2. Valves. Will be measured on the basis of each gate valve or butterfly valve completely installed and tested including valve, valve riser and cap, earthwork and miscellaneous materials.

3. Air Valves. Will be measured on the basis of each air valve assembly completely installed and tested including tap-to main, piping, all valves, fittings, valve box, earthwork, and miscellaneous materials.

4. Fire Hydrants. Will be measured on the basis of each fire hydrant assembly completely installed and tested including tap-to-main, piping, valve, valve riser and cap, fittings, hydrant, earthwork and miscellaneous materials.

5. Blow-offs. Will be measured on the basis of each blow-off assembly completely installed and tested including tap-to-main, piping, valve, valve riser and cap, fittings, earthwork and miscellaneous materials.

6. Special Bedding. Will be measured on the basis of the cubic yards of special bedding required to bring the bedding up to grade for the trench size excavated up to the maximum size of trench allowable under these specifications. Only that special bedding for which there are stipulated costs, or for which special bid items are listed in the bid sheet will be measured for payment.

   No allowance will be made for over-excavation except as directed by the Engineer, or for special bedding required in the contract work under other bid items.

7. Bore Casing. Will be measured on the basis of horizontal centerline distance and shall include all excavation, furnishing and placement of casing, furnishing and placement of all required back-packing and grouting around casing, backfilling within casing, pipe bracing, restoration of surfaces, and all labor and material for a finished job. Furnishing and installation of pipe within casing shall be included in pipeline measurement.

8. Paving. Will be measured as a part of project causing removal and/or replacement of paving, except as otherwise specified on the Bidding Sheet.

B. Payment. Payment for quantities for installation of pipeline and appurtenances on District-administered contracts will be paid for in the following manner. Quantities of items listed herein, measured as stated above and accepted, will be paid for at the unit bid prices as stated herein, which prices and payments shall constitute full compensation for furnishing all labor, equipment and tools necessary to complete the described work in place. No additional compensation will be paid above the unit bid prices for changes in quantities.

1. Pipelines. Quantities of pipelines will be paid for at the respective unit bid prices per horizontal linear foot for the kinds and sizes of pipe stated in the bidding sheet. Work includes all earthwork, installation and testing of pipe, specials, fittings, welding, anchors, removal and restoration of pavement, curbs, gutters and sidewalks, and clean-up. Payment for pipe in place shall be further broken down based upon the Contractor's submittal under Section F-10 of the General Conditions, as concurred by the Engineer, but not to exceed in the ordinary project the following percentages of the linear foot price stated on the Bidding Sheet:

Trench excavation	10%
Pipe laid in place and shaded	65%
Trench Backfilled and the Backfill Compacted	20%
Testing and Clean-up, Exclusive of Pavement Replacement	5%

2. Fittings and Specials. Payments for quantities of fittings and specials shall be included in the payment for installation of pipelines. Work includes installation of bends, tees, crosses, joint restrainers, couplings, saddles, outlets, tapers, butt straps and all necessary cuts and welding and all earthwork, and no additional compensation will be made therefore.

3. Valves. Quantities of gate valves or butterfly valves will be paid for at the respective unit bid prices for the size of valves stated in the bidding sheet. Work includes installation of valves, valve risers and caps, saddles, flanges, gaskets, bolts, and all earthwork.

4. Air Valves. Quantities of air valve assemblies will be paid for at the respective unit bid prices for the size of air valves stated in the bidding sheet. Work includes installation of tap-to-main, valves, service stops, elbows, bends, valve boxes, and all piping.

5. Fire Hydrants. Quantities of fire hydrant assemblies will be paid for at the respective unit bid prices for the sizes of fire hydrants stated in the bidding sheet. Work includes installation of tap-to-main, valves, valve risers and caps, saddles, bends, flanges, gaskets, bolts, hydrants, and all piping.

6. Blow-offs. Quantities of blow-off assemblies will be paid for at the respective unit bid prices for the sizes of blow-offs stated in the bidding sheet. Work includes installation of tap-to-main, valves, valve risers and caps, fittings, earthwork and miscellaneous materials.

7. Special Bedding. Quantities of special bedding measured as stated above and accepted, will be paid for at the stipulated cost price, or the respective unit bid price for the quantities as stated in the bidding sheet, which price shall constitute full compensation for all labor, materials, and equipment necessary to complete the work in place, including the special bedding material.

8. Bore Casing. Payment for bore casing in place measured as stated above shall be made as specified on the bidding sheet.

9. Paving. Payment for quantities of paving measured as stated above and accepted shall be included in the unit bid for pipeline. Work includes removal and/or restoration of paving and all earthwork, and no additional compensation will be made therefore, except as otherwise provided on the bidding sheet.

1.07 GUARANTEE

All work, materials, and equipment shall be guaranteed for the periods of time set forth elsewhere in the contract documents for General Guaranty or Warranty.

PART 2 - PRODUCTS & MATERIALS

2.01 SERVICE CONNECTIONS

Service connections to asbestos-cement pipe main shall be by prefabricated heavy tapped couplings for 3/4", 1" & ½" Meter Service Connections. Service connections to ductile iron pipe and PVC pipe shall be made using service saddles.

2.02 FLANGE X HUB-END VALVES

Where valves do not connect to fittings, the fitting may be hub-end, or flange x hub-end. However, where valves connect to cast iron or welded steel fittings, fittings shall be flanged. Where flange x hub-end valves are not available for use with asbestos-cement pipe, flanged valves shall be used with flange x hub-end adaptors. All fittings and valves for ductile iron pipe and PVC pipe shall be bolted mechanical joint type.

All valves shall be hung plumb, with the stems vertical.

2.03 PORTLAND CEMENT CONCRETE

Cast-in-place structures of plain and reinforced concrete shall conform to the requirements of Chapter 26 of the Uniform Building Code and ACI 318, unless otherwise approved by the Engineer.

Classes of concrete used in the construction of cast-in-place structures shall be proportioned as specified in Section 03300 of the District standard specifications.

2.04 CEMENT MORTAR PIPE JOINTS

Mortared joints shall meet the following requirements:

A. Joint Mortar

1. Composition of mortar for caulking, buttering, or coating of joints shall be composed of cement, sand and water, well mixed and of such consistency as to produce a dense, homogeneous mortar that will adhere firmly to the pipe surface. Sufficient hand plastering of the joint prior to placing of the mortar is to be encouraged, to enhance the bond between the pipe and mortar.

   a) Cement shall be Type V Portland Cement (sulfate resistant)

   b) Water for mixing mortar shall be clean and free from mud, oil, organic material, or other deleterious substances.

   c) Aggregate sand shall be silica sand passing at No. 16 mesh screen; or "plaster" sand at least 80% passing a No. 16 mesh screen; or other well graded inert, granular material produced from hard rock, with strong, durable, uncoated grains, upon prior approval of the District.

2. Proportions of cement and sand in joint mortar shall be one part of Portland cement to one and one-half parts of sand by volume. The exact proportion shall be determined by the characteristics of the sand used, and approved by the Engineer.

3. Water content shall be kept to the minimum allowing workability, as approved by the District, recognizing that better flow characteristics are required for placement in diapers around the pipe than for placement by caulking or buttering.

4. Mixing of the mortar should be long enough (approximately 3 minutes in paddle-type mixers, or 1 minute in turbine mixers) to obtain maximum plasticity. The mortar shall be used before initial set; therefore, only enough mortar shall be mixed at a time for immediate use even to the extent of discarding mortar already mixed in the event of delay in the pipelaying operation.

B. Diapers shall be impervious if available.

1. Width of diapers, where used, shall be sufficient to allow cupping of the diaper for increased thickness of the joint mortar. Recommended minimum diaper widths:

20" dia. pipe and larger:.....12"
12" - 18" dia. pipe: .....10"
10" dia. pipe and smaller: ..... 9"

2. Mortar placement shall be from one side of the diaper, to allow the mortar to flow around the bottom and up the opposite side of the pipe, to preclude the possibility of any voids inside the diaper.

C. Curing operations shall begin immediately after completion of joint mortaring.

1. Immediate backfill should follow the completion of the joint mortaring operation where possible. Care must be taken to immediately wet down and consolidate the backfill, to avoid draining the moisture from the mortar through porous diapers into dry backfill soil, or disturbing the mortar set by subsequent compaction of the backfill.

2. Completed-joint mortar to be exposed to the sunlight where backfill will not take place until after the mortar has hardened must be kept continually moist during the curing period to prevent cracking of the curing mortar.

2.05 LOCATOR WIRE

Locator wire shall be installed over all waterlines, reclaimed waterlines and forcemains whether or not telemetry wire is buried with pipe. Locator wire per Standard Drawing B-656 shall be 14-1 solid insulated copper wire (UF), in a continuous strand, placed on top of pipe and secured with tape. Locator wire shall be brought to the surface at the edge of the right of way at 660 feet maximum on centers in Brooks No. 1-SP, or equal, valve boxes.

The valve boxes shall be placed within two feet of fire hydrants when fire hydrants are available at 660' or less on center. Where no fire hydrants are available, EMWD marker posts shall be installed within two feet of the valve boxes.

For subdivision construction, instead of the marker post, mark the face of the curb in front of the box with the letters “LW”. Loop 2 feet of wire in valve box. Provide the inspector survey stations at each valve box for as-built drawings.

After all trench backfill operations are complete, the District shall pay for and conduct the locatibility test to confirm that the wire is continuous. The Contractor shall be responsible for all costs to confirm, locate and repair any breaks in the location wire identified in the locatibility test. In addition, the Contractor shall reimburse the District for all costs to retest repaired sections of the wire. The Contractor is advised to use care in the installation and backfilling operations to prevent damage to the wire.

2.06 TELEMETRY CABLE

On District-administered contracts, the District will supply the telemetry cable for installation in accordance with these specifications and contract drawings. The telemetry cable will be delivered to the Contractor at the District's warehouse. Prior to acceptance and delivery of the cable, a continuity test will be performed by District personnel or the Contractor's representative. Certification of the test results will be acknowledged by the Contractor or his representative in writing. The Contractor will be responsible for the safe handling, installation and retesting for total continuity of the cable installation prior to acceptance by the District.

2.07 POLYETHYLENE ENCASEMENT

All underground installed valves, 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/A21.5.

2.08 JOINT BONDS

All metallic pipes shall be electrically continuous except at insulating flanges. All joints that are not welded shall have bonds to ensure continuity.

Cathodic test stations and/or Insulated Test Connection 4-wire test stations shall be installed at every half mile or less except where otherwise indicated on the plans.

2.09 DROPS AND SIPHONS

All waterline drops and siphons larger than 12” shall be CML&C. A soil corrosivity report with recommendations shall be prepared by a corrosion engineer and submitted to the District for approval prior to construction.

PART 3 - EXECUTION

3.01 GENERAL

It shall be the responsibility of the Contractor, prior to start of construction, to meet with the Engineer:

A. For approval of schedule of construction for work and completion of pipelines or sections thereof.

B. To submit the required forms listed in the General Conditions.

C. To coordinate delivery of District-furnished materials.

1. Determine location and placing of the pipe to be unloaded and direction of placing bells;

2. Determine the quantity of pipe to be placed in a particular location;

3. Coordinate delivery of pipe and other materials to meet his construction schedule.

D. To furnish such additional information as may be required from time to time as construction progresses, regarding the progress of the procurement and delivery of the required equipment and materials, and/or the scheduling of the work.

Any subsequent shuttling of pipe, turning of bells, etc., will be at the Contractor's expense and no additional compensation will be allowed above the unit bid price, unless authorized by the Engineer in writing. All quantities shown on the Bidding Sheet and the contract drawings indicate the estimated quantities of materials for the completed pipelines in place.

3.02 BEDDING PIPE

A. General. Each section of pipe shall be lowered into the trench in a manner that will prevent injury to the pipe, coating, or joints and shall be carefully bedded to provide continuous bearing and prevent uneven settlement. The inside of the pipe shall be clean and free from foreign material of any kind before being installed.

B. Steel Pipe. For bedding steel pipe without encasement, the trench bottom shall be given a final trim such that each pipe section first laid will be continuously in contact with the ground along the bottom as shown on the drawings, provided that in the event ground is encountered which, due to its instability or other properties, but through no fault of the Contractor, cannot be trimmed in the prescribed manner or made to retain the specified shape, a 2-inch bedding or other suitable modification of the method of bedding the pipe will be ordered by the Engineer. Bellholes will be provided to prevent bridging the pipe supported at the bells.

Wherever, due to over-excavation or inaccurate trimming by carelessness in the operation of the Contractor's equipment or by his workmen, the shaping is inadequate to afford uniform support for the normal bedding of the pipe, the Contractor at his own expense, shall refill with sand, consolidate, and then reshape the trench bottom to the required section.

Pipe zone bedding shall be completed in accordance with the requirements of the District standards and/or the manufacturer's trench section bid submittal.

C. Asbestos-Cement Pipe. Asbestos-cement pipe without encasement shall be installed in accordance with AWWA Spec. C603, shall be bedded in accordance with Section 3.2 of that specification for pipe laid on earth mounds, and in accordance with the standard drawings.

D. Ductile Iron Pipe. Ductile iron pipe without encasement shall be installed in accordance with AWWA Spec. C600.

E. PVC Pipe. PVC pipe without encasement shall be installed in accordance with ASTM D-2774-82.

For PVC pipe and ductile iron pipe with mechanical joints, the gasket shall be placed in the groove of the bell. Lubricate the spigot lead of the pipe, keeping it clean and free of dirt or sand and then insert the spigot end into the bell and force into position per manufacturer's recommendation.

F. Tolerance. The pipe shall be accurately laid to alignment and grade shown on the drawings or established by the Engineer. Where grade stakes are provided with which to establish the proper pipeline grade, pipe shall be laid to grade within a tolerance of 0.1', or 0.2' cumulative deviation from elevations set by adjacent grade stakes. As ordered by the Engineer, the allowed tolerance may be greater than herein indicated for lines on steep grades, or less than herein indicated for the larger lines or lines on flat grades, where necessary to avoid air pockets.

3.03 RUBBER GASKET PIPE JOINTS

After the subgrade has been prepared as specified, the rubber gasket shall be placed in the groove on the spigot ring, and the spigot end of the pipe then entered into the bell of the adjoining pipe and forced into position. Care shall be taken to avoid twisting or cutting the gasket when jointing the pipe. The inside surface of the bell shall be lubricated with a compound of Sherwin-Williams Fluxsoap or approved equal which will facilitate the telescoping of the joint.

A. Lining. For steel pipe smaller than 21 inches, buttering of joints with cement mortar and drawing sewer ball or an approved swab or squeegee through the pipe may be substituted in place of caulking and troweling. Water shall not be turned into the pipe until the inside joints have been properly cured.

B. Coating. In the case of wrapped steel pipe, the outside joints shall be completely primed with Primer 1170 and wrapped with Protecto-Wrap.

In case of cement mortar coated steel pipe, the outside joints shall be completely coated with cement mortar using diapers as set forth in Article 2.04, Cement Mortar Pipe Joints.

All field coatings other than joint mortar shall be shaded with pipe zone backfill after their initial set, but prior to four (4) hours following installation, and properly protected during the shading operation. Joint mortar shall be cured as set forth in Article 2.04, Cement Mortar Pipe Joints.

3.04 CURVES, ANGLES, CLOSURES AND SHORT SECTIONS

The laying of pipe on curved alignment by means of unsymmetrical closure of spigot into bell rings will be permitted. The amount of pull permitted from normal closure on one side of the joint will be up to 1/2" for 8" pipe or smaller, up to 3/4" for 10" through 21" pipe, and up to 1" for pipe 24" and larger; provided that the maximum deflection shall not exceed the manufacturer's recommendation. Where smaller radius of curvature is required, sections of pipe with beveled ends may be fabricated for the purpose and laid on curved alignment, unless fabricated bends are shown on the drawings or ordered by the Engineer. Beveled pipe may have a maximum bevel of five degrees measured from a plane perpendicular to the pipe's axis. The center of the short side of the bevel shall be marked on the joint bands. For the purpose of reducing the angular deflections at pipe joints and for closure sections, the Contractor shall be permitted to install pipe sections of less than standard length. Where such installations are allowed, Contractor shall be responsible for anchorage of the necessary joints, as directed by the Engineer. Curved Sections of PVC pipe shall be in accordance with AWWA C-900 and manufacturer's recommendations.

Closing courses and short sections of straight pipe shall be fabricated and installed by the Contractor as found necessary in the field and approved. Where closing pieces are required, the Contractor shall make all necessary measurements and shall be responsible for the correctness. Other than closing courses and short sections approved by the Engineer for field fabrication, all pipe and special fittings shall be fabricated in a shop approved by the Engineer for that purpose.

Asbestos-cement pipe cutting or beveling operations shall utilize tools that do not produce concentrations of airborne asbestos dust exceeding levels permitted by regulatory agencies.

PVC pipe shall be cut square, deburred and beveled in accordance with pipe manufacturer's recommendations. The pipe shall be cut in a neat and workmanlike manner without damage to the pipe.

3.05 WELDING

The Contractor shall be responsible for the quality of work performed by his welding organization. All welding operators shall be qualified under the Standard Qualification procedure of the American Welding Society. All welds shall be made by an electric shielded arc method of welding. When continuous welded pipe is specified, the Contractor shall use filler rods made of the same material as the cans, per the manufacturer's recommendations. No bending of the pipe shall be allowed.

All pipe welds at joints and fittings shall be double pass full welds. Welding shall be performed only after any mortar within two (2) feet has a 24-hour set.

The Engineer shall have the right at any time to call for and witness the making of test specimens by any welder in accordance with these specifications, and the expense of such tests shall be borne by the Contractor.

Welds considered by the Engineer to be deficient in quality, or made contrary to any mandatory provision of these specifications, shall be removed by chipping or melting, and shall be remade. The weld-metal shall be removed throughout its depth to expose clean base metal, but in case of a strictly local deficiency, the weld need not be removed throughout its entire length, provided that a sufficient amount shall be removed to insure that sound weld metal only remains. A cracked weld shall be removed throughout its length.

3.06 JOINT INSPECTION

For sizes smaller than 30 inch, Contractor must provide closed circuit television inspection (CCTV) as a post-construction method to determine if the pipeline has been installed as required and all joints have been properly finished. CCTV system shall have a rotating lens camera with articulating head. Each joint will be scanned 360 degrees. The television camera shall be specifically designed and constructed for water pipe inspection. The camera shall be operative in 100% humidity conditions. Lighting for the camera shall minimize relative glare. Lighting and camera quality shall be suitable to provide a clear, in focus picture of the entire periphery of the water pipe for all conditions encountered during the work. Focal distance shall be adjustable through a range from 6" to infinity. The remote reading footage counter shall be accurate to one percent (1%) over the length of the particular section being inspected. The camera, television monitor and other components of the color video system shall be capable of producing a minimum of 350 line resolution. Documentation consisting of a color video tape and a written report detailing the condition of the mainline and joints shall be submitted to EMWD for approval prior to pressure testing.

Any defects in the pipe lining or joints, shall be repaired and another video taken of the repaired section and submitted for approval by EMWD prior to pressure testing. **For domestic water systems, all video equipment must be certified for DOMESTIC WATER LINE INSPECTION ONLY, and NEVER to have been utilized in a non-potable system.**

3.07 FIRE HYDRANT RUNS

In asbestos-cement pipe, ductile iron pipe, and PVC pipe systems where thrust blocks are required, trenches shall be trimmed neat to avoid encroachment of the thrust block into the area of future utility trench assignment.

3.08 FLANGE, FITTING AND BOLT CORROSION PROTECTION

All corporation stops, valves and other appurtenances and fittings at the pipeline shall be primed, and wrapped with Protecto-Wrap No. 200 or 300 Coal Tar Resin tape. Bolts and nuts shall be protected using zinc caps anodes in accordance with section 15089.

Fittings and valves on pipeline shall be encased in alkalized sandslurry envelope between 12" and 18" thick. Composition 50 lb. hydrated lime per cubic yard of sand.

All bare iron and steel shall be field coated with one of the following as directed by the Engineer:

A. Protecto-Wrap #1170 primer and #200 or #300 Coal Tar Resin tape; or

B. two coats of Koppers Supertank solution; or

C. cement mortar meeting the requirements of Article 2.04.

3.09 VALVE CAP AND RISER INSTALLATION

In new subdivision developments, Contractor shall leave valve cans 3" minimum below rough-graded subgrade street surface, properly covered, and shall return after paving of the streets is completed by others, to raise the valve slip can and cap to grade. Contractor shall coordinate his work with that of the paving contractor to place the slip can during placement of the road sub-base, if desirable.

3.10 SERVICE CONNECTION METER BOX LOCATIONS AND METER INSTALLATION

Service connections shall be installed by the Contractor of the size and at the locations shown on the standard drawings, with meter boxes located as shown on the standard drawing for the proper size meter service connection. Where meter installation is indicated on the standard drawings, spacers as shown on the standard drawings shall be furnished and installed by the Contractor for later installation of meters to be furnished and installed by the District.

Except as specifically stated otherwise, or as coordinated by the Engineer upon mutual agreement during construction, meter boxes shall be set after curbs have been constructed in those areas involving curb construction in the street improvement, and after grading of the parkway or road shoulders. The Contractor shall maintain the meter boxes within County road improvements until those improvements are accepted by the County.

3.11 SERVICE CONNECTIONS

Service connections to asbestos-cement pipe shall utilize heavy tapped couplings where service connections are made or locations are known at the time of main installation. Service connections to ductile iron pipe and PVC pipe shall utilize service saddles. Water Service Compression Couplings where required or permitted, shall utilize a stainless steel insert in accordance with the drawings. The stainless insert specified shall be a full circle insert; split or collapsible inserts will not be accepted.

3.12 ELECTROLYSIS FACILITIES

Such as insulating flanges, test connection stations, and bonding of pipe joints shall be installed to eliminate conductivity of electrical current or to ensure such conductivity, whichever is appropriate. Inasmuch as the testing of these installations requires specialized equipment, any tests required by the Engineer will be performed by the District or its agent at District expense on District-administered contracts. The electrical potential and current necessary to successfully test the installation shall be determined by the District or its agent for each individual facility, dependent upon such factors as the pipe-to-soil potentials available.

3.13 TEMPORARY BUMPHEADS

The Contractor shall furnish and install complete, all the necessary temporary bumpheads or skillets and appurtenances thereto in the pipeline used for backfilling or testing purposes and shall remove such bumpheads upon completion of the line.

The Contractor shall furnish, at his own expense, any openings in the pipeline or bumphead and any valves or by-pass arrangements which are for his convenience in filling, testing and/or emptying the pipeline.

At all times when the work of installing pipe is not in progress, all openings into the pipe and the ends of the pipe in the trench shall be tightly closed to prevent entrance of animals and foreign materials.

The Contractor shall take all necessary precautions to prevent the pipe from floating due to water entering the trench from any source, shall assume full responsibility for any damage due to this cause and shall at his own expense restore and replace the pipe to its specified condition and grade if it is displaced due to floating.

If the Contractor, upon approval by the Engineer, elects to test a system utilizing valves and connecting pipe installed by the District, the District will assume responsibility for any leaks occurring in any pipeline or valve furnished and installed by the District. In the event Contractor is unable to satisfactorily test his system because of leaks in the District-installed system, Contractor shall install temporary bumpheads in his construction to perform tests, as determined necessary by the Engineer. Full compensation for furnishing all labor, tools, materials, and equipment (except water when provided by the District), and for doing all work involved in testing, and for repairing any leaks shall be included in the price paid for installation of the pipe, and no additional compensation by the District will be allowed therefore.

3.14 FIELD HYDROSTATIC TEST

Upon completion of the laying, jointing, backfilling, and proper curing of the joints, and compaction of backfill, the pipeline or portions thereof shall be hydrostatically tested.

For convenience of testing, the pipeline may be divided into sections and each section tested separately. Main line valves may be used in lieu of special bumpheads, or if valves are not conveniently located, temporary bumpheads shall be constructed. Bumpheads shall be constructed to safely withstand the hydraulic pressures imposed upon them. No payment will be made expressly for the work and materials required for the bumpheads and any compensation desired by the Contractor for this work shall be included in the price quoted for the installation of pipe. The Contractor shall have no claim against the District by reason of required construction of bumpheads due to the omission of the installation of any or all main line valves.

After the section of pipeline has been bumpheaded and completely filled with water, it shall be allowed to stand under pressure a sufficient time to allow the pipe to obtain a maximum absorption of water and to allow the escape of air from any air pockets. The pressure shall then be increased to the specified test pressure as hereinafter described, and shall be maintained at this pressure for not less than four (4) hours.

All pipes shall be tested under a pressure 1 1/2 times the pressure rating of the pipe, but not less than 150 pounds per square inch. Maximum test pressure shall not exceed 225 pounds per square inch unless otherwise specified by the Engineer.

As a matter of information, valves specified elsewhere for installation shall meet the following conditions:

Gate Valves

AWWA C-500 requires:

12" & smaller: 200 psig rated working pressure
16" & larger: 150 psig rated working pressure

At these pressures, allowable hydrostatic leakage rate is 1 fl. oz./hour/inch of nominal valve size.

Butterfly Valves

AWWA C-504 requires:

3" - 72": 150 psi working pressure

Allowable leakage:

Drip-tight at 150 psi hydrostatic pressure differential

Dresser 450 [AWWA Class 150-B (150 psi)]

4" - 12": 200 psi rated working pressure
14" & larger: 150 psi rated working pressure

Allowable leakage:

Bottle tight at rated working pressure differential

If testing is against gate valves and leakage is detected through the valve, additional leakage over and above the allowable leakage for the pipeline may be allowed at the rate of 1 fl. oz./hour/inch of valve diameter. There will be no allowance for leakage through butterfly valve.

If any leakage is evidenced in the testing of the pipeline, the various sections of the pipeline shall be isolated for testing between available valves, or between bumpheads located as directed by the Engineer. The maximum allowable leakage for asbestos-cement pipe shall be ten (10) gallons per day per mile of pipe per inch of pipe inside diameter. The maximum allowable leakage for steel pipe shall be two (2) gallons per day per mile of pipe per inch of pipe inside diameter. The maximum allowable leakage for ductile iron pipe shall be seven (7) gallons per day per mile of pipe per inch of pipe inside diameter. The maximum allowable for PVC pipe shall be six (6) gallons per day per mile of pipe per inch of pipe inside diameter. If the leakage exceeds this amount, the section being tested will be considered defective. The Contractor shall determine the points of leakage, make the necessary repairs and perform another test. This procedure shall be continued until the leakage in each section falls below the allowable maximum for that section of pipeline.

Leakage shall be determined by metering the water injected into the pipeline while under the required pressure. The Contractor shall submit to the District before and after the test the gage and meter used so that these devices may be tested by this District.

The Contractor shall provide all calibrated meters for measurement of leakage, all bumpheads or skillets, piping, calibrated gages, pumps and other equipment, all water not furnished by the District, and all power and labor necessary for the performance of pressure tests satisfactory to the Engineer. The Contractor shall furnish all necessary equipment and labor to fill each section of pipeline tested and for pumping the water from one test section to another as may be necessary for obtaining and maintaining the required water pressure and for filling the entire pipeline with water after the conclusion of the testing, as hereinafter provided.

The Contractor, at his own expense, shall do any excavation necessary to locate and repair leaks or other defects which may develop under test, including removal of backfill already placed, shall replace such excavated material, and shall make all repairs necessary to meet the required water tightness after which the test shall be repeated until the pipe meets the test requirements. All tests shall be made in the presence of the Engineer. After the pipe has met successfully all test requirements specified herein, the entire pipeline shall be filled with water and so maintained until the completion of the contract unless otherwise ordered by the Engineer.

3.15 CHLORINATION

A. Flushing. Sections of pipe to be disinfected shall first be flushed to remove any solids or contaminated material that may have become lodged in the pipe. If no hydrant is installed at the end of the main, then a tap should be provided large enough to develop a velocity of at least two and five-tenths (2.5) feet per second in the main. A two and one-half (2½) inch hydrant opening will, under normal pressures, provide this velocity in pipe sizes up to and including twelve (12) inch.

All taps required for chlorination, flushing purposes, or for temporary or permanent release of air shall be provided for by the CONTRACTOR as a part of the construction of water mains.

B. Requirement of Chlorine. Before being placed into service, all new mains and repaired portions of, or extension to existing mains shall be chlorinated so that the initial chlorine residual is not less than 50 mg/l and that a chlorine residual of not less than twenty-five (25 mg/l) remains in the water after standing twenty-four (24) hours in the pipe.

C. Form of Applied Chlorine. Chlorine shall be applied by one of the methods which follow subject to approval by the ENGINEER.

1. Liquid Chlorine. A Chlorine gas-water mixture shall be applied by means of a solution-feed chlorinating device, or the dry gas may be fed directly through proper devices for regulating the rate of flow and providing effective diffusion of the gas into the water within the pipe being treated. Chlorinating devices for feeding solutions of the chlorine gas, or the gas itself, must provide means for preventing the backflow of water into the chlorine.

2. Chlorine-Bearing Compounds in Water. A mixture of water and high-test calcium hypochlorite (65-70% Chlorine) may be substituted for the chlorine gas water mixture. The dry powder shall first be mixed as a paste and then thinned to a one (1) percent chlorine solution by adding water to give a total quantity of seven and five-tenths (7.5) gallons of water per pound of dry powder. This solution shall be injected in one end of the section of main to be disinfected while filling the main with water in the amounts as shown in the table which follows:

Chlorine Requirements to Produce 50 mg/l
Concentration in 100 Foot of Pipe - By Diameter

Pipe Size Inches	100% Chlorine Chlorine, LB.	1% Chlorine Solution, Gals.
4	0.027	0.33
6	0.061	0.73
8	0.108	1.30
10	0.170	2.04
12	0.240	2.88

3. Tablet Disinfection. Tablet disinfection if best suited to short extensions (up to 2500 ft.) and smaller diameter mains (up to 12 inch). Since preliminary flushing must be eliminated in using this method, it should be utilized only when scrupulous cleanliness has been used in construction. It should not be used if trench water or foreign material has entered the main or if the water is below 41 F.

   Tablets should be placed in each section of pipe, hydrants, hydrant branches, and other appurtenances. Tablets must be at the top of the main and shall be attached by an adhesive, such as Permatex No. 1 or any alternative approved by the ENGINEER. Tablets in joints between pipe sections, hydrants, hydrant branches, or appurtenances are to be crushed and placed inside the annular space, rubbed like chalk in butt ends of sections to coat them if the type of assembly does not permit crushing.

   In filling a section of piping with water when using the tablet method, water velocity shall be less than one (1) foot per second.

Number of 5-Grain Hypochlorite Tablets Required
for a Dosage of 50 MG/L per Length of Pipe Section

Pipe Size Inches	Length of Pipe Section <----------Foot---------->				
	Up to 13	18	20	30	40
2	1	1	1	1	1
4	1	1	2	2	2
6	2	2	3	3	4
10	3	5	7	7	9
12	5	6	10	10	14

D. Point of Application. The preferred point of application of the chlorinating agent is at the beginning of the pipe line extension or any valved section of it, and through a corporation stop inserted in the pipe. The water injector for delivering the chlorine-bearing water into the pipe should be supplied from a tap made on the pressure side of the gate valve controlling the flow into the pipe line extension. Alternate points of application may be used when approved or directed by the ENGINEER.

E. Preventing Reverse Flow. Valves shall be manipulated so that the strong chlorine solution in the line being treated will not flow back into the line supplying the water. Check valves may be used if desired.

F. Retention Period. Treated water shall be retained in the pipe at least twenty-four (24) hours. After this period, the chlorine residual at pipe extremities and at other representative points shall be at least twenty-five (25) mg/l.

G. Chlorinating Valves and Hydrants. In the process of chlorinating newly laid pipe, all valves or other appurtenances shall be operated while the pipe line is filled with the chlorinating agent and under normal operating pressure.

H. Final Flushing and Testing. Following chlorination, all treated water shall be thoroughly flushed from the newly laid pipe at its extremity until the replacement water throughout its lengths shows upon test, a chlorine residual of less than one (1) mg/l. In the event chlorine is normally used in the source of supply, then the tests shall flow a residual of not in excess of that carried in the system.

After flushing, water samples collected on two (2) successive days from the treated piping system, as directed by the ENGINEER, shall show satisfactory bacteriological results.

A minimum of one sample shall be taken from the end of the new main and one from each branch of the new main. If the new main is extremely long, then samples shall be collected along the length of the line as well as at its end. If trench water has entered the main during construction, or if excessive quantities of dirt or debris have entered the main, then bacteriological samples shall be taken every 200 feet at 24 hours after the final flush.

Each sample will be subjected to the MMO-MUG or approved method and Heterotrophic Plate Count.

If total and/or fecal coliform bacteria are present, then the sample fails and corrective action shall be performed, and a re-sample submitted.

If an HPC of greater than 500 colony forming units is found, then the sample fails State and Federal regulations.

For both the re-sample, and the replacement sample, it may be recommended that upsteam and downstream samples are taken to eliminate the possibility of a poor sampling site. (Another way to eliminate a poor sampling site is to request that the contractor install a sampling station or a sampling spigot.) It may also be recommended that a source sample is obtained. This sample will be taken outside the influence of the main being tested, and labeled “source”.

Bacteriological analysis must be performed by a laboratory certified by the California Department of Public Health.

I. Repetition of Flushing and Testing. Should the initial treatment result in an unsatisfactory bacterial test, the original chlorination procedure shall be repeated by the CONTRACTOR until satisfactory results are obtained.

3.16 PIPE ENTRY RESTRICTIONS

No person shall enter a pipe that has not been checked for hazardous gases and oxygen concentration. Incapacitated persons in the pipe shall be practically accessible for rescue within five minutes.

The Contractor shall adhere to all the installation recommendations of the pipe manufacturer including any requirements for bedding and backfill before stull removal and joint mortar. The recommendations of the manufacturer shall be included in the prices bid for installation.

END OF SECTION 02718

SPECIFICATIONS - DETAILED PROVISIONS
Section 03604 - Casing Grouting-Annular Space

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SECTION 03604
CASING GROUTING-ANNULAR SPACE

PART 1 - GENERAL

1.01 DESCRIPTION

Provide grouting of the annular space between the carrier pipe and the casing pipe. The annular space (void between the carrier pipe and the casing pipe) shall be completely grouted to support the carrier pipe and provide long-term stability. The Contractor shall provide testing of materials and methods for compliance with the requirements which follow. All proposals shall be submitted to the Engineer.

PART 2 - PRODUCT

2.01 MATERIALS

A. Grout. The grout materials shall consist of portland cement (portland cement and fly ash) and/or additives.

B. Compressive Strength. The grout shall have a minimum penetration resistance of 100 psi in 24 hours when tested in accordance with ASTM C 403 and a minimum compressive strength of 300 psi in 28 days when tested in accordance with ASTM C 495 or C 109.

C. Performance Requirements. The Contractor shall submit the proposed grout mixes, methods, plans, and criteria of the grouting operations. The grouting system shall have sufficient gauges, monitoring devices, and tests to determine the effectiveness of the grouting operation and to ensure compliance with the pipe specifications and design parameters.

D. Mix Designs. One or more mixes shall be developed to completely fill the annular space based on the following requirements:

1. Size of the annular void

2. Sufficient strength and durability to prevent movement of the carrier pipe

3. Provide adequate retardation, and

4. Provide less than 1 percent shrinkage by volume

E. Density. The Contractor shall design a grout mix with a density to meet the requirements to prevent floating of the pipe. The apparent viscosity shall not exceed 35 seconds in accordance with ASTM C 939.

PART 3 - EXECUTION

3.01 QUALIFICATIONS

The Contractor shall provide references of previous projects demonstrating to the Engineer its capabilities of filling the annular space and performing work in conformance with the Plans and the Specifications.

3.02 GROUTING EQUIPMENT

The materials shall be mixed in equipment of sufficient size and capacity to provide the desired amount of grout material for each stage in a single operation. The equipment shall be capable of mixing the grout at densities required for the approved procedure and shall also be capable of changing density as dictated by field conditions any time during the grouting operation.

3.03 INJECTION PROCEDURE AND PRESSURE

The gauged pumping pressure shall not exceed the liner pipe manufacturer's approved recommendations. Pumping equipment shall be of a size sufficient to inject grout at a velocity and pressure relative to the size of the annular space. Gauges to monitor grout pressure shall be attached immediately adjacent to each injection port. The gauge shall conform to an accuracy of no more than one-half percent error over the full range of the gauge. The range of the gauge shall not be more than 100 percent greater than the design grout pressure. Pressure gauges shall be instrument oil filled and attached to a saddle-type diaphragm seal (gauge saver) to prevent clogging with grout. All gauges shall be certified and calibrated in a accordance with ANSI B40, Grade 2A.

3.04 ONSITE TEST EQUIPMENT

Density shall be verified by ASTM C 138 or by other methods as approved by the Engineer. Viscosities shall be checked with a flowcone provided by the Contractor and tested per ASTM C 939.

3.05 TEST SECTION

The Contractor may be required to perform an above ground test on each type of grout and grout system proposed to be used. The test Section to be grouted and the size of the annular space considered for each type of grout system shall be determined by the Contractor and approved by the District.

3.06 SUBMITTALS AND REQUIRED CALCULATIONS

The Contractor shall submit the following to the Engineer at least 20 working days prior to the start of the grouting operation.

A. The proposed grouting mix

B. The proposed densities and viscosities

C. Initial set time of the grout

D. The proposed grouting method

E. The maximum injection pressures

F. The 24-hour and 28-day minimum compressive strength

G. Proposed grout volumes

H. Bulkhead designs

I. Buoyant force calculations

J. Flow control

K. Pressure gauge certification

L. Vent location plans

These shall be submitted as a complete package for a single or sample section only. The Contractor shall notify the Engineer of any changes to be made in grouting.

END OF SECTION 03604

SPECIFICATIONS - DETAILED PROVISIONS
Section 09900 - Painting and Protective Coatings

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SECTION 09900
PAINTING AND PROTECTIVE COATINGS

PART 1 - GENERAL

1.01 SCOPE

Requirements of Conditions of Contract and Division 1 apply to this Section. Provide all labor, materials, apparatus, scaffolding, and all appurtenant work in connection with painting and protective coatings, complete as indicated, specified and required.

A. Work Included in This Section. Principal items include:

1. All exposed piping, conduits, ducts and other metal surfaces, interior and exterior, except as hereinafter specifically excluded.

2. All submerged and intermittently submerged metal surfaces, except stainless steel.

3. All structural and miscellaneous steel, including tanks.

4. The interior of wet wells, headworks, manholes, junction structures, transition stations and similar structures.

5. Exterior above-ground concrete and concrete block as specified and shown on the Drawings.

6. The interior and exterior of structures as specified in the Painting Schedule and shown on the Drawings.

7. Equipment furnished with and without factory finished surfaces.

8. Equipment on which factory applied finishes have been marred, abraded, scratched, nicked, or otherwise damaged.

9. Exterior and interior concrete, concrete unit masonry, cement plaster, doors, frames, sheet metal surfaces and other architectural work as specified and shown on the Drawings.

10. The Contractor shall furnish to the Owner, at no charge for use during this project, the necessary dry film thickness gages and electrical flaw or holiday detection equipment.

11. Protective coating of submerged and intermittently submerged concrete and masonry surfaces, except portion of such surfaces designated to receive waterproofing.

12. Recoating of existing interior and exterior painted surfaces from architectural break where damaged or altered in performance of Work of this General Contract.

B. Related Work Not Included in This Section. The following surfaces, in general, shall not be painted:

1. Concrete surfaces subject to pedestrian or vehicular traffic except as herein specified.

2. Plastic surfaces and fiberglass reinforced plastic (FRP) surfaces, except as specified for identification purposes.

3. Nonferrous metals and stainless steel unless otherwise noted or indicated. Galvanized metal shall not be coated unless specified otherwise.

4. Mechanical equipment with factory finish as specified herein.

5. Electrical and instrumentation equipment with approved factory finish as indicated herein.

6. Waterproofing, dampproofing and roof covering Work.

7. Pavement stripping and marking as specified elsewhere in these Specifications.

8. Existing painted surfaces which are not within areas of alterations performed under this General Contract unless such surfaces are damaged in performance of Work of this General Contract.

C. In no case shall any concrete, wood, metal, or any other surface requiring protection be left unpainted or uncoated even though not specifically defined herein.

1.02 GUARANTEE

A two (2) year guarantee which commences on the date of acceptance against failure of all coatings shall be provided. Failure of any coating during the guarantee period shall be repaired by the Contractor who shall absorb all costs related to the repair of the coating.

As part of this two (2) year guarantee, the Contractor shall perform an inspection of all painted surfaces at eleven (11) months from date of acceptance with an Owner's representative. All coating failures shall be repaired. The costs of this inspection and any repair services shall be the Contractor's responsibility.

1.03 REFERENCE SPECIFICATIONS AND STANDARDS

A. Without limiting the generality of other requirements of these Specifications, all cleaning, surface preparation, and coating shall conform to the applicable requirements of the referenced portions of the standards specified herein to the extent that the requirements therein specified are not in conflict with the provisions of this Section.

B. Unless otherwise specified, all work and materials for the preparation and coating of all metal surfaces shall conform to the applicable requirements specified in the Steel Structures Painting Manual, Volume 2, Systems and Specifications, latest edition, published by the Steel Structures Painting Council.

C. The following referenced surface preparation specifications of the Steel Structures Painting Council shall form a part of this Section.

1. White Metal Blast Cleaning (SSPC-SP5-63). Removal of all visible rust, mill scale, paint, and foreign matter by blast cleaning by wheel or nozzle (dry) using sand, grit, or shot. (For very corrosive atmosphere.)

2. Near-White Blast Cleaning (SSPC-SPl0-63T). Blast cleaning nearly to White Metal Cleanliness, until at least 95 percent of each element of surface area is free of all visible residues. (For high humidity, chemical atmosphere, marine or other corrosive environment.)

3. Commercial Blast (SSPC-SP6-63). Blast cleaning until at least 67 percent of each element of surface area is free of all visible residues.

4. Brush-Off Blast Cleaning (SSPC-SP7-63). Blast cleaning of all except tightly adhering residues of mill scale, rust and coatings, exposing numerous evenly distributed flecks of underlying metal.

5. Solvent Cleaning (SSPC-SP1-63). Removal of oil, grease, dirt, soil, salts, and contaminants by cleaning with solvent, vapor, alkali, emulsion or steam.

D. Quality Assurance. Evaluation of surface preparation for ferrous metals will be based upon SSPC-Vis l ASTM Designation D220 and "Standard Methods of Evaluating Degree of Rusting on Painted Steel Surfaces", SSPC-Vis 2 ASTM Designation D 6l0.

1. To facilitate inspection, the Contractor shall, on the first day of sandblasting operations, sandblast metal panels to the degree called for in the Specification and as noted above. After mutually agreeing that a specific panel meets the requirements of the Specification, the panel shall be initialed by the Contractor and Inspector and then be coated with a clear, non-yellowing finish. Panels shall be prepared for each type sandblasting specified and shall be maintained and utilized by the Inspector throughout the duration of sandblasting operations.

1.04 COMPLIANCE WITH ENVIRONMENTAL REGULATORY REQUIREMENTS

A. Contractor shall comply with all current federal, state, and local environmental laws and regulations, including, but not limited to the laws and regulations of the U.S. Environmental Protection Agency (USEPA), the California Air Resources Board (CARB), and the South Coast Air Quality Management District (SCAQUMD).

1.05 SUBMITTALS

A. Samples

1. For compliance with these Specifications, the Contractor shall prepare and submit three (3) paint and protective coating samples of each finish, including all coats thereof, to the Owner for review, as specified in Section 0l300, "Submittals". The samples shall be clearly marked with the manufacturer's name and product identification, and shall be submitted in sufficient time to allow for review, and, if necessary, resubmittal without causing any delay of the Project.

2. The Contractor, at the beginning of the Project, shall furnish one sq. ft. steel panels to be sandblasted in accordance with the sandblasting specifications and to be coated with a non-yellowing shellac, to be used as the standard for preparation of steel surfaces for the duration of this Project.

B. Coating Materials List

1. The Contractor shall provide eight (8) copies of a paint and coating materials list which indicates the manufacturer and paint number, keyed to the coating schedule herein, for approval of the Owner prior to, or at the time of, submittal of samples required herein.

2. The Contractor shall include with his submittal his protective coating schedule for shop and field coatings of items to receive protection. The schedule shall conform to the specified requirements for surface preparation, priming, and coating for items covered, and shall follow the

same requirements for similar work where such work has not been specifically called-out. No bare ferrous nonworking surfaces shall be omitted from the schedule. Particular care shall be taken to cover in sufficient detail the coating of mechanical joints and other mechanical devices, which shall conform to the recommended practice of the manufacturer of the joint or other mechanical devices.

3. Submittals shall be sufficiently early to permit Owner's review and then Contractor's coordination with affected material and equipment suppliers to assure their use of reviewed shop coats of same manufacture as field coats and compatibility with field applied coats for respective coating system.

4. Coatings to be used on plastic and fiberglass materials shall be certified as acceptable by all plastic and fiberglass manufacturers whose products are to be coated. Certification copies shall be submitted to the Owner. The Contractor shall be certified in writing by the painting and coating material manufacturers as qualified applicators of their products, and copies of the certification submitted to the Owner.

C. Product Data Sheets and Material Safety Data Sheets. Contractor shall submit paint and coatings material manufacturers' printed technical data sheets for products intended for use in each of various paint and coating systems. Data sheets shall fully describe material as to its intended use, make-up, recommended surface preparation and application conditions, primers, material mixing and application (including recommended dry mil thickness), precautions, safety and maintenance cleaning directions.

1.06 PROTECTION OF WORK

The Contractor shall be responsible for any and all damage to his Work or the work of others during the time his Work is in progress.

1.07 RIGHT OF REJECTION

The Owner shall have the right to reject all material or Work that is unsatisfactory, and require the replacement of either or both at the expense of the Contractor.

1.08 JOB CONFERENCE

Prior to commencing Work, a pre-job conference shall be held for the purpose of reviewing and clarifying the painting and coating requirements of the Project.

The Owner, Contractor, Applicator, Coatings and Paint Manufacturers, and the Inspector shall be present. A schedule of work to be accomplished will be established.

PART 2 - PRODUCTS

2.01 GENERAL

Surfaces to receive paint protective coating materials as herein specified in this Section shall be coated in conformance with the applicable coating systems specified herein. All materials specified by name and/or manufacturer or selected for use under these Specifications, shall be delivered unopened at the job site in their original containers and shall not be opened until inspected by the Owner. Whenever a manufacturer's brand name is specified, it is intended to define the general type and quality of paint or coating desired. Other coatings or paints of equal quality may be used.

Coating materials shall be as specified herein or approved equal. Architectural paint finishes are specified hereinafter. All paint and coatings shall be produced and applied as herein called for, or, if not specifically called for, it shall be applied in accordance with the manufacturer's printed recommendations as reviewed by Owner. So far as possible, all paint and coating materials shall be provided by a single source supplier.

2.02 PAINT AND COATING MATERIALS

A. Definitions. The term "coating materials", as used herein, shall include enamels, paints, sealers, epoxy resins, stains, and all other paints and protective coatings, excepting galvanizing, whether used as a pretreatment, primer, intermediate coat, or finish coat.

B. General

1. Paint and protective coating materials shall be sealed in containers that plainly show the designated name, formula or specification number, batch number, color, date of manufacture, manufacturer's directions, and name of manufacturer, all of which shall be plainly legible at the time of use. Pigmented paints shall be furnished in containers not larger than five (5) gallons. Materials shall conform to the specifications shown herein and to the requirements hereinafter specified.

2. Products shall be standard for recognized manufacturer engaged in production of such materials for essentially identical or similar applications in the water and wastewater treatment industry and industrial plants.

C. Compatibility. Only compatible materials shall be used in the Work. Particular attention shall be directed to compatibility of primers and finish coats. If necessary, subject to review of the Owner, a compatible barrier coat shall be applied between all existing prime coats and subsequent field coats to ensure compatibility.

D. Colors. All colors and shades of colors of all coats of paints and protective coating material shall be as selected by the Owner. Each coat shall be of a slightly different shade, as directed by the Owner, to facilitate inspection of surface coverage of each coat.

2.03 SERVICE CONDITION A

Ferrous metals, other than stainless steel, submerged or intermittently submerged in water, sludge, sewage, chemical mixtures or similar corrosive liquid and all steel angles in contact with concrete shall be prepared and coated in accordance with the following requirements.

A. Surface Preparation. All metal surfaces shall be field sandblasted in accordance with Steel Structures Painting Council Specification SSPC-SPl0 (Near White Blast Cleaning). An anchor profile of not less than 2 mils, as determined by a profile comparator, shall be attained. Weld surface, edges, and sharp corners shall be ground to a curve and all weld splatter removed, and all welds neutralized with thinner.

B. Application. Application shall be in strict conformance with the manufacturer's printed recommendations. All sharp edges, nuts, bolts, or other items difficult to coat shall receive a brush-applied coat of the specified coating prior to application of each coat.

C. Coating System A. Except as otherwise noted, the prime coat shall have minimum dry film thickness of 10 mils; and the final coat, 10 mils. The total system shall have a minimum dry film thickness of 20 mils.

Carboline System:	Primer - Carboguard 891 Final - Carboguard 891
Engard System:	Primer - 480 H.S. Epoxy Final - 480 H.S. Epoxy
Tnemec System:	Primer - 69 Hi-Build Epoxoline II Final - 69 Hi-Build Epoxoline II

2.04 SERVICE CONDITION B

Ferrous metals, other than stainless steel, not subject to chemical attack, normal indoor or outdoor exposure, shall be prepared and coated in accordance with the following requirements.

A. Surface Preparation. All surfaces shall be free of dirt, dust, grease, or other foreign matter before coating. Surfaces, except galvanized, shall be cleaned in accordance with the Steel Structures Painting Council Specification SSPC-SP7 (Brush-Off Blast Cleaning). Weld surfaces, edges, and sharp corners shall be ground to a curve and all weld flux and splatter removed, and all welds neutralized with thinners prior to coating application.

B. Application. Application shall be in strict conformance with the manufacturer's printed recommendations. All sharp edges, nuts, bolts, or other items difficult to coat shall receive a brush-applied coat of the specified coating prior to application of each coat.

C. Coating System B. Except as specified below, the prime coat shall have a minimum thickness of 1.5 mils and two or more finish coats minimum total dry film thickness of 4.5 mils. The total system shall have a minimum of 6.0 mils.

Carboline System:	Primer - Carbocoat 150 2 Finish Coats - Carbocoat 139
Engard System:	Primer – 126 2 Finish Coats - 222
Tnemec System:	Primer - 4-55 2 Finish Coats - Tnemec - Series 2H, HiBuild

2.05 SERVICE CONDITION C

Ferrous metals, other than stainless steel, subject to a corrosive atmosphere and condensation shall be prepared and coated in accordance with the following requirements.

A. Surface Preparation. All metal surfaces shall be sandblasted in accordance with Steel Structures Painting Council Specification SSPC-SP10 (Near White Metal Blast Cleaning). An anchor profile of not less than 2 mils as determined by a profile comparator shall be attained. Weld surface, edges and sharp corners shall be ground to a curve and all weld splatter removed.

B. Application. Application shall be in strict conformance with the manufacturer's recommendations. A minimum of l2 hours time is required before additional coats may be applied to the prime coat, two hours for the intermediate coat, and two hours for the finish coat.

C. Coating Systems C. Except as hereinafter specified, the prime coat shall have a minimum dry film thickness of 3.0 mils; the intermediate coat, 4 mils; and the final coat, 2 mils. The total system shall have a minimum dry film thickness of 9.0 mils.

Carboline System:	Primer - Carbozinc 11HS Intermediate - Carboguard 891 Finish - Carbothane 133HB Satin
Engard System:	Primer - 519 Inorganic Zinc Intermediate - 460 H.S. Epoxy Finish - 428 Urethane Semi Gloss

Tnemec System:	Primer - 69-1211 Intermediate - 69 Hi-Build Expoxoline II Finish - 75 Polyurethane, Semi-Gloss

2.06 SERVICE CONDITION D

Concrete which is subject to submerged and intermittent submergence in water, sludge or chemical mixtures, or which is exposed to corrosive atmospheres, shall be prepared and coated in accordance with the following requirements:

A. Surface Preparation. All concrete surfaces shall be aged for 30 days prior to application. All surfaces shall be cleaned of all dirt, dust, form oil, curing compounds, and other deleterious compounds. In general, the concrete shall have a slight texture, be free of pockets and cavities, and be tightly adherent, not powdery. All hollow areas, bug holes, honeycombs, and voids shall be blasted clean and filled in accordance with Section 03300. All fins, form marks, protrusion and rough edges shall be ground off to provide a smooth, continuous surface of suitable texture for proper adhesion of coating. Horizontal surfaces shall be etched with a 15 to 20 percent solution of muriatic acid and thoroughly rinsed with clean water. Vertical walls shall be cleaned by brush blasting (NACE #4 or SSPC-SP7-63). Prior to coating, all surfaces shall be tested per ASTM D 4263. All surfaces shall be completely dry before application of the coating. After concrete repair, fill all voids with coating manufacturer's approved epoxy putty or filler.

B. Application. Application shall be in strict conformance with the manufacturer's printed recommendations. All coats shall be applied within 24 hours of the previous coat.

C. Coating System D. The prime coat shall have a minimum dry film thickness of 6 mils and two finish coats shall have a minimum total dry film thickness of 16 mils. The total system shall have a minimum dry film thickness of 22 mils.

Carboline System:	Primer - Two parts Bitumastic 300-M - thinned to manufacturer’s written recommendations. Two Finish Coats - Bitumastic 300-M
Engard System:	Primer - 463 Coal Tar Epoxy coating - thinned to manufacturer's written recommendations. Two Finish Coats - 463 Coal Tar Epoxy Coating
Tnemec System:	Primer - Tnemec 69 Hi-Build Expoxoline II Two Finish Coats - 46H-413

2.07 SERVICE CONDITION E

Concrete surface subject to corrosive atmosphere and condensation shall be prepared and coated in accordance with the following requirements.

A. Surface Preparation. All concrete surfaces shall be aged for 30 days prior to application. All surfaces shall be cleaned of all dirt, dust, form oil, curing compounds, and other deleterious compounds. In general, the concrete shall have a slight texture, be free of pockets and cavities, and be tightly adherent, not powdery. All hollow areas, bug holes, honeycombs, and voids shall be blasted clean and filled in accordance with Section 03300. All fins, form marks, protrusion and rough edges shall be ground off to provide a smooth, continuous surface of suitable texture for proper adhesion of coating. Horizontal surfaces shall be etched with a 15 to 20 percent solution of muriatic acid and thoroughly rinsed with clean water. Vertical walls shall be cleaned by brush blasting (NACE #4 or SSPC-SP7-63). Prior to coating, all surfaces shall be tested per ASTM D 4263. All surfaces shall be completely dry before application of the coating. After concrete repair, fill all voids with coating manufacturer's approved epoxy putty or filler.

B. Application. Application shall be in strict conformance with the manufacturer's recommendations. Allow a minimum of two hours between coats.

C. Coating System E. First and second coats shall have a minimum dry film thickness of 4.0 mils each. The top coat, minimum dry film thickness shall be 1.5 mils. The total system shall have a minimum dry film thickness of 9.5 mils.

Carboline System:	First Coat - Carboguard 890 Second Coat - Carboguard 890 Top Coat - Carbothane 133HB Satin
Engard System:	First Coat - 460 H.S. Epoxy Second Coat - 460 H.S. Epoxy Top Coat - 428 Urethane Semi-Gloss
Tnemec System:	First Coat - 69 Hi-Build Epoxoline II Second Coat - 69 Hi-Build Epoxoline II Top Coat - 75 Polyurethane Semi-Gloss

2.08 SERVICE CONDITION F

Coating for plastic and fiberglass pipe for purposes of color coding and label stenciling. Coatings to be used for this category shall be certified by the pipe manufacturer to be completely acceptable and non-injurious to the pipe.

A. Surface Preparation. Lightly sand pipe and wipe with a solvent to degrease and clean surface.

B. Application. Application shall be in strict conformance with manufacturer's printed recommendation.

C. Coating System F. Two (2) coats having a total dry film thickness of 8.0 mils.

Carboline System:	Two coats - Carbothane 133HB Satin
Engard System:	460 Chemical Resistant Primer 428 HS Chemical Resistant Urethane
Tnemec System:	135 Chembuild

2.09 SERVICE CONDITION G

Submerged moving parts including cables, chains, gears, pulleys, etc. shall be prepared and coated in accordance with the following requirements.

A. Surface Preparation. All rust, scale, dust, and foreign matter removed by power or hand tool cleaning.

B. Application. Application shall be in strict accordance with manufacturer's recommendation.

C. Coating System G. The system shall have a total thickness of 25 mils and shall consist of the following:

Chevron - E.P. Roller Grease
Texaco - Rust Inhibitive Grease
Engard - 880 Grease Coating

2.10 SERVICE CONDITION H

Ferrous metals requiring a heat resistant coating. To ensure proper coating selection, accurately measure surface temperatures. Surface preparation shall be performed in strict conformance with manufacturer's printed directions and treated surfaces shall be coated as soon as possible to avoid surface contamination. In conformance with printed directions of manufacturer: mix and apply coats of each system; and cure coats before recoating or before run-in to surface operating temperature. Contingent upon expected temperature range, apply one of the following or equal systems, and avoid excessive film buildup.

A. Rust-Oleum Systems:

150-450^{o}F (66-l77^{o}C) Temp.	Range - 4l00 System
300-800^{o}F (l49-427^{o}C) Temp.	Range - 4200 System
400-l200^{o}F (260-649^{o}C) Temp.	Range - 4300 System

B. Engard Systems:

Ambient to 250°F - 222 HS Finish
460 Chemical Resistant Primer
519 MIL-P-23236 Class 3
Inorganic Zinc Coating

250° to 750°F - 5l9 MIL-P-23236 Class 3 Inorganic Zinc Coating
750° to l000°F - 240 TT-P-28 High Temperature Coating
l000° to 2000°F - 540 Fire Shield II

C. Tnemec Systems:

To l50° F -	Tneme Gloss System 2-9 Endura-Shield System 70-1 Tneme-Zinc System 90-2 Hi-Build-Epoxylene System 66-2
To 750°F -	Tneme-Zinc System 90-97
To l200°F -	Silicone-Aluminum Systems 39-2

2.11 SERVICE CONDITION I

Coating of concrete and metal surfaces within the extremely corrosive areas as indicated on the Schedule.

A. Surface Preparation. All concrete surfaces shall be aged for 30 days prior to application. All surfaces shall be cleaned of all dirt, dust, form oil, curing compounds, and other deleterious compounds. In general, the concrete shall have a slight texture, be free of pockets and cavities, and be tightly adherent, not powdery. All hollow areas, bug holes, honeycombs, and voids shall be blasted clean and filled in accordance with Section 03300. All fins, form marks, protrusion and rough edges shall be ground off to provide a smooth, continuous surface of suitable texture for proper adhesion of coating. Horizontal surfaces shall be etched with a 15 to 20 percent solution of muriatic acid and thoroughly rinsed with clean water. Vertical walls shall be cleaned by brush blasting (NACE #4 or SSPC-SP7-63). Prior to coating, all surfaces shall be tested per ASTM D 4263. All surfaces shall be completely dry before application of the coating. After concrete repair, fill all voids with coating manufacturer's approved epoxy putty or filler.

All metal surfaces shall be cleaned in accordance with SSPC-SP.1 All weld surfaces, edges shall be ground to a curve and all spatter removed. Surface shall then be sandblasted in accordance with SSPC-SP10-63T.

B. Application. Application shall be in strict conformance with the manufacturer's printed recommendations. The applicator shall be a licensed applicator by the coating manufacturer. The finished coating shall be spark tested and all holidays repaired.

C. Coating System I. Except as otherwise noted, the prime coat on metal surfaces shall have a minimum thickness of 2.0 mils and a maximum thickness of 3.0 mils. The finish coat on a non-abrasive metal surface shall be 30 mils and in an abrasive area shall be 40 mils. The prime coat on concrete surfaces shall have a minimum thickness of 3.0 mils and a maximum thickness of 5.0 mils. A minimum cure time of 12 hours is required. The finish coat on the concrete shall be applied within 36 hours of the application of the primer and should be performed as recommended by the manufacturer. The finish coat shall be 65 mils minimum thickness.

Sancon System or equal

Primer	
Concrete	- Sancon 100 Epoxy
Steel	- United Coatings No. 32
Finish	- Sancon 100 Polyurethane

2.12 ARCHITECTURAL PAINT FINISHES

A. Manufacturer. Unless otherwise noted, products listed below are the products of the Dunn-Edwards Corporation and Sinclair Paints. Reviewed equivalent products of Ameritone Co. will be acceptable.

1. System P-1 - Enamel On Structural Steel Members

Dunn Edward's System:

- First Coat - "Bloc-Rust", rust inhibitive red primer 43-4 (delete on factory primed materials)
- Second Coat - "Lockote" 42-33
- Third Coat - "Endurasheen" semigloss enamel 39 series
- Fourth Coat - "Endurasheen" semigloss enamel 39 series

Sinclair's System:

- First Coat - Red Oxide Primer No. 15
- Second Coat - CorroPrime No. 14
- Third Coat - Sash and Trim Enamel GX22
- Fourth Coat - Sash and Trim Enamel GX22

2. System P-2 - Concrete Masonry Paint on Concrete Unit Masonry

Dunn Edwards' System:
- First coat - "Hi Build Indistrial Epoxy Primer Eff-Stop", W-709
- Second & Third Coats - "Ultrashield" IP-631.

Sinclair's System:
- First coat - CLA5-9 translucent acrylic emulsion primer
- Second & Third Coats - UR22-8 Clear Anti Graffiti Coating

3. System P-3 - Concrete Masonry Paint on Concrete

Dunn-Edwards' System:
- Two Coats - Primer "Evershield" W-701 (100% Acrylic).

Sinclair's System:
- First Coat - 18 Epoprime or 36 Unipoxy
- Second Coat - 1300 Stuc-O-Life

4. System P-4 - Enamel on Galvanized Metal
(On Doors, Frames, and Sheet Metal)

Dunn-Edwards System:
- Pretreatment - Vinyl wash pretreatment, 42-36
- First Coat - "Galvaprime", zinc dust primer 43-3
- Second Coat - "Loc Kote" synthetic body coat 42-23
- Third Coat - "Endurasheen" semi-gloss enamel 39 series

Sinclair's System:
- Pretreatment - Vinyl wash pretreatment, 7113
- First Coat - Corro Prime 14
- Second Coat - Sash & Trim Primer GX22
- Third Coat - Sash & Trim Enamel GX2

5. System P-5 - Enamel on Primed Metal

Dunn-Edwards System:
- First Coat - (over prime) - "Loc Kote" synthetic body coat 42-33
- Second Coat - "Endurasheen" semi-gloss enamel 39 Series

Sinclair's System:
- First Coat - Corro Prime 14
- Second Coat - Sash and Trim Enamel GX22
- Third Coat - Sash and Trim Enamel GX22

6. System P-6 - Semi Gloss Enamel Paint on Interior Concrete Unit Masonry

Dunn Edwards' System:
- First Coat - "Blocfill" Smooth W305
- Second Coat - Decoglo W450
- Third Coat - Decoglo W450

Sinclair's System:
- First Coat - Smooth Block Filler V423-11
- Second Coat - 1400 Sinco Satin II
- Third Coat - 1400 Sinco Satin II

7. System P-7 - Sealer for Unpainted Masonry Surfaces.
A transparent waterproofing sealer shall be applied to all above grade masonry surfaces, with the exception of interior building walls, both smooth face and split face block as shown on plans and in Coating Systems Schedule. The waterproofing shall be Rain Guard Blok-Lok, Chemstop heavy duty waterproofing or approved equal. Apply to dry, clean split faced surface with airless spray. Rate of application shall be a minimum of 40 square feet per gallon for first coat and a minimum of 80 square feet per gallon for second coat and manufacturer's recommendation. The products selected for waterproofing shall comply with AQMD requirements for voc in California.

2.13 MISCELLANEOUS COATINGS

A. Hydrants, indicator post, traffic posts, guard rails and ladders shall be safety yellow, matching OSHA Safety Yellow Color and using specified Coating System "B".

B. Handwheels and operating handles of all valves and equipment shall be safety red, matching OSHA Safety Red Color, using, contingent upon exposure, Coating System "B" in non-corrosive atmosphere and Coating System "C" in corrosive atmosphere and high humidity exposures.

C. Interior pipe insulation shall be finished with solvent paint system equal to Rust-Oleum's primer No. 2764 and "New Color Horizon" finish coat in color selected by Owner. Metal-protected exterior pipe insulation shall be coated with System "B".

2.14 PATCH COAT FOR GALVANIZED SURFACES

All galvanized surfaces which are scratched, marred, or otherwise damaged shall be patched with Carboline's Carbo Zinc ll, "Drygalv" by American Solder and Flux Co., Engard 515 Zinc Rich Primer, or approved equal.

2.15 PRIMER OVER BITUMINOUS COATING

Two (2) coats, Rust-Oleum 578l Rust-O-Crylic.

PART 3 - EXECUTION

3.01 MANUFACTURER'S RECOMMENDATIONS

Unless otherwise specified herein, the paint and coating manufacturer's printed recommendations and instructions for thinning, mixing, handling, applying, and protection of his coating materials; for preparation of surfaces for coating; and for all other procedures relative to coating shall be strictly observed. No substitutions or other deviations shall be permitted without written permission of the Owner.

3.02 DELIVERY AND STORAGE

Materials shall be delivered in manufacturer's original, sealed containers, with labels and tags intact. Coating materials and equipment shall be stored in designated areas. Coating containers shall be opened only when required for use. Coatings shall be mixed only in designated rooms or spaces in the presence of the

Owner's Representative. Coating shall be thoroughly stirred or agitated to uniformly smooth consistency and prepared and handled in a manner to prevent deterioration and inclusion of foreign matter. Unless otherwise specified or reviewed, no materials shall be reduced, changed, or used except in accordance with the manufacturer's label or tag on container.

3.03 SAFETY REQUIREMENTS

In accordance with the requirements of the latest revision of the California Administrative Code Title 8 Construction Safety orders enforced by the California Department of Occupational Safety and Health (CAL OSHA), and applicable OSHA Regulations for Construction, the Contractor shall provide and require the use of personal protective lifesaving equipment for all persons working in or about the Project site.

A. Protective Equipment. Respirators shall be worn by all persons engaged in, and assisting in, spray painting. In addition, workers engaged in or near the Work during sandblasting shall wear eye and face protection devices meeting the requirements of ANSI Z87.l latest revision, and approved OSHA Regulations for sandblasting operations and approved air-purifying, half-mask or mouthpiece respirator with appropriate filter.

B. Ventilation. Where ventilation is used to control potential exposure to workers as set forth in Section l9l0.94 of the OSHA Regulations for Construction, ventilation shall be adequate to reduce the concentration of the air contaminant to the degree that a hazard to the worker does not exist. Methods of ventilation shall meet the requirements set forth in ANSI Z9.2, latest revision.

C. Sound Levels. Whenever the occupational noise exposure exceeds the maximum allowable sound levels as set forth in Table D-2, Permissible Noise Exposures, in Section l926.52, of the OSHA Regulations for Construction, ear protective devices shall be furnished and used. Ear protective devices inserted in the ear shall be fitted or determined individually, by competent persons. Plain cotton is not an acceptable protective device.

D. Storage and mixing of coating materials shall be performed only in those areas designated by the Owner.

E. Cloths and cotton waste that might constitute a fire hazard shall be placed in closed metal containers or destroyed at the end of each work day.

3.04 STORAGE, MIXING, AND THINNING

Paint and coating materials shall be protected from exposure to cold weather, and shall be thoroughly stirred, strained, and kept at a uniform consistency during application. Materials of different manufacturers shall not be mixed together. Packaged materials may be thinned immediately prior to application in accordance with the manufacturer's directions.

3.05 WORKMANSHIP

A. Skilled craftsmen and experienced supervision shall be used on all Work.

B. All paint and coatings shall be applied in a workmanlike manner so as to produce an even film of specified uniform thickness. Edges, corners, crevices, and joints shall receive special attention to ensure that they have been thoroughly cleaned and that they receive an adequate thickness of paint. The finished surfaces shall be free from runs, drops, ridges, waves, laps, brush marks, and variations in color, texture, and finish. The hiding shall be so complete that the addition of another coat of paint would not increase the hiding. All coats shall be applied so as to produce a film of uniform thickness. Special attention shall be given to ensure that edges, corners, crevices, welds, and similar areas receive a film thickness equivalent to adjacent areas, and installations shall be protected by the use of drop cloths or other approved precautionary measures. Rough exterior cement plaster shall be spray painted.

3.06 PREPARATION FOR PAINTING AND PROTECTIVE COATING

All surfaces to receive paint and protective coatings shall be cleaned as specified herein prior to application of coating materials. The Contractor shall examine all surfaces to be coated, and shall correct all surface defects before application of any coating material. Beginning the Work of this Section without reporting unsuitable conditions to the Owner constitutes acceptance of conditions by the Contractor. Any required removal, repair, or replacement of the Work caused by unsuitable conditions shall by done at no additional cost to the Owner. All marred or abraded spots on shop-primed and factory-finished surfaces shall receive touch-up restoration prior to any other coating application.

3.07 ITEMS NOT TO BE COATED

Hardware, hardware accessories, nameplate data tags, machined surfaces and similar items in contact with coated surfaces not to be coated shall be removed or masked prior to surface preparation and painting operations. Following completion of coating of each piece, removed items shall be reinstalled. Such removal and installation shall be done by workmen skilled in the trades involved.

3.08 SANDBLASTING

A. All sandblasting shall be done in strict accordance with the referenced specifications of the Steel Structures Painting Council.

B. When items are to be shop primed or shop primed and finish coated in the shop, surface preparation shall be as specified in this Section. The Owner shall have the right to witness, inspect, and reject any sandblasting done in the shop.

C. When sandblasting is done in the field, care shall be taken to prevent damage to structures and equipment. Pumps, motors, and other equipment shall be shielded, covered, or otherwise protected to prevent the entrance of sand. No sandblasting may begin before the Owner inspects and reviews the protective measures.

D. After sandblasting, dust and spent sand shall be removed from the surfaces by brushing or vacuum cleaning.

3.09 APPLICATION OF ARCHITECTURAL PAINT FINISHES

Perform surface preparation, material mixing and application (including dry-mil thicknesses) for each "Architectural Paint Finish System" in strict conformance with submitted and approved material manufacturers' printed recommendations.

A. Surface Preparation

1. General.

a) Before priming, correct all finish surfaces which are not properly prepared, sandpapered and cleaned or which are not in proper condition to receive finish specified. Do no priming until surfaces are approved.

b) Prior to surface preparation and painting operations, remove or protect all hardware, hardware accessories, plates, lighting fixtures and similar items in contact with painted surfaces and not to be painted.

c) Program cleaning and painting so that dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

2. Clean concrete and masonry surfaces of all dirt, encrustations, efflorescence and other foreign matter. Roughen glazed surfaces on concrete.

3. Clean ferrous metal not provided with a shop prime of rust, mill scale, oil, grease and foreign matter by wire brushing, scraping or sandblasting as necessary. Clean ferrous metal provided with shop prime of oil, grease and foreign matter. Prime scratched and abraded areas with No. l5 Chrome Oxide Primer.

4. Clean galvanized metal with mineral spirits and pretreat with Sinclair's No. 7ll3 Vinyl Wash Primer. Prime cleaned and pretreated galvanized metal with Sinclair's No. 25 Zinc Dust Primer the same day that cleaning has been performed.

5. Clean gypsum board (drywall) of all dust, dirt, encrustations and foreign matter.

B. Application

1. Apply material evenly, free from sags, runs, crawls, holidays or defects. Mix to proper consistency, brush out smooth leaving minimum of brush marks, enamel, and varnish uniformly flowed on.

   a) Sand and dust between each coat to remove defects visible from a distance of five feet.

   b) Finish coats shall be smooth, free of brush marks, streaks, laps or pile up of paints, and skipped or missed areas. Finished metal surfaces shall be free of skips, voids or pinholes in any coat when tested with a low voltage detector.

   c) Do not apply initial coating until moisture content of surface is within limitations recommended by paint manufacturer.

   d) Rate of application shall not exceed that as recommended by paint manufacturer for the surface involved less ten percent allowance for losses.

   e) Keep brushes and spraying equipment clean, dry, free from contaminants and suitable for the finish required.

2. Apply paint by brushes, roller or spray.

3. Tint all pigmented undercoats to approximately same shade as final coat. Perceptibly increase the depth of shade in successive coats.

4. Allow each coat to dry thoroughly before succeeding coat application. For oil paints, allow at least 48 hours between coats of exterior work, except where otherwise recommended by the manufacturer.

5. Finish all four edges of doors with the same number and kind of coatings as specified for their main surfaces. Where openings into rooms having different finishes, finish door edges as directed.

6. Do not paint factory finished items unless specifically directed.

7. Paint surfaces of metal ducts and vents.

8. Apply two finish coats of paint to shop primed metal surface of all mechanical and electrical equipment, to match adjoining wall or ceiling surfaces. In addition to above, prime coat all unprimed surfaces. Principal items of this Work include interior of hose cabinets, air grilles, ceiling diffusers, electric panels, telephone panels, access panels, conduit, outlet and pull boxes, ducts and pipes.

9. Miscellaneous Painting: Paint surfaces to be painted and not specifically described herein, with a product specifically manufactured or prepared for the material and surface; prime coat and two finish coats.

10. Upon completion, remove all rubbish caused by this trade. Remove spots from floors, glass and other surfaces. Leave in a clean and orderly condition.

11. At the completion of other trades, touch up damaged surfaces as required.

3.10 APPLICATION OF PROTECTIVE COATINGS

A. Shop Coating. Fabricated metalwork and equipment which requires coating may be shop primed before fabrication with specified primer. Any such work delivered to the job site with any other shop coat shall have this coating removed and the specified coating applied in the field. Manufactured equipment with approved corrosion resistant factory finishes and galvanized finishes shall be exempt from this requirement.

B. Application of Field Coatings

1. Except where in conflict with the manufacturer's printed instructions, or where otherwise specified herein, the Contractor may use brush, roller, air spray, or so-called airless spray application; however, any spray painting must first have the approval of the Owner. Rollers for applying enamel shall have a short nap. Areas inaccessible to spray coating or rolling shall be coated by brushing or other suitable means.

2. The Contractor shall give special attention to the Work to ensure that edges, corners, crevices, welds, bolts, and other areas, as determined by the Owner, receive a film thickness at least equivalent to that of adjacent coated surfaces.

3. All protective coating materials shall be applied in strict accordance with the manufacturer's printed instructions.

4. Prime coat shall be applied to all clean surfaces within a four hour period of the cleaning, and prior to deterioration or oxidation of the surface, and in accordance with the manufacturer's recommendations. Drift from sandblasting procedures shall not be allowed to settle on freshly painted surfaces.

5. All coatings shall be applied in dry and dust-free environment, and unless otherwise directed by the Owner, shall not be applied when the air temperature or the temperature of the surface to be painted is outside the range of 50 degrees F to 90 degrees F.

6. Each coat shall be applied evenly, at the proper consistency, and free of brush marks, sags, runs, and other evidence of poor workmanship. Care shall be exercised to avoid lapping paint on glass or hardware. Coatings shall be sharply cut to lines. Finished coated surfaces shall be free from defects or blemishes. Protective coverings shall be used to protect floors, fixtures, and equipment. Care shall be exercised to prevent paint from being spattered onto surfaces from which such paint cannot be removed satisfactorily. Surfaces from which paint cannot be removed satisfactorily shall be painted or repainted as required to produce a finish satisfactory to the Owner. Whenever two (2) coats of a dark colored paint are specified, the first coat shall contain sufficient powdered aluminum to act as an indicator of proper coverage, or the two (2) coatings shall be of a contrasting color.

7. Interior surfaces of roof plates, roof rafters, and supports, and all contact surfaces inaccessible after assembly, shall be coated before erection; however, no structural friction connections or high tensile bolts and nuts shall be painted before erection. Areas damaged during erection shall be hand or power-tool cleaned and recoated with prime coat.

8. Touch-up of all surfaces shall be performed after installation.

9. All surfaces to be coated shall be clean and dry at the time of application.

C. <u>Time of Coating</u>

1. Sufficient time shall be allowed to elapse between successive coats to permit satisfactory recoating, but, once commenced, the entire coating operation shall be completed without delay. No additional coating of any structure, equipment, or other item designated to be painted shall be undertaken without specific permission of the Owner until the previous coating has been completed for the entire structure, piece of equipment, or other item.

2. Piping shall not be finish coated until it has been pressure-tested and approved.

D. Thickness of Coating. The dry film mil-thickness specified shall be achieved and verified for each coat.

3.11 TESTING AND INSPECTION

A. Inspection Devices. The Contractor shall furnish, until final acceptance of coating and painting, inspection devices in good working condition for detection of holidays and measurement of dry-film thickness of coatings and paints. The Contractor shall also furnish U.S. Department of Commerce, National Bureau of Standards certified thickness calibration plates to test the accuracy of dry-film thickness gauge and certified instrumentation to test accuracy. Dry-film thickness gauges shall be made available for the Inspector's use at all times until final acceptance of application. Holiday detection devices shall be operated in the presence of the Inspector. Inspection devices shall be operated in accordance with the manufacturer's instructions at the direction of the Owner or the Owner's Representative.

B. The Contractor shall conduct film thickness measurements and electrical inspection of the coated surfaces with equipment furnished by him and shall recoat and repair as necessary for compliance with the Specifications.

C. After repaired and recoated ferrous metals areas have cured, final inspection tests will be conducted by the Owner or the Owner's Representative. Coating thicknesses specified in mils on ferrous substrates will be measured with a nondestructive magnetic type dry-film thickness gauge such as the Elcometer, manufactured by Gardner Laboratories, Inc. Discontinuities, voids and pinholes in the coatings will be determined with a nondestructive type electrical holiday detector. Epoxy coatings and other thin film coatings will be checked for discontinuities and voids with a low voltage detector of the wet-sponge type, such as Model MI as manufactured by Tinker and Rasor. Use a non-sudsing type wetting agent, such as Kodak Photo-Flo, which shall be added to the water prior to wetting the sponge. A high voltage, low current, spark type detector such as Model EP, manufactured by Tinker and Rasor, will be used for electrical inspection of only coat tar enamel. Tape type coatings will be inspected for holidays using a device designed for use in detecting such flaws. All pinholes shall be marked, repaired in accordance with the manufacturer's printed recommendations and retested. No pinholes or other irregularities will be permitted. Wide film thickness discrepancies shall be measured and verified with a micrometer or other approved measuring instrument. Coatings not in compliance with the Specifications will not be acceptable and shall be replaced and reinspected at Contractor's expense until the Specifications are met.

D. On non-ferrous surfaces, dry film thickness readings shall be taken at random locations with a Tooke Gauge at the rate of approximately five readings per l00 square feet of surface. Groove cut into coating shall be repaired by application of all coats of paint or coating film being tested. The average of all readings for a given area or surface shall be within required dry film thickness range and no individual reading shall be more than 20 percent below the recommended dry film thickness. Any areas that are found to be below standard shall be marked and recoated to obtain proper film thickness.

E. Warranty Inspection. Warranty inspection shall be conducted during the eleventh month following completion of all coating and painting Work. All personnel present at the Pre-Job Conference shall attend this inspection. All defective Work shall be repaired in accordance with this Specification and to the satisfaction of the Owner or his appointed representative.

3.12 CLEAN UP

A. Upon completion of the Work, staging, scaffolding, and containers shall be removed from the site or destroyed in an approved manner. Paint spots, oil, or stains upon adjacent surfaces shall be removed.

B. The Contractor shall clean the site in accordance with the requirements for "Cleaning Up" in the General Conditions.

3.13 PAINT AND COATING SCHEDULE

A. General. The following schedule shall indicate the coating system to be used. The list shall not be construed as a complete list of all surfaces to be coated but rather as a guide as to the application of the various coating systems. All surfaces shall be painted except those specifically deleted herein. The Owner shall select the colors. Where reference is made to ferrous metal in this schedule, it shall not include stainless steel.

B. Color Identification. All exposed and/or unburied pipe, including steel, copper and brass tubing, galvanized pipe, polyvinyl chloride pipe, fiberglass reinforced pipe, and stainless steel pipe, shall be identified by color to show its use/function. Color bands of an approved tape type may be used on PVC, FRP, and stainless steel pipe and all other pipe not readily susceptible to painted finish. Bands shall be adhesive type with extra strength and suitable for continuous duty at 250 degrees F. All markers shall have a protective silicone film.

COLOR CODE SCHEDULE

Item	Color Code	Label
Aeration Air	Light Green	AA
Belt Press Return Water	Gray	BPRW
Building Drain	NA	BD
Compressed Air	Light Green w/Yellow	CA
Chlorinated Effluent	Blue	CE
Chlorine Gas	Yellow/Green Band	CG
Chlorine Solution	Yellow	CS
Cold Digested Sludge	Brown	CSL
Diesel Fuel	Yellow	DF
Digested Sludge	Brown	DSL
Digested Sludge Transfer	Brown	XSL
Digester Gs	Red	DG
Drain	NA	D
Electrical Panel (within bldg)	ANSI 61 - Gray	--
Electrical Conduit and Equipment (except panels)	White (Sherwin Williams F65W1)	--
Engine Coolant Water	Blue	ECW
Froth Spray	Blue	FS
Flotation Thickener Overflow	NA	FTO
Fresh Water	Light Blue	FW
Gravity Thickener Overflow	Gray/Yellow Bands	GTO
Grit	Brown	GRIT
Grit Washer Overflow	Gray	GWO
Ground Water Drain	NA	GWD
Heated Digested Sludge	Brown/Yellow Bands	HSL
High Temperature Water	Blue/Yellow Bands	HTW
Irrigation Water	NA	IW
Low Temperature Water	Blue/Orange Bands	LTW
Natural Gas	Light Yellow	NG

COLOR CODE SCHEDULE

(continued)

Item	Color Code	Label
Oil Lines	Black	Oil
Polymer	Light Blue/Yellow Bands	POLY
Primary Tank Drain	Brown	PTD
Primary Sludge	Brown	PSL
Primary Scum	Brown	PSK
Raw Sewage	Brown	S
Return Digested Sludge	Brown	RDS
Return Water	Gray	RW
Secondary Scum	Brown	SSK
Sludge Bed Drain	NA	SBD
Sludge Heater Bypass	Brown	SLHB
Storm Water Drainage	NA	SWD
Thickened Sludge	Brown	TS
Thickener Dilution Water	Blue	TDW
Waste Activated Sludge	Brown	WAS
Waste Digested Sludge	Brown	WDS
Wash Water	Red	WW

Architectural System	Descriptive Color Code	Manufacturers' Paint Designation
PLANT BUILDINGS:		
General Surface	Tan	Rustoleum #865 (Dunes Tan)
Trim & Doors	Dark Brown	Rustoleum #977 (Chestnut Brown)
Walls (metal)	Yellow-White	Dunn-Edwards #CH-60B (Parchment)

Both the direction of fluid flow, and the name of the fluid in the pipe shall be stenciled on all pipe at least once every twenty-five (25) feet and at every change of direction. Color bands shall be spaced at fifteen (l5) foot intervals and every change in direction. The size of the letters and color bands shall be as specified in the table below:

Outside Diameter Pipe or Covering	Width of Color Band	Height of Legend Letters
1/4 to 1-1/4	1	1/2
1-1/2 to 2	1	3/4
2-1/2 to 6	6	2
8 to 10	6	2-1/2
Over 10	6	3-1/2
All dimensions are given in inches.		

The stenciled labels shall be abbreviated and conform to the piping abbreviations shown on Color Code Schedule. The labels shall be safety yellow, matching OSHA Safety Yellow. Engines and herein listed electrical items shall be color coded as follows:

White:	Sherwin Williams F65W1 Electrical (Excluding panels)
Gray:	ANSI 61 Electrical panels
Light Yellow:	(EMWD) Engines

C. Process Valve Identification. After the painting of process piping is complete, the Contractor shall stencil the tag numbers, as supplied by the Owner, of all valves on the pipe adjacent to the valve for pipe 2 inches and over. Characters shall be one inch high minimum and shall be oriented to be visible from the valve operating position. When the valve has extended operator shaft or chain operator, the number shall be placed both at the operating position and at the valve if practicable. The latter requirement does not apply if the valve is buried or in a pit. Valves in pipes under 2 inches shall have characters as large as the pipe will permit or at the Owner's option, on an adjacent surface. Characters shall be preferably white; however, if this would not provide sufficient contrast to the pipe, the Owner may select another color. Paint used shall be of the same type and quality as used for painting the pipe.

END OF SECTION 09900

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SPECIFICATIONS - DETAILED PROVISIONS
Section 09940 - Epoxy Coating

C O N T E N T S

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SECTION 09940
EPOXY COATING

PART 1 - GENERAL

1.01 REQUIREMENT
Where specified or shown, an epoxy coating shall be applied as specified herein.

PART 2 - PRODUCTS

2.01 MATERIAL
The material used shall be 100 percent (100%) powder epoxy and shall be Dow Corning DC 3100, Furane Plastics Co. No. 268, Three-M Company "Scotchcoat," Michigan Chrome and Chemical Company "Miccron 650 or 651," or approved equal.

PART 3 - EXECUTION

3.01 SURFACE PREPARATION
The surface shall be blast-cleaned in accordance with SSPC-SP-5 (White Metal Blast Cleaning). The grit size used shall be as recommended by the epoxy manufacturer.

3.02 APPLICATION
Application of the epoxy coating shall be in accordance with the manufacturer's instructions.

3.03 THICKNESS OF COATING
The minimum dry coating thickness shall be 8 mils, provided, however, that the thickness of coating in the grooves for valves or fittings designed to receive a rubber gasket shall be approximately 5 mils.

3.04 INSPECTION
Coating thickness shall be checked with a nondestructive magnetic type thickness gage. Coating integrity shall be tested with a spark testing unit operating at approximately 2,000 volts. All pinholes shall be marked, repaired, and retested. No pinholes or other irregularities will be permitted in the final coating.

3.05 FIELD REPAIRS
If small local repairs are necessary, they shall be made using Keysite 740, or approved equal. The surface must first be solvent-cleaned in accordance with SSPC-SP-1 (Solvent Cleaning).

END OF SECTION 09940

SPECIFICATIONS - DETAILED PROVISIONS
Section 15059 - Welded Steel Fittings

C O N T E N T S

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SECTION 15059
WELDED STEEL FITTINGS

PART 1 - REQUIREMENT

1.01 FITTINGS

Fittings shall be fabricated as shown on the contract drawings, and/or as specified in the Special Conditions.

1.02 FLANGES

A. Steel flanges shall conform to the requirements of Drawing B-288 made a part hereof by reference.

B. Ring flanges shall be for welding to the pipe unless otherwise noted on the plans.

C. Screwed flanges, where required, shall be Crane No. 556 or approved equal.

END OF SECTION 15059

SPECIFICATIONS - DETAILED PROVISIONS
Section 15061 - Steel Cylinder Water Pipe

C O N T E N T S

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SECTION 15061
STEEL CYLINDER WATER PIPE

PART 1 - GENERAL

1.01 DESCRIPTION

Contractor to furnish steel pipe as hereinafter described.

A. Types of Steel Pipe

1. Cement mortar lined and cement mortar coated steel pipe (CML&C). This type of pipe is to be used in steel pipeline construction unless otherwise specified.

2. Pre-tensioned concrete cylinder pipe.

3. Cement mortar lined and coal-tar enamel coated and wrapped steel pipe.

4. Cement mortar lined and asphalt coated and wrapped steel pipe.

B. Pipe Class or Working Pressure shall be 150 psi unless otherwise specified. This specification includes all classes and specific tables for Class 100, 150, and 200 psi.

C. Nominal Pipe Diameter shall mean the approximate inside diameter of the cement mortar lining.

D. Fabricated Steel Plate Specials, defined as bends, wyes, reducers, outlets, and other pipe structures.

1.02 QUALITY ASSURANCE

Includes the requirements of this specification and the requirements of the latest revision of the following standards as applicable. Unless specifically stated otherwise, the most stringent requirement will govern when there is a conflict.

A. AWWA C-200. American Water Works Association (AWWA) C-200 standard for steel water pipe 6 inches and larger.

B. AWWA C-203. AWWA C-203 coal-tar protective coatings for hot applied enamel and tape.

C. AWWA C-205. AWWA C-205 cement mortar lining and coating. Section 5.5.4 wire mesh: When wire mesh is used as the reinforcement for the coating, it shall have a minimum of 1/2" coating over the wire mesh.

D. AWWA C-208. Standard dimensions for steel water pipe fittings.

E. AWWA C-303. Reinforced concrete pressure pipe – steel cylinder type, pre-tensioned.

F. ASTM C-150. Portland Cement.

1. Type II Cement.

2. Type V Cement.

G. ASTM A-234. Piping fittings of wrought carbon steel and alloy steel for moderate and elevated temperatures.

H. ASTM-A-615-GR40. Deformed and plain billet-steel bars for concrete reinforcement.

I. AWWA Manual M-11. Design and installation of steel pipe.

J. Standard Drawing B-288. EMWD standard drawing for steel plate flanges.

K. ASTM D-2240. Rubber property - durometer hardness.

1.03 SUBMITTALS

A. Pipe Layout Drawings. Pipe (36 inches and larger) shall be fabricated to adhere to the contract construction drawings. The Contractor shall submit pipe layout drawings for approval by the Engineer when the pipe layout varies from the alignment or grade shown on the contract drawings. These drawings shall be the same scale as the contract drawings. The District will allow the manufacturer to utilize a set of reproducible contract drawings to reflect the proposed deviations from the planned grades. Departures from line and grade within the following parameters will be permitted in the manufacture of the pipe to allow the use of joint pulls to effect changes of alignment:

1. Horizontal alignment shall be within 4 inches of the alignment shown on the contract drawings.

2. In vertical alignment, depth may be reduced 1 inch or increased 4 inches if the following minimum vertical clearances between outside diameters of other facilities are maintained and no additional highpoints are created :

a) 1 foot vertical clearance between sewer and water pipelines.

b) 0.5 foot vertical clearance between all other facilities except when specifically shown otherwise on the contract drawings.

3. Horizontal location of the vertical P.I. may deviate by 0.5 feet.

(Pipe smaller than 36 inch may be straight run pipe with horizontal and vertical bends fabricated to conform to construction drawings and welded to straight run pipe with butt straps per Standard Drawing B-304 or other approved full welded joint connections.)

Proposed departures in excess of these limits must be approved by the Engineer prior to initiation of layout drawings.

Computer printouts will be accepted in lieu of layout drawings except for such proposed departures.

B. Fabricated Steel Plate Specials. Fabricated steel plate specials submittals shall be approved prior to fabrication. The dimensions shall conform to AWWA C-208 except as modified herein or as otherwise shown on the plans.

1. Pipe Outlets. The measurement from the outside of pipe to the face of flange shall be 12" unless otherwise shown. Outlets shall be designed per AWWA Manual M-11, and design of stiffner plates shall follow the nomograph method.

   Pipe outlets shall also be provided for chlorination corp stops, air valve assemblies, services, and other appurtenances required by the contract drawings. Brass plugs shall be provided for installation upon later removal of the chlorination corp stops.

2. Bends

   a) The radius of bends shall be a minimum of 2½ times the pipe diameter unless specified otherwise.

   b) Bends may be welded to adjacent pipe sections.

   c) Bends shall conform to the following table:

2-piece	0° - 30°
3-piece	30° - 45°
4-piece	45° - 67½°
5-piece	67½° - 90°

C. Rubber Gaskets. Test results showing the properties of the material used in the rubber gaskets shall be submitted by the Contractor if requested by the Engineer.

D. Pipe Design. Pre-tensioned concrete cylinder pipe reinforcing steel shall be computed as follows:

$$A_s = \frac{6\ P_w\ D_y}{f_s}$$

Where:

A_s = Total cross-sectional area of circumferential steel (cylinder plus bar reinforcement) --- sq. in./ft. of pipe

P_w = Pressure Rating (Class) --- psi

D_y = Inside diameter of steel cylinder – inches

f_s = Average circumferential stress in psi in the steel cylinder and bar reinforcement when the section is subjected to working pressure

and

f_s = is not to exceed 16500 psi nor 50% of the specified minimum yield strength of the steel used in the cylinder. Bar reinforcement shall not be greater than 60% of the total area of circumferential reinforcement.

1.04 DELIVERY

Pipe and material shall be furnished, delivered and strung along the trench site.

A. Internal bracing adequate for handling and transportation shall be installed as soon as practical after the application of cement mortar lining. All bracing shall remain in the pipe until installation and backfilling are completed.

B. Gasket material shall be furnished with the pipe for storage in a cool, well ventilated place and protected from direct sunlight.

1.05 JOB CONDITIONS

Pipe and materials shall not be fabricated, stored, or installed in climatic conditions that will adversely affect the quality of the finished pipeline project.

1.06 ALTERNATIVES

Pipe for projects that are federally funded, in part or whole, shall also meet or exceed federal requirements:

A. Steel pipe shall conform to federal specification SS-P-385A for cement mortar lined and reinforced cement mortar coated pipe.

B. Pre-tensioned concrete cylinder pipe shall conform to federal specification SS-P-381B.

PART 2 - PRODUCTS

2.01 MATERIALS

For all steel manufactures outside the United States, the Contractor shall submit to the District, for its approval, a certified letter stating that the steel meets or exceeds the following: all of the requirements of AWWA C-200, the applicable ASTM Standards, and this Specification, and provide certified physical and chemical test results. The manufacturer of the steel cylinder shall be responsible for all requirements of these specifications. Manufacturers must be per EMWD's "approved materials list" and are: Ameron, Continental Pipe Manufacturing Co., Mid America Pipe, Northwest Pipe Company and Rosco Moss.

A. Cement Mortar Lined Steel Pipe Cylinder

1. Steel thickness shall be at least 12 ga. (0.1046").

2. Steel thickness shall be determined from the pressures imposed (Class) and the design stress of the steel. Design stress is defined as one-half ( ) of the allowable minimum yield stress of the steel.

3. Steel pipe shall conform to the following table which includes minimum diameters and minimum thicknesses for various classes and nominal diameters. Note: Plate thickness is based on steel with a yield stress of 33,000 psi and a design stress equal to 50% of the yield stress (16,500 psi).

Nominal Pipe Diameter	Minimum Cylinder Diameter	Class 200 Min. Cylinder Plate Thickness	Class 150 Min. Cylinder Plate Thickness	Class 100 Min. Cylinder Plate Thickness
4"	4-1/2"O.D.	0.1046"	0.1046"	0.1046"
6"	6-5/8"O.D.	0.1046"	0.1046"	0.1046"
8"	8-5/8"O.D.	0.1046"	0.1046"	0.1046"
12"	12-3/4"O.D.	0.1046"	0.1046"	0.1046"
14"	15-1/4"O.D.	0.1046"	0.1046"	0.1046"
16"	17-3/8"O.D.	0.1046"	0.1046"	0.1046"
18"	19-3/8"O.D.	0.1160"	0.1046"	0.1046"
20"	21-3/8"O.D.	0.1280"	0.1046"	0.1046"
21"	22-3/8"O.D.	0.1340"	0.1046"	0.1046"
24"	25-3/8"O.D.	0.1519"	0.1143"	0.1046"
27"	28-3/8"O.D.	0.1699"	0.1278"	0.1046"
30"	31-3/8"O.D.	0.1879"	0.1413"	0.1046"
33"	34-3/8"O.D.	0.2058"	0.1548"	0.1046"
36"	37-3/8"O.D.	0.2238"	0.1684"	0.1126"
39"	40-3/8"O.D.	0.2418"	0.1819"	0.1216"
42"	43-3/8"O.D.	0.2597"	0.1954"	0.1306"

Nominal Pipe Diameter	Minimum Cylinder Diameter	Class 200 Min. Cylinder Plate Thickness	Class 150 Min. Cylinder Plate Thickness	Class 100 Min. Cylinder Plate Thickness
45"	46-7/8"O.D.	0.2807"	0.2111"	0.1412"
48"	49-7/8"O.D.	0.2987"	0.2247"	0.1502"
54"	55-7/8"O.D.	0.3346"	0.2517"	0.1683"

4. Cylinder shall conform to AWWA C-200.

5. Cement mortar lining shall conform to AWWA C-205.

6. Separate joint rings, if used, shall conform to Section 2.6, AWWA C-303.

B. Pre-tensioned Concrete Cylinder Pipe

1. Shall conform to the following table:

PRE-TENSIONED CONCRETE CYLINDER PIPE
WORKING PRESSURE

		Class 200		Class 150		Class 100	
Nominal Pipe Diameter	Cylinder Diameter	Plate Thickness	Total Area (sq."/ft)	Plate Thickness	Total Area (sq."/ft)	Plate Thickness	Total Area (sq."/ft)
12"	12-3/4"O.D.	12ga.	1.485	12ga.	1.485	12ga.	1.485
14"	15-1/4"O.D.	12ga.	1.485	12ga.	1.485	12ga.	1.485
16"	17-3/8"O.D.	12ga.	1.485	12ga.	1.485	12ga.	1.485
18"	19-25/32"O.D.	12ga.	1.485	12ga.	1.485	12ga.	1.485
20"	21-25/32"O.D.	12ga.	1.584	12ga.	1.485	12ga.	1.485
21"	22-25/32"O.D.	12ga.	1.657	12ga.	1.485	12ga.	1.485
24"	25-3/4"O.D.	12ga.	1.873	12ga.	1.495	12ga.	1.495
27"	28-25/32"O.D.	12ga.	2.093	12ga.	1.570	12ga.	1.525
30"	31-7/8"O.D.	12ga.	2.318	12ga.	1.737	12ga.	1.555
33"	34-7/8"O.D.	12ga.	2.536	12ga.	1.902	12ga.	1.585
36"	37-7/8"O.D.	12ga.	2.755	12ga.	2.066	12ga.	1.615
39"	40-7/8"O.D.	12ga.	2.973	12ga.	2.230	12ga.	1.645
42"	43-7/8"O.D.	11ga.	3.191	12ga.	2.393	12ga.	1.675
45"	46-7/8"O.D.	11ga.	3.409	12ga.	2.557	12ga.	1.704
48"	49-7/8"O.D.	10ga.	3.628	11ga.	2.720	11ga.	1.915
54"	55-7/8"O.D.	9ga.	4.063	11ga.	3.048	11ga.	2.032

12 ga. = .1046 = 1.255 square inch/ft.
11 ga. = .1196 = 1.435 square inch/ft.
10 ga. = .1345 = 1.614 square inch/ft.
9 ga. = .1495 = 1.794 square inch/ft.

2. Rod reinforcing shall conform to ASTM A615 GR40, and the minimum diameter shall be 7/32".

3. Shall conform to AWWA C-303.

C. Coatings

1. Pre-tensioned concrete cylinder pipe shall be coated per AWWA C-303 except the cement shall be Type II or Type V.

2. Cement mortar lined steel pipe shall be cement mortar coated unless specified otherwise.

a) Cement Mortar Coating

(i) Shall be a minimum of 3/4" thick.
(ii) Shall either be Type II or Type V cement, unless specifically stated on the plans or in the Special Conditions.
(iii) Shall be one type of cement; i.e., Type II & V shall not be mixed together.
(iv) Shall meet or exceed AWWA C-205 requirements.
(v) Shall be of adequate thickness to provide required rigidity and corrosion protection.

b) Coal-Tar Enamel Coated and Wrapped Coating shall conform to AWWA C-203

(i) Type B primer shall be used.
(ii) Coal-tar enamel may be Type I or Type II.
(iii) Wrapping shall be a single layer of glass mat or 15-pound coal tar saturated asbestos felt.
(iv) The coating shall be whitewash.

c) Asphalt Coated and Wrap Coating shall use

(i) Asphalt primer.
(ii) Asphalt (hot applied).
(iii) Mica surfaced 15-pound pipeline felt.

d) Field painting shall be used on above-ground installation as shown on the drawings

e) Bare metal shall be coated with a suitable primer for its intended use

D. Steel Plate Specials

1. Shall be constructed of steel plate, thickness computed from the greater of the following criteria, unless a still greater requirement is shown on the drawings or stated in the special conditions:

   a) Thickness not less than 3/16"; or

   b) Thickness as determined from the formula

$$T \geq \frac{D \times P}{2 \times 12{,}500}$$

   Where:
   T = wall thickness in inches
   D = inside diameter of steel cylinder in inches
   P = design pressure (class) in pounds per square inch

2. Schedule 30 or heavier steel pipe in standard diameters may be used in lieu of above paragraph "2.01, D1" for outlets that are 12" and smaller diameter (12.75", 10.75", 8.625", 6.625" and 4.5" outside diameters).

3. Steel welding fittings conforming to the requirements of ASTM Designation A-234 may be used when available in suitable sizes.

4. Cement mortar lining meeting AWWA C-205 except handwork reinforcement shall be 2"x 4" No. 12 welded wire fabric.

5. Coating meeting the requirements of straight pipe.

6. Stiffner plates, when required, designed per the nomograph method of AWWA Manual M-11.

7. Reinforced steel collar pads designed for the specified pressure where needed.

8. Materials meeting or exceeding AWWA C-200 requirements.

E. Rubber Ring Gaskets

1. Shore durometer hardness range shall be in the range of 50-55 in accordance with ASTM D-2240.

2. Compound shall conform to the requirements of Section 2.8 AWWA C-303.

2.02 MIXES

All mixes shall conform to the applicable reference sections.

2.03 FABRICATION OF PIPE

A. Steel cylinder pipe shall be fabricated in accordance with:

1. AWWA C-200 for cement mortar lined steel pipe.

2. AWWA C-303 for pre-tensioned steel cylinder steel pipe.

B. Cement mortar lining process shall be followed with sealing each pipe end with a waterproof cover prior to carefully moving the pipe section. The pipe sections shall be cured under sprinklers or by other processes approved by the Engineer.

C. Coatings shall be applied after the exterior of the pipe is thoroughly cleaned and free from all loose mill scale and rust.

1. Cement mortar coating shall be applied pneumatically or by impaction resulting in a dense uniform coating that adheres tightly to the pipe.

2. Coal-tar enamel and wrapped coating shall be applied in accordance with AWWA C-203.

3. Asphalt coating and wrapping.

a) Shall be applied after pipe is fabricated and hydrostatically tested.

b) Asphalt primer.

(i) Shall be applied to clean-dry surfaces to produce a suitable bond between the metal and subsequent coating of asphalt.

(ii) Shall be uniform and free from bare spots.

(iii) Shall be protected from rain and fog during and between applications.

c) Hot asphalt shall be applied after the primer has completely hardened and with, or immediately preceding, the wrapping material in sufficient quantity to form a bead on the exposed edge of wrap.

d) Wrapping material shall be spirally wrapped under tension to ensure complete coverage, 3/4" lap at edge, no wrinkles and buckles, and complete cementing to the pipe with hot asphalt.

e) Coating and wrapping shall be omitted at each end for a sufficient distance to permit the making of field joints. All exposed bare metal shall be coated with a suitable primer.

D. Joints

1. All pipes shall have rubber gasket joints unless otherwise shown.

   a) The steel area in the bell shall not be less than the area in an equivalent length of pipe barrel.

   b) Rubber gasket ends formed integrally with the steel cylinder shall be formed either by sizing with a machined swage or die, or by rolling per AWWA C-200.

   c) Separate rubber gasket joint rings shall be formed per requirements of Section 3.3 of AWWA C-303.

2. Ends that are not rubber gasket, including but not limited to weld bells, plain ends, grooved ends, and butt straps shall conform to AWWA C-200 where applicable, and to the construction drawings.

3. Flanges shall conform to Eastern Municipal Water District standard drawing B-288.

E. Steel Plate Specials shall conform to approved shop drawings and shall be fabricated in a shop approved for that purpose by the Engineer.

1. Each special shall have a mark on the top and bottom corresponding to the true vertical axis.

2. Outlets, including wyes, shall be built into the wall of the pipe.

3. Fabricated steel fittings of suitable design shall be welded to the cylinder before the exterior coating is placed around the fittings.

4. Cement mortar lining shall meet the requirements of straight pipe with the provisions that handwork lining reinforcement shall be positioned approximately in the center of the lining. The wires spaced 2" on center shall extend circumferentially around the pipe. The fabric shall be securely fastened to the pipe. Splices shall be lapped 4" and the free ends tied or looped to ensure continuity.

PART 3 - EXECUTION

3.01 INSPECTION

A. Notification of Manufacture. Unless specifically waived, EMWD Inspection Department shall be notified at least 48 hours prior to commencement of the manufacture of pipe.

B. Hydrostatic Testing. Steel cylinders shall be hydrostatically tested to a stress equal to 75% of the minimum yield point of the steel. Certification of all cylinders is required by the District.

C. Specials. Specials shall be bulkheaded and tested prior to lining and coating of weld seams at one-and-one-half (1½) times the design pressure (class). Dye penetrant process may be used on all untested welds in lieu of hydrostatic testing if the straight pipe used in fabricating the special has passed a hydrostatic test of 75% of the yield point. All defective welds including pinholes and porous welds shall be chipped out, rewelded, and retested.

D. Soap and Compressed Air Test

1. All double-welded lap joints, butt-strap joints, and other joints susceptible to this test shall be tested by the soap and compressed air method as hereinafter described. After completion of the shop hydrostatic test of the pipe sections the soap and compressed air test also may be used instead of hydrostatic testing of welded joints in the steel manhole outlets, which are attached to steel-plate sections.

2. As soon as practicable after the welding of each joint to be tested by the soap and compressed air test has been completed, the Contractor shall subject each joint to a soap test by forcing compressed air, at approximately 40 pounds pressure per square inch, into each said joint and, while the joint is under pressure, every portion of every welded seam forming a part of the joint shall be swabbed with a heavy soap solution or an approved, commercial, bubble producing leak test fluid and shall be carefully examined for leakage. The Contractor shall repair any defects disclosed by the test by chipping out and rewelding the chipped section, after which the same test shall again be applied. The Contractor shall provide all apparatus and materials for making the tests, shall drill and tap the necessary holes and shall plug weld the holes after testing.

E. Rubber Gaskets. Rubber gaskets shall be subject to inspection and/or testing by the Engineer. All unsatisfactory gaskets shall be immediately replaced at no expense to the District.

F. Manways. All 30" diameter and larger pipe shall have 24" diameter or larger access manways within 750 feet of any interior point of the pipeline.

1. Manways shall consist of 24" diameter outlets with 24" blind flanges.

2. Manways shall have a maximum spacing of 1500 feet on center. At valve installations, manways shall be located on both sides of each valve a maximum of 35 feet.

3. Outlets or bumped heads that provide an equal or larger opening than a 24" manway may be used for pipe access.

4. Manway locations shall be selected to minimize impact to traffic, and shall be approved by EMWD prior to pipe fabrication.

3.02 INSTALLATION

A. Preparation. Internal bracing, in addition to the bracing used for handling and transportation of the pipe, shall be installed when required to ensure maximum permissible deflections are not exceeded during laying, backfill, and compaction.

B. Pipe Zone Density. Relative compaction in pipe zone III as shown on standard drawing B-286B shall be in accord with the manufacturer's recommendation. All pipe bid for this project shall meet EMWD's minimum standards as set forth in Section 15061 herein. The Contractor, in conjunction with the pipe manufacturer, will indicate in the space provided and attached hereto as part of the bid forms, the pipe zone compaction to be constructed, the mortar thickness - both lining and coating - and the trench slope construction.

C. Diapers shall be impervious if available.

1. Width of diapers, where used, shall be sufficient to allow cupping of the diaper for increased thickness of the joint mortar. Recommended minimum diaper widths:

a) 20" dia. pipe and larger: 12"

b) 12" - 18" dia. pipe: 10"

c) 10" dia. pipe and smaller: 9"

2. Mortar placement shall be from one side of the diaper, to allow the mortar to flow around the bottom and up the opposite side of the pipe, to preclude the possibility of any voids inside the diaper.

D. Curing operations shall begin immediately after completion of joint mortaring.

1. Immediate backfill should follow the completion of the joint mortaring operation where possible. Care must be taken to immediately wet down and consolidate the backfill, to avoid draining the moisture from the mortar through porous diapers into dry backfill soil, or disturbing the mortar set by subsequent compaction of the backfill.

2. Completed-joint mortar to be exposed to the sunlight where backfill will not take place until after the mortar has hardened must be kept continually moist during the curing period to prevent cracking of the curing mortar.

END OF SECTION 15061

SPECIFICATIONS - DETAILED PROVISIONS
Section 15080 – Force Balanced Flexible Expansion Joints

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SECTION 15080
FORCE BALANCED FLEXIBLE EXPANSION JOINTS

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section describes the general requirements and procedures for force balanced flexible expansion joints.

1.02 SUBMITTALS

A. Submit shop drawings in accordance with District standards and the Special Conditions.

B. Submit the manufacturer's catalog data and descriptive literature for force balanced flexible expansion joints. Show dimensions, materials of construction by specification reference, linings and coatings.

C. Submit the manufacturer's affidavit of compliance with the referenced standards.

PART 2 - PRODUCTS

2.01 FORCE BALANCED FLEXIBLE EXPANSION JOINTS

A. Force balanced double ball flexible expansion joints shall be installed in the locations indicated on the drawings and shall be manufactured of ductile iron conforming to the material requirements of ASTM A536 and ANSI/AWWA C153/A21.53. Foundry certification of material shall be readily available upon request.

B. Each force balanced flexible expansion joint shall be pressure tested prior to shipment against its own restraint to a minimum of 250 psi. A minimum 2:1 safety factor, determined from the published pressure rating, shall apply.

C. Each force balanced flexible expansion joint shall consist of an expansion joint designed and cast as an integral part of a ball and socket type flexible joint, having a minimum per ball deflection of: 25º, 4" - 8"; 20º, 10" - 12"; 15º, 14+" and 4-inches minimum expansion. The flexible expansion fitting shall not expand or exert an axial imparting thrust under internal water pressure. The flexible expansion fitting shall not increase or decrease the internal water volume as the unit expands or contracts. End connections on flexible expansion joints shall be flanged. Additional expansion sleeves shall be available and easily added or removed at the factory or in the field. Both standardized mechanical joint and flange end connections shall be available.

D. All wetted internal surfaces shall be lined with a minimum of 15 mils of fusion bonded epoxy conforming to the applicable requirements of ANSI/AWWA C213 and shall be holiday tested with a 1500 volt spark test conforming to said specification. Sealing gaskets shall be constructed of EPDM. Both the coating and gasket materials shall meet ANSI/NSF 61.

E. All exterior surfaces shall be shop coated with a minimum of 6 mils of fusion bonded epoxy conforming to the applicable material requirements of ANSI/AWWA C116/A21.16.

F. Manufacturer's certification of compliance to the above standards and requirements shall be readily available upon request. The purchaser (or owner) shall reserve the right to inspect the manufacturer's facility for compliance. All flexible expansion joints shall be The Force Balanced FLEX-TEND as manufactured by EBAA Iron, Inc., Eastland, TX., U.S.A.

PART 3 - EXECUTION

A. The Contractor shall follow the manufacturer's installation instructions for the installation of force balanced double ball flexible expansion joints.

B. No supports shall be installed directly beneath the force balanced flexible expansion joints.

END OF SECTION 15080

SPECIFICATIONS - DETAILED PROVISIONS
Section 15081 - Gaskets

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SECTION 15081
GASKETS

PART 1 - GENERAL

1.01 REQUIREMENT

Gaskets for steel and cast iron flanges shall be of dimensions conforming to the requirements of Standard Drawing B-288, and shall be standard full face for pipe 27" diameter and larger.

Gaskets shall be 1/16", non-asbestos model # Garlock 3000 or Tripac 5000.

1.02 FLANGE INSULATING GASKET KITS

A. Pipe flange insulating kit materials shall be of the type designated by the manufacturer as suitable for appropriate service at the operating temperatures and pressures specified on the Plans.

B. Flange insulating kits shall consist of a one piece full-face, insulating gasket, an insulating sleeve for each bolt, two insulating washers for each bolt, and a steel washer between each insulating washer and nut.

1. Insulating gasket shall be a full faced NEMA Grade G-10 Glass Epoxy Laminated Retainer with a precision tapered groove to accommodate the compression of a BUNA-N or VITON sealing element. Minimum total thickness shall not be less than 1/8-inch. Dielectric strength shall be not less than 550 volts per mil, and compressive strength of not less than 50,000 psi. Use PSI Linebacker or equal.

a. Optional Materials:
1. Neoprene faced phenolic gasket

2. Insulating sleeves shall be full length, one piece, insulating flange bolt sleeves for the appropriate bolt size. Insulating sleeves shall be NEMA G-10 Glass Epoxy Laminated tubing (Pyrox). Dielectric strength shall be not less than 400 volts per mil.

a. Optional Materials:
1. Phenolic tubing
2. Nomex tubing
3. Mylar tubing
4. Polyethylene tubing

3. Insulating washers shall be NEMA Grade G-10 Glass Epoxy Laminated Washers with a minimum thickness of 1/8-inch. Dielectric strength shall not be less than 550 volts per mil, and compressive strength of not less than 50,000 psi.

a. Optional Materials:
   1. Phenolic Washers
   2. Nomex Washers

4. Provide cadmium plated steel flange bolt washers for placement over the insulating washers with a minimum thickness of 1/8 inch.

END OF SECTION 15081

SPECIFICATIONS - DETAILED PROVISIONS
Section 15089 - Nuts & Bolts

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SECTION 15089
NUTS & BOLTS

PART 1 - GENERAL

1.01 REQUIREMENT

Bolts and nuts for flanged fittings shall be bare steel conforming to SAE J429 Grade 5 or ASTM A449 medium carbon steel quenched and tempered meeting the following requirements, and shall have hex heads and lite-pattern hex nuts.

¼" Through 1" diameter

85,000 p.s.i. proof strength
92,000 p.s.i. yield strength
120,000 p.s.i. tensile strength

Over 1" to 1½" diameter

74,000 p.s.i. proof strength
81,000 p.s.i. yield strength
105,000 p.s.i. tensile strength

1.02 USE OF ZINC CAPS FOR BURIED PIPE

Each bolted fitting including couplings, flange adapters, restrained joints, etc. that have manufactured bolts and nuts shall have a minimum of 2 zinc caps anodes as specified below.

Bolt sizes and number of zinc caps:

through 1" diameter - 2 zinc caps
over 1" diameter - 4 zinc caps

Weight of zinc caps:

Zinc caps to be 6 oz. weight.

Material reference:

Zinc caps shall be per ASTM B418-80 and Mil-A-18001J, and be manufactured by Mars, Reliance, or equal.

END OF SECTION

SPECIFICATIONS - DETAILED PROVISIONS
Section 16640 - Corrosion Monitoring System for Underground Piping

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SECTION 16640
CORROSION MONITORING SYSTEM FOR UNDERGROUND PIPING

PART 1 - GENERAL

1.01 DESCRIPTION
Construct corrosion monitoring system for the pipeline by installing test stations as shown on the drawings and as specified herein.

1.02 SUBMITTAL
Submit catalog data on test boxes, wire, copper sulfate reference cells, thermite welds, and weld coating.

PART 2 - PRODUCT

2.01 TEST BOXES
Each test station enclosure shall be a concrete valve box with a cast iron cover marked "EMWD CP Test". Test stations shall be Brooks Products valve box 1-RT or approved equal through EISEL Enterprises or J & R Concrete Products.

2.02 WIRE
Copper-Copper Sulfate (CSE) reference electrodes lead wires are specified under "Reference Electrodes" below. Other wiring to be copper of the size shown and shall have THWN insulation of the color shown. Dyed insulation is not acceptable.

2.03 REFERENCE ELECTRODES
Reference electrodes shall be copper-copper sulfate (CSE) suitable for direct burial. They shall be designed to remain stable for at least twenty years. The reference cell shall be capable of maintaining a potential within 15 millivolts of a freshly made cell while draining 2 microamperes. Reference cells shall contain a barrier to inhibit migration of chloride ions from the soil into the reference cell. Reference cell lead wire shall be #14 AWG copper, with yellow RHW insulation and shall be silver soldered to the copper core of the reference cell with the connection epoxy sealed by the manufacturer. CSEs shall be Stelth 2 by Borin Manufacturing, Staperm Model CU-1-UGPC by GMC Corrosion, or equal.

2.04 THERMITE WELDS

Thermite weld shall be “Cadweld” by Erico Products, “Thermoweld” by Continental Industries, Inc., or equal. Mold shall be the type recommended by the manufacturer for the wire size, metal shape, and orientation. Weld alloy shall be formulated for use on steel or iron pipe as appropriate and shall be of the weight recommended by the manufacturer for the size cable and mold being used. Welds to be buried or submerged shall be primed with an elastomer resin based primer then be covered with a 100% solids mastic filled plastic cap or cement-mortar. Use the plastic cap on dielectric coated pipe following the manufacturer’s instructions. Use cement-mortar on cement-mortar coated pipe. Primer and cap shall be Roybond Primer 747 and Handy Cap as manufactured by Royston Laboratories, or equal.

PART 3 - INSTALLATION

3.01 REFERENCE CELLS

Install reference cells as detailed on the drawings. Backfill around each reference cell and compact to the relative compaction specified in Section 02201 taking care not to damage the reference cell. Coil the reference cell wire in slack loops to compensate for settlement both near the cell and near the cathodic test station. Any damage to the insulation on the reference cell wire shall be wrapped with two layers of Scotch No. 88 vinyl electrical tape or equal. Wet the reference cell and backfill per the manufacturer’s instructions.

3.02 THERMITE WELD

Clean pipe to bright metal. Weld according the manufacturer’s instructions. Test completed weld by striking the side of the weld solidly with a 16 ounce or larger hammer. Remove flux and coat as specified above.

3.03 SPLICE

Splices shall be made only where shown or allowed. Splices shall be made using split bolt connectors or crimp connectors of the smallest size compatible with the cables being used. Connections shall be insulated with two half lapped layers of rubber tape and at least one half lapped layer of plastic tape, by encasing in resin (3M Scotchcast), heat shrink sleeve (Raychem ASE), or equal.

3.04 TESTING PROCEDURES FOR COMPLETED TEST STATIONS AND JOINT BONDS

After the pipeline is backfilled test each test station and joint bonds for effectiveness using the procedures described below. The testing and report shall be completed by or under the direction of a California licensed corrosion engineer or NACE International Certified Cathodic Protection Specialist.

Measure native pipe-to-soil potentials to a portable CSE using each wire at each test station and to the stationary CSE where installed. Repair or replace any wires or test stations that are not operating properly and remeasure to confirm proper operation. Record the data in clear tabular form.

Test to determine if the joint bonds are effective using a temporary cathodic protection system. Measure pipe-to-soil potentials at test stations at the ends of the pipe and other locations as necessary to confirm electrical continuity with cathodic current applied and immediately after turning the current off. Installer shall repair all discontinuities found. Repaired test station shall be retested until continuity is established throughout the installed piping. Record the potentials and currents.

During the corrosion monitoring system test described above, measure pipe-to-soil potentials on both sides of each insulated joint to determine its effectiveness. If defective insulated joints are found, repairs shall be made by the installer. Retests and measurements shall be reported until all insulated joints are proved effective.

Submit a written report with test data, conclusions, and any recommendations signed by licensed corrosion engineer or cathodic protection specialist.

END OF SECTION

APPENDIX A

EMWD APPROVED MATERIALS LIST

Latest Revision:
January 3, 2013

EASTERN MUNICIPAL WATER DISTRICT
APPROVED MATERIALS LIST

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EASTERN MUNICIPAL WATER DISTRICT
APPROVED MATERIALS LIST

If Contractor uses materials listed on this approved material list, no formal submittal will be required, except for pipe submittals. Contractor, however, must submit and identify that materials to be used on the project comply with the approved list.

1. AIR VALVES

Air Release and Vacuum Valve - EMWD Standard Drawing B-598 and B-367, Sizes 1" & 2"
- APCO VALVE COMPANY - Model 143C and 145C
- CRISPIN VALVE COMPANY - Model UL-10 and UL-20
- EMPIRE VALVE COMPANY - Model 940
- VALVMATIC VALVE COMPANY - Model 201-C and 202C
- CLA-VAL COMPANY - Model #361-CAV564B and #362-CAV332

Air Release and Vacuum Valve - EMWD Standard Drawing B-578, Sizes 4" & 6"
- APCO VALVE COMPANY - Model APCO 149-C & APCO 150-C
- CRISPIN VALVE COMPANY - Model UL-41 (4") and Model AL-61/PL-10 (6")
- CLA-VAL COMPANY - Model #364-CAV332 and #366-CAV732-3

Pump Air Valve
- ARMSTRONG MACHINE WORKS - Model 21

2. CAST IRON FITTINGS C-110

Cast Iron Flanged Fittings, Various Sizes -
- Shall conform to the latest revision of ASA Specification A21.10 (AWWA C110) Flanged Fittings. These fittings shall be cement lined in accordance with the latest revision of ASA Specification No. A21.4 and shall have standard machine finish.

Cast Iron Hub Fittings -
- Shall conform to the latest revision of AWWA C100.52 ASA 21-10250 PSI for Class 150 and 200 pipe, cement line in accordance with the latest revision of ASA Specification A21.4.
- Size, Joint size, and Pressure Rating shall be as specified on Purchase Orders, Construction plans, and Bid Sheets.

Cast Iron Fittings -
- Shall conform to latest revision of ASA Spec. A21.10 (AWWA C110) Flanged Fittings.

Fittings shall be cement lined, ASA Spec. A21.4, and shall have standard machine finish.
- SIGMA CORPORATION - Model Sigma/Nappco
- STAR PIPE PRODUCTS - Model Star Fittings
- TYLER PIPE - Model Tyler Fittings
- UNION FOUNDRY* - Model Union Fittings *(Domestic Fittings)
- SMITH COPPER - Model Flanged Fittings for 125# and 250#

3. DUCTILE IRON FITTINGS C-153

Fittings shall be Ductile Iron and conform to ANSI/AWWA C153/A21.53, ANSI/AWWA C111/A21.11 and ANSI/AWWA C110/A21.10.

Fittings shall be Mechanical Joints or Push-on Joints, Tar coated (Seal), and Cement-mortar lined per ANSI A21.4 (AWWA/C104).

- PACIFIC STATES
- SIP INDUSTRIES
- SIGMA CORPORATION
- STAR PIPE PRODUCTS
- TYLER PIPE COMPANY
- UNION FOUNDRY
- U.S. PIPE
- ONE BOLT INC. (ASTM/A536 Restraint Joint Fittings)
- PIPELINE COMPONENTS, INC. (M.J. Compact Fittings – All Sizes; M.J. Full Body Fittings – All Sizes and Push On Fittings – 4" – 8")

4. FIRE HYDRANTS

Super Hydrant (6" x 1-4 x 2-2 ½"), EMWD Standard Drawings B-516 & B-517.

- AVK – Series 24 – Model 90 (24-90)
- CLOW - Model: El Rancho 2060 Bronze and Model: 860
- JONES - Model: J-3765 Bronze
- LONG BEACH IRON - Model: LBIW 615
- LONG BEACH IRON - Model: Series 130 Bronze (New Pattern)

Standard Hydrant (6" x 1-4 x 1-2 ½"), EMWD Standard Drawings B-362 & B-356

- AVK - Series 24 – Model 70 (24-70)
- CLOW - Model: El Rancho 2050 Bronze and Model: Ranger 850, F850, F860 Cast Iron
- JONES - Model: J-3700 Bronze, Model: J4040, J4060 Cast Iron
- LONG BEACH IRON - Model: Series 125 Bronze - New Pattern and Model: 611 East Bay

Intermediate Hydrant (6" x 2-2 ½"), EMWD Standard Drawings B-360 & B-354.

- CLOW - Model: Clow Rich Ranger 945
- JONES - Model: J-3720
- LONG BEACH IRON - Model: 601-613 Rich East Bay

5. FRAMES AND COVERS

Manhole Covers & Frames - 24" & 36" - Standard Drawing SB-61

- ALHAMBRA FOUNDRY - Model: A-1251 & A-1254
- EVERETT ENTERPRISES - Model: GTS - Pont-A-Mousson
- FAMEX - B&W Precast Construction - Model: F-1251 & F-1254
- NEENAH FOUNDRY - Model: R-1593
- RIVERSIDE FOUNDRY - Model #1254 and #1251
- SOUTHBAY FOUNDRY - Model: SBF-1251 & SBF-1254. Model SBF-1348 with Pick Hole for EMWD Std. Dwg. SB #30.
- NORFOLK CASTING CORP. – Model #NC-254
- STAR PIPE PRODUCTS – Model #1254

Manhole Covers & Frames - Locking
- ALHAMBRA FOUNDRY - Model: A-1175
- FAMEX FOUNDRY - Model: F-1251
- NEENAH FOUNDRY - Model: R-1251
- SOUTHBAY FOUNDRY - Model: SBF-1251
- LONG BEACH IRON WORKS - Model RE85R3PD GTS
- Manhole Shafts, Cones, Flat Tops & Grade Rings - 24" - 48"
- AMERICAN PIPE
- ASSOCIATED CONCRETE
- B&W PRECAST CONSTRUCTION
- INLAND CONCRETE
- HOWARD ENTERPRISES
- MAR-CON PRODUCTS
- SAN DIEGO PRECAST
- SOUTHWEST CONCRETE

6. METERS

a. Propeller
- McCROMETER - Model: MG-900 Series, MW-900 Series and MW-500 Series. (ECR Register AMI/AMR, Flex Net compatible, acre feet register)

- SENSUS Tech. Inc. – Model 101 & 102
  Agriculture (ECR Register AMI/AMR, Flex Net compatible, acre feet register)

b. Magnetic (Water & Sewer)
- ENDRESS & HAUSER – Model Promag 53 W - 1” - 78” (AMI/AMR Sensus Flex Net) (acre feet register)

- ABB – Model WaterMaster-FE 121-Flowmeter system - 10” - 88” (AMI/AMR Sensus Flex Net) (acre feet register)

- SIEMANS – Model Sitrans F M Mag 5100 W - 1” - 78” (AMI/AMR Sensus Flex Net) (acre feet register)

c. Compound
- SENSUS Tech. Inc. – Model Omni C2 - 3” – 6” (AMI/AMR Sensus Flex Net) (cubic feet registers)

d. Multi-jet
- SENSUS Tech. Inc. – Model Bronze Multi-Jet - 5/8” – 2” (AMI/AMR Sensus Flex Net) (cubic feet register)

e. Turbine
- SENSUS Tech. Inc. Model Series “W” - 8” – 10” (AMI/AMR Sensus Flex Net) (acre feet register) (strainer required)

- SENSUS Tech. Inc. - Model Omni T2 - 1.5” – 6” (AMI/AMR Sensus Flex Net)
  Domestic Turbine Meters (cubic feet register)
  Landscape Turbine Meters (2” & smaller shall have cubic feet registers, 3” & larger shall have acre feet register) (strainer required)

f. Electromagnetic (Domestic Water)
- SENSUS Tech. Inc. Model iPerl – 5/8” – 1” (AMI/AMR Sensus Flex Net) (cubic feet registers)

7. METER BOXES

a. Concrete or Polymer Concrete EMWD Standard Drawing B-590, B-591, B-342, B-344

- ARMORCAST PRODUCTS - 12" x 20", A6000485SA (No. 37) 5/8" Polymer Concrete
  13" x 24", A6001946PC-12 (No. 38) 1" Polymer Concrete
- BROOKS PRODUCTS - 17" x 30", Model No. 66 and 30" x 48", Model No. 68
- EISEL ENTERPRISES (H&C) - 17" x 30", Model # 666B and 30" x 48", Model # 68MB
- J&R CONCRETE - 12"x20", Model No. 4½ (No. 37) Polymer Concrete
  13"x24", Model W5 ¼ "P" (No. 38) Polymer Concrete
  17" x 30", Model No. 6B
  30" x 48", Model No. 8
- ASSOCIATED CONCRETE PRODUCTS –
  12" x 20", Cat #WPB111812C21 (#437) Polymer Concrete and Cat #WPC1118RLC11
  13" x 24", Cat #WPB132412A21 (#438) Polymer Concrete and Cat #WPC1324RLC11

b. Meter Boxes and Vaults - Cross Reference Chart

Valve Box Equals

BROOKS PRODUCTS	EISEL ENTERPRISES	J&R CONCRETE PRODUCTS
#1-RD	#1R-VB-CC	#1-R
#1-RT	#2VB-VC	#2-R
#3-RT	#10VB-VC	#3-R
#4-TT	#4TT VB-VC	#4-T
#1-SP	#1RVB-CC	#5-R

Utility Vault Equals

SIZE	BROOKS	EISEL ENTERPRISES	J&R CONCRETE PRODUCTS
4'x4'	#W-300 Series	#EM 4848	#4400-1W
4'x6'6"	#W-500 Series	#EM 4878	#4660-2W
4'6"x8'6"	#W-510 Series	#EM 60108	#4686-1W
4'x 7'9"	#W-600 Series	#EM 4896	#4700-1W
4'6"x10'6"	#W-610 Series	#EM 60132	#5106-1W
6'x8'	#W-680 Series	#EM 7296	n/a #5080W

c. Vaults

- BEST CONCRETE PRODUCTS - Model: MCT-4 and MCT-5
- ASSOCIATE CONCRETE - As approved by Engineering.
- ARMORCAST PRODUCTS - Polymer Concrete only.

c. Domestic Meter Box Lid Covers

- ARMORCAST PRODUCTS – Model # A6000484-H1
- JR CONCRETE – Model # PC 412 QRP

8. MISCELLANEOUS BRASS

a. Corp Stops
- FORD - F-1000 Series, F-600 Series, FB700 Series
- JONES - J-3401 Series, J-1500 Series, J-1505 Series, J-1929 Series, J-1930 Series,
- J-1935 Series
- McDONALD - 4701-T, 4701-22 and 4701
- MUELLER - H-15000 Series, H-15008 Series, H-15000(w/110), H-15013 (w/IPT),
- H-15023 (w/IPT) and H-15008

b. Curb Stops
- FORD - ZV-3W
- JONES - J-182
- MCDONALD – 10621S
- MUELLER - H-11026
- PUBCO - 2110

c. Elbows

d. Angle Stops
- FORD - KY43-444W, FV23-666W, FV23-777W, FV43-666W, FV43-777W
- JONES - J-4201, J-1973W, J-1975W
- - MUELLER - H-14258, H-14277, Mueller (110)
- - McDONALD - 4602-T and 4602-22

e. Brass Saddles

*Service Saddles for A.C. Pipe - 4" thru 12"
- JONES - Model: J-975, J-979

*Service Saddles for C-900 Pipe - 4" thru 12"
- JONES - Model: J-996R, J-996
- McDONALD - Model: 3805
- MUELLER – Model: H-13000
- ROMAC - Model: B-101, B-202
- FORD - Model S902 & S912 (Style B2 piece bolted design)
- CAMBRIDGE BRASS – #800 series hinged bronze saddle - ¾” - 2”

*Service Saddles for Ductile Iron Pipe - 4" thru 36"
- - FORD - Model: F-101, F-202
- - ROMAC - Model: Romac 101, Romac 202
- - SMITH-BLAIR - Model: Rockwell 311, Rockwell 313

*Tapping Saddles for A.C., C-900, and Ductile Iron Pipe. Size 4" - 24"
- - FORD - Model: Fast-Sleeve 18-8 All Stainless Steel
- - JCM IND. - Model: JCM-432 All Stainless Steel, JCM-452 All Stainless Steel 14" & above.
- - POWERSEAL PRODUCTS - Model: 3490 All Stainless Steel
- - ROMAC - Model: SST 18-8 All Stainless Steel
- - SMITH BLAIR INC. - #663 (4” – 24”) AND #665 (6” – 12”)

*NOTE: Size 10" & above require double strap.

9. PIPE

a. Cement Mortar Lined & Coated Pipe
- AMERON CONCRETE PIPE
- CONTINENTAL PIPE
- NORTHWEST PIPE & CASING
- ROSCOE-MOSS
- MID AMERICA PIPE

b. Ductile Iron Pipe - EMWD Spec. 15057 - AWWA C-600, AWWA C-151, AWWA C-150, & AWWA C-104
- PACIFIC STATES
- U.S. PIPE

c. High Density Polyethylene Pipe

J-M Manufacturing Company, Inc.
Chevron Phillips Chemical Company

d. Polyvinyl Chloride Pipe C-900/C-905

4" - 12" - C-900, EMWD Spec. 02768 & 15064
14" - 36" - C-905, EMWD Spec. 15064

- CARLON PIPE - Carlon
- CERTAIN-TEED CORP.
- JOHN-MANSVILLE COMPANY - JM
- PW PIPE
- VINYL-TECH - White Knight
- DIAMOND PLASTICS CORP. - 4" - 24"

e. PVC Pipe (Sewer) - Note: See 1.a (Fittings and pipe shall be from the same manufacturer when they make both. If only pipe is made, fittings from 1.a shall be used).
- ARMCO PIPE - Contech
- CARLON PIPE
- CERTAIN-TEED CORP.
- P.W. PIPE
- JOHNS-MANSVILLE COMPANY
- VINYL-TECH - White Knight
- DIAMOND PLASTICS CORP. - SDR 35 PVC
- SYRCO INC – SDR 35 PVC
- LAMSON VYLON - 21" thru 48"

f. PVC Sewer Fittings (4" - 8"), gravity use only
- GPK
- MULTI-FITTINGS CORP.
- JOHNS-MANSVILLE CO.

g. Reinforced Concrete Pipe (Sewer)
- AMERON
- HYDRO CONDUIT
- RIALTO PIPE

h. Vitrified Clay Pipe (Sewer) - Note: Fittings to be same as pipe.
   - BUILDING PRODUCTS CO. (MCP) - JCP Compression Joints
   - GLADDING McBEAN CO. - "Speed-Seal"
   - MISSION CLAY PRODUCTS - "Band Seal"
   - PACIFIC CLAY PRODUCTS - "Wedgelock"

10. PRECAST MANHOLES - Manhole Shafts, Cones, Flat Tops & Grade Rings 24" - 48"

- AMERICAN PIPE
- AMERICAN HIGHWAY PRODUCTS
- ASSOCIATED CONCRETE
- B&W PRECAST CONSTRUCTION
- HOWARD ENTERPRISES
- INLAND CONCRETE
- MAR-CON PRODUCTS
- SAN DIEGO PRECAST
- SOUTHWEST CONCRETE

11. RESTRAINING JOINT DEVICES

- EBBA IRON – 2000 PV Series - 4" - 24" (C-900 & C-905)
  1100 Series - 3" - 48"
  2100 Series - 4" - 12" (C-900)
  2800 Series – 14" – 36" (C-905)

- NAPPCO/SIGMA CORP. - Model: PV-LOK Model PVM - 2" - 12"
  PV-LOK Model PVP - 2" - 12"
  ONE LOK - 4" - 36"

- U.S. PIPE - Field Lok Gaskets - 4" - 12"

- FORD - Uni-flange Series No. 200, 900, 1300 & 1400
  Uni-flange Series 1500 restraint joint for PVC pipe - 4" - 12"
  Uni-flange Series 1390 restraint joint for PVC pipe

- ROMAC INDUSTRIES – Grip Ring – 4" – 12"
  RomaGrip PVC Restrainer 3" - 24".

- STAR - Allgrip 3600 - 4" - 12" for C900 and ductile iron pipe
  Series 1000 - 4" - 12" for C-900
  Series 1100 - 4" - 12" for C-900/C-905
  PVC Grip 3500 – 4" – 16" for C-900
  Stargrip 3000 – 4" – 36" for D.I.P.

12. VALVES

a. Gate Valves

Bronze Threaded - EMWD Standard Drawing B-590 thru B-344B
NRS - ½"
- HAMMOND VALVE COMPANY - Model: 606-125 psi
- MILWAUKEE VALVE COMPANY - Model: 105-200 psi
- STOCKHAM VALVE COMPANY - Model: B-103-200 psi

NRS - 3/4" - 1" - *To be used in customer side of meter installation only. EMWD Standard Drawing B-591
- AMERICAN VALVE COMPANY - Model: Milano, M-300
- FAIRBANKS VALVE - Model: 125-S 250
- *F&F VALVE - Model: 710-Brass
- *KITZ VALVE - Code No. 27 Fig. AKH
- MILWAUKEE VALVE - Model: 1105M & 105
- NIBCO VALVE - Model: T-113 Domestic
- *PIONEER ENTERPRISES - Model: GTI-0102 & 0103
- RED AND WHITE VALVE - Model: B-206
- STOCKHAM VALVE - Model: B-103
- WOLVERINE VALVE - Model: 50293

NRS 1-1/2" - 2"
- AMERICAN VALVE - Model: 3-F Bronze
- MILWAUKEE VALVE - Model: 1105M & 105
- NIBCO VALVE - Model: T-113, Domestic
- STOCKHAM VALVE - Model: B-103

Cast Iron with 2" Operating Nut - 2" Blow-offs
- IOWA VALVE - Model: List 14
- MUELLER VALVE - Model: A-2380-8 and A-2380-6
- CLOW VALVE
- RENSSELSER VALVE - Model: Ludlow, List 13A
- STOCKHAM VALVE

IBBM - Horizontal, Double-Disc IBBM with By-Pass - 24"
- AMERICAN FLOW SYSTEMS - Model: A.D. "50-Line"
- CLOW - Model: Clow F5070
- MUELLER VALVE COMPANY - Model: A-2380-6

Resilient Seat - Flanged
R.S.G.V. - AWWA C-509, AWWA C-515 and AWWA C-550.
To meet EMWD Spec. 15102, Size 4" - 36"
- AMERICAN AVK COMPANY - Model: 25 AVK
- AMERICAN FLOW CONTROL COMPANY - Model: AFC-500 for 4"-12" or Series 2500 for 4"-36"
- ACIPCO - Model: 82-200W-77785-7
- CLOW - Model: Clow RW, Class 150
- KENNEDY - Model: Kennedy RS, Class 150
- M&H - Model: M&H A-4067

- MUELLER COMPANY - Model: A-2360
- STOCKHAM COMPANY - Model: Stockham G700-0
- TYLER - DRS 250
- WATEROUS COMPANY - Model: Waterous #AFC-500
- U.S. PIPE - Model: Metroseal, RS Class 150

b. Butterfly Valves

EMWD Spec. 15103 - Class 150, AWWA C-504

- AMERICAN FLOW CONTROL - Model: A.D. 150, Size 4" - 48"
- CLOW - Model: Clow BFV, Class 150, Size 4" - 72"
- DEZURIK COMPANY - Model: Dezurik BFV, Class 150, Size 4" - 20"
- KENNEDY (Mueller Co.) - Model: Kennedy BFV, Class 150, Size 4" - 72"
- CRISPIN (Previously CMB Industries) - K-FLO Model 500 Series, 3"-20" and K-FLO 47 Series, 24" - 48"
- KUBOTA - Model: Kubota BFV, Class 150, Size 24" - 48"
- M&H COMPANY - Model: 4500, Class 150, Size 4" - 24"
  Model: 1450, Class 150B, Size 30" - 48"
- MUELLER COMPANY - Model: Mueller Lineseal III, Size 4" - 24"
  Model: Mueller Lineseal III, Size 30" - 48" (with Ductile Iron Disc)

- PRATT VALVE COMPANY -
  Model: Pratt Ground Hog BFV. Class 150 with no power operation allowed. Size 4" - 12"
  Model: Pratt Ground Hog with power operation allowed with knowledge of turns. Size 14" - 48"
  Model: Pratt Triton XR-70 with handwheel. Size 24" - 48"

Class 250

- DEZURIK - Model: Dezurik
- CRISPIN (Previously CMB Industries) - Model: K-FLO Model 500 series
- PRATT/WATTS - Model: H.P. 250

Coatings - All valves larger than 12" in diameter shall have all AWWA C-550 Ferrous parts epoxy coated thermosetting.

c. Check Valves - Bronze Threaded

Bronze Swing Check Valve - Threaded 3/4" thru 2"

- HAMMOND VALVE CO. - Model No. 946 Bronze
- MILWAUKEE VALVE CO. - Model No. 510 & 511
- STOCKHAM VALVE CO. - Model No. B-320

d. Check Valves Flanged

Check valves shall be single disc, swing type, with spring and lever when so specified on the Bidding Sheet. EMWD Spec. No. 15111

- -APCO VALVE CO.
- -CLOW CO.
- -KENNEDY VALVE CO.
- -M&H CO.
- -MUELLER CO.
- -STOCKHAM CO.

e. Ball Valves - AWWA C507
- LUNKENHEIMER COMPANY
- MARPAC, INC.
- VALVE TECHNOLOGY CO. - Models D-7410-7420 and D7421-7432 Series

Meter Ball Valves - with Handles
- A.Y. MCDONALD - Model 6101 MWH 3/4" and 1"
- THE FORD METER BOX CO., INC. - Model B13-332 W - 3/4"
  Model B13-444 - 1"
- JAMES JONES - Model J1908W - 3/4" and 1"

f. Detector Checks

Single Detector Check - Less By-Pass, EMWD Standard Drawing B-389, B-390, B-573 (4" - 10")
- AMES - Model: A113-225, A113-226
- Model: A113-227, A113-228
- Model: 1000 Epoxy Coated
- FEBCO - Model: 906-UL
- GLOBE - Model: B
- HERSEY - Model: EDC III
- KENNEDY - Model: Grinnell 1371-G
- PRATT-WATTS - Model: 07F-UL/FM approved.

Double Check Detector Assemblies - EMWD Standard Drawing B-657 (3/4" - 10")
PER LATEST EDITION OF USC – FOUNDATION FOR CROSS-CONNECTION CONTROL AND HYDRAULIC RESEARCH "LIST OF APPROVED BACKFLOW PREVENTION ASSEMBLIES."

Reduced Pressure Detector Assemblies
- AMES - Model: 5000 RPDA
- FEBCO - Model: 826YD
- HERSEY - Model: 6CM-RPDA
- PRATT-WATTS - Model: 909DDCM2, 909DDC

g. Reduced Pressure Assemblies

(3/4" - 10") - For High Hazard Service
PER LATEST EDITION OF USC - FOUNDATION FOR CROSS-CONNECTION CONTROL AND HYDRAULIC RESEARCH "LIST OF APPROVED BACKFLOW PREVENTION ASSEMBLIES."

(2 ½" - 10") - For Automatic Fire Sprinkler Systems containing Toxic Substances
- AMES - Model: 5000 RPDA
- FEBCO - Model: 826YD
- HERSEY - Model: 6CM RPDA
- PRATT-WATTS - Model: 909 Series

h. Double Check Assemblies

(3/4" - 10") - For Non-Toxic Service

PER LATEST EDITION OF USC - FOUNDATION FOR CROSS-CONNECTION CONTROL AND HYDRAULIC RESEARCH "LIST OF APPROVED BACKFLOW PREVENTION ASSEMBLIES."

(4" - 10") - For Automatic Sprinkler Systems containing Non-Toxic Substance
- AMES - Model: 3000 DCDA, 3000 DCDC
- CLA-VAL - Model: 16
- FEBCO - Model: 806 YD
- MUELLER - Model: Hersey DDCII
- WATTS - Model: 709DDC
- WILKINS - Model: DCDA

Double Check Detector Assemblies - EMWD Standard Drawing B-657 (3/4" - 10")
PER LATEST EDITION OF USC - FOUNDATION FOR CROSS-CONNECTION CONTROL AND HYDRAULIC RESEARCH "LIST OF APPROVED BACKFLOW PREVENTION ASSEMBLIES."

i. Plug Valves

(3" - 24") - Ballcentric
- HENRY PRATT CO. - Pratt Keystone - 580 Series, #898

*Other Manufacturers as Approved by Engineering

13. ZINC CAPS

- RELIANCE ZINC CAPS
- MARS ZINC CAPS

14. WIRING

a. Telemetry Cable

ALCATEL DEDW - Telemetry wire, Double jacketed, filled polyethylene jacket for burial 5-mil copper shield, solid strand 6-pair, 19 gauge copper wire Alcatel DEDW. (Approximately 5,000 ft. Rolls)

Distributors - POWER AND TELEPHONE SUPPLY
Phone No. 1-800-451-4381

b. Telemetry Hardware

CHARLES INDUSTRIES - Pedestal Model No. CPLM8-1/GTE
ENTRELEC - Terminal Model No. M4/6.SNB 0115686.13
Terminal End Stop Model No. 114836.00
DIN Rail Model No. 101598.26
3M - Splice Kit Model No. 72-N2

Distributors - CHARLES INDUSTRIES
Phone No. (847) 806-6300

REXEL ESD ELECTRICAL
Phone No. (760) 747-2211

ROYAL WHOLESALE ELECTRIC
Phone No. (951) 683-6625

c. Locating Wire - EMWD Std. Drawing B-656#14-1 UF Black Copper- Insulated Locating Wire

d. Insulated CP Test Connections & Blow-Off Connections EMWD Std. Drawing B-582 & B-379 #4 HMW – Pe (High Molecular Wt-Polyethylene Coated) Stranded Wire Black #12 TW – Solid Wire – Green or Yellow

e. Variable Frequency Drive

15. VARIABLE FREQUENCY DRIVES (VFD's)

Variable Frequency Drives
- ABB - Model ACS 600 Direct Torque Control up to 350 hp (Western Switch).
- ALLEN BRADLEY
- TOSHIBA

APPENDIX B

EMWD DE MINIMUS PERMIT

California Regional Water Quality Control Board
Santa Ana Region

3737 Main Street, Suite 500, Riverside, California 92501-3348
Phone (951) 782-4130 • FAX (951) 781-6288 • TDD (951) 782-3221
www.waterboards.ca.gov/santaana

Linda S. Adams
Secretary for Environmental Protection

Arnold Schwarzenegger
Governor

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EMWD/MAILROOM

2009 MAY 13 PM 2:23

Recd. Electronic

May 13, 2009

To: Ghaderi, Khos
Javier, Alfred
Joy, Jayne

Khos Ghaderi, Director of Water Operations
Eastern Municipal Water District
P.O. Box 8300
Perris, CA 92572-8300

DISCHARGE AUTHORIZATION AND MONITORING AND REPORTING PROGRAM NO. R8-2009-0003-003, UNDER GENERAL PERMIT NO. R8-2009-0003, NPDES NO. CAG998001, FOR EASTERN MUNICIPAL WATER DISTRICT, RIVERSIDE COUNTY

Dear Mr. Ghaderi:

On May 11, 2009, you submitted a complete Notice of Intent to continue discharging wastewater from various sites under the terms and conditions of the Regional Board's renewed general permit, Order No. R8-2009-0003. This Order replaces Order No. R8-2003-0061, under which you previously had authorization to discharge.

Effective immediately, you are authorized to discharge wastewater under the terms and conditions of Order No. R8-2009-0003. Enclosed is Monitoring and Reporting Program (MRP) No. R8-2009-0003-003, which specifies the frequency of sampling and the constituents to be monitored. Modifications to the sampling frequency and constituents to be monitored can be considered on a case-by-case basis.

Please note that changes in the California Water Code require the Regional Board to assess a mandatory minimum penalty of $3,000 for each month your monthly monitoring reports are overdue.

Order No. R8-2009-0003 will expire on March 1, 2014. If you wish to terminate coverage under this general permit prior to that time, please notify us immediately upon project completion so that we can rescind your authorization and avoid billing you an annual fee.

MAIL		ADD. INFO	
BD		ORIG	
CI		W/O	
EN		W/E	
EX		W/CK	
FI		W/ENV	
HR		W/MAP	
LG		ADV. COPY	
OP	X		
RD			
SF			

The Riverside County Flood Control and Water Conservation District has requested that dischargers in Riverside County call Jason Uhley at (951) 955-1273 regarding local agency requirements for this discharge. If you have any questions regarding the Discharge Authorization or the M&RP, please contact Julio Lara of our Compliance Section at (951) 782-4901 or email at Jlara@waterbords.ca.gov.

Sincerely,

for Gerard J. Thibeault
Executive Officer

Enclosures: MRP No. R8-2009-0003-003

cc w/o enc: US EPA Permits Issuance Section (WTR-5) - Doug Eberhardt
Riverside County Flood Control and Water Conservation District – Jason Uhley

cc w/ enc: EMWD – Khos Ghaderi, ghaderik@emwd.org
EMWD – Jayne Joy, joyj@emwd.org
EMWD – Al Javier, javiera@emwd.org

Attachment E – Monitoring and Reporting Program

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Attachment E – Monitoring and Reporting Program (MRP)

The Code of Federal Regulations (CFR) at 40 CFR §122.48 requires that all NPDES permits specify monitoring and reporting requirements. CWC Sections 13267 and 13383 also authorize the Regional Water Quality Control Board (Regional Water Board) to require technical and monitoring reports. This MRP establishes monitoring and reporting requirements that implement the federal and California regulations.

I. GENERAL MONITORING PROVISIONS

A. General Monitoring Provision

1. All sampling and sample preservation shall be in accordance with the current edition of "Standard Methods for the Examination of Water and Wastewater" (American Public Health Association).

2. All laboratory analyses[1], [2] shall be performed in accordance with test procedures under 40 CFR 136 (revised as of April 11, 2007) "Guidelines Establishing Test Procedures for the Analysis of Pollutants," promulgated by the United States Environmental Protection Agency (EPA), unless otherwise specified in this MRP. In addition, the Regional Water Board and/or EPA, at their discretion, may specify test methods that are more sensitive than those specified in 40 CFR 136.

3. Chemical, bacteriological, and bioassay analyses shall be conducted at a laboratory certified for such analyses by the California Department of Public Health in accordance with the provision of Water Code Section 13176, or conducted at a laboratory certified for such analyses by the EPA or at laboratories approved by the Regional Water Board's Executive Officer.

4. In conformance with federal regulations 40 CFR 122.45(c), analyses to determine compliance with the effluent limitations for metals shall be conducted using the total recoverable method. For Chromium (VI), the dissolved method in conformance with 40 CFR 136 may be used to measure compliance with the Chromium (VI) limitation.

---

1 *For Selenium testing use modified EPA Method 200.8 using a Dynamic Reaction Cell (DRC) with an ICP-MS and with reporting limit below 1 ug/L*

2 *For testing organic volatile compounds use EPA Method 8260B and report entire suite of detected constituents*

5. The Discharger shall require its testing laboratory to calibrate the analytical system down to the minimum level (ML)[3] specified in Attachment "H" for priority pollutants with effluent limitations in this Order, unless an alternative reporting level is approved by the Regional Water Board's Executive Officer. When there is more than one ML value for a given substance, the Discharger shall use the ML values, and their associated analytical methods, listed in Attachment "H" that are below the calculated effluent limitation. The Discharger may select any one of those cited analytical methods for compliance determination. If no ML value is below the effluent limitation, then the lowest ML value and its associated analytical method, listed in Attachment "H" shall be used. Any internal quality control data associated with the sample must be reported when requested by the Executive Officer. The Regional Water Board will reject the quantified laboratory data if quality control data is unavailable or unacceptable.

6. The Discharger shall report the results of analytical determinations for the presence of chemical constituents in a sample using the following reporting protocols:

   a. Sample results greater than or equal to the reported ML shall be reported as measured by the laboratory (i.e., the measured chemical concentration in the sample).
   b. Sample results less than the reported ML, but greater than or equal to the laboratory's current Method Detection Limit (MDL)[4], shall be reported as "Detected, but Not Quantified," or "DNQ." The estimated chemical concentration of the sample shall also be reported.
   c. Sample results not detected above the laboratory's MDL shall be reported as "not detected" or "ND."

7. The Discharger shall submit to the Regional Water Board reports necessary to determine compliance with effluent limitations in this Order. The Discharger shall report with each sample result:

   a. The reporting level achieved by the testing laboratory; and
   b. The laboratory's current MDL, as determined by the procedure found in 40 CFR 136 (revised as of April 11, 2007).

---

3 *Minimum level is the concentration at which the entire analytical system must give a recognizable signal and acceptable point. The ML is the concentration in a sample that is equivalent to the concentration of the lowest calibration standard analyzed by a specific analytical procedure, assuming that all the method specified sample weights, volumes, and processing steps have been followed.*

4 *MDL is the minimum concentration of a substance that can be measured and reported with 99 percent confidence that the analytical concentration is greater than zero, as defined in 40 CFR 136, Appendix B, revised as of April 11, 2007.*

8. For receiving water monitoring and for those priority pollutants without effluent limitations, the Discharger shall require its testing laboratory to quantify constituent concentrations to the lowest achievable MDL as determined by the procedure found in 40 CFR 136 (revised as of April 11, 2007)[5]. In situations where the most stringent applicable receiving water objective (freshwater or human health (consumption of organisms only), as specified for that pollutant in 40 CFR 131.38[6] is below the minimum level value specified in Attachment "H" and the Discharger cannot achieve an MDL value for that pollutant below the ML value, the Discharger shall submit justification why a lower MDL value cannot be achieved. Justification shall be submitted together with monthly monitoring reports.

9. The Discharger shall have, and implement an acceptable written quality assurance (QA) plan for laboratory analyses. Duplicate chemical analyses must be conducted on a minimum of ten percent (10%) of the samples, or at least one sample per month, whichever is greater. A similar frequency shall be maintained for analyzing spiked samples. When requested by the Regional Water Board or EPA, the Discharger will participate in the NPDES discharge monitoring report QA performance study.

10. For every item of monitoring data where the requirements are not met, the monitoring report shall include a statement discussing the reasons for noncompliance, the actions undertaken or proposed that will bring the discharge into full compliance with requirements at the earliest time, and an estimate of the date when the Discharger will be in compliance. The Discharger shall notify the Regional Water Board by letter when compliance with the time schedule has been achieved.

11. The Discharger shall assure that records of all monitoring information are maintained and accessible for a period of at least five years (this retention period supercedes the retention period specified in Section IV.A. of Attachment D) from the date of the sample, report, or application. This period of retention shall be extended during the course of any unresolved litigation regarding this discharge or by the request of the Regional Water Board at any time. Records of monitoring information shall include:

    a. The information listed in Attachment D- IV Standard Provisions – Records, subparagraph B. of this Order;
    b. The laboratory which performed the analyses;
    c. The date(s) analyses were performed;
    d. The individual(s) who performed the analyses;
    e. The modification(s) to analytical techniques or methods used;
    f. All sampling and analytical results, including
        (1) Units of measurement used;
        (2) Minimum reporting level for the analysis (minimum level);

---

5 *For Selenium testing use modified EPA Method 200.8 using a Dynamic Reaction Cell (DRC) with an ICP-MS and with reporting limit below 1 ug/L*

6 *See Federal Register/ Vol. 65, No. 97 / Thursday, May 18, 2000 / Rules and Regulations.*

(3) Results less than the reporting level but above the method detection limit (MDL);
(4) Data qualifiers and a description of the qualifiers;
(5) Quality control test results (and a written copy of the laboratory quality assurance plan);
(6) Dilution factors, if used; and
(7) Sample matrix type.

g. All monitoring equipment calibration and maintenance records;
h. All original strip charts from continuous monitoring devices;
i. All data used to complete the application for this Order; and,
j. Copies of all reports required by this Order.
k. Electronic data and information generated by the Supervisory Control And Data Acquisition (SCADA) System.

12. The flow measurement system shall be calibrated at least once per year or more frequently, to ensure continued accuracy.

13. All monitoring instruments and devices used by the Discharger to fulfill the prescribed monitoring program shall be properly maintained and calibrated as necessary to ensure their continued accuracy. In the event that continuous monitoring equipment is out of service for greater than a 24-hour period, the Discharger shall obtain a representative grab sample each day the equipment is out of service. The Discharger shall correct the cause(s) of failure of the continuous monitoring equipment as soon as practicable. In its monitoring report, the Discharger shall specify the period(s) during which the equipment was out of service and if the problem has not been corrected, shall identify the steps which the Discharger is taking or proposes to take to bring the equipment back into service and the schedule for these actions.

14. Monitoring and reporting shall be in accordance with the following:

a. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity.

b. The monitoring and reporting of influent, effluent, and sludge shall be done more frequently as necessary to maintain compliance with this Order and or as specified in this order.

c. Whenever the Discharger monitors any pollutant more frequently than is required by this Order, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the discharge monitoring report specified by the Executive Officer.

d. A "grab" sample is defined as any individual sample collected in less than 15 minutes.

e. A composite sample is defined as a combination of no fewer than eight individual grab samples obtained over the specified sampling period. The volume of each individual grab sample shall be proportional to the discharge flow rate at the time of sampling. The compositing period shall equal the specific sampling period, or 24 hours, if no period is specified.

f. Daily samples shall be collected on each day of the week.

g. Monthly samples shall be collected on any representative day of each month.

h. Quarterly samples: A representative sample shall be taken on any representative day of January, April, July, and October and test results shall be reported in either micrograms/liter (ug/L) or milligrams/liter (mg/L) or nanograms/L (ng/L), as appropriate, by the last day of the month following the month that the sample was taken.

i. Semi-annual samples shall be collected in January and July.

j. Annual samples shall be collected in January to December.

II. MONITORING LOCATIONS

The Discharger shall establish monitoring locations to demonstrate compliance with the effluent limitations, discharge specifications, and other requirements in this Order: The sample station shall be located where representative samples of the discharge can be obtained. The volume of daily discharge shall be recorded daily on a permanent log.

III. INFLUENT MONITORING REQUIREMENTS – NOT APPLICABLE

IV. EFFLUENT MONITORING REQUIREMENTS

A. The following shall constitute the effluent monitoring program for discharges other than decant filter backwash wastewater and/or sludge dewatering filtrate water. If there is no discharge see Section VIII.B.5., below.

1. For intermittent (less than daily) discharge flow of less than 25,000 gallons per day (gpd), effluent monitoring is as follows:

Table 1. Effluent Monitoring Program for Flow Less than 25,000 GPD

Parameter	Unit	Sample Type	Minimum Sampling Frequency	Required Analytical Test Method and Minimum Level, units, respectively
Flow	gpd	measured	Each discharge event	--
Total Petroleum Hydrocarbons[7]	µg/L	Grab	Once monthly, see also Section IV.A.3.	EPA METHOD 8015 Modified
Oil and Grease[8]	mg/L	Grab	"	See Section I.A.2. above, of this MRP
Total Residual Chlorine[9]	mg/L	Grab	"	See Section I.A.2. above, of this MRP
Total Suspended Solids	mg/L	"	"	"
Total Inorganic Nitrogen (TIN)	mg/L	"	Annually, see also Section IV.A.3.	"
Sulfate	mg/L	"	"	"
pH	Std. Units	"	"	"
Total Dissolved Solids	mg/L	Grab	Annually, see also Section IV.A.3.	"
Hardness[10]	mg/L	"	"	"
Pollutants listed in Attachment "I"	µg/L	Grab	Once during the first[10] 30 minutes of the discharge and annually thereafter; see also Section IV.A.4. and IV.A.5.	See Section I.A.2. & I.A.3. above, of this MRP

7 *Applies when dewatering operations are near suspected petroleum hydrocarbon contaminated sites or when diesel or gasoline powered generator is used in the dewatering operations.*

8 *Not applicable to discharges from established water supply systems where no oil and grease are expected.*

9 *Unless it is known that chlorine is not in the discharge.*

10 *If the pollutants were monitored at the outset during the application process, the Discharger may submit the analytical results in lieu of the first sampling event.*

2. For discharge flow of 25,000 gpd or more, effluent monitoring is as follows:

Table 2. Effluent Monitoring Program for Flow Over 25,000 GPD

Parameter	Unit	Sample Type See also IV.A.6., below	Minimum Sampling Frequency	Required Analytical Test Method and Minimum Level, units, respectively
Flow	gpd	measured	Daily	--
Total Petroleum Hydrocarbons[11]	µg/L	Grab	During the first 30 minutes of the discharge, then monthly see also Section IV.A.3.	EPA METHOD 8015 Modified
Oil and Grease[12]	mg/L	Grab	"	See Section I.A.3. above, of this MRP
Total Residual Chlorine[13]	mg/L	Grab	"	See Section I.A.3. above, of this MRP
Total Suspended Solids	mg/L	"	During the first 30 minutes of each discharge event, then monthly, see also Section IV.A.3.	"
Total Inorganic Nitrogen (TIN)	mg/L	"	Semi-annually	"
pH	Std. Units	"	Semi-annually	"
Total Dissolved Solids	mg/L	Grab	Semi-annually	"
Hardness[15]	mg/L	"	Semi-annually	"
Pollutants[14] listed in Attachment "I"	µg/L	Grab	Once during the first[15] 30 minutes of the discharge and annually thereafter; see also Section IV.A.4., and IV.A.5.	See Section I.A.2. & I.A.3. above, of this MRP

11 *Applies when dewatering operations are near suspected petroleum hydrocarbon contaminated sites or when diesel or gasoline powered generator is used in the dewatering operations.*

12 *Not applicable to discharges from established water supply systems where no oil and grease are expected.*

13 *Unless it is known that chlorine is not in the discharge.*

14 *For testing organic volatile compounds use EPA Method 8260B and report entire suite of detected constituents.*

15 *If the pollutants were monitored at the outset during the application process, the Discharger may submit e analytical results in lieu of the first sampling event.*

3. Should any of the weekly, bi-monthly, monthly, quarterly or annual monitoring for a specific constituent show effluent concentrations above the effluent limit, the frequency of monitoring for that constituent shall be increased to weekly or as directed by the Executive Officer. To return to the monitoring frequency specified, the Discharger shall request and receive approval from the Regional Water Board's Executive Officer or designee. (See also Provision VII.C.6.a. of the Order regarding conditions that necessitate termination of the discharge.)

4. Should the annual monitoring for a specific constituent show effluent concentrations above the values specified in Attachment I, the monitoring frequency for that constituent shall be increased to weekly for one quarter or as directed by the Executive Officer. To return to the monitoring frequency specified, the Discharger shall request and receive approval from the Regional Water Board's Executive Officer or designee. (See also Provision VII.C.6.a. of the Order regarding conditions that necessitate termination of the discharge.)

5. Should two consecutive annual monitoring results for all the constituents specified in Attachment I show values below those listed in Attachment "I", the Discharger may stop monitoring for the pollutants listed in Attachment I.

6. If the discharge does not last for more than a day, one composite sample shall be taken for the duration of the discharge and shall be analyzed.

V. WHOLE EFFLUENT TOXICITY TESTING REQUIREMENTS – NOT APPLICABLE

VI. LAND DISCHARGE MONITORING REQUIREMENTS – NOT APPLICABLE.

VII. RECEIVING WATER MONITORING REQUIREMENTS

Whenever there is a discharge and the Discharger asserts that there are no surface waters at the point where the discharge reaches the stream, the Discharger shall record on a permanent log the following information: (a) the date(s), time(s), and duration(s) of the discharge; (b) a description of the location where the discharge(s) percolated into the ground, (c) the climatic condition in the area during the discharge and (d) the name of the individual(s) who performed the observation. This information shall be submitted with the required quarterly report.

VIII. REPORTING REQUIREMENTS

A. General Monitoring and Reporting Requirements

1. The Discharger shall comply with all Standard Provisions (Attachment D) related to monitoring, reporting, and recordkeeping.

2. All analytical data shall be reported with method detection limit[16] (MDLs) and with identification of either reporting level or limits of quantitation (LOQs).

3. Laboratory data for effluent samples must quantify each constituent down to the down to ML specified in Attachment "H" for priority pollutants. Any internal quality control data associated with the sample must be reported when requested by the Executive Officer. The Regional Water Board will reject the quantified laboratory data if quality control data are unavailable or unacceptable.

4. Discharge monitoring data shall be submitted in a format acceptable to the Regional Water Board. Specific reporting format may include preprinted forms and/or electronic media. The results of all monitoring required by this Order shall be reported to the Regional Water Board, and shall be submitted in such a format as to allow direct comparison with the limitations and requirements of this Order.

5. The Discharger shall submit to the Regional Water Board reports necessary to determine compliance with effluent limitations in this Order and shall follow the chemical nomenclature and sequential order of priority pollutant constituents shown in Attachment "G" – Priority Pollutant Lists. The Discharger shall report with each sample result:

   a. The reporting level achieved by the testing laboratory; and
   b. The laboratory's current MDL, as determined by the procedure found in 40 CFR 136 (revised as of April 11, 2007).

6. For non-priority pollutants monitoring, all analytical data shall be reported with identification of method detection limits, as determined by the procedure found in 40 CFR 136 (revised as of April 11, 2007).

7. The State or Regional Water Board may notify the Discharger to discontinue submittal of hard copies of reports. When such notification is given, the Discharger shall stop submitting hard copies of required monitoring reports.

B. Reporting Requirements:

1. All monitoring reports, or information submitted to the Regional Water Board shall be signed and certified in accordance with 40 CFR 122.22 and shall be submitted under penalty of perjury.

2. All reports shall be arranged in a tabular format to clearly show compliance or noncompliance with each discharge limitation.

---

16 *The standardized test procedure to be used to determine the method detection limit (MDL) is given at Appendix B, 'Definition and Procedure for the Determination of the Method Detection Limit' of 40 CFR 136.*

3. Five days prior to any discharge from locations already reported, the Discharger shall notify the Regional Board staff by phone or by a fax letter indicating the date and time of the proposed discharge.

4. Five days prior to any planned discharge[17] from locations not yet reported, the discharger shall notify the Regional Board staff by phone or by a fax letter indicating the following:

   a. Specific type of the proposed wastewater discharge (see listing on Finding 1 of the Order);
   b. The estimated average and maximum daily flow rates;
   c. The frequency and duration of the discharge;
   d. The affected receiving water(s);
   e. A description of the proposed treatment system (if appropriate); and
   f. A description of the path from the point of initial discharge to the ultimate location of discharge (fax a map if possible);

5. If no discharge occurs during the previous monitoring period, a letter to that effect shall be submitted in lieu of a monitoring report specified in Table 4, below.

6. Noncompliance Reporting

   a. The discharger shall report any noncompliance that may endanger health or the environment. Any information shall be provided to the Executive Officer (951-782-4130) and the Office of Emergency Services (1-800-852-7550) orally within 24 hours from the time the discharger becomes aware of the circumstances. A written submission shall also be provided within 5 days of the time the discharger becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause, the period of noncompliance, including exact dates and times and, if the noncompliance has not been corrected, the anticipated time it is expected to continue, and, steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.
   b. Any violation of a maximum daily discharge limitation for any of the pollutants listed in this Order shall be included as information that must be reported within 24 hours.
   c. The Regional Water Board may waive the above required written report on a case-by-case basis.

---

[17] *For those unplanned discharges, as much prior notification as possible is required before any discharge is initiated.*

7. Except for data determined to be confidential under Section 308 of the Clean Water Act (CWA), all reports prepared in accordance with the terms of this Order shall be available for public inspection at the offices of the Regional Water Quality Control Board and the Regional Administrator of EPA. As required by the CWA, effluent data shall not be considered confidential.

8. Monitoring reports shall be submitted by the 30th day of each month following the monitoring period and shall include:

   a. The results of all chemical analyses for the previous month, and annual samples whenever applicable,

   b. The daily flow data,

   c. A summary of the month's activities including a report detailing compliance or noncompliance with the task for the specific schedule date, and

   d. For every item of monitoring data where the requirements are not met, the monitoring report shall include a statement discussing the reasons for noncompliance, and of the actions undertaken or proposed which will bring the discharger into full compliance with requirements at the earliest time, and an estimate of the date when the discharger will be in compliance. The discharger shall notify the Regional Water Board by letter when compliance with the time schedule has been achieved.

9. For Dischargers discharging at a volume equal to or greater than 150,000 gallons per day, the Discharger shall submit semi-annual reports that tabulate all measured flows and measured parameters within the most recent six month period. Where discharges associated with these projects last less than 6 months, a report covering the period of discharges shall be submitted. Copies of these monitoring reports shall be submitted to the Regional Water Board and to the Water Quality Director of the Orange County Water District at P.O. Box 8300, Fountain Valley, CA 92728-8300.

C. Self Monitoring Reports (SMRs)

1. At any time during the term of this permit, the State or Regional Water Board may notify the Discharger to electronically submit Self-Monitoring Reports (SMRs) using the State Water Board's California Integrated Water Quality System (CIWQS) Program Web site (http://www.waterboards.ca.gov/ciwqs/index.html). Until such notification is given, the Discharger shall submit hard copy SMRsin accordance with the requirements described in subsection B.5 below. The CIWQS Web site will provide additional directions for SMR submittal in the event there will be service interruption for electronic submittal.

2. The Discharger shall report in the SMR the results for all monitoring specified in this MRP under sections III through IX. Additionally, the Discharger shall report in the SMR the results of any special studies, acute and chronic toxicity testing, TRE/TIE, PMP, and Pollution Prevention Plan required by Special Provisions – VI.C. of this Order. The Discharger shall submit monthly, quarterly, and annual SMRs including

the results of all required monitoring using USEPA-approved test methods or other test methods specified in this Order. If the Discharger monitors any pollutant more frequently than required by this Order, the results of this monitoring shall be included in the calculations and reporting of the data submitted in the SMR.

3. Monitoring periods and reporting for all required monitoring shall be completed according to the following schedule:

Table 3. Monitoring Periods and Reporting Schedule

Sampling Frequency	Monitoring Period Begins On...	Monitoring Period	SMR Due Date
Continuous	Day after permit effective date	All	30th day of the month following the sampling month.
Hourly	Day after permit effective date	Hourly	30th day of the month following the sampling month.
Daily	Day after permit effective date	Midnight through 11:59 PM or any 24-hour period that reasonably represents a calendar day for purposes of sampling.	30th day of the month following the sampling month.
Weekly	Sunday following permit effective date or on permit effective date if on a Sunday	Sunday through Saturday	30th day of the month following the sampling month.
Monthly	First day of calendar month following permit effective date or on permit effective date if that date is first day of the month	1st day of calendar month through last day of calendar month	30th day of the month following the sampling month.
Quarterly	Closest of January 1, April 1, July 1, or October 1 following (or on) permit effective date	January 1 through March 31 April 1 through June 30 July 1 through September 30 October 1 through December 31	April 30 July 30 October 30 January 30
Semiannually	Closest of January 1 or July 1 following (or on) permit effective date	January 1 through June 30 July 1 through December 31	July 30 January 30
Annually	See Table 1	See Table 1	30th day of the month following the sampling month.
Per Discharge Event	Anytime during the discharge event or as soon as possible after aware of the event	At a time when sampling can characterize the discharge event	30th day of the month following the sampling month.

D. Other Reports – Not Applicable

APPENDIX E

ATTACHMENT "E" COUNTY OF RIVERSIDE TRANSPORTATION DEPARTMENT, CONTRACTOR JOB MIX FORMULA PROPOSAL

COUNTY OF RIVERSIDE
TRANSPORTATION AND LAND MANAGEMENT AGENCY
Transportation Department
Materials Laboratory

CONTRACTOR JOB MIX FORMULA PROPOSAL

FOR *HOT MIX ASPHALT*

CONTRACTOR NAME, ADDRESS, PHONE NO. & FAX NO:	**CONTRACT NO. / TRACT NO. / PERMIT NO. / OTHER:**
	PROJECT INFORMATION (LOCATION, NAME AND PHASE NO):

SUBMITTED BY CONTRACTOR (PRINT NAME AND SIGN):	**DATE:**

HOT MIX ASPHALT (HMA) TYPE:	**ASPHALT BINDER, ASPHALT MODIFIER AND CRUMB RUBBER MODIFIER (CRM) SUPPLIER / ASPHALT RUBBER BINDER PRODUCER:**
HMA PRODUCER NAME, ADDRESS AND PHONE NO:	
PRODUCER MIX IDENTIFICATION NUMBER / NOTES:	**GRADE OF ASPHALT BINDER / NOTES:**

JOB MIX FORMULA (JMF)

Sieve Size	JMF Target Value (TV) (% passing)	TV Limits (% passing)	Project Specification Limits (TV± Tolerance)
1.50"			
1.00"			
0.75"			
0.50"			
0.375"			
No. 4			
No. 8			
No. 16			
No. 30			
No. 50			
No. 100			
No. 200			
RAP percentage (dwa)			
Asphalt binder percentage (dwa)			

Aggregate sources and California Mine and SMARA identification numbers for each *bin:*

Reclaimed asphalt pavement (RAP) source:

Note to Contractor:
Please include with your submittal all supporting HMA design data.

2950 Washington StreetRiverside, CA 92504-phone (951) 955-6876 / fax (951) 955-6806