and casing interior. A minimum of three casing spacers shall be installed, equally spaced, on each carrier pipe section at intervals recommended by the manufacturer.

3.05 *Casing End Seals*

Casing end seals shall be installed in accordance with the manufacturer's recommendations. Where approved by the Owner's Representative, brick and mortar bulkheads shall be constructed in accordance with the SSPWC.

Carrier pipe shall pass hydrostatic or leakage tests in accordance with Section 33 14 00 prior to the installation of casing end seals, brick and mortar bulkheads or backfilling operations.

END OF SECTION 33 05 23.10

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SECTION 33 11 13
PIPING SYSTEMS AND APPURTENANCES

PART 1 General

1.01 Description

As specified herein, the Contractor shall furnish all labor, materials, equipment and tools required for the complete installation and testing of the pipe system, appurtenances and structures as shown in the Bid Schedule Sheets, as shown on the Approved Plans and within the contract time allotted.

The piping shown on the Approved Plans is intended to define the general layout, configuration, routing, and method of support, pipe size and type. The plans are not intended as pipe fabrication drawings. It is the Contractor's responsibility to develop the details necessary to construct all mechanical piping systems, to accommodate the specific equipment provided and to provide and install all spools, spacers, adapters, connectors, and other appurtenances in order to provide a complete and functional system.

The work includes, but is not limited to, all excavation, backfill, disposal, resurfacing of roads and driveways, verification of utilities, installation of all pipe and pipeline fittings/specials such as crosses, tees, elbows, bends, restrained joint systems, couplings, reducer, increasers, bolts, nuts, polyethylene encasement, valve wells and extensions, meter boxes and all necessary cuts and welds. All thrust forces in the pipe, such as at the ends of lines, closed valves, at crosses, tees, elbows, bends, reducers, etc., shall be sufficiently restrained to withstand all unbalanced forces. Unless otherwise approved by the Owner's Representative, restrained fittings for ductile iron pipe shall be used as shown on the Approved plans, as indicated in these Specifications and as directed by the Owner's Representative. All pipe restraint systems shall be included in the bid price for the installation of pipe.

1.02 Quality Assurance

The Contractor shall be responsible for the quality of all work of his forces and that of his subcontractors, for adherence to all laws and regulations, for all public relations regarding the contract work and as set forth elsewhere in these Specifications.

1.03 Submittals

Submittals shall be submitted pursuant to the requirements of these Specifications and shall show the materials, dimensions, stations and relevant details.

1.04 *Delivery, Storage, and Handling*

All piping materials, fittings, valves and appurtenances shall be delivered in clean and undamaged condition and shall be stored off the ground. All defective or damaged material shall be replaced with new materials by the Contractor at Contractor's expense.

PART 2 Materials

2.01 *Restrained Joint System*

Restrained joint systems shall be designed for ductile-iron pipe and shall be selected from the Approved Materials List.

2.02 *Bolts and Nuts*

- A. Bolts and nuts shall be selected from the Approved Materials List.
- B. Cadmium/Zinc plated or fluoropolymer coated bolts and nuts shall be used for the installation of pipelines up to 18-inch diameter and shall be carbon steel conforming to ASTM A307, Grade A Bolts and A307 2H heavy hex nuts, unless otherwise indicated on the Approved Plans.
- C. Stainless steel bolts and nuts shall be used for the installation of pipelines 24-inch diameter and larger and for submerged flanges. Bolts and nuts shall be Type 316 stainless steel conforming to ASTM A193, Grade B8M for bolts and Grade 8M for nuts, unless otherwise indicated on the Approved Plans.
- D. All bolt heads shall be hexagonal conforming to ASME B18.2.1 and nuts shall be hexagonal conforming to ASME B18.2.2, except where special shapes are required. Bolts shall be of such length that a minimum of two threads shall protrude past the nut when fully tightened.

2.03 *Polyethylene Encasements*

Polyethylene encasement shall be as indicated below.

- A. Encasement material shall be V-Bio Enhanced Polyethylene with a minimum of 0.008 inch (8 mils) thickness from linear low-density polyethylene film (LLDPE) in accordance with ANSI/AWWA C105/A 21.5.
- B. Polyethylene encasement wrap or tubes shall be clear or white for potable water and purple for use with non-potable water.
- C. Polyethylene encasement material shall be clearly marked in accordance with AWWA/C105/A 21.5 with manufacturer's name, year manufactured, AWWA C105/A 21.5, film thickness and material type LLDPE.

- D. Polyethylene encasement wrap or tubes shall be secured with 2-inch wide polyethylene or vinyl adhesive tape.
- E. Polyethylene encasement shall be only tube type for pipe and shall be installed per methods A per AWWA C105/A 21.5.

2.04 *Valve Operator Wells*

- A. Valve operator wells shall consist of 8-inch polyvinyl chloride (PVC), AWWA C900-07 DR-18 pipe, concrete valve can, cast iron triangular cover and concrete collar selected from the Approved Materials List and as shown on the Approved Standard Drawings.
- B. Valve operator wells 8-inch PVC, AWWA C900-07 DR-18 for potable water system applications shall be white or blue.
- C. Valve operator well lids shall be triangular ductile iron selected from the Approved Materials List. Lids shall be cast as shown on the Approved Standard Drawings.

2.05 *Valve Operator Nut Extension*

Valve operator nut extensions shall be selected from the Approved Materials List.

2.06 *Meter Boxes*

- A. Meter boxes shall be selected from the Approved Materials List.
- B. Meter box lids for use for potable water systems shall be gray in color.
- C. Meter box lid for uses in non-potable systems shall be purple in color.

PART 3 Execution

3.01 *Restrained Joint System*

Restrained joint system shall be installed as shown on the Approved Plans and in accordance with the manufacturer's recommendations and as directed by the Owner's Representative.

3.02 *Bolts and Nuts*

- A. All bolts and nuts shall be new and unused. Bolts shall not be reused once tightened. All used bolts and nuts shall be discarded and removed from the job sites. Rusted or oxidized bolts and nuts shall not be used and are to be discarded.
- B. Bolts and nuts shall be clean and lubricated prior to assemble.

- C. Tighten bolts and nuts per the manufacture's recommended bolt tightening sequence and torque procedure.
- D. All stainless steel bolts shall be coated with anti-seize compound selected from the Approved Materials List.

3.03 *Polyethylene Encasement Installation*

Polyethylene encasement shall completely encase and cover all metal surfaces in accordance with AWWA C105.

A. Pipe:

All ductile-iron pipe shall be encased with polyethylene tubes in accordance with Method A as described in AWWA C105.

B. Pipe-Shaped Appurtenances:

All ductile-iron pipe-shaped appurtenances such as bends, reducers and offsets shall be encased with polyethylene tubes in accordance with Method A as described in AWWA C105.

C. Odd-Shaped Appurtenances:

Odd-Shaped Appurtenances such as tees and crosses shall be encased with polyethylene wrap in accordance with AWWA C105.

D. Valves:

Valves shall be encased with polyethylene wrap in accordance with AWWA C105. Valves shall be wrapped such that only the stem and operator nut are exposed and the wrap shall be attached so that the valve operation will not disturb or tear the polyethylene wrap sealing the valve. The exposed valve stem and operator nut above the polyethylene wrap shall be coated with NO-OX-ID protective grease selected from the Approved Materials List.

E. Securing Polyethylene Tubes:

Polyethylene sleeves shall be secured with polyethylene or vinyl adhesive tape at the ends and quarter points along the tube in such a manner that will hold the tube securely in place during backfill operation.

F. Securing Polyethylene Wrap:

Polyethylene wrap shall be secured with polyethylene or vinyl adhesive tape in such a manner that will hold the wrap securely in place during backfill operation.

- G. All holes, tears or abrasions to the polyethylene wrap shall be taped over or covered with a second layer of polyethylene wrap. The polyethylene surface shall be clean to allow full adhesion of the tape to the surface.

3.04 *Valve Operator Wells*

Valve operator wells shall be installed as shown on the Approved Standard Drawings and as described below.

- A. The valve operator well frame and lid shall be raised to final pavement grade.
- B. The valve operator well shall be centered over the valve operator nut. The valve operator well shall be free of all soil and debris for access to the valve operator nut prior to progressing the valve for service.
- C. The contractor shall make the final adjustment to caps as per the manufacturer's instruction and to the satisfaction of CVWD's representative. The cap shall not rock, shake or rattle when the roadway is open to vehicle traffic.
- D. The concrete collar shall be constructed of 560-C-3250 concrete with fiber reinforcing.
- E. Valve operator well caps shall be color-coded to identify the valves normal position of closed or open.

<u>Color</u>	<u>Valve Well Cap</u>
Red	Normally Closed System Valve
Yellow	Normally Open System Valve
Blue	Butterfly Valve
Silver	Blow-off
Purple	Non-potable
Green	Sanitation

3.05 *Valve Operator Nut Extension*

All valve operator nut extensions shall be fabricated and installed in accordance with the Approved Standard Drawings when the operator nut is more than 4 feet below the roadway or finished grade. Valve operator nut extensions shall be installed where necessary to maintain the depth below finish grade to the operator nut to no more than four feet. The design of the valve operator nut extension shall be such to ensure the centering of the operator nut within the valve operator well. The stem extensions shall be complete with operator nut, location ring, and lower socket to fit valve operator nut. The configuration of the extension stem socket shall match that of the valve it operates.

3.06 *Meter Box Installation*

Meter boxes shall be installed at the elevations and locations as shown on the Approved Plans and in accordance with the Approved Standard Drawings. After sidewalk, curb and gutter have been installed a final meter box adjustment to finished grade may be required. Water meters shall not be installed until final adjustments are made to the meter box and are approved by the Owner's Representative.

3.07 *Installation of Water Pipeline*

Installation of pipeline shall be per the latest edition of the "Standard Specifications for Public Work Construction" (SSPWC) unless supplemented by this specification.

The pipe shall be accurately laid to the alignment and grade shown on the Approved Plans or as established by the Owner's Representative. Prior to placing the pipe in the trench, the contractor shall remove any material that may damage the pipe or the pipe polyethylene encasement including sharp rocks, lumber, nails, sheet metal or other sharp objects. The pipe ends shall be covered at the end of each day or when work activity has ceased on a particular section of pipe. The pipe is to remain free and clear of any dirt and foreign objects. The contractor shall be responsible for protecting the pipeline from mud and trench water during the construction of pipeline.

3.08 *Permanent Abandonment of Pipelines and Appurtenances*

When indicated on the Approved Plans or when directed by the Owner's Representative, existing pipelines to be abandoned shall be disconnected from all source pipelines in accordance with the modifications and instructions listed below:

- A. All above-ground appurtenances connected to pipelines to be abandoned shall be removed and disposed of or salvaged in accordance with this Section.
- B. All piping and appurtenances buried at a depth of 24-inch or less and connected to pipelines to be abandoned shall be removed and disposed of or salvaged in accordance with this Section. Remaining pipe ends, gate wells and other appurtenances cut at a depth of 24-inch shall be removed entirely or pressure grout or blown sand filled. Excavated areas shall be replaced with compacted backfill and surfaces shall be repaired in accordance with these Standard Specifications.
- C. All pipelines and appurtenances buried at a depth greater than 24-inch shall be pressure grout or blown sand filled or the pipeline crushed in place and appurtenances removed or as directed by the Owner's Representative.
- D. Abandoned pipe 16-inch and larger shall be entirely filled by pressure-grouting or by blown sand.

- E. All valves buried at a depth greater than 24-inch on pipelines to be abandoned and are not shown to be salvaged on the Approved Plans shall be turned to the closed position, the valve stem shall be severed and the operator nut removed. All valves to be abandoned regardless of depth shall have the valve can, concrete collar, lid and frame removed and the street repaired.
- F. Water services to be abandoned that are connected to pipelines that will remain in service shall be abandoned in-place and deactivated at the corporation. Water services connected to pipelines to be abandoned shall be abandoned in-place and cut ends shall be crimped.
- G. Sewer laterals connected to sewer mains to be abandoned or laterals to be abandoned shall be pressure grout or blown sand filled as directed by the Owner's Representative for the specific circumstance and material type identified.
- H. Sewer manholes shall have the cover and frame, concrete ring, grade rings and cone section removed to the depth indicated on the Approved Plans. Inlet and outlet piping shall be plugged with concrete, manhole void shall be filled with sand, and a 12-inch thick, reinforced concrete slab shall be poured over the top of remaining manhole. The Contractor shall backfill hole to ground surface with compacted select fill.
- I. Sewer and Storm Drain manhole covers and frames shall be salvaged and remain the property of CVWD in accordance with Section 3.11 Salvage.

3.09 *Removal of Pipelines and Appurtenances*

- A. Existing pipe and appurtenances shall be completely removed when indicated on the Approved Plans or as directed by the Owner's Representative. All materials removed during construction operations shall be salvaged or disposed of in accordance with this Section.
- B. When fittings, appurtenances, or pipe segments are removed from pipelines that are to remain in service, the removed portions shall be replaced with straight segments of pipe and appropriate couplings selected from the Approved Materials List.
- C. Contractor shall provide measures that allow for the removal of existing sewer mains and appurtenances with no leakage of raw sewage. Transportation of sewer mains and appurtenances removed from service shall be in waterproof trucks to prevent raw sewage from leaking on public streets.
- D. Removal of asbestos-cement pipe (ACP) and sewer mains and appurtenances shall be in accordance with all applicable State and Federal requirements, and disposal shall be in accordance with the requirements of this Section.

- E. Backfill, compaction, and surface repair of all excavations for removal of pipe and appurtenances shall be made in accordance with the Approved Plans, these Standard Specifications, or as directed by the Owner's Representative.

3.10 *Reconnections*

Existing water service lines or appurtenances shall be connected to new pipelines as shown on the Approved Plans or as directed by the Owner's Representative.

3.11 *Salvage*

When the Contractor is required to remove existing pipe and appurtenances, such materials may, when shown on the Approved Plans or directed by the Owner's Representative, be considered salvage. All materials identified as salvage are considered property of CVWD. The Contractor shall temporarily stockpile all material identified as salvage in a location that will not disrupt traffic or otherwise create an unsafe condition and shall deliver salvaged material to the CVWD's materials yard in Coachella. The Contractor shall provide all transportation and equipment to offload such materials as directed by the Owner's Representative.

3.12 *Disposal*

All materials removed during construction operations and not identified by the Owner's Representative as salvage shall be legally disposed of in accordance with all applicable Local, State, and Federal requirements.

Disposal of asbestos-cement pipe requires special handling and attention, including but not limited to, encapsulation within airtight packaging, submittal of certification letters and/or waste profile statements, and the use of a Cal-OSHA registered asbestos abatement contractor to transport and dispose of such wastes. The Owner's Representative shall be provided with copies of all applicable documentation regarding the transportation and disposal of asbestos-cement pipe. Contractor shall comply with all applicable regulations and all requirements of the disposal site. Contractor is responsible for all costs associated with disposal of materials, specifically including any materials that may contain asbestos.

END OF SECTION 33 11 13

SECTION 33 11 13.10
DUCTILE IRON WATER PIPE AND FITTINGS

PART 1 General

1.01 *Requirements*

It is required that the contractor shall furnish, unload and string along the trench site, all pipe and material as hereinafter described in these specifications. All fabrication, workmanship, material, and testing of pipe shall conform to the latest revision of the Specifications.

1.02 *Delivery*

- A. Transport, deliver, unload, store and handle all materials in a manner to prevent damage to the materials or the work.
- B. All damaged, broken or otherwise defective materials will be rejected.
- C. Store all circular rubber gaskets and special lubricants in packaged materials with the manufacturer's name, brand and all other applicable data plainly marked thereon.

1.03 *Quality Assurance*

- A. American Water Works Association (AWWA).
 - 1. Ductile iron pipe centrifugally cast in metal molds or sand-lined molds for water or other liquids ANSI A21.51 (AWWA C151).
 - 2. Cement mortar lining for ductile iron pipe and fittings for water ANSI A21.4 (AWWA C104).
 - 3. Rubber gasket joints for ductile iron pressure pipe and fittings (ANSI A21.11 (AWWA C111)).
 - 4. Standard for disinfecting water mains ANSI/AWWA C651.
 - 5. Installation of ductile cast iron water mains and appurtenances ANSI/AWWA C600.
 - 6. Thickness design of ductile iron pipe ANSI A21.50 (AWWA C150).

1.04 *Measurement and Payment*

Payment for pipe shall be made on a unit price basis per lineal foot of pipe.

PART 2 Product

2.01 Type of Pipe

Ductile iron pipe shall conform to ANSI A21.51 (AWWA C151) class to thickness designed per ANSI 21.50 (AWWA C150), Tar (Seal) coated and cement mortar lined per ANSI A21.4 (AWWA C104) unless otherwise specified, with bolted mechanical joints or push-on joints as indicated on the plans or special provisions. The minimum laying lengths for DIP shall be 18 feet. Cut sections of pipe (pups) shall not be less than 2 feet in length for pipe diameters 12-inch and smaller and not less than 3 feet for pipe diameters 18-inch and larger. Delivered pipe to include 5% +/- short joints.

2.02 Class of Pipe

Ductile iron pipe shall be minimum pressure class 350 for pipe diameters 12-inch and smaller, Class 250 for 18-inch and larger unless indicated differently on the plans.

2.03 Type of Fittings

Fittings shall be ductile iron and shall conform to ANSI A21.10 (AWWA C110) or A21.53 (AWWA C153), and ANSI A21.11 (AWWA C111). Fittings shall be bolted mechanical joints or push-on joints unless otherwise indicated on the plans, bid items, or the special provisions. All bends shall use mechanical joints for 18-inch and above. Fittings shall be tar (seal) coated and cement mortar lined per ANSI A21.4 (AWWA C104). Above grade fittings shall be flanged and from the Approved Materials List.

2.04 Service Connection Outlets

Service connection outlets shall be bronze service saddles with CS (Mueller) threads for receiving a bronze corporation stop in accordance with CVWD Standard Drawings W-7, W-9, and W-11. Service Saddle shall be Mueller, Jones or approved equal, for piping up to 18-inch. Piping 24-inch and larger shall not be tapped for domestic services unless approved on the plans.

2.05 Polyethylene Encasement

All ductile iron pipe and fittings shall be polyethylene encased at the time of installation. Polyethylene encasement and installation shall be in accordance with ANSI/AWWA C105.

2.06 Restrained Systems

Restrained systems for ductile iron pipe shall be installed in accordance with Section 33 11 13, Part 2 of CVWD Specifications.

PART 3 Execution

3.01 *Installation*

Ductile iron pipe shall be installed in accordance with ANSI/AWWA C600 and Section 33 11 13 of these Specifications.

END OF SECTION 33 11 13.10

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SECTION 33 12 13
COPPER PIPE, TUBING, BRASS AND BRONZE PIPE FITTINGS

PART 1 General

1.01 *Description*

This section includes materials and installation of copper tubing, brass and bronze pipe fittings and appurtenances. All copper services and fittings shall conform to AWWA C800 and these Specifications.

1.02 *Service Lateral Hot/Wet Tap Connections*

CVWD will perform all hot/wet tap connections to existing pipelines in accordance with Section 33 11 13.

1.03 *Submittals*

If required by the Owner's Representative, the following items shall be submitted to CVWD for review and approval prior to ordering or delivery.

- A. The manufacture shall provide proof of compliance with NSF/ANSI 61 Annex G, NSF/ANSI 372 and conform with the lead content requirements for "lead-free" plumbing as defined by California's statute §116875.

PART 2 Materials

2.01 *Copper Pipe and Tubing*

Copper tubing shall conform to ASTM B 88 and shall be Type K soft (annealed). Copper tubing in 1-inch diameter and smaller may be delivered in coils. Copper 1 ½ inch and over shall be delivered in 20 foot straight lengths (not coils).

2.02 *Brass Pipe, Nipples, and Fittings*

Threaded nipples, brass pipe and fittings shall conform to ASTM B 43, regular wall thickness. Threads shall conform to ANSI B1.20.1. Fittings shall be compression type. Cast brass or bronze pipe fittings shall conform to ANSI / ASME B1.20.1 for thickness and pressure tests. Pipe threads for cast brass pipe fittings shall conform to ANSI / ASME B1.20.1.

2.03 *Bronze Appurtenances*

- A. Corporation stops, curb stops, meter and angle meter stops, meter flange adapters, and bronze-bodied service saddles shall be selected from the Approved Materials List in accordance with the Standard Drawings.
- B. Fittings intended to connect to copper tubing shall be compression type.
- C. All items specified herein shall be manufactured of bronze conforming to ASTM B 62.
- D. Service saddles for Ductile Iron Pipe (DIP) shall be the double strap type.

2.04 *Bolts and Nuts for Flanges*

Bolts and nuts shall be in accordance with Section 33 11 13 and the Approved Materials List.

PART 3 Execution

3.01 *Copper Tubing and Fittings*

- A. Trenching, bedding, backfilling and compacting shall be performed in accordance with Section 31 23 17 and the Standard Drawings. Provide a minimum cover of 30-inch below finished street grade.
- B. Cut tubing true and square and remove burrs.
- C. Bends in soft copper tubing shall be a long sweep. Shape bends with shaping tools. Form bends without flattening, buckling, or thinning the tubing wall at any point.
- D. Assemble copper tubing and fittings per the manufacturer's recommendation in accordance with the Approved Standard Drawings.

3.02 *Service Saddles*

- A. Service saddles shall be located a minimum of 24-inch from any pipe joint or fittings.
- B. Service saddles for connections shall be located a minimum of 24-inch from other saddles. Additionally, multiple service saddles for connections that are installed on the same side of a single pipe length shall be alternately staggered between 10 degrees and 30 degrees to prevent a weak plane in the pipe.

- C. The surface of the pipe shall be clean and all loose material shall be removed to provide a hard, clean surface.
- D. The service saddle shall be tightened in accordance with the manufacturer's recommendations to ensure a tight seal, using care to prevent damage or distortion of the service saddle or corporation stop due to over-tightening.
- E. The service saddle hole into the pipe shall be made in accordance with the pipe manufacturer's recommendation. Tools and/or shell cutters with internal teeth or double slots that will retain the coupon shall be used.

3.03 *Disinfection and Bacteriological Testing*

Disinfection, bacteriological testing, and flushing shall be performed in accordance with Section 33 13 00.

3.04 *Hydrostatic Testing*

Field hydrostatic testing shall be performed in accordance with Section 33 14 00.

END OF SECTION 33 12 13

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33 12 16.10

RESILIENT-SEATED GATE VALVES

PART 1 General

1.01 Description

This section includes materials, testing, and installation of manually-operated Resilient-Seated Gate Valves (RSGVs).

1.02 Service Application

- A. RSGVs shall be installed on potable and recycled water mains and appurtenances in accordance with the Approved Plans and the Approved Standard Drawings.
- B. RSGVs shall be used to isolate and depressurize pipeline segments for repairs, modifications, inspections or maintenance.
- C. In general, RSGVs shall be used when valves are required on pipelines and appurtenances sized 4-inch through 12-inch.
- D. Valves for pipelines sized 14-inch and larger generally require the use of butterfly valves (BFV's) in accordance with Section 33 12 16.20.
- E. Valves 3-inch and smaller shall be in accordance with Section 33 12 16.40.

1.03 Submittals

If required by the Owner's Representative, the following items shall be submitted to CVWD for review and approval prior to ordering or delivery of valves.

- A. RSGVs 12-inch and smaller shall be selected from the Approved Materials List.
- B. RSGVs 14-inch and larger require CVWD Approval. Submittals shall include catalog data showing conformance to AWWA C509, size(s) proposed for use, valve dimensions, pressure rating, and materials of construction, and such valves shall also conform to all other requirements specified herein.
- C. The manufacture shall provide proof of compliance with NSF/ANSI 61 Annex G, NSF/ANSI 372 and conform with the lead content requirements for "lead-free" plumbing as defined by California's statute §116875.

1.04 *Sizing of Valves*

Valves shall be the same size as the line in which they are installed unless otherwise noted on the Approved Plans.

1.05 *Valve Ends*

RSGVs shall be furnished with flanged ends. Ductile-iron flanges shall be in accordance with Section 33 11 13.10.

1.06 *Valve Testing*

RSGVs shall be hydrostatically leak tested and coatings shall be holiday detected prior to shipment to the field. Valves delivered to the site prior to successful hydrostatic testing and holiday detection shall be rejected.

1.07 *Delivery, Storage and Handling*

Valves shall be delivered and stored in accordance with AWWA C550. The port openings shall be covered with plastic, cardboard or wood while in transit and during storage in the field. These covers shall remain in place until valves are ready to be installed. Valves shall not be stored in contact with bare ground. Valves shall not be stacked.

1.08 *Polyethylene Wrap*

Polyethylene wrap shall be used for the buried installation of RSGVs in accordance with Section 33 11 13.

PART 2 Materials

2.01 *Resilient-Seated Gate Valves (RSGVs)*

- A. RSGVs shall be ductile-iron in accordance with AWWA C509 and C515 except as modified herein.
- B. RSGVs shall have smooth unobstructed waterways free from any sediment pockets.
- C. RSGVs shall be leak-tight at their rated pressure.
- D. RSGVs shall have a non-rising low-zinc bronze or stainless steel stem, opened by turning left (counterclockwise).
- E. Stem seals shall be the O-ring type incorporating a minimum of two rings as required by AWWA C509.

- F. Low-friction torque-reduction thrust washers or bearings shall be provided on the stem collar.
- G. Wedge (gate) shall be fully encapsulated with a bonded-in-place Ethylene Propylene Diene Monomer (EPDM) elastomeric covering. Minimum thickness of the rubber seating area shall be ¼ inch.
- H. Valves for buried applications shall be provided with a 2-inch square operating nut, and valves located above ground or in structures shall be equipped with a minimum 12-inch diameter hand wheel in accordance with AWWA C509 unless otherwise indicated on the Approved Plans or required by the Owner's Representative.
- I. RSGV interior and exterior surfaces (except for the encapsulated disc) shall be coated as described below.
- J. All bolts and nuts used in the construction of RSGVs shall be Type 316 stainless steel.

2.02 *Epoxy Lining and Coating*

Epoxy linings and coatings for valves shall be provided in accordance with AWWA C210, C213 and C550, with the following modifications:

- A. Epoxy lining and coating of valve surfaces shall be performed by the valve manufacturer by qualified personnel in a facility where the environment can be controlled. Epoxy lining and coating of valves in the field is prohibited.
 - 1. Surface preparation shall be as detailed in SSPC-SP5, White-Metal Blast Cleaning.
 - 2. The manufacture shall provide proof of compliance with NSF/ANSI 61 Annex G, NSF/ANSI 372 and conform with the lead content requirements for "lead-free" plumbing as defined by California's statute §116875.
 - 3. The minimum dry film thickness for epoxy linings shall be 0.008-inch or 8 mils. Liquid epoxy lining shall be applied in two (2) coats in accordance with AWWA C210 and application shall conform to the coating manufacturer's recommendations.
 - 4. Powder epoxy lining and coating materials shall contain one hundred percent (100%) solids in accordance with AWWA C213, shall be applied in one or more coats, and shall conform to the coating manufacturer's recommendations.

5. Repairs made to manufacturer's applied linings shall be performed by a company approved by the valve manufacturer, by qualified personnel, and in a facility where the environment can be controlled.

2.03 *Valve Wells and Extension Stems*

Valve wells and extension stems for buried valves shall be in accordance with Section 33 11 13 and selected from the Approved Materials List.

2.04 *Concrete*

Concrete used for thrust, anchor, and support blocks shall be in accordance with Section 03 30 00.

PART 3 Execution

3.01 *Installation*

- A. Install valves with the bolt holes straddling the vertical centerline of pipe and the operating nut in the vertical position unless otherwise noted on the Approved Plans.
- B. Valves shall be installed in accordance with the manufacturer's recommendations and the applicable section of these specifications for the piping material and joint type being used.

3.02 *Disinfection of Valves*

Disinfection and flushing shall be in accordance with Section 33 13 00, as part of the process of disinfecting the main pipeline. The valves shall be operated during the disinfection period to completely disinfect all internal parts.

3.03 *Hydrostatic Testing*

Valves shall be subject to pressure during the hydrostatic test of the pipelines in accordance with Section 33 14 00.

END OF SECTION 33 12 16.10

33 12 16.20
BUTTERFLY VALVES

PART 1 General

1.01 *Description*

This section includes materials, testing, and installation of manually operated butterfly valves (BFV).

1.02 *Service Application*

- A. Butterfly valves (BFV) shall be installed on potable and non-potable water mains and appurtenances where shown on the Approved Plans and in accordance with the Standard Drawings.
- B. Butterfly valves shall be used for open/closed operations.
- C. Valves discontinued by the manufacturer as of the bid opening date will not be accepted.
- D. In general butterfly valves shall be used when valves are required on pipelines 18-inch and larger and where the use of a motor-operated valve is required as shown on the Approved Plans. Butterfly valves smaller than 18-inch shall only be used as indicated on the Approved Plans or with the prior approval of the Owner's Representative.
- E. Valves for pipelines sized 12 inch and smaller generally require resilient wedge gate valves (RWGVs) in accordance with Section 33 12 16.10.
- F. Valves 3-inch and smaller shall be in accordance with Section 33 12 16.40.

1.03 *Submittals*

If required by the Owner's Representative, the following items shall be submitted to CVWD for review and approval prior to ordering or delivery of valves.

- A. An affidavit from the valve manufacturer shall be provided for the following:
 - 1. The valve manufacturer shall certify that all actuators were furnished and installed by the valve manufacturer.
 - 2. Submit all calculations for valve break and dynamic torque for butterfly valves operation from 0 to 90 degrees, at full open, the valves full rated pressure, and for bi-directional velocity. Pressure shall be 150 pounds per square inch (psi) at 16 feet per second (fps) unless otherwise noted. Where applicable, electric actuators shall be sized for a minimum safety

factor of 2.0 applied to the maximum dynamic torque for modulating valves or a safety factor of 1.5 applied to both break and dynamic torque for either open, closed or modulating valves. Calculations shall be provided for both methods in sizing electric actuators with the greater of the two methods governing.

3. Valves have successfully passed hydrostatic testing per AWWA C504 and coatings testing by the valve manufacturer.
 4. Provide copies of all test results certifying compliance with all applicable AWWA valve standards and as required in these specifications.
- B. The valve manufacturer's catalog data showing the size to be used, valve dimensions, pressure rating and materials of construction.
- C. Upon the request of the Owner's Representative for butterfly valves 30-inch and larger, each valve body shall be pressure tested to the equal to twice the design water-working pressure, unless specified otherwise. Leak test each valve at 200 psi for class 150B valves and 250 psi for class 250B valves. Provide signed and dated certificates of conformance.
- D. Actuator manufacturer's catalog data and detail construction sheets showing the dimensions, materials, number of turns, and required torque input of the actuator to be used.
- E. The manufacture shall provide proof of compliance with NSF/ANSI 61 Annex G, NSF/ANSI 372 and conform with the lead content requirements for "lead-free" plumbing as defined by California's statute §116875.

1.04 *Sizing of Valves*

Valves shall be the same size as the line in which they are installed unless otherwise noted on the Approved Plans.

1.05 *Valve Ends*

Valve ends shall be flanged ductile-iron unless otherwise called for on the Approved Plans or as directed by the Owner's Representative.

Ductile-iron flanges shall generally be in accordance with AWWA C115, and rated at a working pressure of 250 psi. When Class 250 butterfly valves are shown on the Approved Plans or are otherwise required, ductile-iron flanges shall be compatible with AWWA C207, Class "F".

Maximum working pressure of the flange shall as specified in AWWA or ASME/ANSI. Flanges shall be integrally cast per AWWA C110.

1.06 *Valve Testing*

Each valve body shall be tested by the manufacturer under a test pressure equal to twice its design water working pressure, and shall be shop-operated three (3) times in accordance with the requirements of AWWA Standard C-504.

A. Butterfly Valves Larger Than 18-Inches

Butterfly Valve Testing. Butterfly valves with size greater than 18 inches shall be hydrostatically tested per AWWA C504 in both directions. This test shall be conducted within 50 miles of the CVWD office and shall be performed in the presence of CVWD Inspection. No valve shall be installed until this testing has been completed and approved by CVWD.

Each valve shall be tested as detailed in the CVWD Standard Specifications and as specified below:

1. Visually inspect each valve and its actuator for compliance with the submittal.
2. Visually inspect each valve for obvious damage or substandard construction.
3. The testing medium shall be water. Under no circumstances is air to be used as the test medium.
4. Each valves is to be tested at its rated pressure.
5. Both sides of each valve are to be tested.
6. The test duration on each side of the valve is 5 minutes. A passing test is one where there is no visible leakage and no decrease on the initial test pressure.
7. A valve which fails the pressure test shall be either repaired or replaced. Repaired valves shall be retested. Replacement valves shall be tested using this procedure.
8. Valves shall only be repaired by personnel authorized by the valve manufacturer to do the necessary repairs. Unless they have been authorized by the valve manufacturer, supplier or contractor shall not be permitted to perform repairs.

1.07 *Delivery, Storage and Handling*

Valves shall be delivered and stored in accordance with AWWA C504 and AWWA C550. The port openings shall be covered with plastic, cardboard or wood while in transit and during storage in the field. These covers shall remain in place until the valve

is ready to be installed. Valves shall not be stored in contact with bare ground. Valves shall not be stacked.

1.08 *Polyethylene Wrap*

Polyethylene wrap shall be used for buried installation of butterfly valves in accordance with Section 33 11 13.

PART 2 Materials

2.01 *Butterfly Valves (BFV)*

- A. Butterfly valves and appurtenant components and materials shall be selected from the Approved Materials List.
- B. Butterfly valves shall be short body, leak-tight closing, and rubber-seated in accordance with AWWA C504 except as modified herein.
- C. Butterfly valve bodies shall be ductile-iron as defined within AWWA C504.
- D. Except as modified below, BFVs shall be Class 150B in accordance with AWWA C504, rated for a flow velocity of 16 feet per second (fps).
- E. Where the static pressure of the pipeline in which the BFV is to be installed exceeds 150 psi, a Class 250B butterfly valve in general conformance with AWWA C504 shall be required. Class 250B butterfly valves shall be submitted to the Owner's Representative for approval prior to ordering or delivery.
- F. Butterfly valves shall open by turning left (counterclockwise). Valve disc shall rotate ninety degrees (90°) from the full open position to the tight shut position.
- G. Butterfly valve interior and exterior surfaces shall be coated as described below.

2.02 *Butterfly Valve Discs*

- A. The butterfly disc shall be ductile-iron as defined within AWWA C504.
- B. The butterfly disc shall be secured to shaft with Type 304 stainless steel, straight through taper pins and locking nuts.

2.03 *Rubber Seat*

- A. Butterfly valve shall be seat on body construction only.
- B. Seat material shall be peroxide cured EPDM. Buna-N and Sulfur cured EPDM seat material are not acceptable.
- C. The seat shall not be mechanically retained with bolts, clamps or rings.

2.04 *Butterfly Valve Disc Seating Edge*

The butterfly valve disc seating edge shall be stainless steel type 304 or 316, or nickel-chromium alloy and attached to the disc. Seat edge material shall completely cover the leading edge of disc and shall be installed prior to application of coating. Valves disc seating edge shall be free of paint, overspray or coating.

2.05 *Shaft Seal*

Shaft seals shall be of a standard split “V” design and shall be self-adjusting and wear compensating. Valves with manual packing glands are not acceptable.

2.06 *Manual Valve Actuators*

- A. General:
 - 1. Operators and component parts: AWWA C504, unless otherwise specified in these Specifications.
 - 2. All valve actuators shall be watertight, designed for buried or submerged uses. Actuators shall be fully gasketed, sealed, and factory packed with grease.
 - 3. As directed by the Owner’s Representative, actuators for valves located above ground or in vaults and structures may have hand wheels or chain wheels. Minimum hand wheel diameter shall be 12-inch. The actuator shall be equipped with a dial indicator, which shows the position of the valve disc. The Owner’s Representative may require the use of a 2-inch square-operating nut in some cases.

4. Actuators for valves shall be provided with a 2-inch square-operating nut when buried or when indicated on the Approved Plans.
5. Actuators shall have travel stops, which can be adjusted in the field without having to remove the actuator from the valve.
6. Actuators shall accept a minimum of 450 foot-pounds of input torque at the full open and full closed positions without damage to the actuator or the valve.
7. Actuators equipped with 2-inch operator nuts shall require a maximum input torque of 150 foot-pounds to operate the valve. A maximum input torque of 80 foot-pounds shall be required to operate valves with hand wheels.
8. Actuators shall be installed, adjusted, tested and certified by the valve manufacturer prior to shipping.
9. Actuators shall require a maximum of one hundred (100) input turns for the complete ninety-degree (90°) movement of the disc.
10. Actuators shall receive an epoxy coating on the exterior surface as described below.

B. Traveling Nut Actuators:

1. Actuators for butterfly valves sizes 18-inch through 24-inch may be the manual traveling nut type. Traveling nut actuators shall not be used on valves requiring motor driven actuators or where CVWD has specified a worm gear type actuator.

C. Worm Gear Type Actuators:

1. Actuators for butterfly valves 30-inch or larger shall be the worm gear type. In addition, worm gear type actuators shall be used on butterfly valves requiring motor driven actuators or where CVWD has specified a worm gear actuator.
2. Worm gear actuators shall be totally enclosed and self-locking.

2.07 *Epoxy Lining and Coating*

Epoxy linings and coatings for valves shall be provided in accordance with AWWA C213 and C550, with the following modifications:

- A. Epoxy lining and coating of valve surfaces shall be performed by the valve manufacturer by qualified personnel in a facility where the environment can be controlled. Epoxy lining and coating of valves in the field is prohibited.
 - 1. Epoxy lining materials shall be listed in the NSF Listing for Drinking Water Additives, Standard 61, and certified for use in contact for potable water.
 - 2. The minimum thickness for epoxy linings shall be 0.012-inch or 12 mils.
 - 3. Powder epoxy lining and coating materials shall contain one hundred percent (100%) solids in accordance with AWWA C213, shall be applied in three coats, and shall conform to the coating manufacturer's recommendations.
 - 4. Repairs made to manufacturer's applied linings shall be performed by a company approved by the valve manufacturer, by qualified personnel, and in a facility where the environment can be controlled.

2.08 *Valve Wells and Extension Stems*

Valve wells and extension stems for buried valves shall be in accordance with Section 33 11 13 and selected from the Approved Materials List.

2.09 *Concrete*

Concrete used for thrust, anchor, and support blocks shall be in accordance with Section 03 30 00.

PART 3 Execution

3.01 *Installation*

- A. Install valves with the bolt holes straddling the vertical centerline of pipe and the operating nut in the vertical position unless otherwise noted on the Approved Plans.
- B. Valves shall be installed in accordance with the manufacturer's recommendations and the applicable section of these specifications for the piping material and joint type being used.

C. Aboveground valves shall be rigidly held in place using supports and hangers in accordance with the Approved Plans and Standard Drawings. The stem orientation of valves in elevated piping shall be as approved by the Owner's Representative for accessibility, except that no valves shall be installed with stems aligned below horizontal. Saddle type valve supports shall be provided. Supports shall be of rugged construction providing at least one hundred twenty degrees (120°) under support for the valve body. Valve supports shall be constructed of steel, and shall be anchored to the foundations using stainless steel anchor bolts.

3.02 *Disinfection of Valves*

Disinfection and flushing shall be in accordance with Section 33 13 00, as part of the process of disinfecting the main pipeline. The valves shall be operated during the disinfection period to completely disinfect all internal parts.

3.03 *Hydrostatic Testing*

Valves shall be subject to pressure during the hydrostatic test of the pipelines in accordance with Section 33 14 00.

END OF SECTION 33 12 16.20

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SECTION 33 12 16.40
MISCELLANEOUS VALVES (3-inch and Smaller)

PART 1 General

1.01 *Description*

This section includes materials and installation of manually operated valves such as check valves, corporation stops, meter stops and ball valves.

1.02 *Submittals*

If required by the Owner's Representative, the following items shall be submitted to CVWD for review and approval prior to ordering or delivery of valves.

- A. The valve manufacturer's product data sheet showing the size to be used, valve dimensions, pressure rating and material construction.
- B. The manufacture shall provide proof of compliance with NSF/ANSI 61 Annex G, NSF/ANSI 372 and conform with the lead content requirements for "lead-free" plumbing as defined by California's statute §116875.
- C. Manufacturer's installation instructions or procedures including field adjustments as required.

1.03 *Sizing of Valves*

Valves shall be the same size as the appurtenance in which they are to be installed with unless otherwise called for on the Approved Plans or indicated on the Standard Drawings.

1.04 *Valve Ends*

Valve ends shall be compatible with the piping system or appurtenance in which they are to be installed or as called for on the Approved Plans or indicated on the Standard Drawings.

1.05 *Delivery, Storage and Handling*

Valves shall be delivered and stored in accordance with the manufacturer's recommendations. Valves shall remain in factory packaging until ready for installation. Valves shall not be stored in contact with bare ground.

1.06 *Polyethylene Wrap*

Polyethylene wrap shall be used for the buried installation of valves in accordance with Section 33 11 13.

PART 2 Materials

2.01 *Check Valve*

Water service straight single check valves shall be selected from the Approved Materials List.

2.02 *Corporation Stops*

Corporation stops shall be the ball type with a copper alloy body and T-Head operator. Valve ends shall be compatible with the piping system in which they are being installed or as called for on the Approved Plans or indicated on the Standard Drawings. Corporation stops shall be rated for a minimum pressure of 200 pound per square inch (psi). Corporation stops shall be selected from the Approved Materials List. A submittal will be required as described in this section.

2.03 *Angle Meter Stops*

Angle meter stops shall be the ball type with a copper alloy body and 90° lockwing. Valve ends shall be 110-style compression inlet and swivel meter nut for 1-inch and meter flange for 2-inch outlets. Angle meter stops shall be rated for a minimum pressure of 200 psi. Angle meter stops shall be selected from the Approved Materials List. A submittal will be required as described in this section.

2.04 *Ball Valve*

Ball valves 2-inch and smaller shall be of copper alloy construction conforming to ASTM B62 and equipped with a lever handle operator as required. Valve ends shall be compatible with the piping system in which they are being installed or as indicated on the Approved Plans or Standard Drawings. Ball valves shall be rated for a minimum pressure of 200 psi. Ball valves shall be selected from the Approved Materials List. A submittal will be required as described in this section.

PART 3 Execution

3.01 *Miscellaneous Valves*

- A. Valves shall be set in true alignment straddling the centerline of pipe with the valve operator in the vertical position unless otherwise noted on the Approved Plans or shown on the Standard Drawings.

- B. Valves shall be installed in accordance with the manufacturer's recommendations and the applicable section of these specifications for the piping material and joint type being used.
- C. Aboveground valves shall be rigidly held in place using supports and hangers in accordance with the Approved Plans and Standard Drawings. The stem orientation of valves in elevated piping shall be as approved by the Owner's Representative for accessibility, except that no valves shall be installed with stems aligned below horizontal. Saddle type valve supports shall be provided. Supports shall be of rugged construction providing at least one hundred twenty degrees (120°) under support for the valve body. Valve supports shall be constructed of steel, and shall be anchored to the foundations using stainless steel anchor bolts.

3.02 *Disinfection of Valves*

Disinfection and flushing shall be in accordance with Section 33 13 00 as part of the process of disinfecting the main pipeline. The valves shall be operated during the disinfection period to completely disinfect all internal parts.

3.03 *Hydrostatic Testing*

Valves shall be hydrostatically tested in conjunction with the pipelines in which they are installed in accordance with Section 33 14 00.

END OF SECTION 33 12 16.40

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BLOWOFF ASSEMBLIES

PART 1 General

1.01 *Description*

This section includes materials, testing, and installation of blowoff assemblies.

1.02 *Service Application*

- A. Blowoff assemblies shall be installed on potable and recycled water mains.
- B. Blowoff assemblies shall be sized and located as shown on the Approved Plans. In general, blowoff assemblies will be installed at the ends and at low points of pipelines as shown below:
 - 1. 2-inch blowoff assemblies will be required on pipelines for temporary use or as otherwise directed by the Owner's Representative.
 - 2. 4-inch blowoff assemblies will be required on pipeline sizes 16-inch and smaller.
 - 3. 6-inch blowoff assembly will be required on pipeline sizes 18-inch and larger.

PART 2 Materials

2.01 *General*

Blowoff assemblies and appurtenant components and materials shall be selected from the Approved Materials List.

2.02 *Concrete*

Concrete used for thrust or anchor blocks shall be in accordance with Section 03 30 00.

2.03 *Polyethylene Wrap*

Polyethylene wrap shall be used for buried installation of blowoff piping and appurtenances in accordance with Section 33 11 13.

PART 3 Execution

3.01 Installation

- A. Blowoff assemblies shall be installed at locations shown on the Approved Plans or as directed by the Owner's Representative in accordance with the Standard Drawings.
- B. Blowoff assemblies shall be connected to water mains no closer than 24-inch to a bell, coupling, joint or fitting.
- C. Locations of blowoff assembly valve operator well shall be in accordance with the Approved Standard Drawings.
- D. If a blowoff is installed as a future point of connection (POC) the size of Blowoff control valve shall be equal to the size of the main if appurtenances are or will be installed between the blowoff and the nearest isolation valve.
- E. All blowoffs shall be restrained and all piping leading up to the assembly shall follow CVWD's restrained joint guidelines, see Appendix "A".

3.02 Concrete

Concrete thrust and restraint joints shall be installed in accordance with Section 03 30 00 and the Standard Drawings. Refer to Section 03 30 00 for the minimum concrete curing time required.

3.03 Disinfection of Blowoff Assemblies

Blowoff assemblies shall be disinfected in accordance with Section 33 13 00 in conjunction with disinfecting the main to which it is connected. Blowoff assembly valves shall be operated and the assembly shall be flushed to completely disinfect all internal parts.

3.04 Hydrostatic Testing

Blowoff assemblies shall be hydrostatically tested in accordance with Section 33 14 00 in conjunction with hydrostatically testing the pipeline to which it is connected.

END OF SECTION 33 12 17

SECTION 33 12 18
COMBINATION AIR/VACUUM VALVE ASSEMBLIES

PART 1 General

1.01 *Description*

This section includes materials, testing, and installation instructions for above ground combination air/vacuum valve assemblies (air/vac).

1.02 *Service Application*

- A. Combination air/vac valves are installed on all mains where shown on the Drawings and in accordance with the Standard Drawings and as directed by the Owner's Representative.
- B. Unless otherwise directed by the Owner's Representative, combination air valves will be required as shown below:
 - 1. 1-inch air/vac assemblies shall be installed on pipelines sizes 6-inch through 8-inch.
 - 2. 2-inch air/vac assemblies shall be installed on pipelines sizes 12-inch through 24-inch.
 - 3. 4-inch air/vac assemblies shall be installed on pipelines sizes 30-inch and larger.

1.03 *Submittals*

The manufacturer shall provide proof of compliance with California's lead free statute §116875 by providing certification from the independent American National Standards Institute (ANSI) or NSF International.

1.04 *Delivery, Storage and Handling*

Valves shall be delivered and stored in accordance with AWWA C550. The port openings shall be covered with plastic, cardboard or wood while in transit and during storage in the field. These covers shall remain in place until valves are ready to be installed. Valves shall not be stored in contact with bare ground. Valves shall not be stacked.

PART 2 Products

2.01 General

Combination air/vac valve assemblies shall comply with AWWA C512 except as modified herein. Combination air/vac valve assemblies and appurtenant components and materials suitable for the system pressure shall be selected from the Approved Materials List.

Combination air/vac valve assemblies shall conform to the following:

- A. Valves shall be of the sizes indicated on the Drawings, with flanged or threaded ends to match the adjacent piping.
- B. Seat washers and gaskets shall be of a material ensuring water tightness with a minimum of maintenance.

2.02 Epoxy Lining and Coating

Epoxy lining and coating for valves shall be provided in accordance with AWWA C550.

- A. Liquid epoxy lining materials shall be listed in the NSF Listing for Drinking Water Additives, Standard 61, certified for use in contact for potable water and shall also be in conformance with California's lead free statute § 116875.
- B. The minimum dry film thickness for epoxy linings shall be 0.008-inch or 8 mils. Liquid epoxy lining shall be applied in two (2) coats in accordance with AWWA C210.

2.03 Enclosures

Air/Vac enclosures shall be selected from the Approved Materials List.

2.04 Concrete

Concrete used for anchor or thrust blocks and equipment pads shall be in accordance with Section 03 30 00.

PART 3 Execution

3.01 Installation

- A. Air/Vac valve assemblies shall be provided as shown on the Drawings. Additional air/vac valve assemblies may be required in areas of potential air entrapment, at the discretion of the Owner's Representative.
- B. Air/Vac valve assemblies shall be installed relative to street improvements in accordance with the Approved Standard Drawings.

- C. Connection for the air/vac valve assemblies shall be made within a section of the main line no closer than 24-inches of a bell, joint or fitting.
- D. The air/vac service line shall slope continuously upward from the main to the air/vac relief valve.
- E. The air/vac valves appurtenances shall be installed in accordance with the Approved Standard Drawing Nos. W-21A, 21B, 22A and 22B.
- F. Air/Vac valve assemblies 4-inch and larger shall not be hot taped or direct taped. The service line shall be connected to main with a tee, the tee and service line shall be equally sized to match the size of the air/vac valve in accordance with the Approved Standard Drawing.
- G. Air/Vac valve assemblies 4-inch and larger shall have a butterfly valve (BFV) to isolate the air/vac valve assemblies for repairs and maintenance. The minimum size BFV shall be equal to the size of air/vac or the next size larger as directed by the Owner's Representative.

3.03 *Disinfection*

Air/Vac valve assemblies shall be disinfected in accordance with Section 33 13 00 in conjunction with disinfecting the main to which it is connected. Air/Vac valve assembly shall be operated and the assembly shall be flushed to completely disinfect all internal parts.

3.04 *Hydrostatic Testing*

Air/Vac valve assemblies shall not be hydrostatically tested in conjunction with testing of the pipeline. The isolation valve shall be closed or the air/vac valve assemblies can be installed in the riser after the pipeline hydrostatic test is accepted.

3.05 *Field Tests*

After installation of air/vac valve assemblies and before acceptance thereof, the Contractor shall perform such tests as may be necessary to assure proper operation of all components. All defects disclosed by such testing shall be repaired to the satisfaction of the Owner's Representative.

END OF SECTION 33 12 18

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33 13 00

DISINFECTION OF PIPING

PART 1 General

1.01 Description

This section describes the requirements for flushing and disinfection of potable water mains, services, pipe appurtenances and connections.

The Contractor shall flush and disinfect potable water mains and appurtenances, complete, including providing the water and the disposal thereof.

1.02 Service Application

- A. All existing water mains and appurtenances taken out of service for inspection, repairs or other construction activities that might lead to contamination shall be disinfected prior to connection to CVWD's existing system.
- B. All new water mains and appurtenances shall be disinfected prior to placing the facilities into CVWD's system.
- C. All components incorporated into a connection to CVWD's existing system shall be disinfected prior to installation.
- D. Disinfection of piping shall be done after passing hydrostatic testing of pipelines in accordance with Section 33 14 00.

1.03 Submittals

A written schedule shall include plans for water conveyance, control and disinfection shall be submitted in writing for approval a minimum of 7 days before commencing flushing and disinfection operations. The submittal shall also include the Contractor's plan for obtaining sufficient flow to flush disinfected water, neutralization of water from the pipeline, and release of water from pipelines after testing and disinfection has been completed.

PART 2 Materials

2.01 Material Requirements

- A. All test equipment, chemicals for chlorination, temporary valves, temporary blow-offs, or other water control equipment and materials shall be determined and furnished by the Contractor.
- B. Liquid chlorine for disinfection shall be used.

- C. Liquid chlorine shall be in accordance with the requirements of AWWA B301.
- D. The placing of HTH capsules, tablets or powder in pipe sections during the laying process is not acceptable.

PART 3 Execution

3.01 General

- A. The disinfection requirements under Title 17 and 22 of the California Code of Regulations, Article 5, §64580 Disinfection of New or Repaired Mains, shall be in accordance with AWWA C651.
- B. Disinfection of pipelines shall not proceed until all appurtenances and any necessary sampling ports have been installed and the Owner's Representative provides authorization.
- C. The Contractor shall make every effort to keep the water main and its appurtenances clean and dry during the construction installation process.
- D. All potable water pipelines, valves, fitting and appurtenances which become contaminated during installation shall be cleaned, rinsed with potable water, and then sprayed or swabbed with a 5 percent sodium hypochlorite chlorine disinfecting solution prior to installation.
- E. Water mains under construction that become flooded by storm water, runoff, or ground water shall be cleaned by draining and be flushed with metered potable water until clear water is evident. Upon completion, the entire main shall be disinfected using a method approved by the Owner's Representative.

3.02 Preliminary Flushing

Prior to disinfection, water mains 12-inches and smaller shall be flushed in accordance with AWWA C651. The flushing velocity in the main shall not be less than 2.5 feet per second (fps) for main sizes up to 16-inches in diameter. Flushing shall be sustained for a period of time not less than twice the minimum theoretical time necessary to flush the entire length of main. If so directed by the Owner's Representative, portions of certain appurtenances may be required to be temporarily reconfigured for flushing purposes. In the event of possible adverse effects of flushing on system operations, flushing shall be conducted during the hours of least demand or as directed by the Owner's Representative. CVWD shall not be responsible for loss or damage resulting from flushing operations.

For mains 18-inches and larger, an acceptable alternative to flushing shall be approved by the Owner's Representative.

3.03 *Disinfecting Potable Water Pipelines*

- A. All pumping equipment, piping, appurtenances and all other equipment in contact with the potable water shall be disinfected in accordance with the requirements of AWWA C651 using the Continuous-Feed Method as modified herein.
- B. The chlorine solution shall be introduced at one end of the pipeline through a tap in such a manner that as the pipeline is filled with water, the dosage applied to the water entering the pipe shall be a minimum 50 mg/l. Where pumping equipment is used with an injector, a backflow device shall be installed and connected to the potable water supply.
- C. The Owner's Representative will verify the presence of the chlorine disinfection solution throughout the system by sampling and testing for acceptable chlorine concentrations at various appurtenances and/or at test ports provide by the Contractor.
- D. The chlorinated water shall be retained in the system for a minimum of 24 hours. The Owner's Representative will test the total chlorine residual and will notify the Contractor of the test results. At the end of the 24 hour period the chlorine residual at the pipeline extremities and at other representative points shall be at least 25 mg/l.
- E. During the process of chlorinating the pipelines, all valves and other appurtenances shall be operated while the pipeline is filled with the heavy chlorinated water.
- F. If the initial test fails to produce satisfactory results the disinfection process shall be repeated. Two consecutive satisfactory test results shall be required after any unsatisfactory test results.
- G. Final flushing shall be done by the Contractor after being notified of a satisfactory chlorine residual test by the Owner's Representative. The chlorinated water shall be flushed from the pipeline until chlorine measurements show that the concentration in the water leaving the pipeline is no greater than what generally prevails in the system or is acceptable for its intended use.

3.04 *Disposal of Testing Water*

- A. All water used in testing and disinfecting the portions of pipeline or water system component, including that used for retesting, shall be disposed of following such testing, retesting, and disinfecting by the Contractor at Contractor's sole expense. The disposal of water shall, in all cases, be carried out in compliance with the water quality objectives and discharge permit restrictions established by the California Regional Water Quality Control Board.
- B. For contracts administered by CVWD, the Contractor will be authorized to discharge test water to the storm drain under the National Pollution Discharge Elimination System (NPDES) permit issued to CVWD if all requirements and procedures per such permit are followed. For all other projects, including Developer projects, Contractor or Developer shall obtain an NPDES permit and comply with that permit.
- C. Disposal of test water or chlorinated water used for disinfection will require the Contractor to apply a reducing agent (i.e. sodium thiosulfate, or ascorbic acid, etc.) to the test water in order to neutralize residual chlorine to meet the discharge limitation of "Non-Detect" (ND). Reducing agents used in neutralizing chlorinated water shall be in accordance with Appendix "C" of AWWA C651. Additionally, the flow of water from the portions of pipeline shall be controlled to prevent erosion of surrounding soil, damage to vegetation, and altering of ecological conditions in the area and shall not contribute to silt, mud, debris, or other contaminants entering storm drains or surface waters.

3.05 *Bacteriological Sampling Ports*

- A. Bacteriological sampling ports shall be installed in accordance with AWWA C651 and the Approved Standard Drawings.
- B. Bacteriological sampling ports shall be installed at intervals no greater than 1,200 feet on new water main, plus one port located at the end of the line and one port for each branch line. Under special conditions outlined under AWWA C651, the Owner's Representative may require additional bacteriological sample ports at no additional cost to CVWD.
- C. No hose or fire hydrant shall be used in the collection of samples.
- D. When approved by the Owner's Representative, Air/Vac's and Blow-off assemblies maybe modified to be used as a sampling port with a riser modification in accordance with AWWA C651 Figure 2. Upon the completion of collecting samples, all modified Air/Vac and Blow-off assemblies shall be returned to its previous condition and shall be in conformance with all sections of this specification and the Approved Standard Drawings.

- E. After samples have been collected, all temporary sampling port assemblies including the corporation stop at the main shall be removed and capped with a threaded plug of similar metal type (saddle or direct tap). Polyethylene encasement shall be repaired after the removal of sampling ports as per AWWA C105.

3.06 *Bacteriological Testing of Disinfected Potable Water Pipelines*

- A. After the chlorinated water has been flushed from the system, CVWD will perform bacterial analysis on the water samples from the disinfected system. The Contractor shall install necessary temporary bacterial sample risers in accordance with the Approved Standard Drawings. Only after successfully passing bacterial analysis shall temporary bacterial sample risers be removed and abandoned as directed by the Owner's Representative.
- B. Before the new water main is connected to the distribution system, two consecutive sets of acceptable samples, taken at least 24 hours apart, shall be collected from the new main. At least one set of samples shall be collected from every 1,200 feet of new water main, plus one set from the end of the line and at least one set from each branch line.
- C. If the initial disinfection fails to produce satisfactory bacteriological results or if other water quality is affected, the new main may be reflashed and shall be resampled. If check samples also fail to produce acceptable results, the main shall be re-chlorinated by the continuous-feed method until satisfactory results are obtained-that being two consecutive sets of acceptable samples taken 24 hours apart.
- D. The Contractor shall be responsible for all repeat flushing, disinfecting, disposal, dechlorination and bacteriological testing costs.

END OF SECTION 33 13 00

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33 12 19
FIRE HYDRANTS

PART 1 General

1.01 *Description*

This section includes materials and installation of wet-barrel fire hydrant assemblies. All wet-barrel fire hydrants shall conform to AWWA C503 and these specifications.

1.02 *System Description*

Hydrants shall generally have the follow number and size of outlets as follows:

1. One 6-inch bottom connection
2. Two 2 ½ inch hose connections
3. One 4-inch pumper connection

1.03 *Service Application*

- A. Fire hydrants shall be installed on potable water mains only.
- B. Wet-barrel hydrants shall generally be used for pressures up to 200 pounds per square inch (psi). System pressures up to and including 150 psi requires standard wet-barrel hydrants and pressures up to 200 psi shall require high-pressure wet-barrel hydrants in accordance with the Approved Materials List.
- C. Break-off check valve assemblies shall be installed on all wet-barrel hydrants.

1.04 *Submittals*

If required by the Owner's Representative, the following items shall be submitted to CVWD for review and approval prior to ordering or delivery of hydrants.

- A. Fire hydrants assembly shall be selected from the Approved Materials List.
- B. Provide manufacturer's catalog data.
- C. The manufacture shall provide proof of compliance with NSF/ANSI 61 Annex G, NSF/ANSI 372 and conform with the lead content requirements for "lead-free" plumbing as defined by California's statute §116875.

1.05 *Fire Hydrant Assembly Joints and Fittings*

Fire hydrant assembly shall be installed in accordance with the Approved Standard Drawing.

1.06 *Delivery, Storage and Handling*

Fire hydrants shall be delivered and stored in accordance with AWWA C210, AWWA C213, and AWWA C550. The port openings shall be covered with plastic, cardboard or wood while in transit and during storage in the field. These covers shall remain in place until the hydrant is ready to be installed. Fire hydrants shall not be stored in contact with bare ground. Fire hydrants shall not be stacked at the project site.

1.07 *Polyethylene Wrap*

Polyethylene wrap shall be used for all of buried fire hydrant assemble, hydrant pipe runs and valves in accordance with Section 33 11 13.

PART 2 Materials

2.01 *Fire Hydrant Assembly*

- A. Fire hydrants shall be selected from the Approved Materials List.
- B. Wet-barrel fire hydrants shall comply with AWWA C503 and these specifications unless otherwise indicated on the Approved Plans.
- C. The interior of ductile-iron hydrants and break-off check valve assembly shall be fusion-epoxy lined per C213 and C550.
- D. Epoxy lining materials shall be listed in the NSF Listing for Drinking Water Additives, Standard 61, certified for use in contact for potable water.
- E. All outlets shall be provided with National Standard Fire-Hose Threads. Outlets shall be provided and equipped with brass or ductile iron caps and chains.
- F. Wet-barrel fire hydrant flange, 90-degree bury ells and riser shall incorporate a six-hole bolt pattern to match the break-off riser and break-off check valve.
- G. Fire hydrants shall be opened by turning left (counterclockwise) unless otherwise indicated on the Approved Plans.
- H. Break-off check valves shall be selected from the Approved Materials List.

2.02 *Bolts and Nuts*

- A. Hydrant flange bolts and nuts shall be selected from the Approved Materials List.
- B. When indicated on the Approved Plans or with the prior approval of the Owner's Representative, wet barrel fire hydrants not equipped with break-off check valves shall be installed with break-away flange bolts selected from the Approved Materials List.

2.03 *Concrete*

Concrete used in the construction of the fire hydrant assembly for splash pads, thrust or anchor blocks shall be in accordance with Section 03 30 00.

2.04 *Field Painting and Coating*

Field painting and coating material shall be in accordance with the Approved Materials List.

The color scheme for fire hydrants shall follow AWWA C503 and NFPA 291, Chapter 3 and as modified herein.

Fire hydrant body shall be painted as follows:

<u>Supply</u>	<u>Body Color</u>
CVWD System:	Chrome Yellow
Private System:	Red

Fire hydrant bonnets shall be as follows:

<u>COLOR</u>	<u>CLASS</u>	<u>Available Flow @ 20 psi Residual</u>
GREEN	A	1,000 gallons per minute (gpm) or more
ORANGE	B	500 – 999 gpm
RED	C	Below 500 gpm

2.05 *Fire Hydrant Pavement Markers*

Fire hydrant pavement markers shall be blue and shall be selected from the Approved Materials List.

PART 3 Execution

3.01 Installation

- A. Fire hydrant assemblies shall be installed at locations shown on the Approved Plans and in accordance with the Approved Standard Drawings.
- B. The fire hydrant outlet ports shall be orientated as shown on the Approved Standard Plans.
- C. Fire hydrants depending on the location may require marker posts, protection posts or concrete retaining wall (if located in landscape slopes). When required by the Owner's Representative, or when shown on the Approved Plans the addition of marker posts, protection posts or retaining walls shall be installed in accordance with the Approved Standard Drawings.
- D. Trenching, bedding, backfilling and compacting shall be performed in accordance with Section 31 23 17, 33 11 13 and the Approved Standard Drawings.
- E. Blue hydrant reflective pavement markers shall be placed on all thoroughfares to mark fire hydrant locations. Markers shall be placed directly opposite each fire hydrant approximately three inches from the centerline of the street on the side of the street nearest the hydrant. Markers shall be selected from the Approved Materials List. Markers not listed on the Approved Materials List shall be approved by the Riverside County Fire Marshall.

3.02 Disinfection of Fire Hydrant Assembly

Disinfection and flushing shall be in accordance with Section 33 13 00 as part of the process of disinfecting the main pipeline. The fire hydrant shall be operated during the disinfection period to completely disinfect all internal parts.

3.03 Hydrostatic Testing

The fire hydrant assembly shall be subject to pressure during the hydrostatic test of the pipelines in accordance with Section 33 14 00.

END OF SECTION 33 12 19

SECTION 33 14 00
HYDROSTATIC TESTING OF PRESSURE PIPELINES

PART 1 General

1.01 *Description*

This section describes the requirements and procedures for pressure and leakage testing of all pressure mains. Hydrostatic testing shall conform to AWWA C600 and these specifications.

1.02 *Requirements Prior to Testing*

- A. All thrust blocks and anchor blocks shall be allowed to cure in accordance with Section 03 30 00.
- B. All piping, valves, fire hydrants, services, and related appurtenances shall be installed.
- C. Pressure tests on exposed, aboveground and vault installed piping shall be conducted only after the entire piping system has been installed and attached to pipe supports, hangers or anchors as shown on the Approved Plans.

1.03 *Hydrostatic Testing of Pipelines*

Hydrostatic testing of pipelines shall be performed prior to disinfection operations in accordance with Section 33 13 00. In the event repairs are necessary, as indicated by the hydrostatic test, the Owner's Representative may require additional flushing in accordance with Section 33 13 00.

1.04 *Connection to Existing Mains*

The Contractor shall install test plates at each valve that is connected to an active water main. Hydrostatic testing shall be performed prior to placing the facilities into service in CVWD's system. Test plates shall be removed by the Contractor after the pressure test has been accepted. CVWD authorization for connection to existing system shall be given only on the basis of acceptable hydrostatic testing, disinfection and bacteriological test results. Connection to existing mains shall be performed in accordance with Section 33 11 13, under direct CVWD inspection.

1.05 *Valve Locks*

The Contractor shall install valve-locking devices on all valves at stub-outs or where a valve connects directly to an active domestic water main. Locking devices shall also be installed on the control valves at newly constructed detector checks. The locking device shall be provided by the Contractor and the padlock provided by CVWD. At the time the new water system is progressed for service, locking devices will be removed by the Contractor under direct inspection by a CVWD inspector. Locking devices located on detector check valves shall be removed by CVWD's forces and returned to the Contractor or developer after the detector check has been installed.

PART 2 Products

2.01 *Water*

Potable water, supplied by a source approved by the Owner's Representative, shall be used for all hydrostatic testing of potable pipelines.

2.02 *Connections*

- A. Testing water shall be supplied through a metered connection equipped with a backflow prevention device in accordance with Section 33 13 00 at the point of connection to the potable water source used.
- B. The Contractor shall provide any temporary piping needed to deliver potable water to the piping that is to be tested. Temporary piping shall be in accordance with Section 33 11 13.

PART 3 Execution

3.01 *General*

- A. The Contractor shall provide CVWD with a minimum of 24 hours notice prior to the requested date and time for hydrostatic tests.
- B. The Contractor shall furnish all labor, materials, tools, and equipment for testing.
- C. Test pressure shall not exceed rated working pressure of gate or butterfly valves.
- D. Corporation stops shall be rated the same as the design pressure of the pipeline.
- E. Temporary blocking during the test will be permitted only at temporary plugs, caps or where otherwise directed by the Owner's Representative.

- F. The test pressure shall not exceed the thrust restraint design pressure or 1.5 times the pressure rating of the pipe or joint, whichever is less (as specified by the manufacture).
- G. While filling the pipeline, care shall be taken to release all air within the pipe and appurtenances to be tested. Air shall be released through services, fire hydrants, air release valves, or other approved locations. After filling the pipeline and before application of test pressure, test section shall be maintained at the working pressure for a minimum of one (1) hour to allow the pipeline to stabilize with respect to line movement under pressure, water absorption by the lining and for an initial leak inspection.
- H. The pressure shall be increased to 1.5 times the stated system pressure, or 150 pounds per square inch (psi), whichever is greater, to a maximum of 300 psi. Pressure shall be measured at, or corrected to, the lowest point in the portion of the pipeline being tested.

The test pressure for the entire section under test (if no leaks have been found, or if found, have been repaired and re-subjected to test pressure) shall be maintained for four (4) hours between ± 5 psi of the stated test pressure for the duration of the test. During the test time the amount of leakage shall be determined by measuring the quantity of water which must be added to maintain the test pressure. The maximum allowable leakage per 1,000 feet of pipe, in gallons per hour, shall conform to the hydrostatic testing table in the Approved Standard Drawings.

If the leakage exceeds the allowable loss, the leak points shall be located and repaired as required by the Owner's Representative. All defective pipes, fittings, valves and other appurtenances discovered shall be removed and replaced with sound material. The hydrostatic test shall be repeated until the leakage does not exceed the rate specified. All visible leaks shall be similarly repaired.

END OF SECTION 33 14 00

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