S201-ITB2, Volume 2 – 31 23 10 - TRENCHING, BACKFILLING, AND COMPACTING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Construction Drawings, Technical Specifications, Addenda, and Contact Agreement, including any Addenda, including other Division 1 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. This section includes materials, testing, and installation for trench excavation, backfilling, and compacting.

1.03 RELATED SECTIONS

A. SECTION 33 04 00 – ABANDONMENT OF WET UTILITIES

B. SECTION 33 11 00 – WATER DISTRIBUTION PIPING

1.04 DEFINITIONS

A. Pavement Zone - The pavement zone includes the asphalt concrete and aggregate base pavement section placed over the trench backfill.

B. Street Zone - The street zone is the top 18 inches of the trench or depth determined by the jurisdictional agency immediately below the pavement zone in paved areas.

C. Trench Zone - The trench zone includes the portion of the trench from the top of the pipe zone to the bottom of the street zone in paved areas or to the existing surface in unpaved areas.

D. Pipe Zone - The pipe zone shall include the full width of trench from the bottom of the pipe or conduit to a horizontal level 12 inches above the top of the pipe. Where multiple pipes or conduits are placed in the same trench, the pipe zone shall extend from the bottom of the lowest pipes to a horizontal level 12 inches above the top of the highest or topmost pipe.

E. Pipe Bedding - The pipe bedding shall be defined as a layer of material immediately below the bottom of the pipe or conduit and extending over the full trench width in which the pipe is bedded. Thickness of pipe bedding shall be as shown on the drawings or as described in these specifications for the particular type of pipe installed.

1.05 STANDARDS

A. American Society for Testing and Materials (ASTM)

A. ASTM D 1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3(2,700 kN-m/m^3))

B. ASTM D 4253 - Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table

C. ASTM D 75 - Standard Practice for Sampling Aggregates

1.06 SUBMITTALS

A. All submittals shall follow the requirements of SECTION 01 33 00 SUBMITTAL PROCEDURES

B. All product requirements listed in Part 2.

1.07 QUALITY ASSURANCE

A. Determine the density of soil in place by the use of a sand cone, drive tube, or nuclear tester.

B. Determine laboratory moisture-density relations of existing soils by ASTM D 1557.

C. Determine the relative density of cohesionless soils by ASTM D 4253.

D. Sample backfill materials by ASTM D 75.

E. Express "relative compaction" as the ratio, expressed as a percentage of the in place dry density to the laboratory maximum dry density.

F. Compaction shall be deemed to comply with the specifications when no test falls below the specified relative compaction.

G. The developer will secure the services of a soils tester and pay the costs of all compaction testing. On capital projects, the District will secure the service of a soils tester and pay the cost of initial testing. The Contractor will be responsible for the cost of all retests in failed areas. Test results will be furnished by the District representative.

PART 2 - MATERIALS

2.01 NATIVE EARTH BACKFILL

A. Native earth, segregated from topsoil, shall be used for trench backfill.

B. Clean native sand, free from roots, debris and rocks over 2-inch, may be used in the pipe zone.

2.02 IMPORTED BACKFILL MATERIAL

A. Whenever the excavated material is not suitable for backfill, the Contractor shall arrange for and furnish suitable imported backfill material that is capable of attaining the required relative density.

B. The Contractor shall dispose of the excess trench excavation as specified in the preceding section. Backfilling with imported material shall be done in accordance with the methods described herein.

2.03 GRANULAR MATERIAL

A. Granular material shall be defined as soil having a minimum sand equivalent of 30 as determined in accordance with State of California, Division of Highways, Test "California 217," with not more than 20% passing a 200-mesh sieve.

2.04 IMPORTED SAND

A. Imported sand shall have a minimum sand equivalent of 30 per State of California, Division of Highways, Test "California 217" with 100% passing a 3/8-inch sieve and not more than 20% passing a 200-mesh sieve. Certification that the sand meets this requirement shall be provided.

2.05 CRUSHED ROCK AND GRAVEL

A. Crushed rock shall be the product of crushing rock or gravel. Fifty percent of the particles retained on a 3/8-inch sieve shall have their entire surface area composed of faces resulting from fracture due to mechanical crushing. Not over 5% shall be particles that show no faces resulting from crushing. Less than 10% of the particles that pass the 3/8-inch sieve and are retained on the No. 4 sieve shall be weatherworn particles. Gravel shall not be added to crushed rock.

B. Gravel shall be defined as particles that show no evidence of mechanical crushing, are fully weatherworn, and are rounded. For pipe bedding, where gravel is specified, crushed rock may be substituted or added.

C. Where crushed rock or gravel is specified in the bedding details on the plans, the material shall have the following gradations:

Sieve Size	1-1/2 Inch Max Gravel % Passing	1-inch Max Gravel % Passing	¾ Inch Max Crushed Rock % Passing
2”	100		
1-1/2”	90 – 100	100	
1”	20 – 55	90 – 100	100
¾”	0 - 15	60 – 80	90 – 100
½”	-	-	30 – 60
3/8”	0 - 5	0 - 15	0 - 20
No. 4	-	0 - 5	0 - 5

2.06 SAND-CEMENT SLURRY

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

PART 3 - EXECUTION

3.01 SAFETY

A. All excavations shall be performed, protected, and supported as required for safety and in the manner set forth in the operation rules, orders, and regulations prescribed by the Division of Industrial Safety of the State of California.

B. Barriers shall be placed at each end of all excavations and at such places as may be necessary along excavations to warn all pedestrians and vehicular traffic of such excavations. Lights shall also be placed along excavations from sunset each day to sunrise of the next day until such excavation is entirely refilled.

C. No trench or excavation shall remain open during non-working hours. The trench or excavation shall be covered with steel plates, spiked in place, or secured with temporary A.C. pavement around the edges, or backfilled. A security fence shall be installed around the work area during non-working hours.

3.02 COMPACTION REQUIREMENTS

A. Unless otherwise shown on the drawings or otherwise described in the specifications for the particular type of pipe installed, relative compaction in pipe trenches shall be as described below:

1. Pipe zone and pipe base: 95% relative compaction

2. Trench zone not beneath paving: 95% relative compaction

3. Trench zone to street zone in paved areas: 95% relative compaction

4. Street zone in paved areas: per agency requirements or 95% relative compaction. The most stringent agency requirements shall prevail

5. Rock refill material for foundation stabilization: 90% relative density

6. Rock refill for over excavation: 90% relative density

3.03 MATERIAL REPLACEMENT

A. Removal and replacement of any trench and backfill material which does not meet the specifications shall be the Contractor's responsibility.

3.04 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.

C. Organic material from clearing and grubbing operations will be disposed of at a proper waste disposal facility.

3.05 SIDEWALK, PAVEMENT, AND CURB REMOVAL

A. Saw cut bituminous or concrete pavements regardless of their thickness, and curbs and sidewalks prior to excavation for the structure in accordance with the requirements of the city, or agency having jurisdiction. Curbs and sidewalks, that are damaged in the course of construction, are to be cut and removed from joint to joint.

B. Haul removed pavement and concrete materials from the site, to a proper disposal facility. These materials are not permitted for use as trench backfill. If the material to be removed exceeds 50 cubic yards, the Contractor shall obtain a haul route permit from the city(s) having jurisdiction.

3.06 TRENCHING

A. Excavation for pipe, fittings, and appurtenances shall be open trench to the depth and in the direction necessary for the proper installation of the facilities as shown on the plans.

B. Trench banks shall be kept as near to vertical as possible and shall be properly braced and sheeted.

3.07 BRACING

A. The Contractor's design and installation of bracing and shoring shall be consistent with the rules, orders, and regulations of the State of California Construction Safety Orders. See SECTION

B. Excavations shall be so braced, sheeted, and supported that they will be safe 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 sheeting, shoring, and bracing shall be arranged so as not to place any stress on portions of the completed work until the general construction thereof has proceeded far enough to provide ample strength.

D. Care shall be exercised in the drawing or removal of sheeting, shoring, bracing, and timbering to prevent the caving or collapse of the excavation faces being supported.

3.08 TRENCH WIDTHS

A. Excavation and trenching shall be true to line so that a clear space of not more than 8 inches or less than 6 inches in width is provided on each side of the largest outside diameter of the pipe in place measured at a point 12 inches above the top of the pipe. For the purpose of this article, the largest outside diameter shall be the outside diameter of the bell on bell and spigot pipe or the pipe collar.

B. Where the sewer trench width, measured at a point 12 inches above the top of the bell of the pipe, is wider than the maximum set forth above, the trench area around the pipe shall be backfilled with crushed rock, Class B concrete, or slurry to form a cradle for the pipe at the discretion of the Marina Coast Water District (MCWD) representative.

3.09 DE-WATERING

A. The Contractor shall provide and maintain at all times during construction ample means and devices with which to promptly remove and properly dispose of all water from any source entering the excavations or other parts of the work. De-watering shall be done by methods that will ensure a dry excavation and preservation of the final lines and grades of the bottoms of excavations. De-watering methods may include well points, sump points, suitable rock or gravel placed below the required bedding for drainage and pumping, temporary pipelines, and other means, all subject to the approval of the District representative. Water shall be discharged in accordance with the requirements of the project's NPDES permit.

B. In no event shall the sewer system be used as drains for de-watering the construction trenches.

C. De-watering shall commence when groundwater is first encountered and shall be continuous until such times as water can be allowed to rise. No concrete shall be poured in water, nor shall water be allowed to rise around the concrete or mortar until it has set at least eight hours.

3.10 EXCAVATED MATERIAL

A. All excavated material shall not be stockpiled in a manner that will create an unsafe work area or obstruct sidewalks or driveways. Gutters shall be kept clear or other satisfactory measures shall be taken to maintain street or other drainage.

B. In confined work areas, the Contractor may be required to stockpile the excavated material off-site, as determined by the project permits.

3.11 PLACING PIPE BEDDING

A. Place the thickness of pipe bedding material over the full width of trench necessary to produce the required bedding thickness when the material is compacted to the specified

relative density. Grade the top of the pipe bedding ahead of the pipe to provide firm, uniform support along the full length of pipe.

B. Excavate bell holes at each joint to permit assembly and inspection of the entire joint.

3.12 PLACING MOUNDS TO SUPPORT PIPE (DIP ONLY)

A. As an alternate to placing continuous imported sand pipe bedding material, the ductile iron pipe may be supported on mounds of imported sand.

B. The mounds shall be of imported sand and extend the full trench width. The mounds shall provide a minimum of 6 inches of contact with the pipe.

C. The pipe shall be supported to maintain its design line and grade.

D. The mounds shall be located 2½ feet from the bell/spigot of the pipe.

3.13 BACKFILLING WITHIN PIPE ZONE

A. Backfill per the detailed piping specification for the particular type of pipe and per the following.

B. After pipe has been installed in the trench, place pipe zone material simultaneously on both sides of the pipe, keeping the level of backfill the same on each side. Carefully place the material around the pipe so that the pipe barrel is completely supported and that no voids or uncompacted areas are left beneath the pipe. Use particular care in placing material on the underside of the pipe to prevent lateral movement during subsequent backfilling.

C. Compact material placed within 12 inches of the outer surface of the pipe by hand tamping only.

3.14 BACKFILL WITHIN TRENCH ZONE

A. Compact per the detailed piping specification for the particular type of pipe and per the following.

B. Push the backfill material carefully onto the backfill previously placed in the pipe zone. Do not permit free fall of the material until at least 2 feet of cover is provided over the top of the pipe. Do not drop sharp, heavy pieces of material directly onto the pipe or the tamped material around the pipe.

C. The remaining portion of the trench to the street zone or ground surface, as the case may be, shall be backfilled, compacted and/or consolidated by approved methods to obtain the specified relative compaction.

1. Compaction using vibratory equipment, tamping rollers, pneumatic tire rollers, or other mechanical tampers shall be done 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, fittings, manholes, or structures as directed by the MCWD representative damaged by the Contractor's operations.

2. Consolidation of backfill performed by flooding, poling, or jetting shall obtain a relative compaction of the backfill material at least equal to that specified. When flooding, poling, or jetting methods are used, material for use as backfill shall be placed and consolidated in layers not exceeding 3-feet thick. Flooding, poling, or jetting methods shall be supplemented by the use of vibratory or other compaction equipment when necessary to obtain the required relative compaction. Care shall be taken in all consolidating operations to prevent the movement or floating of the pipe. Consolidation methods shall not be used where the backfill material is not sufficiently granular to be self-draining during and after consolidation, or where foundation materials may be softened or otherwise damaged by the quantities of water applied. The Contractor shall rectify any misalignment of the pipe because of consolidation operations as directed by the MCWD representative.

3.15 EXCESS EXCAVATED MATERIAL

A. The Contractor shall make the necessary arrangements for and shall remove and dispose of all excess excavated material unless indicated differently in the special provisions for any job.

B. It is the intent of these specifications that all surplus material not required for backfill or fill shall be properly disposed of by the Contractor at his expense at a proper disposal site.

C. No excavated material shall be deposited on private property unless written permission from the owner thereof is secured by the Contractor. Before the MCWD will accept the work, the Contractor shall file a written release signed by all property owners with whom he has entered into agreements for disposing excess excavated material, absolving the MCWD from any liability connected therewith.

D. The Contractor shall obtain a haul route permit from the city or agency having jurisdiction.

END OF SECTION 31 23 10

S201-ITB2, Volume 2 – 33 11 00 - WATER DISTRIBUTION PIPING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Construction Drawings, Technical Specifications, Addenda, and Contact Agreement, including any Addenda, including other Division 1 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

Abandonment of water facilities, cut and plugs, and straightline water main connections.

1.03 RELATED SECTIONS

A. SECTION 01 33 00 – SUBMITTAL PROCEDURES

B. SECTION 31 40 00 - SHEETING, SHORING, AND BRACING

1.04 STANDARDS

A. American National Standards Institute/American Water Works Association (ANSI/AWWA)

1. ANSI/AWWA C104/A21.5 – Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water

2. ANSI/AWWA C110/A21.10 – Ductile-Iron and Gray-Iron Fittings 3-in Through 48-in for Water and Other Liquids

3. ANSI/AWWA C111/A21.11 – Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings

4. ANSI/AWWA C210 – Liquid Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines

5. ANSI/AWWA C217– Petrolatum and Petroleum Wax Tape Coatings for the Exterior of Connections and Fittings for Steel Water Pipelines.

6. ANSI/AWWA C219 – Standard for Bolted, Sleeve-Type Couplings for Plain-End Pipe

7. ANSI/AWWA C600 – Installation of Ductile-Iron Water Mains and Appurtenances

8. AWWA C651- Disinfecting Water Mains

9. AWWA C800 – Standard for Underground Service Line Valves and Fittings

10. ANSI/AWWA C900 – Polyvinyl Chloride (PVC) Pressure Pipe 4-in Through 12-in for Water Distribution

11. AWWA Manual M23 – PVC Pipe - Design and Installation

B. American Society for Testing and Materials (ASTM)

1. ASTM D1784 – Standard Specification for Rigid for Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds

2. ASTM D1785 – Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120

3. ASTM D2464 – Standard Specification for Threaded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80

4. ASTM D2467 – Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80

5. ASTM D2564 – Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plasticc Piping Systems

6. ASTM F645 – Standard Guide for Selection, Design, and Installation of Thermoplastic Water Pressure Piping Systems

7. ASTM B584 – Standard Specification for Copper Alloy Sand Castings for General Applications

8. Bronze ASTM B62 – Standard Specification for Composition Bronze or Ounce Metal Castings (NOT USED)

9. ASTM B16 – Standard Specification for Free-Cutting Brass Rod, Bar, and Shapes for Use in Screw Machines

10. ASTM B99 – Standard Specification for Copper-Silicon Alloy wire for General Applications

11. ASTM A47 – Standard Specification for Ferritic Malleable Iron Castings

C. Standard Specifications for Public Works Construction (2015) (SWPPC).

1.05 SUBMITTALS

A. All submittals shall follow the requirements of SECTION 01 33 00 SUBMITTAL PROCEDURES.

B. Manufacturer’s catalog cuts on materials identified in Part 2.

C. Disinfection Plan and testing results.

1.06 COORDINATION WITH MARINA COAST WATER DISTRICT

A. The Contractor shall coordinate with the Marina Coast Water District (MCWD) for all water main shutdowns a minimum of seven (7) days in advance of shutdown.

B. MCWD shall observe all installation of water materials.

C. Contractor shall coordinate with MCWD for notification of shutdown to affected customers. The

D. The Contractor shall be responsible for all plan review and inspection fees related to connections to the MCWD system.

1.07 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Comply with requirements of MCWD requirements including, but not limited to, potable-water-service piping materials, installation, testing, and disinfection.

B. Piping materials shall bear label, stamp, or other markings of specified testing agency.

C. NSF Compliance: Comply with NSF 61 for materials for water-service piping and specialties for domestic water

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.

B. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.

C. Protect specialties from moisture and dirt.

D. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

1.10 PROJECT CONDITIONS

A. Interruption of Existing Water-Distribution Service: Do not interrupt service to facilities occupied by MCWD or others unless permitted under the following conditions and then only after arranging to provide temporary water-distribution service according to requirements indicated:

1. Notify Engineer no fewer than three days in advance of proposed interruption of service.

2. Do not proceed with interruption of water-distribution service without Engineer written permission.

3. Existing fire hydrants shall remain in service until closest proposed fire hydrant is in service.

PART 2 - PRODUCTS

2.01 AWWA C900 PIPE AND FITTINGS

A. Pipe Dimensions: Dimensions for PVC pressure pipe from 4- through 12-inch diameter shall conform to Table 1 of ANSI/AWWA C900 for cast iron pipe equivalent outside diameters.

B. Pipe Marking: Pipe shall be marked in conformance with ANSI/AWWA C900 including nominal size, outside diameter, pressure class, seal of testing agency, etc.

C. Pipe shall have DR14, 305 psi.

2.02 PIPING SPECIALTIES

A. Transition Couplings: Manufactured coupling with pressure rating at least equal to and ends compatible with piping to be joined.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Smith-Blair 413
b. Romac 501, or approved equal.

2. Description: Metal, bolted, split-sleeve-type, reducing or transition coupling with sealing pad and closure plates, O-ring gaskets, and bolt fasteners.

a. Standard: AWWA C219.
b. Sleeve Material: Ductile Iron per ASTM A 536
c. Sleeve Dimensions: Of thickness and minimum width of 12-inches required to provide pressure rating.
d. Gasket Material: O-rings made of SBR rubber per ASTM D2000, unless otherwise indicated.
e. Pressure Rating: 200 psig minimum.
f. Nuts and Bolts: Type 316 stainless steel conforming to ASTM A 193 (Grade B8M) for bolts and ASTM A 194 (Grade 8M) for nuts
g. Metal Component Finish: Fusion bonded epoxy per AWWA C116. Minimum DFT shall be 12 mils.

B. Flexible Coupling: Manufactured coupling with pressure rating at least equal to and ends compatible with piping to be joined

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Smith-Blair 411
b. Romac 501, or approved equal.

2. Description: Metal, bolted, split-sleeve-type, reducing or transition coupling with sealing pad and closure plates, O-ring gaskets, and bolt fasteners.

a. Standard: AWWA C219.
b. Sleeve Material: Ductile Iron per ASTM A536.
c. Sleeve Dimensions: Of thickness and minimum width of 12-inches required to provide pressure rating.
d. Gasket Material: O-rings made of SBR rubber per ASTM D2000, unless otherwise indicated.
e. Nuts and Bolts: Type 316 stainless steel conforming to ASTM A 193 (Grade B8M) for bolts and ASTM A 194 (Grade 8M) for nuts.
f. Pressure Rating: 200 psig minimum.
g. Metal Component Finish: Fusion bonded epoxy per AWWA C116. Minimum DFT shall be 12 mils.

C. Asbestos Cement Restrainer

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. JCM 630, or approved equal

2. Description: Metal, bolted, split-sleeve-type, restained coupling with sealing pad and closure plates, O-ring gaskets, and bolt fasteners.

a. Standard: AWWA C219.
b. Sleeve Material: Steel per ASTM A285 Grade C or better.
c. Sleeve Dimensions: Of thickness and minimum width of 8-inches required to provide pressure rating.
d. Gasket Material: O-rings made of SBR rubber per ASTM D2000, unless otherwise indicated.
e. Nuts and Bolts: Type 304 stainless steel conforming to ASTM A 193 (Grade B8M), epoxy coated for bolts and ASTM A 194 (Grade 8M) for nuts.
f. Pressure Rating: 200 psig minimum.
g. Metal Component Finish: Fusion bonded epoxy per AWWA C213. Minimum DFT shall be 12 mils.

2.03 THRUST BLOCKS

A. All Portland cement concrete shall conform to the provisions of Section 201 of the SSPWC except as herein modified.

B. Portland cement concrete shall be composed of Portland cement, fine aggregate, coarse aggregate, and water proportioned and mixed to produce a smooth dense workable

mixture. It can be of the ready-mix variety as produced by any reliable ready-mix concrete firm.

C. Portland cement, including Portland cement used in precast products, shall be Type V conforming to ASTM C 150.

D. Concrete for thrust blocks shall conform to 560-C-3250 per the SSPWC.

2.04 DISINFECTING MATERIALS

A. Contractor shall furnish all equipment and labor to perform disinfection activities.

B. Chlorination can be accomplished with calcium hypochlorite tables with average weight of 0.009 pounds each and shall contain not less than 70% available chlorine or by liquid chorine meeting the requirements of AWWA C651 Sections 4.1.1 or 4.1.2.

PART 3 - EXECUTION

3.01 PIPING INSTALLATION

A. Install PVC, AWWA pipe according to ASTM F645 and AWWA M23.

B. Bury piping with depth of cover over top at least 36 inches.

C. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.

3.02 JOINT CONSTRUCTION

A. AWWA C900 Pipe. Make pipe joints according to the following AWWA M23.

3.03 THRUST BLOCKS

A. Thrust blocks shall be constructed where shown on the drawings.

B. The area and design of the bearing surface shall be per MCWD Standard Plans W-13 and W-14.

C. The bearing surface shall be against undisturbed ground in all cases, except where unstable conditions are encountered. In unstable conditions, the bearing surface shall be as directed by the MCWD representative.

D. Unless otherwise directed by the MCWD representative, the blocking shall be placed so that the pipe and fitting joints are accessible for repair.

E. Metal harness of tie rods and pipe clamps shall be used to prevent movement if shown on the plans or directed by the MCWD representative.

F. Exposed non-steel rods and clamps shall be coated with bituminous mastic consisting of coal tar pitch with minimum 68% soils by volume.

G. Reinforcing steel tie-down rods shall be used on all line valves.

3.04 PIPE COUPLINGS

A. Install flexible, transitions, and restrained couplings per manufacturer's instructions.

B. Clean oil, scale, rust, and dirt from pipe ends. Clean gaskets in flexible pipe couplings before installing. Install expansion joints per manufacturer's recommendations. Install expansion joints so that 50% of total travel is available for expansion and 50% is available.

C. Lubricate bolt threads with graphite and oil prior to installation.

D. Wrap the couplings with 8-mil polyethylene wrap per AWWA C105.

3.05 FIELD QUALITY CONTROL

A. Piping Tests: Conduct piping tests before joints are covered and after concrete thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.

B. Hydrostatic Tests: Test at not less than one-and-one-half times working pressure for two hours.

1. Increase pressure in 50-psig increments and inspect each joint between increments. Hold at test pressure for 1 hour; decrease to 0 psig. Slowly increase again to test pressure and hold fAr 1 more hour. Maximum allowable leakage is 2 quarts per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.

2. Prepare reports of testing activities.

3.06 IDENTIFICATION

A. Install continuous underground warning tape during backfilling of trench for underground water-distribution piping. Locate warning tape a minimum of 1 foot above and centered on the pipe. The warning tape shall be installed continuously in the trench.

B. Plastic warning tape shall be an inert plastic film specifically formulated for prolonged underground use. The minimum thickness shall be 4 mils and the minimum width of the tape shall be 6 inches. Printing shall be a minimum of 2-inch block letters.

C. Warning tape for domestic water pipelines shall be blue with black printing having the words "CAUTION: DOMESTIC WATER-LINE BURIED BELOW."

3.07 PROOF OF DISINFECTION

A. Contractor shall submit a Disinfection Plan for approval by the MCWD. The Disinfection Plan shall address trench treatment, sampling and bacteriological testing procedures, and per AWWA C651. The Contractor shall submit this plan 7 working days prior to beginning this work.

B. Procedure

1. Contractor shall notify the MCWC two (2) working days prior to chlorination of facilities.

2. Cutting into Existing Mains. Following the opening of an existing domestic water main, the interior of all accessible pipes and fittings shall be swabbed with a hypochlorite solution. The drained portion of the existing line and any new section shall be flushed from two directions toward the cut-in, if possible.

3. Mains shall be filled but isolated from the system until disinfection has been proved through bacteriological testing.

4. Contractor shall be responsible for taking samples for bacteriological testing.

C. Bacteriological Testing

1. The sampling and bacteriological testing procedure for the newly disinfected facilities shall be in accordance with AWWA C651-99, Section 5.1. The sampling and bacteriological testing procedure for main repairs shall be in accordance with AWWA C651-99, Section 4.7. The Contractor shall provide sampling containers approved by the MCWD and the Contractor shall notify the MCWD two (2) working days prior to collecting samples. A MCWD representative shall be present during the collection of the samples. The Contractor shall deliver the samples to a California DOHS approved testing laboratory. The Contractor shall be required to provide the MCWD with signed copies of all test results and chain of custody documents.

   All mains and services must successfully pass bacteriological tests prior to connecting to the existing system. Services must be tested per the following procedure.

END OF SECTION 33 11 00

S201-ITB2, Volume 2 – 33 04 00 ABANDONMENT OF WET UTILITIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Construction Drawings, Technical Specifications, Addenda, and Contact Agreement, including any Addenda, including other Division 1 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

A. This section includes abandonment in place of existing pipelines and manholes, when indicated on the Drawings for abandonment.

1.03 RELATED SECTIONS

A. SECTION 31 23 10 – TRENCHING, BACKFILLING AND COMPACTING

B. SECTION 33 11 00 – WATER DISTRIBUTION PIPING

1.04 DEFINITIONS

A. Abandonment – Pipeline abandonment consists of filling or plugging portion of existing pipelines with flowable fill or grout plugs as indicated in the Contract Documents.

B. Flowable Fill – Flowable fill shall be controlled low strength material consisting of fluid mixture of cement, fly ash, aggregate, water and with admixtures as necessary to provide workable properties. Placement of flowable fill may be by grouting techniques in pipelines or other restrictive areas, or as mass placement by chutes or tremie methods in unrestrictive locations with open access.

C. Backgrouting – Secondary stage pressure grouting to ensure that voids have been filled within abandoned pipes. Backgrouting shall only be required at critical locations indicated on the Contract Documents of if there is incomplete flowable fill placements.

1.05 STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM C150 – Standard Specification for Portland Cement

2. ASTM C494 – Standard Specification for Chemical Admixture for Concrete

3. ASTM C618 – Standard Specification for Fly Ash and Raw or Calcinated Natural Pozzolan for use as Mineral Admixture in Portland Cement Concrete

4. ASTM C940 – Standard test Method for Expansion and Bleeding of Freshly Mixed Grout for Replaced Aggregate Concrete in the Laboratory

5. ASTM C1017 – Standard Specification for Chemical Admixture for Use in Producing Flowing Concrete

6. ASTM C1107 – Standard Specification for Packaged Dry, Hydrailic-Cemeent Grout (Non-Shrink)

1.06 SUBMITTALS

A. All submittals shall follow the requirements of SECTION 01 33 00 SUBMITTAL PROCEDURES

B. Flowable fill mix design report

1. Flowable fill type and production method. Describe if fill will be mixed to final proportions and consistency in batch plant or if constituents will be added in transit mixer atplacement location.

2. Aggregate gradation of fill. Aggregate gradation of mix shall be used as pilot curve forquality control during production.

3. Fill mix constituents and proportions including materials by weight and volume, and aircontent. Give types and amounts of admixtures including air entrainment or air generating compounds.

4. Fill densities and viscosities, including wet density at point of placement.

5. Initial time of set.

6. Bleeding and shrinkage.

7. Compressive strength.

C. Submit technical information for equipment and operational procedures including projected injection rate, grout pressure, method for controlling grout pressure, bulkhead and vent design and number of stages for grout application.

PART 2 - PRODUCTS

2.01 FLOWABLE FILL

A. Design Mix Criteria. Provide design of one or more mixes to meet design criteria and conditions for placement. Present information required by Part 1, Paragraph E.1 in mix design, to include the following:

1. Cement: ASTM C150 Type I or II. Volume and weight per cubic yard of fill. Provide minimum cement content of 50 pounds per cubic yard.

2. Fly ash: ASTM C618, Class C or F. Volume and weight per cubic yard of fill. Provide minimum fly ash content of 200 pounds per cubic yard.

3. Potable water: Volume and weight per cubic yard of fill. Amount of water determined by mix design testing.

4. Aggregate gradation: 100 percent passing 3/8-inch sieve and not more than 10 percent passing No. 200 sieve. Mix design report shall define pilot gradation based on following sieve sizes: 3/8 inch, No. 4, 8, 16, 30, 50 100 and 200. Do not deviate from pilot gradation by more than plus or minus 10 percentage points for any sieve for production material.

5. Aggregate source material: Screened or crushed aggregate, pit or bank run fine gravels or sand, or crushed concrete. If crushed concrete is used, add at least 30 percent natural aggregate to provide workability.

6. Admixtures: use admixtures meeting ASTM C494 and ASTM C1017 as needed to improve pumpability, to control time of set and to reduce bleeding.

7. Fluidifier: Use fluidifier meeting ASTM C937 as necessary to hold solid constituents in suspension. Add shrinkage compensator if necessary.

8. Performance additive: Use flowable fill performance additive, if needed, to control fill properties.

2.02 FLOWABLE FILL REQUIREMENTS

A. Unconfined compressive strength: minimum 75 psi and maximum 150 psi at 56 days as determined based on an average of three tests for same placement. Present at least three acceptable strength tests for proposed mix design in mix design report.

B. Placement characteristics: self-leveling.

C. Shrinkage characteristics: non-shrink.

D. Water bleeding for fill to be placed by grouting method in pipes: not to exceed 2 percent according to ASTM C940.

E. Minimum wet density: 90 pounds per cubic foot.

2.03 GROUT PLUGS

A. Cement-based dry-pack grout conforming to ASTM C1107, Grade B or C.

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

A. Pipes greater than 8-inch diameter indicated on the Drawings to be abandoned in place shall be completely filled with flowable fill.

B. Pipes equal or less than 8-inch diameter indicated on the Drawings to be abandoned in place shall be cut and a grout plug set at each end.

3.02 PREPARATION

A. Notify inspector at least 24-hours in advance of grouting with flowable fill.

B. Select fill placement equipment and follow procedures with sufficient safety and care to avoid damage to existing underground utilities and structures. Operate equipment at pressure that will not distort or imperil portions of the work, new or existing.

C. Cut and cap portions of the piping system to remain, as shown on the Drawings. Drain water mains to be abandoned.

D. Clean sewer lines. During placement of fill, compensate for irregularities in sewer pipe, such as obstructions or open joints, to ensure no voids remain unfilled.

E. Perform demolition work prior to starting fill placement. Clean placement areas for pipes and manholes of debris that may hinder fill placement. Remove excessive amounts of sludge and other substances that may degrade performance of the fill. Do not leave sludge or other debris in place if filling more than 2 percent of placement volume. Dispose of waste material in accordance with applicable codes and regulations.

F. Remove free water prior to fill placement.

3.03 EQUIPMENT

A. Mix flowable fill in automated batch plant and deliver it to site in ready-mix trucks. Performance additives may be added at placement site if required by mix design. 2. Use concrete or grout pumps capable of continuous delivery at planned placement rate.

3.04 ABANDONMENT OF SEWER MANHOLES

A. Sewer manholes shall be abandoned in place. Cover and frames shall be left and manhole shall be abandoned empty.

3.05 INSTALLATION OF FLOWABLE FILL

A. Abandon pipelines, as required in Section 3.01, by completely filling with flowable fill.

B. Place flowable fill equal to volume of pipe being filled. Continuously place flowable fill from manhole to manhole with no intermediate pour points, but not exceeding 500 linear feet of pipe per fill segment.

C. Perform operation with experienced crews with equipment to monitor density of flowable fill and to control pressure.

D. Temporarily plug or cap pipe segments which are to remain in operation during filling to keep lines free of flowable fill.

E. Pump flowable fill through bulkheads or use other suitable construction methods to contain flowable fill in lines to be abandoned.

F. Place flowable fill under pressure flow conditions into properly vented open system until flowable fill emerges from vent pipes. Pump flowable fill with sufficient pressure to overcome friction. Fill sewers from the downstream end to vent at upstream end.

G. Backfill excavations per SECTION 31 23 10 TRENCHING, BACKFILLING AND COMPACTING.

H. Collect and dispose of excess flowable fill material and debris.

3.06 INSTALLATION OF GROUT PLUGS

A. Clean inside surface of pipe at least 12-inches from ends, achieving firm bond and seal grout plug to pipe surface. Similarly clean and prepare exterior surface if manufactured cap is to be used.

B. Place temporary plug or bulkhead approximately 12-inches inside pipe. Fill pipe end completely with dry-pack grout mixture.

C. Backfill excavations per SECTION 31 23 10 TRENCHING, BACKFILLING AND COMPACTING.

D. Collect and dispose of excess grout material and debris.

3.07 REMOVAL OF ASBESTOS CEMENT PIPE (ACP)

A. Removal of ACP shall be removed in whole sections where possible. Cutting or breaking of ACP to facilitate removal shall be in compliance with California Regulations, Title 8, and Section 1529.

B. Non-friable ACP. If non-friable asbestos cement pipe (ACP) is identified, the Contractor shall employ adequate care to maintain the pipe in a non-friable condition. At a minimum, the Contractor shall follow the following requirements for ACP that is to be cut or broken:

1. The Contractor shall evacuate the area of unauthorized or untrained personnel, post warning signs, and provide a demarcation zone and adequate barrier to keep unauthorized personnel out of the area.

2. The Contactor shall provide personal protective equipment (respiratory apparatus, gloves, etc.) to minimize asbestos exposure.

3. The area to be cut or broken shall be adequately wetted with amended water to reduce fiber emission. The method employed by the Contractor shall minimize fiber release. Power saw cutting will not be allowed. All related debris from the cutting or breaking of ACP shall be considered friable. The Contractor shall dispose of friable material in accordance with California Regulations, Title 8 and Section 5208.

C. Friable asbestos-containing materials is defined as material that can be crumbled, pulverized, or reduced to powder by hand pressure. All friable asbestos-containing materials shall be

considered hazardous waste and shall be transported by a licensed hazardous waste hauler. Procedures for handling friable asbestos-containing material shall conform to the requirements of California Regulations, Title 8.

D. The Contractor is responsible for all ACP removal and associated contamination. Disposal of all ACP shall be in accordance with of California Regulations, Title 8, in an authorized disposal site.

3.08 QUALITY CONTROL

A. Provide batch plant tickets for each truck delivery of flowable fill. Note on tickets addition of admixtures at site.

B. Check flow characteristics and workability of fill as placement proceeds.

C. Obtain at least threes test cylinders fro each placement area for determination of 56-day compressive strength and bleeding. Acceptance of placement will be based on average strength of three tests.

D. Record volume of flowable fill placement to demonstrate that voids have been filled. If voids exceed 10% of pipeline volume, injection grouting may be required at the direction of the Project Manager.

3.09 PROTECTION OF PERSONS AND PROPERTY

A. Provide safe working conditions for employees throughout demolition and removal operations. Observe safety requirements for work below grade.

B. Maintain safe access to adjacent property and buildings. Do not obstruct roadways, sidewalks or passageways adjacent to the work.

END OF SECTION 33 04 00