STANDARD SPECIFICATIONS AND STANDARD DRAWINGS
FOR THE CONSTRUCTION OF

WATER FACILITIES

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District Engineer

APRIL 2018

MESA WATER DISTRICT

1965 Placentia Avenue
Costa Mesa, CA 92627
(949) 631-1291

Mesa Water District

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Master Table of Contents

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PART 1

PROCEDURAL GUIDE AND DESIGN REQUIREMENTS

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TABLE OF CONTENTS

PART 1

PROCEDURAL GUIDE AND DESIGN REQUIREMENTS

SECTION 100

PROCURING WATER SERVICE FROM MESA WATER DISTRICT

100.1 PURPOSE

The purpose of these Procedural Guide and Design Requirements is to provide developers (applicant) and their agents with the general steps for procuring a water service from Mesa Water District (Mesa Water), as well as, providing the general design requirements for the preparation and processing of water improvement plans for a new water service from Mesa Water.

This manual is a declaration of existing policy and is not intended as a change by Mesa Water District of any of its terms and conditions contained in Mesa Water's "Rules and Regulations for Water Service". All requests for water service by Mesa Water District shall be completed in accordance with all of the terms and conditions of Mesa Water's Water Service Agreement and the "Rules and Regulations for Water Service".

Upon acceptance of the Water Service Agreement by Mesa Water, together with all fees and charges, including the Capacity Charge, as determined by the District Engineer or an authorized representative, subject to appeal to the General Manager or the Board of Directors, plans and specifications, bonds, conveyance of necessary easements, and other items as may be required, Mesa Water District will agree to provide the requested water service subject to the terms and conditions set forth in the Water Service Agreement and Mesa Water's "Rules and Regulations for Water Service".

100.2 AVAILABILITY OF SERVICE

Mesa Water provides domestic water to all properties within its service area boundaries. The developer (applicant) or his agent shall check with Mesa Water to determine the current boundaries of Mesa Water District and the availability of service prior to preparing water improvement plans. The developer (applicant) or his agent may confirm service availability with the Mesa Water's Engineering Department, located at 1965 Placentia Avenue, Costa Mesa, California, or by calling (949) 631-1291.

100.3 PRELIMINARY FEASIBILITY INVESTIGATION

In some areas, a feasibility investigation and/or report may be necessary to establish whether and how Mesa Water can serve the proposed development area. An agreement whereby the applicant shall advance the estimated cost to Mesa Water for making any feasibility study shall be executed and money deposited if deemed necessary by Mesa Water. The applicant's engineer shall submit an initial concept plan and/or design report, as required by Mesa Water, of the water facilities for review and approval by Mesa Water.

100.4 VERIFICATION OF SERVICE AVAILABILITY

If service verification is requested by the Builder/Developer (applicant), the service verification request shall be addressed to the District Engineer, and must be accompanied by an 8- ½ inches by 11 inches vicinity map and two (2) copies of the tentative tract map showing the proposed services and their points of connection to the existing Mesa Water facilities. Conceptual sizing of the water system shall be shown along with dwelling unit densities, and estimated water demands. The normal information required on tentative tract maps is also required.

A "Will-Serve" letter or "Statement of Certification" will be prepared by Mesa Water upon the applicant's request for a development within the boundaries of Mesa Water District. This document may be required by local jurisdictional agencies for processing tentative maps or development reviews. Water supply assessments and water service verifications will need to be requested for developments of 500 dwelling units or more, in accordance with the California Water Code Section 10910.

100.5 CONSTRUCTION PROJECTS AND WATER SERVICE REQUIREMENTS

For projects that require construction of a new water service or changes to existing water services, Mesa Water requires the following specific procedures to be followed before these water services can be constructed or modified. For project notifications that were received from the City of Costa Mesa Planning Division (or from City of Newport Beach or County of Orange), Mesa Water will send a letter to all prospective Builders/Developers that water plans must be submitted for the proposed project. See Appendix 1 for an example of this notification letter.

A new water service will be required if one does not currently exist at the location. An additional service may be needed or modifications to the existing services if:

- Existing meter is too small or too large for the amount of water needed for the project.
- The project wants to add or remove a water service.
- Fire or irrigation services will be modified or constructed as part of the project.
- A dedicated irrigation water meter will be required for all irrigated landscape areas greater than 2,500 square feet to facilitate water management. This policy pertains to commercial, industrial, and multi-tenant projects of four units or more.

If new or modified water services are needed, the following are the procedures that will need to be followed:

1. An Application for New Service (Appendix 2) must be completed.
2. Project plans must be submitted for Mesa Water's approval, including the plumbing plans, showing all external and internal water fixtures, as well as the irrigation plans. The submittal shall include the total number of fixture units to be served by the new or modified water service, and the future expected flow rates of the irrigation system. Payment of the plan check deposit is required prior to Mesa Water initiating the plan check process.
3. Payment of deposits which may include: plan check and inspection deposit; capacity charges; and meter installation deposits.
4. An acceptable Payment and Performance Bond must be posted.
5. Project plans must be approved and signed by Mesa Water.
6. Water Services Agreement (Appendix 4) must be signed by the applicant property owner and by Mesa Water.

100.6 SPECIAL CONDITIONS FOR CONDOMINIUMS AND LAND SUBDIVISIONS

All projects must conform to Mesa Water's single metering policy, which requires "each dwelling unit or building under separate ownership must be provided with its own service connections." Mesa Water reserves the right to limit the number of houses or buildings, or the area of land under one ownership, to be supplied by one service connection.

- *Condominiums* – Mesa Water will require a separate meter for each condominium (except in unusual cases).
- *Land Subdivisions* – When property with an existing service is subdivided, the service connection shall be considered as belonging to the lot or parcel of land, which it directly enters. A service connection shall not be used to supply adjoining property of the same or a different owner. Mesa Water will require a separate service and meter for each lot at the time of subdivision.

100.7 REMODELS / TENANT IMPROVEMENT PROCEDURES

If the project will include the installation of new plumbing fixtures, Mesa Water requires that the adequacy of the existing meter be evaluated and that the meter be upgraded if the addition of new plumbing fixtures and/or landscaping will cause water flow rates to exceed the capacity of the existing meter.

The following procedures must be followed before water meters can be upgraded:

1. Provide payment of Plan Check Deposit.
2. Submit a plumbing plan showing all future plumbing fixtures including existing plumbing fixtures to remain and landscape plans showing the future expected flow rates of the irrigation system. A listing of plumbing fixtures can be supplied in place of a plumbing plan.
3. Mesa Water Engineering Department will calculate the required meter size and determine if a meter upgrade is required.
4. If a meter upgrade is required, a capacity charge and meter installation deposit will be assessed.
5. Following payment of all required deposits, the existing meter will be replaced with a larger meter by Mesa Water.

100.8 PLAN CHECKING OF PROPOSED DESIGN

The applicant shall submit one (1) set of design plans, 24" by 36" in size (maximum), of the proposed water facilities for any improvement/development to Mesa Water for review and approval. The plan submittal shall include, as a minimum, one set of site plans, one set of plumbing plans, and one set of irrigation plans and the completed Application for New Service including the Standard Terms (Appendix 2). Included within the submittal shall be the total number of fixture units to be served by the new or modified water service, and the future expected flow rates of the irrigation system. The Builder/Developer or his engineer/agent shall pay a deposit for plan check to the Engineering Department to start the plan check process. The Builder/Developer shall also submit other pertinent information to assist Mesa Water in reviewing the plan submittal (e.g.: tract map, fire master plan, water calculations, etc.).

Plans shall also be submitted to the City Engineer of the City of Costa Mesa (or City of Newport Beach or County of Orange) for review and determination of the requirements for approval of work within their jurisdiction.

100.9 APPLICATION, AGREEMENT, AND FEE PAYMENT

Upon the applicant's and/or his engineer's submission of the application form, plans and payment of the plan check deposit, Mesa Water's Engineering Department will perform its review of the plans and

application submittal.

Once the plans and submittal have been reviewed by the Engineering Department, Mesa Water will notify the Builder/Developer that the plans are ready for pick-up with Mesa Water's corrections/comments noted. When the plans are close to final, the plan comments will include Mesa Water's preliminary summary of the Capacity and Plan Check Deposits – Payment Voucher (Appendix 3) for the proposed construction/development. Since the Capacity and Plan Check Deposits are based on the project's quantities of water improvements, Mesa Water reserves the right to postpone the preparation of the Capacity and Plan Check Deposits until such time when the quantities are finalized.

The Builder/Developer shall make corrections and re-submit to the Engineering Department along with Mesa Water's previous redlined check print. Mesa Water will review the second submittal and return with corrections/comments as noted. This process is repeated until Mesa Water is satisfied that the plans meet Mesa Water's Standard Specifications.

Once the plans meet Mesa Water's Standard Specifications and there are no more comments, Mesa Water will request a 24" by 36" 4-mil duplicate mylar for the District Engineer's signature. Mesa Water will require the submittal of a copy of the approved Fire Master Plan for the project site prior to approving the plans. The Capacity Charges and Plan Check Deposit shall be collected by Mesa Water, and the acceptable bond posted prior to the approving of the plans by the District Engineer.

In addition, the Owner shall sign the Water Service Agreement (Appendix 4) and return the original Agreement to Mesa Water. Once the Water Service Agreement is accepted and executed by the District Engineer the Builder/Developer must submit to Mesa Water a 24" by 36" 4-mil mylar of the plan for the District Engineer's signature and Engineering Department files along with one (1) compact disk (CD). The CD will contain a single PDF file of the entire approved plan set, i.e. reflecting Mesa Water's approval signatures. The PDF file will be of a quality high resolution since it will be made a part of Mesa Water's public electronic library of plans.

100.10 EASEMENTS

The applicant shall grant, or cause to be granted to Mesa Water District, without cost to Mesa Water, all necessary easements for construction, installation, maintenance and access to the water facilities, across all privately-owned lands to be traversed by the facilities, which easements shall be in a form and condition of title satisfactory to Mesa Water District and shall be executed by all necessary parties having an interest in said lands. All easement documents and plat map and legal descriptions shall be submitted to Mesa Water. Mesa Water will submit the easement documents to the County of Orange for recording. A copy will be mailed to the property owner(s) after recording.

100.11 RESPONSIBILITY FOR FURNISHING MATERIAL AND INSTALLATION

Installation of the development's water facilities and any other required off-site facilities will be the obligation of, and at, developer's expense. The applicant shall cause all installation work to meet Mesa Water's "Standard Specifications," and upon final acceptance, convey the off-site facilities to Mesa Water District. Prior to the onset of construction activities, the project contractor is required to schedule a pre-construction meeting with Mesa Water's Construction Inspector. That Developer to provide material specifications to Mesa Water District for approval two weeks prior to commencing construction.

100.12 GUARANTEES

As set forth in the Agreement, the applicant guarantees the water facilities against defects in workmanship and materials for a period of one (1) year after the date of acceptance of the facilities by Mesa Water District.

It is further agreed that the facilities shall be restored to full compliance with the requirements of Mesa Water's Standard Specifications and Plans, including any test requirements, if during said one (1) year period the facilities or any portion thereof are found not be in conformance with any provisions of said Standard Specifications and Plans. This guarantee is in addition to any and all other warranties, express or implied, with respect to the facilities.

100.13 DEDICATION OF FACILITIES

Upon completion and final inspection of all work, the inspector shall file a Final Inspection and Cash Bond Release Request (Appendix 5) at least 30 days prior to a regular Board Meeting for dedication and formal acceptances. The applicant shall furnish Mesa Water with a report of the actual costs of the water facilities, and to substantiate such report with invoices and receipts acceptable to Mesa Water. Mesa Water shall also be provided with a complete set of record drawings ("as-builts") on reproducible mylars. Upon said acceptance, Mesa Water will give approval for the release of bonds held by Mesa Water District or posted to the city or county for the construction of the water facilities.

100.14 INDEMNITY BOND

If water facilities are to be constructed in a right-of-way under the jurisdiction of an agency requiring Mesa Water District to sign the encroachment permit, the applicant shall furnish Mesa Water with an Indemnity Bond prior to execution of the permit. The bond shall be for a sum not less than the completed value of said facilities. The value shall be determined by the District Engineer.

100.15 IMPROVEMENT BONDS

The Developer shall post improvement bonds directly with Mesa Water District prior to construction of the offsite water systems. A detailed Engineer's cost estimate will be submitted by the Developer. Ten percent (10%) or a minimum of $1,000 (whichever is more) of the total cost estimate will be paid by the Developer before construction. The bonds shall guarantee the satisfactory completion of the water systems in the sole opinion of Mesa Water District.

100.16 BOND RELEASE

Subject to Government Code Section 66499.7, forty (40) days following satisfactory completion of the construction of the improvements and upon written request of the Developer, Mesa Water District will release the construction bonds. The developer surety bonds will be released one year after the acceptance of the facilities by Mesa Water District.

END OF SECTION

SECTION 200

MESA WATER FEES AND CHARGES FOR NEW DEVELOPMENT

200.1 ADMINISTRATION AND ENGINEERING FEES

As set forth in the Water Service Agreement (Appendix 4), the applicant hereby agrees to pay all administration and engineering fees, (including inspection and plan check costs), calculated as a percentage of the total cost as estimated by Mesa Water, as well as Capacity Charges, meter charges, interim water service line charges, (if applicable), and any other charges of Mesa Water District. The amount of such fees and charges shall be based on the applicable schedules of the Rules and Regulations in effect on the date when the applicant has submitted to Mesa Water its completed Application, payment of all fees and charges, plans and specifications, bonds, conveyance of necessary easements and other items which may be required herein prior to issuance of the permit and the plans of the Applicant have been approved by Mesa Water.

The meter charge includes provisions by Mesa Water of a water meter and customer control valve. The customer control valve is to be obtained from Mesa Water and installed by the applicant's contractor as the work progresses, and that the water meter is to be installed by Mesa Water prior to the provision of permanent water service by Mesa Water.

200.2 DEPOSIT

A deposit will be collected on all new development to cover the actual cost for time and materials, including Mesa Water's fully burdened labor rate, for Plan Check, Installation and Inspection Work performed. After the work has been completed, the actual cost of the project will be determined and any excess funds from the deposit will be refunded or the applicant shall be required to pay the costs in excess of the deposit. The current approved Fees and Charges for New Development are included within Appendix 6.

200.2.1 Plan Check

The plan check deposit shall be determined using the current approved Water Rate and Charges schedule for New Development.

The most current and up-to-date approved Water Rate and Charge Schedule can be found at www.mesawater.org.

200.2.2 Construction Inspection

The construction inspection deposit shall be determined using the current approved Fees and Charges for New Development.

200.2.3 Construction Performance Bond

The customer or applicant shall provide a construction performance bond in the amount of 10% of the estimated installation and construction costs or a minimum of $1,000 (whichever is more) as determined by:

1. Cost estimate certified by a Registered California Civil Engineer; or
2. Executed construction contract for water system implementation.

200.2.4 Capacity Charges

The current approved Capacity Charges based on meter type and size are included within Appendix 6, Fees and Charges for New Development. The most current and up-to-date approved Water Rate and Charge Schedule can be found at www.mesawater.org. Capacity charges are not a deposit and applicants are not entitled to a refund except as conditioned under the terms of the Rules and Regulations for Water Service, Section 4.1.5, for consideration of upsizing meter sizes.

200.2.5 Meters

The current approved Meter Installation Deposit is based on meter type and size or on the water rate charge schedule for New Developments and can be found at www.mesawater.org.

200.2.6 Construction Work Performed by Mesa Water for Customers

The applicant is encouraged to perform construction with the assistance of a Contractor. However, the applicant may request Mesa Water to perform the work. Mesa Water may construct facilities upon approval of the General Manager.

It will be the responsibility of the Contractor to furnish all materials which shall meet Mesa Water's Standard Specifications. Contractor to submit material specifications and cut sheets to Mesa Water District for approval, two weeks prior to construction. It will also be the responsibility of the Contractor to provide all labor and equipment necessary to construct or install the water facilities in conformance with the approved plans and the specifications contained in the latest edition of Mesa Water's Standard Specifications. Contractor to provide proof of valid contractor's license issued by the State of California for pipeline construction work (C34 or Class A).

END OF SECTION

SECTION 300

DESIGN AND INSPECTION PROCEDURES

300.1 WATER DEVELOPMENT CONCEPT PLAN

300.1.1 Development Concept Plan

In some areas, a feasibility investigation and/or report may be necessary to establish whether and how Mesa Water can serve the proposed development area. An agreement whereby the applicant shall advance the estimated cost to Mesa Water for making any feasibility study shall be executed and money deposited if deemed necessary by Mesa Water. The applicant's engineer shall submit an initial concept plan and/or design report, as required by Mesa Water, of the water facilities for review and approval by Mesa Water.

One (1) set of the development concept water plans are to be submitted to Mesa Water's Engineering Department for review by the applicant or the applicant's engineer at least thirty (30) days before filing any tentative map for the development. The initial plan checking deposit shall accompany this submittal.

It is Mesa Water's recommendation, but not a requirement, that the local Fire Authority review a copy of the concept plan prior to the submittal to Mesa Water.

300.1.2 Concept Plan Approval

Mesa Water's Engineering Department will review for approval the water system concept plans for the development, taking into consideration the following:

1. Existing water transmission/distribution main locations and sizes.
2. The proposed points of connection to the existing distribution system.
3. The estimated water demands calculated by the developer's engineer.
4. City and/or County fire flow requirements. Whether or not local Fire Authority criteria have been met, it is the responsibility of the Developer to meet with the local Fire Authority separately, to determine specific Fire Authority concerns and requirements.
5. Mesa Water's Water Master Plan.
6. Mesa Water's design criteria (Section 400).

Mesa Water reserves the right to change proposed water main sizes and required system looping after considering the above criteria. The Developer will be required to improve the existing distribution system, if necessary, to support the proposed development project.

Correction comments will be indicated on the development water conceptual plan and returned to the applicant's engineer.

Upon approval of the development water system concept plan, one red-lined copy will be returned to the applicant's engineer showing Mesa Water's comments and corrections.

300.1.3 Fire Department Approval

The applicant's engineer shall obtain approval from the governing local fire department for fire hydrant spacing and proposed water main sizing for the fire flows for the tentative water system concept plan for the development.

Fire Authority's approval shall be obtained by the Developer and/or applicant's engineer and will be required prior to Mesa Water's approval of the plans with submission of a letter from the Fire Department.

300.2 INDIVIDUAL TRACT IMPROVEMENT PLANS

300.2.1 First Plan Check Requirements

The applicant/engineer shall submit the following items for first review of residential/ commercial/industrial subdivisions:

1. One (1) set of water improvement plans (bond paper), maximum size 24" x 36" (without exception); plus one (1) set of the plans in electronic (PDF file) format on CD. The set of plans shall include the site plans, plumbing plans, and the irrigation plans.
2. One (1) copy of tract/parcel map (bond paper) showing gross acreage, street names, Mesa Water District easements with provision for Mesa Water's execution; plus one (1) set of the tract/parcel map in electronic (PDF file) format on CD.
3. One (1) set of grading plans (bond paper); plus one (1) set of the plans in electronic (PDF file) format on CD.
4. Engineer's quantity estimate for water system, including the total number of fixture units to be served by the new or modified water service, and the future expected flow rates of the irrigation system.
5. Plan check deposit amount and signed Application for New Service.
6. Transmittal from applicant's engineer.

The improvement plans will be checked against the tentatively approved development water concept plan and the minimum design standards. Tract maps and parcel maps will be checked against improvement plans for the required easements (if applicable). After the first plan check, Mesa Water will return one red-lined set each of the improvement plans and the tract/parcel map. The returned sets will note any specific variations from the basic requirements.

300.2.2 Detailed Plan Requirements

All plans submitted to Mesa Water for plan checking and approval of water facilities will be submitted on 24" x 36", maximum overall size. These plans shall conform to the "Standard Procedure for Processing Maps and Improvement Plans" of the city having jurisdiction; and the following requirements.

300.2.2.1 Required Details:

1. Title Sheet

A. Project Title, Tract/Parcel Map Development Number, or Project Name.

B. Location Map showing general area with project noted.

C. Index Map is required and must contain all of the following information:

1. Scale: 1" = 100 feet.
2. All existing and proposed water mains, fire hydrants, water valves and meters/services.
3. The size and material for all mains.
4. Lot lines for the proposed development, footprints of buildings, total square footage, number of stories, service stub locations for each lot.
5. North arrow and street names.
6. Legend of symbols and lines.
7. All proposed easements for Mesa Water facilities.

D. Signature block – Mesa Water's approval of facilities. Indicate which facilities are included on the water improvement plans.

E. Bench Mark, description and latest elevations, and survey horizontal control.

F. Name, address, and phone number of engineering firm; name, address, and phone no. of developer; and legal description of property (Tract/Lot, Parcel Map No.)

G. Quantity estimates may appear on Title Sheet.

H. Index of sheets.

I. Underground Service Alert Notification Block per Section 4212/5217 of the Government Code.

J. Revision block.

2. Second Sheet

The second sheet of the plan set will have the following information:

A. Detailed quantity estimates (if not shown on Title Sheet).

B. General Notes.

C. Utility, addresses, and phone numbers, including but not limited to: gas, telephone, power, cable TV, water, sewer, recycled water, and storm drain.

D. Mesa Water's Standard Notes and Construction Notes.

E. Street sections showing street widths to right-of-way and location of sidewalks, if they fit.

3. Plan and Profile Sheets

Separate plan and profile sheets are required for all water pipelines, as follows:

A. Scale: 1-inch = 40-feet.

B. The plan and profile should be on same sheet if possible and aligned.

C. Existing water, recycled water, and sewer facilities adjacent to development must be shown.

D. Easements (if applicable) dedicated to Mesa Water District for water facilities must appear on plans.

E. Building/D.U. pad elevation.

F. Water, sewer, and recycled water system crossing elevations.

G. Storm drain alignment shall be indicated in the plan view and all crossings of water facilities and the storm drain shall be shown in the storm drain profile. Where water lines cross over the storm drains the top of the storm drain and the bottom of the water line must be shown, along with the proposed depth of cover.

H. Provide a key map on each sheet at a scale of 1-inch = 400 feet, if necessary.

300.2.3 Non-Residential Application Procedure Requirements.

In addition to the requirements described in Section 300.2.2, the following is required for all commercial or industrial developments:

300.2.3.1 Water Services

1. Site Utility Plans Showing:

   A. Property lines.

   B. "Footprint" of building.

   C. All on-site public and private fire hydrants.

   D. Stamped/signed by Fire Authority

   E. Fire services for other than residential development, will be required to have a back flow prevention device (minimum double check valve), as determined by Mesa Water.

   F. Non-residential domestic water service will be required to have a reduced pressure principal backflow device as determined by Mesa Water.

   G. One complete set of Plumbing Plans, along with a letter from the developer or his engineer stating the number of fixture units, recommended meter size , not to exceed gpm, to serve (Company Name) at (Address) .

   H. One complete set of Irrigation plans, along with a letter from the developer or his engineer stating the future expected flow rates of the irrigation system , size of the area to be irrigated, recommended meter size , not to exceed gpm, to serve (Company Name) at (Address) . This information may be included in letter for water service (submittal of the plumbing plans). Also, submit MAWA calculations per AB 1881 if required by the City or County of Orange.

   I. Address to be served.

   J. All fees and deposits, stipulated in the agreement, must have been paid.

300.2.3.2 Fire Service Requirements

All 2-inch diameter and larger fire service connections will require, at a minimum, a double check valve assembly (DCVA), fireline turbine water meter with strainer, and the by-pass meter reading in cubic feet. For all fire services with a contaminant control hazard, a reduced pressure principle assembly (RPPA), fireline turbine water meter with strainer, and with the bypass meter reading in cubic feet will be required, as determined by Mesa Water. The RPPA or DCVA fireline turbine water meter and fireline strainer are required to be Underwriters Laboratory (UL) listed and Factory Mutual (FM) approved for fire service.

All fire service connections smaller than 2-inches in diameter, required by either NFPA 13D (one & two family residential fire sprinkler systems) or NFPA 13R (multi-family residential fire sprinkler systems), shall be provided with the following:

- Closed fire sprinkler systems will require a double check (DC) backflow device.
- Open (flow-through) fire sprinkler systems will not require a backflow device as long as the ends of these systems are connected to a fixture that is regularly used. This prevents the water in the fire system from becoming stagnant.

The required backflow device shall be located adjacent to the building but upstream of the residential building valve, and shall be testable, and accessible for maintenance and repairs.

A "domestic water shutoff valve" may be used to effectively negate the need for any additional water demand by the home in the event of a fire. The design of the "domestic water shutoff valve" is such that if there is a fire sprinkler operation/activation during domestic usage, the valve will automatically shut off the flow to the domestic system and divert the available water supply to the sprinkler system, thereby eliminating the lower flow into the sprinkler system that might otherwise be caused by possible significant domestic water usage. The use of a domestic valve can eliminate the need to combine the domestic and sprinkler demand (gallons per minute) when performing the hydraulic design calculation.

All residential fire sprinkler systems shall be designed, fabricated, and installed in accordance with 2010 NFPA 13R or 13D and amendments as adopted by the City, local fire authority and Mesa Water. At least one water pressure gauge shall be installed on the riser assembly for multi-family residential units. All valves shall have permanently affixed signs that designate their function. The water flow switch shall be connected to the service panel on an uninterruptible house circuit. Underground mains and lead-in connections shall be flushed before connection is made to the sprinkler piping. All new systems and additions or modifications to existing piping shall be hydrostatically tested in accordance with NFPA 13R or NFPA 13D. All FDC, wall PIVs, and exposed exterior riser valves shall be painted OSHA safety red. Other fire sprinkler or supply pipe exposed or susceptible to wet conditions shall be painted (any color) or otherwise coated to inhibit corrosion. Stainless steel assemblies and piping may be left unpainted provided that any hose connections, valves, or other components operated by the fire department are painted red.

300.2.3.3 Irrigation Service Requirements:

Facilities for irrigation of new and existing parks, medians, landscaped public area or landscaped areas, lawns, or gardens surrounding condominiums, townhouses, apartments, and industrial parks shall be designed and installed in such a way as to conserve water. Rate and extent of application of water shall be controlled by the owner so as to minimize the water usage.

Irrigation systems for areas of 2,500 sf or less will be allowed to run off the domestic water meter.

In most cases, the irrigation meter shall be sized based on the peak flow through a single valve of the irrigation system (i.e. highest producing valve). However, Mesa Water reserves the right to further evaluate the system and to select a meter size that best meets the needs of the system. The meter size may be based on multiple valves, branches of the system, square footage, or as deemed most appropriate by Mesa Water District.

1. Landscape and irrigation plans must be reviewed by Mesa Water.
2. Plans MUST have an address for each irrigation service.
3. One approved irrigation plan -- showing each service's point-of-connection to Mesa Water's main.
4. Irrigation plans shall include MAWA calculations per AB 1881 if required by City or County.
5. All fees, stipulated in the agreement, must have been paid.

300.2.4 Meter Requirements

300.2.4.1 Meter Sizing

1. The table for the conversion of fixture unit to gallons per minute is included in Appendix 8.
2. Sizing of water meters for domestic application shall be consistent with the following:

GPM Demand	*Meter Size*
1-20 gpm	5/8" Displacement
21-30 gpm	¾" Displacement
31-50 gpm	1" Displacement
51-100 gpm	1-1/2" Displacement
101-120 gpm	2" Displacement
101-160 gpm	2" Compound
161-320 gpm	3" Compound
321-500 gpm	4" Compound
501-1,000 gpm	6" Compound
1,001+	8" Compound

3. Sizing of water meters for irrigation application shall be consistent with the following:

GPM Demand	*Meter Size*
1-10 gpm	5/8" Displacement
11-15 gpm	¾" Displacement
16-25 gpm	1" Displacement
26-50 gpm	1-1/2" Displacement
51-160 gpm	2" turbine

161-350 gpm	3" turbine
351-1,000 gpm	4" turbine
1,001-2,000 gpm	6" turbine
2,001-3,500 gpm	8" turbine
3,501-5,500 gpm	10" turbine
5,501+	12" turbine

Mesa Water reserves the right to size meters.

300.2.4.2 Type of Meter

A turbine meter and strainer shall be used on all irrigation services 2-inch and larger or as determined by Mesa Water.

A compound meter shall be used on all master metered multi-unit developments or as determined by Mesa Water.

300.2.5 License Requirements

The applicant's contractor shall have a Class A or C-34 license. The applicant's contractor shall have a business license to operate within the city having jurisdiction.

300.2.6 Mesa Water's Regulation Regarding Cross-Connection

All domestic water services shall be subject to the provisions of Mesa Water's "Rules and Regulations for Water Service". The following summarizes the cross-connection provisions included within these Rules and Regulations.

The purpose of these provisions is to protect Mesa Water's water supply against actual or potential cross-connections by isolating, within the premises, contamination or pollution that may occur because of undiscovered or unauthorized cross-connections on the premises. These provisions are in accordance with the California Administration Code, Title 17 (Public Health), entitled "Regulations Relating to Cross-Connections". Additional information concerning backflow prevention may be obtained from the "Manual of Cross-Connection Control", Foundation for Cross-Connection Control and Hydraulic Research, University of Southern California, School of Engineering.

Cross-connections of any type that permit a back flow condition from any source or system other than that of Mesa Water's domestic water mains are prohibited. A connection constituting a potential or actual back flow hazard is not permissible unless a back flow device or air gap, which is approved by the California Department of Public Health and the local health agency and complies with Title 17 of the California Administrative Code, is installed. Such an installation shall at all times be subject to inspection and regulation by Mesa Water for the purpose of avoiding possibility of back flow.

Mesa Water recognizes that the water purveyor has a responsibility to take all reasonable precautions to protect the integrity of the public water supply. Thus, in the exercise of this responsibility, Mesa Water may need to conduct a cross-connection control survey of the applicant's plumbing system. Mesa Water

will not address internal protection requirements. Mesa Water recommends that the applicant or his engineer contact the local health agency (Orange County Health Care Agency) to ensure the on-site water system complies with current plumbing codes, and requirements of the local health agency. Mesa Water has a cross-connection specialist who is available for consulting on any questions regarding cross-connections.

Mesa Water will not provide any water service to any premises unless the public domestic water supply is protected as required by State, County and Mesa Water regulations. Except in special situations, it is now required to have back-flow devices installed for:

- All commercial domestic water services.
- All industrial domestic water services.
- All fire service connections except as noted in Section 300.2.3.2.
- All private domestic systems or fire line systems having two, or more, points of connection to Mesa's water mains.
- All irrigation services on the domestic water system.
- All domestic services to sites where there is recycled water on-site.

Back-flow prevention devices shall be approved by the U.S.C. Foundation for Cross-Connection Control and shall be installed by and at the expense of the customer.

The customer shall have the device: tested annually by a tester certified by the Orange County Health Care Agency; service such devices to maintain them in satisfactory operating condition; and shall overhaul or replace such devices if they are found defective. Test results shall be provided before Mesa Water will accept service as complete.

Records of such annual tests, repairs, and overhauling shall be kept by the customer and copies forwarded to Mesa Water cross-connection specialist and local health agency within ten (10) working days after testing.

Service of water to any premises may be discontinued by Mesa Water if a back-flow prevention device required by Mesa Water's Rules and Regulations is not installed, tested, and maintained; or if any defect is found in an installed back-flow prevention device; or if it is found that a back-flow prevention device has been removed or bypassed; or if unprotected cross-connections exist on the premises. Services will be restored only when such conditions or defects are corrected to the satisfaction of Mesa Water.
Mesa Water will further define how water lines must be marked where multiple water systems are in use and outline the duties and responsibilities of a property's water supervisor.

Additional reference for guidelines to when, why, and what types of back-flow and cross-connection control devices are approved may be found in:

A. "Regulations Relating to Cross-Connections", California Administrative Code - Title 17 - Public Health.

B. "Manual of Cross-Connection Control", published by Foundation for Cross-Connection Control and Hydraulic Research, University of Southern California, School of Engineering.

C. EPA Cross-Connection Control Manual.

300.2.7 Backflow Device Locations

All commercial and industrial domestic water services, and domestic services to sites where there is recycled water on-site, will require that a Reduced Pressure Principle backflow device (RPPD) be installed immediately downstream of the water meter. The device must be installed in accordance with Mesa Water's Standard Drawings. The assembly must be installed above ground and cannot be installed in an underground vault. These assemblies can be installed in such a manner as to be screened from view, but must be easily accessible to Mesa Water's personnel to facilitate testing and servicing. There must be a minimum of five (5) feet of clearance on all sides of the backflow assembly. In addition, a fifteen (15 foot wide easement must be dedicated to Mesa Water from the public right-of-way to the fireline backflow assembly combination.

All fire services requiring a backflow assembly as specified in Section 300.2.3.2 (Fire Service Requirements) must be installed in accordance with Mesa Water's Standard Drawings. The required backflow assemblies must be on private property and shall be located adjacent to the building but upstream of the residential building valve, and shall be testable and easily accessible for maintenance and repairs. In addition, a fifteen (15) foot wide easement must be dedicated to Mesa Water from the public right-of-way to the backflow assembly.

300.3 PROVIDING REQUIRED EASEMENTS

If an easement outside of the public right-of-way is granted by the District Engineer and General Manager, per Section 4.2.15 of the Rules and Regulations for Water Service for construction and/or maintenance of water facilities, including but not limited to, water mains, hydrants, meter vaults, and any other water appurtenances; its minimum width shall be 15 feet for water mains; and 5 feet on all sides for meters, fire hydrants, meter vaults, and other appurtenances, unless otherwise determined by Mesa Water.

An easement running parallel with a lot line shall not be split so as to occur on two lots. The easement, title report, and legal descriptions with accompanying sketch and plans shall be prepared by the applicant's engineer, two copies of which shall be sent to Mesa Water's Engineering Department, or easements for Mesa Water facilities shall be shown on a tract or parcel map.

Easement descriptions shall be in a form acceptable to Mesa Water and will be checked by Mesa Water's Engineering Department. Easements shall also be shown on the construction plans. Mesa Water will approve the plans only after all required easements have been deeded to Mesa Water District together with any necessary partial re-conveyance or subordination agreements. Exhibits will be 8-1/2" X 11", no exceptions.

Along public streets, a three or five foot utility parallel easement on private property for Mesa Water District may be required depending upon public right-of-way widths and sidewalk locations.

Applicant shall submit two copies of the easement description, plat and boundary closure calculations to Mesa Water for review.

If acceptable, the applicant shall furnish two additional copies of the description, plat and boundary closure calculations, signed by a professional land surveyor, a current (within 30 days) title report of the property reflecting all deeds of trust and encumbrances, and subordinations signed by the trustees shown on the title

report. If not acceptable, Mesa Water will return the documents with the required corrections noted. Proposed Easements shall be approved by Mesa Water's Board of Directors prior to the installation and activation of water service.

All blanks in the documents, such as project identifications, title report number, map and book numbers and pages, dates, etc., must be filled in. The easement sketch must contain a vicinity map showing the location of the easement in relation to major streets and highways, as well as a sketch depicting the easement boundaries with bearings, distances, points of beginning, north arrow, and any other information required by Mesa Water.

NOTE: Approval by Mesa Water District will not be given for the tract water systems until all easements have been obtained to the satisfaction of Mesa Water District.

300.4 COST ESTIMATE

The developer's engineer shall provide the quantities, to allow Mesa Water's Engineering Department to estimate the project costs for the water facilities to be dedicated to Mesa Water. The items listed will include, but will not be limited to pipes, valves, meters & appurtenances, backflow devices, connections, hot taps, and facilities construction.

300.5 FIRE AUTHORITY APPROVAL

After the first plan check by Mesa Water, it will become the responsibility of the applicant's engineer to have the local Fire Authority approval before submitting the water improvement plans for a second plan check. Fire flow requirements for the development shall be submitted with the second plan check submitted as well as the required fire hydrant spacing. Mesa Water reserves the right to require additional fire protection or modify water facility sizes as deemed necessary. Fire Department letter of requirement as stated under condition of approval will be submitted.

Local Fire Authority's approval shall be coordinated by the Developer and/or his engineer and will be required prior to Mesa Water's approval of the plans.

300.6 SECOND (& SUBSEQUENT) PLAN CHECK SUBMITTALS

The applicant/engineer shall submit the following items for second (and all subsequent plan-checks) of any residential, commercial, or industrial subdivisions:

1. One (1) set of the revised water improvement plans (bond paper) and one (1) set tract/parcel map (bond paper). The plans must be approved by the Fire Authority having jurisdiction over the area of development prior to the second plan check.
2. Redlined plan check set from first plan review.

When the plans are substantially complete, with only minor revisions remaining, Mesa Water may choose to compute the required Capacity and Plan Check Deposits (Payment Voucher included in Appendix 3) and prepare the Water Service Agreement. The applicant will be notified when the agreement and the Payment Voucher are available. One (1) red-lined set of plan check comments will be returned to the applicant's engineer for corrections upon completion of any plan check.

300.7 WATER SERVICE AGREEMENT

When the plans are substantially complete, with only minor revisions remaining, Mesa Water will compute the required Capacity Charges, Meter Charges, and Administrative and Engineering Fees (Payment Voucher included in Appendix 3) and prepare the Water Service Agreement. The applicant will be notified when the agreement and the Payment Voucher are available.

Mesa Water will send a draft copy of the Agreement to the developer including the attached Exhibit "A" summarizing the Water Service Fees and Charges.

300.7.1 Bonds

The applicant will provide, concurrently with the signed Water Service Agreement, if applicable, Payment and Performance Bonds, in connection with the water facilities to be constructed and for an amount to be determined per section 200.2.3 of this document.

300.8 FINAL PLAN APPROVAL

Water improvement plans must be approved by the District Engineer before any construction can start. Approval by the District Engineer will be contingent upon satisfying the following requirements:

1. All required corrections have been made on the water improvement plans, and are in conformance with Mesa Water's Standard Specifications.
2. The Water Service Agreement (Appendix 4) has been executed by the applicant and returned to Mesa Water.
3. All required easement documents have been executed and delivered to Mesa Water. Tract/parcel maps must be signed by Mesa Water prior to plan approval.
4. All required Fees and Charges have been paid by the developer/applicant.
5. All required bonds have been posted with the appropriate entity.
6. All plan submission requirements have been met (mylars, prints and CD).

When the plans have been approved, the applicant's engineer will be notified.

300.9 WATER SERVICE FEES AND CHARGES

The applicant agrees to pay all administrative and engineering fees, (including inspection and plan check costs), as well as Capacity Charges, meter charges, interim water service line charges, if applicable, and any other charges of Mesa Water. Such fees and charges shall be set forth on Exhibit "A" of the Water Services Agreement between the applicant and Mesa Water District.

300.10 BOARD APPROVAL OF AGREEMENT

Upon satisfactory completion of items 300.1 through 300.9, Mesa Water will, at the request of the applicant, finalize cost of services and issue a permit.

300.11 SIGNED PLANS

300.11.1 Submittal of Signed Plans

Once the plan has been signed by the District Engineer, the applicant must submit to Mesa Water a 24" by 36" 4-mil duplicate mylar of the signed plan for the Engineering Department files along with one full-sized set of prints on bond paper (blueprints) of the approved plans and one (1) compact disk (CD). The CD will contain a single PDF file of the entire approved plan set, i.e. reflecting Mesa Water's approval signatures. The PDF file will be of a quality high resolution since it will be made a part of Mesa Water's public electronic library of plans.

300.11.2 Validity of Signed Plans

Plans will be valid for one (1) year from the date of Mesa Water's approval. If construction has not started within one year from date of approval, the signed plans shall become "null and void." Mesa Water will require rechecking of the plans and it reserves the right to charge additional plan check fees.

300.12 ORDER OF PRECEDENCE OF STANDARDS

In the case of conflict between the specifications, drawings, and permit requirements, with regard to construction of facilities, the following order of precedence will apply: the permit requirements of other agencies, special details, plans, special conditions, Standard Drawings, Technical Specifications, General Conditions, the Standard Specifications for Public Works Construction, and the Cal Trans Manual.

Figured dimensions of the drawings shall govern, but work not dimensioned shall be as directed. Work not particularly shown or specified shall be the same as similar parts that are shown or specified or as directed. Full-size details shall take precedence over scale drawings as to shape and details of construction. Scale drawings, full-size details, and specifications are intended to be fully cooperative and to agree; but should any discrepancy or apparent difference occur between the plans and specifications, or should errors occur in projects being constructed by others affecting the work, and the contractor proceeds with the work affected without instruction from Mesa Water, the contractor shall be fully responsible for any resultant damage or defect.

300.12.1 Permit Requirements

The permit requirements, as approved by the agency having jurisdiction, will take precedence over the below listed details and standards with regard to the construction of water facilities.

300.12.2 Special Details

The special details, as approved by the signature of the District Engineer, will take precedence over the below listed details and standards with regard to the construction of water facilities.

300.12.3 Plans

The plans, as approved by the signature of the District Engineer, will take precedence over the below listed details and standards with regard to the construction of water facilities.

300.12.4 Special Conditions

The special conditions, for the specific project and incorporated into the project contract documents, as approved by the District Engineer, will take precedence over the below listed standards with regard to the construction of water facilities.

300.12.5 Mesa Water's Standard Drawings

Mesa Water's Standard Drawings, as approved by the signature of the District Engineer, will take precedence over the below listed details and standards with regard to the construction of water facilities.

300.12.6 Mesa Water's Standard Specifications

Mesa Water's "Standard Specifications and Drawings," as approved by the signature of the District Engineer, will take precedence over the below listed standards with regard to the construction of water facilities.

300.12.7 Mesa Water's Technical Specifications

The Technical Specifications, of Mesa Water's "Standard Specifications and Drawings," as detailed above, and as approved by the District Engineer, will take precedence over the below listed standards with regard to the construction of water facilities.

300.12.8 Standard Specifications for Public Works Construction

The Standard Specifications for Public Works Construction as reference by Mesa Water's details, standards and specifications, will take precedence over other standards with regard to the construction of water facilities.

The "Standard Specifications for Public Works Construction," (Green Book), are incorporated herein by this reference. Copies may be purchased from Building News, Inc., 3055 Overland Avenue, Los Angeles, California 90034.

300.12.9 The Cal-Trans Manual

The Cal-Trans Manual, as referenced by Mesa Water's details, standards and specifications, will take precedence over other standards with regard to the construction of water facilities. The "Standard Specifications," CALTRANS, are incorporated herein by this reference, copies of which may be purchased from the State of California, Department of Transportation.

300.13 RECORD DRAWINGS

Record drawings documenting "as-built" changes will be provided to Mesa Water once construction has been completed. These record drawings will be reviewed by Mesa Water's Construction Inspector to confirm its accuracy.

300.14 PROJECT CONSTRUCTION

300.14.1 Notification

Notice shall be given to Mesa Water Construction Inspector at least 48 hours before starting construction. Signed water improvement plans must be delivered to the inspector at least two working days before the contractor will be allowed to start construction. The City or County inspector shall be notified prior to work within public right-of-way.

300.14.2 Preconstruction Meeting

A preconstruction conference is to be held 24 hours before starting construction, at which will be present the applicant's contractor's working foremen and/or job superintendent, the applicant's engineer, and Mesa Water Construction Inspector. The purpose of this meeting will be to answer any questions on Mesa Water specification requirements, to obtain the contractor's construction schedule, and to discuss any known circumstances that might affect job installation.

300.14.2.1 Preconstruction Meeting Agenda

Without relieving the developer of responsibilities outlined elsewhere in the specifications, Mesa Water will present a list of requirements that may contain, but will not be limited to, the following items:

1. Order of work.
2. Working hours.
3. Operation manuals.
4. Manufacture’s specifications.
5. Pressure test results.
6. Bacterial test results.
7. Record Drawings

300.14.2.2 Order of Precedence

The order of precedence as defined in Section 300.12 will be reviewed in the pre-construction meeting.

300.14.3 Curbs Installed Before Starting Water Facilities

It is a basic requirement of Mesa Water that the curbs be installed in tracts prior to starting the installation of water facilities. They act as positive grade control for setting services and fire hydrants. Mesa Water may approve an exception if the developer signs a written letter, agreeing to comply with the following requirements:

1. All requirements shall be met before the excavation of pipeline trenches.
2. The owner is to submit engineered drawings showing both the plan and profile of the proposed pipelines for Mesa Water review and acceptance.

3. The owner is to provide survey staking. The proposed pipelines per the profile with cuts to flow line at a maximum of 25-foot stationing showing all horizontal and vertical grades breaks, tees, and valves, fire hydrant, blow-offs, air vacs, services, and all other appurtenances indicated on the plans.
4. Prior to backfill, the engineer shall certify line and grade of the pipeline and all the appurtenances and provide Mesa Water Construction Inspector with a copy of the certification.
5. In the event that a portion or any part of the pipeline and its appurtenances is not installed to the satisfaction of the Mesa Water Construction Inspector, the owner agrees to expose and re-lay the pipeline accordingly.

300.14.4 Water for Construction Purposes

The contractor will be furnished construction water at a connection point designated by Mesa Water after payment of fees. The water shall be taken through a metered delivery and the developer shall pay all costs related thereto, including (but not limited to) Mesa Water's standard deposit for temporary meter and actual costs of water used, pumping costs, loading, hauling and the use thereof. The developer shall make all arrangements for transporting the water to the construction site.

300.14.5 Inspection of Work

All materials and equipment that would be in direct contact with the potable water supply shall be NSF 61 compliant.

300.14.5.1 Access

All work shall be subject to inspection by Mesa Water and shall be left open and uncovered until approved by appropriate Mesa Water personnel.

300.14.5.2 Domestic Water System Inspections

The Contractor shall not proceed with any subsequent phase of work until the previous phase has been inspected and approved by Mesa Water. Inspection shall be made at the following intervals of work:

1. Delivery of materials to job site.
2. Trench excavation and bedding.
3. Placing of pipe, fittings, and structures, including notification/warning tape on potable mains and recycled irrigation water main and service lines.
4. Pouring all concrete anchors and thrust blocks.
5. Placing and compacting the pipe zone back fill.
6. Backfilling balance of trench to grade. Compaction tests are to be performed by governing agency road departments in public right-of-way or by private soils consultant retained by the applicant and acceptable to Mesa Water in private streets and easements. Copies of test results shall be given to Mesa Water, and the governing agency, by the applicant for approval before final acceptance of the work. Backfilling and repaving shall be in accordance with the requirements of the city having

jurisdiction.

7. Pressure testing all mains and services.
8. Disinfecting and flushing (Chlorination and bacteriological testing).
9. Health samples.
10. Repaving trench cuts.
11. Raising valve box covers to finish grade and paint to Mesa Water Standards.
12. Fire hydrants painted and pads poured.
13. Installation of service lines, appurtenances meter boxes, and customer service valves.
14. Connection to the existing system.

300.14.6 Mesa Water Authority

300.14.6.1 Access

Mesa Water shall at all times have access to the work during construction and shall be furnished with every reasonable facility for ascertaining full knowledge respecting the progress, quality of labor, and character of materials used and employed in the work. No pipe, fittings, or other materials shall be installed or backfilled until inspected and approved by Mesa Water or its representative. The contractor shall give due notice in advance of backfilling to Mesa Water Inspector so that proper inspection may be provided.

300.14.6.2 Obligation

Inspection of the work shall not relieve the contractor of any obligations to complete the work as prescribed by the Standard Specifications. Any known defective work shall be corrected before testing or final inspection will be permitted. Unsuitable materials may be rejected, even though they may have been previously overlooked by the inspector.

300.14.6.3 Suspension of Work

Mesa Water shall have the authority to suspend the work wholly or in part for such time as it may deem necessary if the contractor fails to carry out orders given by Mesa Water's inspector, or to perform any required provisions of the plans and specifications. The contractor shall immediately comply with a written order of Mesa Water to suspend the work wholly or in part. The work shall be resumed when methods or defective work are corrected as ordered and approved in writing by Mesa Water.

300.14.7 Pressure Test

A pressure test of the newly constructed domestic water lines shall be conducted as detailed in Technical Specification Section 15042.

300.14.8 Water for Flushing, Testing and Sterilization

Domestic water for flushing, testing and sterilization of the completed pipelines or sections thereof will be available from Mesa Water at the point, or points, of connection with the existing domestic water mains via

the construction water connection. The developer shall make all arrangements for this water with Mesa Water, which shall designate the exact location of the outlet or outlets and the time periods these connections may be used.

If, due to construction problems or for any other reason, the developer desires to use water from some other source for testing, flushing, or chlorination, it shall be the responsibility of the developer to obtain the source of water, which water shall be tested and approved by the County of Orange Health Care Agency prior to the use thereof. All expenses for obtaining and using another source of water shall be paid by the developer.

Flushing operations shall be conducted with a residual line pressure not less than 30 psi and a Mesa Water representative will be present. Adequate connections to conduct the flushing, testing and sterilization operations shall be furnished by the contractor and reviewed by the engineer, at no added cost to Mesa Water, and the developer shall pay for any and all costs for flushing, testing and sterilization.

300.14.9 Chlorination and Bacteriological Testing

After a passing pressure test, the domestic water lines shall be chlorinated and tested for bacteria as detailed in Technical Specification Section 15041.

300.14.10 Final Domestic Water Facilities Inspection

Before final acceptance, Mesa Water's inspector will make a final inspection of all work, accompanied by the contractor's superintendent or representative, to verify that:

1. All phases of the job are complete in accordance with plans and specifications.
2. All valve boxes are raised to finish grade and that all repairs are completed.
3. All valves are referenced and the inspector has been given all reference measurements. Valves shall be located by a 2-inch "V" chiseled in the adjacent curb face.
4. All right-angle meter stops, and the meters, are properly positioned and all meter boxes are positioned and raised to proper grade.
5. Fire hydrants are raised to proper grade, are in a vertical position, painted; and its concrete pad is poured.
6. Backfill has passed all compaction testing.
7. All system valves are turned and left open (except those specifically required to be normally closed), turns required for complete open/close cycle are recorded on the record drawings.
8. Domestic water lines have been chlorinated and have passed the required bacteriological tests.
9. Water line pressure testing and flushing have been completed.
10. The job site is clean and cleared of all the contractor's equipment and materials.
11. All service lateral locations have been marked on curbs.
12. Certified test results have been provided for all backflow prevention devices.
13. A mylar and a blue line or bond copy of the water facility plans labeled "RECORD DRAWINGS"

with the "As-Built" revisions have been delivered to Mesa Water.

14. Digital submittal of plan information in a format acceptable to Mesa Water.

300.14.11 Raising of Valve Boxes

For paved areas in the applicant's development, Mesa Water will raise all valves for Mesa Water constructed facilities to the first lift of pavement. For succeeding pavement lifts, it shall be the responsibility of the applicant to raise to grade all valves after each lift of pavement.

Applicant is required to raise all valves constructed by applicant after each pavement lift.

300.15 RECORD MYLARS

Record drawings shall be completed and submitted by the developer's California Registered Civil Engineer (for Easement documents), as detailed in these Standard Specifications. The applicant shall furnish to Mesa Water "record drawings" (one set of blue line or bond prints and one set of mylar) showing all revisions to the original approved plans. All future extension of water transmission mains will have the invert elevation of the terminal pipe verified by the applicant and posted on the drawings. Failure to comply with these requirements will necessitate withholding the letter of acceptance.

300.16 EASEMENT VERIFICATION

The developer's engineer or Professional Land Surveyor will verify in writing that the facilities to be accepted by Mesa Water were constructed within the easements as listed in the easement documents

300.17 METER USE AND FEE VERIFICATION

With the record drawings, the applicant is to furnish Mesa Water a cost breakdown of the newly installed facilities for Mesa Water accounting purposes. This is to be furnished to Mesa Water before an acceptance letter releasing bond will be written. Mesa Water will verify the quantities used in the calculation of the fees for the Water Service Agreement. Any adjustments to the fees will be made at this time.

300.18 BOARD ACCEPTANCE

After satisfactory completion of the items in Section 300.1 through 300.17, Mesa Water will, upon the request of the developer, petition Mesa Water District's governing board for acceptance of the project, and the commencement of the one year warranty period.

Mesa Water will also re-evaluate the plans for compliance with the Water Service Agreement and reserves the right to re-assess the charges and fees if deviations from the originally approved plans have been made.

Changes include, but are not limited to: The number of service connections, meter sizes, building square footage, the irrigated area, the number of dwelling units, and any other measure used to calculate the original charges and fees.

300.19 RELEASE GIVEN TO CITY AND/OR COUNTY

300.19.1 Bond Release

All final inspection requirements shall be fulfilled before Mesa Water will give its final acceptance notice to the city and/or County for release of the applicant's bond to those agencies. The applicant's bond with Mesa Water shall remain in effect in accordance with the Water Service Agreement.

300.19.2 Domestic Water Service in service prior to Acceptance

Mesa Water's District Engineer may approve putting newly installed domestic water system into service prior to Board acceptance after compaction has been approved by the governing agency and the portions have been pressure tested, chlorinated, flushed, and have passed the bacteriological test and inspection for domestic water mains. This partial acceptance shall be granted only upon written request from the applicant and subsequent approval by the District Engineer. Upon this written approval for partial acceptance of facilities, the applicant shall be relieved of the duty to maintain the portions so used or place into operation provided, however, that nothing in this section shall be constructed as relieving the applicant of full responsibility for completing the work in its entirety, for making good any defective work and materials, for protecting the work from damage, and for being responsible for damage and for work as set forth in the agreement and other contractual documents; nor shall such action by Mesa Water be deemed completion and acceptance, and such action shall not relieve the applicant of the guarantee provision of the Water Service Agreement with Mesa Water District.

300.20 SECURITY RELEASE

If in the time period of one year from the date of Board acceptance no failure of the system has occurred, which has gone unrepaired by the developer, to the satisfaction of Mesa Water: the developer may petition Mesa Water District to request final acceptance of the project by the Board and release of the surety.

END OF SECTION

SECTION 400

DESIGN CRITERIA, WATER FACILITIES

The following sections are design criteria to be used in the design of water facilities for Mesa Water. The developer/applicant and his engineer shall be responsible to ensure that designs submitted are consistent with Mesa Water "Rules and Regulations for Water Service", these Standard Specifications, and generally accepted standards of good engineering practice.

400.1 MINIMUM SIZE MAINS

The normal minimum size distribution main pipe shall be looped 8-inch AWWA C-900 PVC, SDR-14, unless otherwise noted and approved. On short cul-de-sac dead-end mains 4-inch (with a maximum of ten (10) each, 1-inch or smaller services) or 6-inch (with more than ten (10) each, 1-inch or smaller service lines) lines may be allowed, however, 8-inch size main must be used to the last fire hydrant.

These smaller mains may be individually approved by the District Engineer on dead-end mains without fire hydrants. These mains shall be sized so that sufficient water is regularly drawn to prevent stagnation.

400.2 DESIGN FLOW AND PIPE VELOCITY CRITERIA

The criteria for velocity shall be as described herein. The maximum velocity in a line shall not exceed 5 fps (feet per second) during the peak hour condition. The peak hour is defined as 4 times the average day demand. The maximum velocity in a line shall not exceed 7 fps during the maximum day plus fire demand condition. The maximum day is defined as 2 times the average day demand.

400.3 TYPE OF MAIN PIPE

Distribution Mains. Typically, AWWA C-900 P.V.C. pipe, SDR-14 is to be used for distribution mains of 4 inches thru 12 inches in diameter.

Transmission Mains. For 16-inch thru 20-inch diameters, pipe shall be ductile-iron pipe, Class 200, or AWWA C-905 P.V.C. pipe, SDR-18 or CML&C steel pipe. For pipe, 24 inches and larger in diameter, only CML&C steel pipe will be allowed.

400.4 MINIMUM DEPTH TO TOP OF WATER MAIN PIPE

400.4.1 Residential Areas (Distribution Mains 10"and smaller)

The top of the pipe is to be a minimum of 30 inches below the street subgrade or 30 inches below the undercut, whichever is greater, unless indicated otherwise on the project construction plans or as directed otherwise by the Mesa Water Inspector because of unusual field conditions. At no time shall the pipe have less than 42 inches of cover between the top of the pipe and the finished street grade.

The top of pipe is to be a minimum of 48 inches below finish grade in unpaved areas.

400.4.2 Transmission Mains (12" and larger)

The top of the pipe is to be a minimum of 36 inches below the street subgrade or 36 inches below the undercut, whichever is greater, unless indicated otherwise on the project construction plans or as directed otherwise by the Mesa Water Inspector because of unusual field conditions. At no time shall the pipe have less than 48 inches of cover between the top of the pipe and the finished street grade.

The top of pipe is to be a minimum of 60 inches below finish grade in unpaved areas.

400.4.3 Storm Drain Systems

Storm drain systems must be designed with sufficient cover so that the water mains and service laterals can be constructed over the top of the storm drain mainline and laterals while still maintaining the above minimum depth of cover.

400.5 STANDARD LOCATION

Water main center-lines shall normally be located six (6) feet from the curb face for all pipelines 12-inches in diameter and smaller. For pipelines 16-inches in diameter and larger, the water main center-line shall be located eight (8) feet from the curb face. Alignments may need to be deflected to avoid cross gutters, concrete bus lanes or other interferences as directed by Mesa Water.

Where water pipelines are designed to cross perpendicular beneath retaining walls or other structures (specific written permission required for each instance), the pipeline shall be constructed in a steel pipe casing of sufficient size and thickness and with a minimum vertical clearance of at least eighteen (18) inches from the footing or structure itself.

400.6 WATER VALVE SPACING

As a general rule, there should be three (3) control valves where one main ties into another. Where two mains cross, there shall be four valves.

On long blocks, intermediate valves should be installed so that no more than twenty-eight (28) dwelling units, six hundred (600) feet of main, or two (2) fire hydrants will be out of service at any time. Additional looping of the main lines may be necessary to satisfy this condition and the arrangement of valves within the distribution system will be reviewed to identify the optimum network layout.

In most cases where water mains pass through easements outside traveled streets, a valve shall be located at each end of the easement.

The final determination of the quantity of valves and their locations shall be as directed and approved by Mesa Water.

400.7 SEPARATION REQUIREMENTS

400.7.1 Horizontal Separation

State Health Department regulations require that new water mains shall be installed at least ten (10) feet horizontally from and one (1) foot above, any parallel pipeline conveying:

- Untreated sewage;
- Primary or secondary treated sewage;
- Disinfected secondary recycled water; and
- Hazardous fluids such as fuels, industrial wastes, and wastewater sludge.

New water mains shall be installed at least four (4) feet horizontally from, and one (1) foot vertically above, any parallel pipeline conveying: disinfected tertiary recycled water (Title 22); and storm drainage.

If crossing a pipeline containing sewage, recycled water, or storm drainage, a new water main shall be constructed no less than 45-degrees to and at least one (1) foot above the pipeline. No connection joints shall be made in the water main within eight (8) horizontal feet of the other pipeline.

The vertical separation noted above is required only when the horizontal distance between a water main and the pipeline carrying the above fluids is less than ten (10) feet.

The minimum separation distances noted above shall be measured from the nearest outside edge of each pipe barrel.

With the State Health Department's approval, newly installed water mains may be exempt from the separation distances noted above if the newly installed main is:

- Less than 1,320 linear feet in length;
- Replacing an existing main, installed in the same location, and has a diameter no greater than six (6) inches more than the diameter of the main it is replacing; and
- Installed in a manner that minimizes the potential for contamination, including, but not limited to: sleeving the newly installed main; or utilizing upgraded piping material.

These requirements are shown on Mesa Water's Separation Requirements Standard Drawing as well as the special construction methods which may be used where this separation cannot be achieved. Separation other than the Health Department minimums must be approved by the District Engineer.

400.7.2 Vertical Separation

Normally, water, sewer, and recycled water shall be located vertically from the street surface of the higher quality, i.e., domestic water shall be above recycled water and recycled water shall be above sewer.

Whenever a crossing must occur where a sewer main passes within one (1) foot of a domestic water main, special construction will be required as shown on Mesa Water Separation Requirement Standard Drawing. Encasement may be required if vertical separation requirements cannot be met. One of the following types of encasement may be required:

1. Reinforced concrete encasement, a minimum thickness of 6 inches.
2. Piping within a continuous steel casing which shall have a thickness of not less than 1/4 inch.

If a sewer is above a water main, the special construction shall extend a minimum of ten (10) feet of horizontal clearance on both sides, or if not feasible, center the piece of new water pipe under the crossing to maximize this horizontal clearance.

If a sewer is located below a water main, and within a vertical distance of a one (1) foot clearance distance, the special construction shall extend a minimum of four (4) feet of horizontal clearance on both sides of the crossing. These construction requirements shall not apply to house laterals that cross perpendicular less than one (1) foot below a pressure water main.

400.7.3 Separation from New and Existing Utilities

Construction of new utilities or structures shall maintain a minimum of five (5) foot parallel separation and a minimum of one (1) foot vertical separation from all Mesa Water pipelines, construction of new water facilities shall maintain a minimum of five (5) foot parallel separation and one (1) foot minimum vertical separation from all existing utilities and structures.

400.8 FIRE FLOW REQUIREMENTS

The design criteria to be used for determining fire flow requirements shall be **the actual fire flow requirements as determined by the Costa Mesa Fire Department, or per appropriate local fire jurisdiction** for the specific area under development.

Before designing the domestic water system for a project, the applicant shall obtain the Orange County Fire Authority or the appropriate local fire jurisdiction fire flow requirements for the project. These requirements, plus indication of the Fire Authority's approval, are required to be on the improvement plans prior to Mesa Water's approval. All existing fire flow tests shall be performed by Mesa Water. Mesa Water will charge a fee to perform this fire flow test. As a general guide, the following shall be considered, as the minimum:

400.8.1 Residential Dwelling Units

The water system shall be capable of providing a residential fire flow minimum of 2,000 gpm, combined flow, for a 4-hour duration from any two adjacent hydrants at a minimum 20 pounds of residual pressure (psi) at the main. For residences 3,600 square feet and under and not contiguous with open space areas, the minimum requirement shall be 1,000 gpm per hydrant at 20 psi (for a total flow of 2,000 gpm). For residences 3,600 square feet and under which are contiguous with open space areas, the minimum requirement shall be 1,000 gpm per hydrant at 30 psi (for a total flow of 2,000 gpm). For residences over 3,600 square feet, the Fire Authority shall be consulted. The open space area is defined as any area bordering an undeveloped open space with no fire control mechanism. New residential dwelling units may be constructed with residential fire sprinkler systems (if required by NFPA 13D or NFPA 13R) which will reduce the minimum fire flow requirements.

400.8.2 Schools and Commercial Areas

The system shall be capable of providing a fire flow of at least 3,000 gpm for 3 hours duration (or as required by the Fire Authority) out of any two adjacent hydrants at a minimum 20 pounds of residual pressure at the main. Most schools and commercial areas will have built-in sprinkler protection for the buildings which will reduce the minimum fire flow requirements.

400.8.3 Industrial Areas

In industrial developments requiring a high fire flow, the applicant shall consult with the Fire Authority to discuss options for upgrading the domestic water system to deliver the fire flow or provide built-in sprinkler protection for the structures.

400.9 FIRE HYDRANT LOCATIONS

The location of fire hydrants shall be as determined by the Orange County Fire Authority or the appropriate local fire jurisdiction for the specific area under development. The exact location with respect to the curb and sidewalk shall be as shown per Mesa Water Standard Drawings.

400.9.1 Fire Hydrant spacing

The maximum fire hydrant separation shall be 300 feet from fire hydrant to fire hydrant. The actual spacing will be determined by the Fire Authority. Fire hydrants shall be located a minimum of three (3) feet from the ECR or BCR at intersections or near lot lines. No fire hydrant shall be located within 3 feet of a driveway, or closer than 40 feet to any structure (unless approved by the Fire Authority).

In selected situations where the fire hydrant run is over 20 feet, the size of the hydrant lateral may be increased to 8-inches.

400.9.2 Types of Hydrants

Wet barrel all- bronze type hydrants with check valve, as specified by Mesa Water Standard Specifications, are to be used at all locations.

400.9.3 Plan Requirements

Fire hydrants shall be shown on the plans where the hydrant is to be located with respect to the property line. Mesa Water fire hydrants shall be located within the public right of way. Maintenance and construction of private hydrants shall be the responsibility of the property owner, and painted red. The building foot prints or building pad areas are also to be shown.

400.10 SERVICE MATERIALS AND MINIMUM SERVICE SIZE

400.10.1 General

Approved materials and manufacturers for various service material tubing and connections are as listed in Mesa Water's Standard Specifications.

400.10.2 Minimum Domestic Service Size

Minimum domestic service line size shall be 1-inch in diameter for 5/8-inch, ¾”-inch and 1-inch meters. Shared services, termed a “Dominguez Tee,” that serve two adjacent properties shall require an individual service upgrade to accommodate an increase in meter size due to a remodel or new construction demands. Improvements shall be paid by the property owner undertaking the proposed property improvements. The sizing of the service shall be specified on the plans designated by lot numbers. Services for private-street residential, commercial or industrial developments are to be as shown on plans and may require a detail on the plans of the location of the proposed service.

400.10.3 Type of Service Line

Acceptable service line material is as described below:

- 1-inch and 2-inch service lines shall be copper tubing, Type “K” soft.
- 4- inch and larger service lines shall use PVC pipe per Technical Specification Section 15064. 3-inch service is not acceptable, use 4-inch piping upstream of meter.

400.10.4 Meters

All residential meters 5/8" through 2" will be furnished by Mesa Water, subsequent to payment of all applicable charges, and installed by Mesa Water. All industrial, commercial, individual service meters 3" and larger will be furnished by Mesa Water, subsequent to payment of all applicable charges, and installed by the applicant.

400.10.5 Pressure Reducing Valves

Individual pressure regulators are required by the Uniform Plumbing Code if the average static pressure in the water main is 80 psi or more. Where required, the water service shall be provided with approved pressure regulators set at 80 psi, and shall be installed per Mesa Water Standard Drawings or appropriate governing agency's standards.

400.11 STANDARD WATER NOTES

The following Standard Water Notes shall be included on all improvement plans or water system construction plans:

1. All water system work shall conform to Mesa Water's "Standard Specifications for the Construction of Water Facilities", as last revised. The contractor shall have a copy of the project plans and Mesa Water’s Standard Specifications on the job at all times.
2. A pre-construction meeting of representatives from various other affected utility companies, agencies and the contractor shall be held on the job site (or at a location approved by Mesa Water) at least forty-eight (48) hours prior to the start of work.
3. Mesa Water’s Inspector shall be notified at least two working days before start of work or any inspection. To arrange for inspection, call (949) 631-1291.
4. Water mains shall be installed after the installation of curb and gutter at six feet off of curb face, or as staked by the applicant's surveyor at a minimum 50-foot stationing, if there are no existing curbs.
5. Water meters shall not be located within a driveway. Any water meter found to be within a driveway shall be removed completely and reinstalled at the proper location, at no cost to Mesa Water.
6. All water service laterals shall be constructed perpendicular to the water main without bends or angles from the connection point on the main.
7. All main line valves shall be maintained so as to be accessible during tract development and construction. All valve stem tops having over 48 inches of cover will require an extension meeting Mesa Water Standard Drawing.

8. The top of the pipe 10 inches in diameter and smaller shall be a minimum of 30 inches of cover from the street subgrade or undercut, whichever is greater, unless indicated otherwise on the job plans or as directed otherwise by Mesa Water Inspector because of unusual field conditions. At no time shall the pipe have less than 42 inches of cover between the top of the pipe and the finished street grade.
9. The top of the pipe 12 inches in diameter and larger shall be a minimum of 36 inches of cover from the street subgrade or undercut, whichever is greater, unless indicated otherwise on the job plans or as directed otherwise by Mesa Water Inspector because of unusual field conditions. At no time shall the pipe have less than 48 inches of cover between the top of the pipe and the finished street grade.
10. Pipe shall be bedded and backfilled per Mesa Water Standard Drawings.
11. Fire hydrants shall be installed in accordance with Mesa Water's Standard Drawings and installed behind curbs and sidewalks where the sidewalks are adjacent to the curbs. Fire hydrants shall be per Mesa Water's Standard Specifications and shall have a concrete pad poured around them. All fire hydrants shall be set with the bottom flange 4 inches above the concrete pad or sidewalk.
12. All water mains 4-inches through 12-inches shall be SDR-14 or thicker, AWWA C-900 PVC, unless otherwise approved by Mesa Water.
13. No facility is to be backfilled until inspected and approved by a Mesa Water Inspector.
14. Shut down or tapping of existing waterlines to facilitate connection to existing facilities shall be coordinated with Mesa Water. Any relocation of existing facilities are subject to approval of the District Engineer.
15. No "hot-taps" or other tie-in connections shall be made to existing Mesa Water mains prior to conducting and passing an approved pressure test and a bacteriological test on the new water distribution system.
16. Tapping sleeves, where called for on the plans, shall be pressure tested in an approved manner in the field, in the presence of Water Mesa Inspector, prior to tapping the main line. Tapping of the main line shall not proceed unless a Mesa Water Inspector is present. Size on size taps of water mains will require approval from Mesa Water on a case-by-case basis.
17. All water services shall be installed per Mesa Water's Standard Specifications. All meters shall be installed in grass or planter areas and accessible by vehicle. Any services located in sidewalks are subject to the City or appropriate governing agency and Mesa Water approval. Any meters located in banks of 4 shall be manifolded per Mesa Water Standard Drawings. All meter registers and lids shall be marked with address identification.
18. Where meters and meter boxes are located within slopes, the angle meter stops shall be so located that the meters and boxes will be parallel and flush, respectively, with the finished surface. Wherever the surrounding grade exceeds eight (8) percent, or in the opinion of Mesa Water Inspector, the adjacent slope is too great, a small retaining wall, clear of the meter box, shall be constructed to the satisfaction of the Mesa Water representative.
19. The applicant shall furnish and install the service lateral between water mains, meters and meter boxes. Water services shall be installed to the property line prior to paving of the street.
20. Curbs shall be inscribed with a "W" indicating locations of all domestic water services. Letter inscription shall be made using a 4-inch power tool wheel grinder.
21. Curbs shall be inscribed with tie downs for all valve locations. Letter inscription shall be made using a 4-inch power tool wheel grinder.

22. The contractor shall expose all points of connection to the existing water system for verification of horizontal and vertical location before construction.

23. All valves shall be located off the tee unless otherwise approved by Mesa Water.

24. At street intersections and bus stops with concrete pads, the main line shall be roped to avoid cross gutter conflict.

25. Individual pressure regulators will be required by the Uniform Plumbing Code if static pressure in the main is 80 psi or more.

26. All 5/8" through 2" meters and customer service valves will be furnished by Mesa Water following receipt of payment of all applicable charges and fees. Mesa Water shall install all 5/8" through 2" meters and customer service valves. The contractor shall expose all angle meter stops and properly locate the meter boxes to grade prior to requesting inspection and installation of the meters and customer service valves by Mesa Water.

27. All nuts and bolts, including valves body bolts and flanges, shall be grade 316 stainless steel. All buried flanges, valves and fittings shall be wrapped with 10-mil polyethylene sheet.

28. Final inspection of new water mains must include water samples that will be tested for presence of bacteria. Two (2) consecutive "passing" samples are required for acceptance.

29. Any water obtained from Mesa Water facilities shall be metered with a construction meter obtained from Mesa Water. The use of jumpers is allowed by permit only. Meters must be installed prior to occupancy of a dwelling.

30. The contractor working on Mesa Water facilities must have a C-34 license issued by the State Contractor's License Board or Class "A" General Contractors License.

31. Contractor shall obtain and show proof of a construction dewatering permit from the State of California, Regional Water Quality Control Board prior to the start of construction, unless otherwise approved by the District Engineer.

32. An Encroachment Permit from the appropriate jurisdictional agency (City of Costa Mesa, City of Newport Beach or the County of Orange) is required prior to any work within public right-of-way or easement.

33. The existence and location of any underground utilities or structures shown on these plans were obtained by a search of the available records. Approval of these plans by Mesa Water does not guarantee the accuracy, completeness, location, or the existence or non-existence of any utility pipe or structure within the limits of this project. The contractor is required to take all due precautionary means necessary to protect those utility lines not shown on these plans.

34. The applicant shall remove to the satisfaction of Mesa Water's Inspector all unused water stubs and/or services that were provided to the project site.

35. All valves 12-inches in diameter and larger shall be flanged and shall be bi-directionally tested and installed in accordance with Mesa Water's Standard Specifications and Standard Drawings.

36. If a 13D sprinkler system is not a flow through (passive purge) system, then a testable backflow device next to building (residential only) shall be installed. Mesa Water's Inspector shall verify all flow through systems by:

    - Turning off house valve
    - Check for flow on flow through connection (i.e. toilet or sink)

37. Vegetation, including trees and shrubbery, shall not be planted within 5 feet of water meters, services, or pipelines.

400.12 MISCELLANEOUS STANDARD GUIDELINES

1. Separate estimate of quantities for the domestic water systems indicating quantity of pipes, valves, fire hydrants, domestic water services, etc. are to be included on the plans.

2. Plan and profile sheet to show existing underground utilities as well as proposed underground utilities. Vertical clearance at crossings shall be indicated by showing top of pipe and bottom pipe elevation at point of intersection.
3. Blow-off assemblies shall be installed at low points of all mains. Temporary blow-offs shall be installed as service stub-outs for testing and flushing purposes.
4. Combination air valves are to be installed at all high points of water mains in accordance with Mesa Water's Standard Specifications.
5. Generally, Mesa Water requires all fittings and valves (smaller than 12-inches in diameter) to have "push-on" type ends, except at tees and crosses where valves are required. Valve and fitting are to have flange to flange connection.
6. Water sample stations shall be provided for each contiguous water service area.
7. Water mains to be constructed in landscape slopes and within easements shall be constructed with C-900 SDR 14 or C-905 PVC SDR 18 PVC pipe. Slope anchors may be required in accordance with Mesa Water's Standard Drawings dependent upon grades and local soil conditions. Thrust blocks will also be required at the angle points at both the top and bottom of the slope.
8. The contractor shall restore or replace all removed or damaged or otherwise disturbed existing surfaces or structures not otherwise noted on the plans or specified herein to a condition equal to that before the work began and to the satisfaction of the Director of Engineering, and the City Engineer. All excess earth and all other debris shall be removed and disposed off by the contractor and the entire site of the work shall be left in a condition acceptable to the City and/or Mesa Water prior to final acceptance of the work. All restoration and cleanup shall be performed in accordance with Mesa Water's Standard Specifications.

400.13 RECORD "AS-BUILT" DRAWINGS

400.13.1 Record Drawings

Record drawings shall be based on an "as built" review and shall show all changes in the work constituting departures from the original contract drawings. Upon completion of each increment of work, all required information and dimensions shall be transferred to the record drawings. Facilities and items to be located and verified on the record drawings shall include the following:

1. Point of connection;
2. Location and elevation of all valves, bends and tees;
3. Location of all services;
4. Type, manufacturer, and model of valves and fire hydrant. Turns required for complete open/close cycle shall be provided for all valves.
5. Location of buried conduit and sensor line assemblies;
6. Items located and constructed as called out in the plans need not be noted as such.
7. Final settings of instrumentation and control equipment.

Prior to submission of the record mylars, two sets of blue lines or bond copy, and CAD files will be submitted for review by Mesa Water's Inspector. One set will be returned with comments if necessary. Final 4-mil mylar record drawings are to be submitted only upon incorporation of Mesa Water's Inspector comments.

400.13.2 "As-Built" Review

An "as-built" survey of the completed water line and appurtenances shall be made by the developer's engineer prior to placement of final paving. Markers or monuments shall be set during the placement of backfill so that all connection points, horizontal and vertical angle points, utility crossings, service connections and any other features and/or appurtenances designated by the engineer may be located. The contractor shall submit to the engineer for review, prior to the start of construction, a program for installing the markers or monuments and shall comply with any recommendations of the engineer to modify such a program. It shall be the responsibility of the contractor to re-establish any lost markers or monuments.

400.13.3 Record Drawings Requirements

400.13.3.1 General Requirements

Keep accurate and legible records on a single set of full size project blue line or bond prints of the drawings.

1. Make the record drawings available for review by Mesa Water's representative in contractor's field office.
2. Maintain record drawings on an up-to-date basis with all entries reviewed by Mesa Water's representative.
3. Protect the record set from damage or loss.

400.13.3.2 Detailed Requirements

1. Mark on the drawings all changes in the work which occur during construction, including adding approved changes.
2. Show locations by key dimensions, depths, elevations of all underground lines, conduit runs, sensor lines, valves, capped ends, branch fittings, pull boxes, etc.
3. Record information on maintenance access and/or concealed work.
4. Make a record of finalized hydraulic and electrical equipment control settings in the tables and spaces provided on the drawings.
5. Deliver the marked record set of drawings to Mesa Water prior to acceptance of the work.

END OF SECTION

APPENDIX

STANDARD SPECIFICATIONS FOR CONSTRUCTION OF WATER FACILITIES

Mesa Water District

1965 Placentia Avenue
Costa Mesa, CA 92627
(949) 631-1291

MESA WATER DISTRICT
APRIL 2018

APPENDIX 1

RECOMMENDED CONDITIONS OF APPROVAL/CODE REQUIREMENTS

ED-002 ATTACHMENT B
MESA CONSOLIDATED WATER DISTRICT

PLANNING DIVISION
Recommended conditions of approval/code requirements

Date: December 8, 2005	***DUE BACK BY: Dec. 13, 2005***
Case Number: DR-05-17	Address: 722 Baker Street
Planner:	Assessor Parcel No: 418-131-12
Annlicant: Bristol Park Medical	Authorized aaent: WBSA-Mike Swain
Publish: No	Number of labels: N/A

Description:

Development Review DR-05-17 for WBSA/Mike Swain, authorized agent for Bristol Park Medical, to construct a new 10,064 sq. ft. medical office and demolish existing building, located at 722 Baker Street, in a C1 zone. Environmental determination: exempt.

1" - BOTH FL

Signatures:
Division:_____ Head:_____
Date:_____

For all projects:
Building Division
Engineering Division
Fire Prevention
Police Department
Parks and Parkways
Transportation Services

For subdivision maps:
All of the list to the left
School District
Water District
Sanitary District

0: Bristol Park Medical: Address above- no phone indicated
A: WBSN/Mike Swain: 4850 Barranca Pky. #203, Irvine 92606 (949) 552-2061

APPENDIX 2

APPLICATION FOR NEW SERVICE

ED-002 ATTACHMENT C

MESA WATER DISTRICT

1965 Placentia Ave., Costa Mesa, CA 92627
Engineering & Inspection: 949-631-1291; Billing 949-631-1200

MESA FILE NO.
THIS APPLICATION BECOMES A PERMIT WHEN APPROVED AND VALIDATED

APPLICATION FOR NEW SERVICE

Legal Description of Property _____

Assessors Parcel No. _____

Address of Property _____

APPLICANT (Property Owner Only) *Type or Print*

(Property Owner)

(Mailing Address)

(City/State/Zip)

Phone

I attest under penalty of law to the truth and correctness of all facts, exhibits, maps and attachments presented with and made a part of this application.

I hereby authorize _____ to act as my representative and to bind me in all matters concerning this application.

_____
Signature – Applicant (Property Owner only)

_____ day of _____, 20 _____

_____
Signature (Notary)

(SEAL)

WATER BILLING SERVICE CUSTOMER

☐ Applicant ☐ Contractor ☐ Other (Below)

Name

Address

Zip

Phone

CONTRACTOR *Type or Print* (if applicable)

Name

Address

Bus. Phone

Job Site Phone

License No.

License Type

FOR DISTRICT USE ONLY – Do Not Write Below This Line

PERMIT

THE TERMS AND CONDITIONS OF THIS PERMIT ARE PRINTED ON BOTH SIDES OF THIS FORM. APPLICANT HEREBY ACKNOWLEDGES THAT HE OR SHE HAS READ AND UNDERSTANDS SAID TERMS AND CONDITIONS AND AGREES TO ABIDE BY THEM.

Date Entered on Computer _____
Customer No. _____
Account Nos. _____

Signature of Applicant (Property Owner only)

PERMIT APPROVED FOR MESA WATER

By _____

Date _____

Permit Expires _____

VALIDATION

STANDARD TERMS

For Work Done By Mesa Water District

AGREEMENT: I agree to have my installation fee credited to charges for installation costs and I understand the installation fee is on a fixed cost basis. I further understand that the installation shall at all times remain under the exclusive control of Mesa Water, and that the water will not be turned on until any required backflow devices have been installed, tested and certified. I further understand that the water service will be billed to the applicant whose name appears on this form, or if specified to the billing customer, until Mesa Water has been instructed to bill otherwise. This Agreement is subject to the current Mesa Water Rules and Regulations and Standard Specifications on file at Mesa Water District's office.

For Work Done Under Permit

A construction performance bond shall be posted in accordance with the current Mesa Water Rules and Regulations. The bond and Permit Fee must be received by Mesa Water prior to Mesa Water's final approval of plans and/or issuance of Permit. All work done under this Permit shall be in accordance with the current Mesa Water Rules and Regulations and Standard Specifications.

I understand that the installation shall at all times remain under the exclusive control of Mesa Water, and that the water will not be turned on until any required backflow devices have been installed, tested and certified. I further understand that the water service will be billed to the applicant whose name appears on this form, or if specified to the billing customer, until Mesa Water has been instructed to bill otherwise.

Capacity Charges

Capacity Charges will be collected by Mesa Water on all projects requiring new or additional water service in accordance with the current Mesa Water Rules and Regulations. I understand that if Mesa Water determines after installation that water use exceeds the expected amount for the sized capacity of a meter, a larger meter with a larger flow capacity will be installed and I will be required to pay the additional net increase in the Capacity Charges.

APPENDIX 3

PAYMENT VOUCHER

MesaWater DISTRICT®

Payment Voucher

1965 Placentia Ave, Costa Mesa, CA 92627 • (949) 631-1291

Date: _____ Job Location: _____

MC File No.: _____

Applicant: _____

Paid By: _____ Check: _____ Cash: _____

Affiliation: _____ Phone: _____

Address: _____ Zip Code: _____

Description			Quantity	Price Each	Deposit Amount	
Meter Installation	SIZE:	-		$ -	$ -	21220
	SIZE:	-		$ -	$ -	21220
	SIZE:	-		$ -	$ -	21220
Fireline Meter or Other*	SIZE:				$ -	21220
Plan Check (Res. $900/Comm. $1225)						
First Service			N/A	$ -	$ -	60454-04
Additional Services				$ 85.00	$ -	60454-04
Meter Changes Only				$ 335.00	$ -	60454-04
Additional Plan Reviews (4th or More)				$ 55.00	$ -	60454-04
Construction Performance Bond			10%		$ -	21213

Capacity Charges			QTY	Price Each	Subtotal		
New Meter Charge	SIZE:	-		$ -	$ -	$ -	21225
	SIZE:	-		$ -	$ -		
	SIZE:	-		$ -	$ -		
Existing Meter Credit	SIZE:	-		$ -	$ -		
	SIZE:	-		$ -	$ -		
	SIZE:	-		$ -	$ -		
					$ -		
Other (Please Specify)							

Construction Inspection	Quantity	Deposit Price		
Backflow/Flow Through Devices - 1st Device		$ 180.00	$ -	40201-04
Backflow Devices - Additional Devices		$ 90.00	$ -	40201-04
Meters - 1st Meter		$ 180.00	$ -	21222
Meters - Additional Meters		$ 90.00	$ -	21222
Service Connection (<2")		$ 270.00	$ -	21222
- $10 per linear foot ____ ft x $10		$ -	$ -	21222
Service Connection - +$20/ft (>2")		$ 355.00	$ -	21222
- $20 per linear foot ____ ft x $20		$ -	$ -	21222
Manifolds - 2" or **less** in diameter		$ 180.00	$ -	21222
Manifolds - 2" or **more** in diameter		$ 205.00	$ -	21222
Pressure Test (per test)		$ 180.00	$ -	21222
Firelines		$ 355.00	$ -	21222
- $20 per linear foot ____ ft x $20		$ -	$ -	21222
Valves		$ 270.00	$ -	21222
Chlorination/Flushing & Health Sample		$ 180.00	$ -	21222
Weld Connections		$ -	$ -	21222
Shutdown		$ 270.00	$ -	21222
After Hours Inspection (per hour)		$ 130.00	$ -	60456-04

Total Deposit $ -

Prepared By: _____ Date: _____

Checked By: _____ Date: _____

Approved By: _____ Date: _____

*Fireline Meter fees are based upon quotes from the manufacturer; additional fees for taxes, shipping, or expired quotes will be charged to the applicant.

pr/payment voucher

APPENDIX 4

WATER SERVICE AGREEMENT

ED-002 ATTACHMENT F

FILE NO. _____

WATER SERVICE AGREEMENT WITH THE
MESA WATER DISTRICT
FOR WATER SERVICE

Date: _____
File No.: _____
Location: _____
Tract: _____ Atlas
Sheet No.: _____

The undersigned, (hereinafter referred to as "Applicant"), hereby requests water service by the **MESA WATER DISTRICT**, (hereinafter referred to as "The District"), in accordance with all of the terms and conditions of this Water Service Agreement and the District's Rules and Regulations For Water Service", (hereinafter referred to as "Rules and Regulations"), which are incorporated herein by this reference and made a part hereof as though fully set forth.

Applicant hereby applies for that service as applicable, which can be provided by the facilities described below, to that certain real property located within the District, in the County of Orange, State of California, described as follows (metes and bounds description or as acceptable to the District):

AP-

Said property is to be used for the purpose(s) of:

Applicant hereby represents that Applicant is the owner of said real property. Applicant estimates that the total service to be required of the District upon development of said real property is _____ gallons per minute ("GPM") on the basis of the connected capacity demand ("CCD") as defined in the Rules and Regulations of the District.

Upon acceptance of this Application by the District, together with all fees and charges, including the Capacity Charge as determined by the District Engineer or an authorized representative subject to appeal to the General Manager or the Board of Directors, plans and specifications, bonds, conveyance of necessary easements, and other items as may be required herein, the District agrees to provide the requested water service subject to the terms and conditions herein set forth and set forth in the Rules and Regulations of the District. The District shall deliver to the Applicant an executed copy of this Agreement.

1. Applicant shall adhere to the requirements prescribed by the Rules and Regulations, as amended from time to time, and to any additional requirements prescribed from time to time by the General Manager or Board of Directors of the District, or both, to insure compliance with such Rules and Regulations as to obtaining water.

2. Applicant hereby agrees to build or cause to be built the described water facilities, (hereinafter collectively referred to as "the Facilities"), and agrees to pay all costs of installation of same, including, but not limited to, cost of labor, materials, equipment, contractor's expense and profit, environmental studies, design, engineering, surveying, inspection, testing, plan check, land and easement acquisition, condemnation, attorney's fees, insurance and bond premiums.

3. Applicant agrees that the Facilities shall be constructed in accordance with plans and specifications which shall comply with all applicable requirements of the District's "Standard Specifications for the Construction of Water Facilities", including, but not limited to, requirements as to information to be shown on the plans. Said document is on file at the office of the District and is by this reference incorporated herein. Such plans and specifications shall be approved by the District. Such approval of the plans and specifications by the District shall not constitute approval of the permit applied for herein. The Facilities shall be constructed by a contractor licensed by the State of California to install said Facilities.

4. Applicant guarantees the Facilities constructed under this Agreement against defects in workmanship and materials for a period of one (1) year after the date of acceptance of the Facilities by the District. It is further agreed that the Facilities shall be restored to full compliance with the requirements of the plans and specifications, including any test requirements, if during said one (1) year period the Facilities or any portion thereof are found not to be in conformance with any provisions of said plans and specifications. This guarantee is in addition to any and all other warranties, express or implied, with respect to the Facilities.

5. Applicant agrees to grant, or cause to be granted to the District, without cost to the District, all necessary easements for construction, installation, maintenance and access to the Facilities, across all privately-owned lands to be traversed by the Facilities, which easements shall be in a form and condition of title satisfactory to the District and shall be executed by all necessary parties having an interest in said lands.

6. Applicant, if applicable, agrees to provide to the District, prior to acceptance of the Facilities, a complete set of reproducible mylars of the approved plans and specifications for the Facilities.

7. Upon completion of the Facilities, Applicant, if applicable, agrees to execute and deliver to the District a report of the actual costs of the Facilities and to substantiate such report with invoices and receipts acceptable to the District. Applicant further agrees that such Facilities will become the property of the District when it is accepted by its duly authorized employee, evidencing acceptance of the Facilities. However, Applicant hereby disclaims in favor of the District all right, title and interest in and to said systems, appurtenances and easements; and Applicant hereby covenants and agrees to execute and deliver to the District any documents required to complete the transfer of the Facilities concurrently with the acceptance thereof by the District; and Applicant hereby agrees that Applicant is holding any title to said Facilities, pending acceptance thereof by the District, as trustee, acknowledging Applicant's obligation to complete said Facilities and transfer the same debt free to the District.

8. It is agreed that the above provisions shall not preclude the use of the Facilities by property owners within the developed area or outside of said development prior to such delivery of actual costs to the District, as long as the quality of said water is acceptable to the District under its Rules and Regulations and written permission has been obtained from the District by such property owners to connect to the Facilities or to existing facilities. Applicant agrees that the use of the Facilities by the Applicant, transferee or assignee of the Applicant, or others within the District, will not constitute acceptance of the Facilities by the District.

9. Applicant agrees to hold the District harmless from any expense or liability resulting from the construction of the Facilities, and further agrees that Applicant will indemnify and hold the District, its agents, employees, officers and representatives, free and harmless from and against any and all liabilities for death, injury, loss, damage or expense, (including reasonable attorney's fees), to person or property which may arise or is claimed to have arisen as a result of any work or action performed by Applicant or on behalf of Applicant with respect to the construction and in the installation or repair of the Facilities.

10. Applicant shall submit, concurrently with this Application, if applicable, Payment and Performance Bonds, in connection with the Facilities to be constructed, and for an amount to be determined by the District.

11. Applicant hereby agrees to pay all administration and engineering fees, (including inspection and plan check costs), calculated as a percentage of the total cost as estimated by the District, as well as Capacity Charges, meter charges, interim water service line charges, (if applicable), and any other charges of the District. The amount of such fees and charges shall be based on the applicable schedules of the Rules and Regulations in effect on the date when Applicant has submitted to the District its completed Application, payment of all fees and charges, plans and specifications, bonds, conveyance of necessary easements and other items which may be required herein prior to issuance of the permit and the plans of the Applicant have been approved by the District. Such fees and charges shall be set forth on Exhibit "A" hereto by the District, which Exhibit is by this reference incorporated herein, and is subject to revision pursuant to any changes in the applicable schedules prior to the date and application and all accompanying materials and payment are completed, submitted to and approved by the District. Other than as provided herein, fees and charges are not subject to adjustment or refund.

Applicant hereby agrees that the meter charge set forth in Exhibit "A" includes the provisions by the District of a water meter and customer control valve. Applicant agrees that the customer control valve is to be obtained from the District and installed by the Applicant's contractor as the work progresses, and that the water meter is to be installed by the District prior to the provision of permanent water service by the District.

Applicant acknowledges and agrees that the payment of such fees is being required prior to final inspection or issuance of certificates of occupancy for the development proposed by Applicant, and that such requirement for prior payment is in accordance with all applicable legal requirements pursuant to Section 53077 et seq. of the Government Code.

12. Applicant agrees to accept such conditions of pressure and service as are provided for by District's water system at the location of all proposed connections thereto and to hold the District harmless from and against any and all damages, liability and expense arising out of high or low pressure conditions with respect thereto or from interruptions of service.

13. Applicant agrees, if said District employs an attorney to enforce this Agreement, to pay said District for all attorney's fees to be incurred.

14. Applicant agrees that the General Manager of the District or his authorized representative may enter upon the hereinabove described property during reasonable hours for the purpose of ascertaining whether the provisions of this Agreement are being performed. Applicant shall not be responsible in any way for the failure of its successors or assigns to comply with any of the provisions of this Agreement.

15. Applicant agrees that service shall be commenced only after the Facilities have been completed and transferred to the District and all required testing and inspection has been accomplished by the District.

Applicant is aware that the contracts may not have been let for all necessary water facilities of the District that Applicant can actually receive water service. Applicant further agrees that the District shall not be obligated to the Applicant or the successors of the Applicant for water service until such time as the actual completion of said necessary District facilities.

16. Special conditions for service, if any:

IN WITNESS WHEREOF, the parties have duly caused their authorized signatures to be affixed hereto.

APPLICANT

_____

Date: _____

Print Name

PROPERTY OWNER

_____

Date: _____

_____
Print Name

MESA WATER DISTRICT

By: _____
General Manager

By: _____
Secretary

Date: _____

EXHIBIT "A" TO
APPLICATION TO AND AGREEMENT WITH
THE MESA WATER DISTRICT
FOR WATER SERVICE

Water Service Fees and Charges

(i) **Capacity Charges**

(a) _____ GPM $ _____

(b) Credit Towards Capacity Charges, (If Applicable) $ _____

(c) Existing Meter Sizes, (If Applicable)

_____

SUBTOTAL $ _____

(ii) **Administrative and Engineering**

Performance Bond $_____at _____% $ _____

Plan Check Fee $ _____

Inspection Fee $ _____

SUBTOTAL $ _____

(iii) **Meter Charge**

_____ meters at $_____per meter $ _____

_____ meters at $_____per meter $ _____

_____ meters at $_____per meter $ _____

SUBTOTAL $ _____

TOTAL $ _____

NOTICE – The Mesa Water District imposes a Capacity Charge pursuant to provisions of Government Code §66000 and following the Rules and Regulations of the Mesa Water District adopted pursuant to Water Code §31024. These fees are used to finance necessary water facilities. The Capacity Charges and the basis for their collection are further described in the documents providing for their imposition and collection.

NOTICE IS FURTHER GIVEN, pursuant to Government Code §66020(d) that you have a 90-day period from the date of approval of the relevant project, or payment of the Capacity Charges, whichever first occurs, to provide a protest to the Mesa Water District of the basis or the amount for such Capacity Charges.

I have received and read the above notice for Capacity Charges.

Signed _____

as an agent for _____

Date _____

APPENDIX 5

FINAL INSPECTION AND CASH BOND RELEASE REQUEST

ED-002 ATIACHMENT N

MESA CONSOLIDATED WATER DISTRICT
FINAL INSPECTION AND CASH BOND RELEASE REQUEST

MC No._____ PROJECT LOCATION_____

RELEASE BOND TO:

APPLICANT : _____
ADDRESS: (street/city/state)_____

_____

TELEPHONE: _____

CONTRACTOR : _____
ADDRESS: (street/city/state)_____

_____

TELEPHONE: _____

BOND AMOUNT : $_____

DUE DATE:—

INSPECTOR

I have inspected and approved the service connections at the above location.

DATE_____ INSPECTOR_____

FIELD CUSTOMER SERVICE

Meter Master used to verify meter size is within proper range per Mesa's meter sizing policy.

DATE_____ FIELD CUST. SERVICE SUPER._____

ACCOUNTING/ OFFICE CUSTOMER SERVICE

All fees and charges related to this project are paid current.

DATE_____ CONTROLLER _____

DATE_____ OFF CE C.S. SUPERVISOR _____

DISTRICT ENGINEER APPROVAL

DATE_____ D STRICT ENGINEER._____

NOTE: For meters 3" and larger, the actual average annual usage must e compared to the estimated average annual usage before the performance bond is returned. A difference of more than ± 10% will result in an additional Development Impact Fee charge or a refand.

APPENDIX 6

FEES AND CHARGES FOR NEW DEVELOPMENT AND MODIFICATION TO EXISTING STRUCTURES

The most current and up-to-date approved Water Rate and Charge Schedule can be found at www.mesawater.org.

APPENDIX 7

CAPACITY CHARGES

CAPACITY CHARGES

MC # _______________

WORKSHEET

NEW METERS

Residential (1-4 Units)	Domestic	CC $ ______	Meter Size _
Multi-Residential	Irrigation		Total GPM _
Commercial	Both		Fixture Units _
Industrial			Account # _

Activity at Location ____

Address ____

Residential (1-4 Units)	Domestic	CC $ ______	Meter Size _
Multi-Residential	Irrigation		Total GPM _
Commercial	Both		Fixture Units _
Industrial			Account # _

Activity at Location ____

Address ____

Residential (1-4 Units)	Domestic	CC $ ______	Meter Size _
Multi-Residential	Irrigation		Total GPM _
Commercial	Both		Fixture Units _
Industrial			Account # _

Activity at Location ____

Address ____

Total Capacity Charges on New Meters $ _______

LESS Total Capacity Charges Credit $ _______ (from back)

LESS Any Carried Forward or Excess Credit $ _______ (attach carried or excess credit sheets)

TOTAL TO COLLECT $ _______ (same as Payment Voucher or Bid Sheet)

Prepared by: _____________ Date: _____________

Checked by: _____________ Date: _____________

Approved by: _____________ Date: _____________ Page ___ of _

CAPACITY CHARGES

CREDIT WORKSHEET

CREDIT ON METERS PULLED AT THE TIME OF REDEVELOPMENT

☐ Residential (1-4 Units) ☐ Domestic CC Credit $ ____________
☐ Multi-Residential ☐ Irrigation Meter Size ____________
☐ Commercial ☐ Both Account # ____________
☐ Industrial
Activity at Location ____
Address ____

☐ Residential (1-4 Units) ☐ Domestic CC Credit $ ____________
☐ Multi-Residential ☐ Irrigation Meter Size ____________
☐ Commercial ☐ Both Account # ____________
☐ Industrial
Activity at Location ____
Address ____

☐ Residential (1-4 Units) ☐ Domestic CC Credit $ ____________
☐ Multi-Residential ☐ Irrigation Meter Size ____________
☐ Commercial ☐ Both Account # ____________
☐ Industrial
Activity at Location ____
Address ____

☐ Residential (1-4 Units) ☐ Domestic CC Credit $ _
☐ Multi-Residential ☐ Irrigation Meter Size _
☐ Commercial ☐ Both Account # _
☐ Industrial
Activity at Location ____
Address ____

CAPACITY CHARGES CREDIT $ ____________

Page_____of _____

APPENDIX 8

FIXTURE UNITS TO GPM CONVERSION TABLE

FIXTURE UNITS TO GPM CONVERSION TABLE

FLUSH TANK			E	
FIXTURE UNITS	GPM		FIXTURE UNITS	GPM
1	2		1	--
2	3		2	--
3	3		3	--
4	4		4	--
5	5		5	22
6	5		6	23
7	6		7	24
8	7		8	25
9	8		9	26
10	8		10	27
11	9		11	28
12	9		12	29
13	10		13	30
14	11		14	31
15	11		15	32
16	12		16	33
17	13		17	34
18	13		18	34
19	14		19	35
20	14		20	35
21	15		21	36
22	16		22	37
23	16		23	37
24	17		24	38
25	18		25	38
26	18		26	39
27	19		27	40
28	19		28	40
29	20		29	41
30	20		30	41
31	21		31	42
32	21		32	43
33	22		33	43
34	22		34	44
35	23		35	44
36	23		36	45
37	23		37	45
38	24		38	46
39	24		39	46
40	24		40	46
41	25		41	47
42	25		42	47
43	26		43	48
44	26		44	48
45	27		45	49
46	27		46	49
47	27		47	50
48	28		48	50
49	28		49	51
50	29		50	51
51	29		51	52
52	29		52	52
53	30		53	53

FLUSH TANK			FLUSH VALVE	
FIXTURE UNITS	GPM		FIXTURE UNITS	GPM
54	30		54	53
55	31		55	53
56	31		56	54
57	32		57	54
58	32		58	54
59	33		59	55
60	33		60	55
61	33		61	55
62	34		62	56
63	34		63	56
64	34		64	56
65	35		65	57
66	35		66	57
67	35		67	57
68	36		68	58
69	36		69	58
70	36		70	58
71	36		71	59
72	37		72	59
73	37		73	59
74	37		74	59
75	37		75	60
76	38		76	60
77	38		77	60
78	38		78	61
79	38		79	61
80	38		80	61
81	39		81	62
82	39		82	62
83	39		83	62
84	39		84	63
85	40		85	63
86	40		86	63
87	40		87	64
88	41		88	64
89	41		89	64
90	41		90	65
91	41		91	65
92	41		92	65
93	42		93	66
94	42		94	66
95	42		95	66
96	42		96	66
97	43		97	67
98	43		98	67
99	43		99	67
100	43		100	68
101	44		101	68
102	44		102	68
103	44		103	68
104	44		104	69
105	45		105	69
106	45		106	69

FLUSH TANK			FLUSH VALVE	
FIXTURE UNITS	GPM		FIXTURE UNITS	GPM
107	45		107	70
108	45		108	70
109	46		109	70
110	46		110	70
111	46		111	71
112	46		112	71
113	47		113	71
114	47		114	72
115	47		115	72
116	47		116	72
117	48		117	72
118	48		118	73
119	48		119	73
120	48		120	73
121	49		121	73
122	49		122	74
123	49		123	74
124	49		124	74
125	50		125	74
126	50		126	74
127	50		127	75
128	50		128	75
129	51		129	75
130	51		130	76
131	51		131	76
132	51		132	76
133	52		133	76
134	52		134	76
135	52		135	77
136	52		136	77
137	52		137	77
138	53		138	78
139	53		139	78
140	53		140	78
141	53		141	78
142	53		142	78
143	53		143	79
144	54		144	79
145	54		145	79
146	54		146	80
147	54		147	80
148	54		148	80
149	55		149	80
150	55		150	80
151	55		151	81
152	55		152	81
153	56		153	81
154	56		154	81
155	56		155	81
156	56		156	82
157	56		157	82
158	57		158	82
159	57		159	82

FLUSH TANK			FLUSH VALVE	
FIXTURE UNITS	GPM		FIXTURE UNITS	GPM
160	57		160	82
161	57		161	83
162	57		162	83
163	58		163	83
164	58		164	83
165	58		165	84
166	58		166	84
167	58		167	84
168	59		168	84
169	59		169	84
170	59		170	85
171	59		171	85
172	59		172	85
173	60		173	85
174	60		174	86
175	60		175	86
176	60		176	86
177	60		177	86
178	61		178	86
179	61		179	87
180	61		180	87
181	61		181	87
182	61		182	87
183	62		183	87
184	62		184	88
185	62		185	88
186	62		186	88
187	62		187	88
188	63		188	88
189	63		189	89
190	63		190	89
191	63		191	89
192	63		192	89
193	64		193	90
194	64		194	90
195	64		195	90
196	64		196	90
197	64		197	90
198	65		198	91
199	65		199	91
200	65		200	91
201	65		201	91
202	65		202	92
203	66		203	92
204	66		204	92
205	66		205	92
206	66		206	92
207	66		207	92
208	67		208	93
209	67		209	93
210	67		210	93
211	67		211	93
212	67		212	94

FLUSH TANK			FLUSH VALVE	
FIXTURE UNITS	GPM		FIXTURE UNITS	GPM
213	68		213	94
214	68		214	94
215	68		215	94
216	68		216	94
217	68		217	95
218	69		218	95
219	69		219	95
220	69		220	95
221	69		221	96
222	69		222	96
223	70		223	96
224	70		224	96
225	70		225	96
226	70		226	96
227	70		227	97
228	71		228	97
229	71		229	97
230	71		230	97
231	71		231	98
232	71		232	98
233	71		233	98
234	72		234	98
235	72		235	98
236	72		236	98
237	72		237	99
238	72		238	99
239	73		239	99
240	73		240	99
241	73		241	99
242	73		242	100
243	74		243	100
244	74		244	100
245	74		245	100
246	74		246	100
247	74		247	100
248	75		248	101
249	75		249	101
250	75		250	101
251	75		251	101
252	76		252	101
253	76		253	102
254	76		254	102
255	76		255	102
256	76		256	102
257	77		257	102
258	77		258	103
259	77		259	103
260	77		260	103
261	77		261	103
262	78		262	103
263	78		263	104
264	78		264	104
265	78		265	104

FLUSH TANK			FLUSH VALVE	
FIXTURE UNITS	GPM		FIXTURE UNITS	GPM
266	78		266	104
267	79		267	104
268	79		268	105
269	79		269	105
270	79		270	105
271	79		271	105
272	79		272	105
273	80		273	106
274	80		274	106
275	80		275	106
276	80		276	106
277	80		277	106
278	81		278	107
279	81		279	107
280	81		280	107
281	81		281	107
282	82		282	107
283	82		283	108
284	82		284	108
285	82		285	108
286	82		286	108
287	83		287	108
288	83		288	109
289	83		289	109
290	83		290	109
291	83		291	109
292	84		292	109
293	84		293	110
294	84		294	110
295	84		295	110
296	84		296	110
297	85		297	110
298	85		298	110
299	85		299	110
300	85		300	110
301	85		301	111
302	85		302	111
303	86		303	111
304	86		304	111
305	86		305	111
306	86		306	111
307	86		307	112
308	87		308	112
309	87		309	112
310	87		310	112
311	87		311	112
312	87		312	112
313	88		313	112
314	88		314	113
315	88		315	113
316	88		316	113
317	88		317	113
318	89		318	113

FLUSH TANK			FLUSH VALVE	
FIXTURE UNITS	GPM		FIXTURE UNITS	GPM
319	89		319	113
320	89		320	114
321	89		321	114
322	89		322	114
323	89		323	114
324	90		324	114
325	90		325	114
326	90		326	115
327	90		327	115
328	90		328	115
329	91		329	115
330	91		330	115
331	91		331	115
332	91		332	115
333	91		333	116
334	91		334	116
335	92		335	116
336	92		336	116
337	92		337	116
338	92		338	116
339	92		339	116
340	93		340	117
341	93		341	117
342	93		342	117
343	93		343	117
344	93		344	117
345	93		345	117
346	94		346	117
347	94		347	118
348	94		348	118
349	94		349	118
350	94		350	118
351	95		351	118
352	95		352	118
353	95		353	118
354	95		354	119
355	95		355	119
356	95		356	119
357	96		357	119
358	96		358	119
359	96		359	119
360	96		360	119
361	96		361	120
362	97		362	120
363	97		363	120
364	97		364	120
365	97		365	120
366	97		366	120
367	97		367	120
368	98		368	120
369	98		369	121
370	98		370	121
371	98		371	121

FLUSH TANK			FLUSH VALVE	
FIXTURE UNITS	GPM		FIXTURE UNITS	GPM
372	98		372	121
373	99		373	121
374	99		374	121
375	99		375	122
376	99		376	122
377	99		377	122
378	100		378	122
379	100		379	122
380	100		380	122
381	100		381	123
382	100		382	123
383	100		383	123
384	101		384	123
385	101		385	123
386	101		386	124
387	101		387	124
388	101		388	124
389	102		389	124
390	102		390	124
391	102		391	124
392	102		392	125
393	102		393	125
394	103		394	125
395	103		395	125
396	103		396	125
397	103		397	125
398	103		398	125
399	104		399	126
400	104		400	126
401	104		401	126
402	104		402	126
403	104		403	126
404	105		404	126
405	105		405	126
406	105		406	127
407	105		407	127
408	105		408	127
409	106		409	127
410	106		410	127
411	106		411	127
412	106		412	127
413	106		413	127
414	107		414	128
415	107		415	128
416	107		416	128
417	107		417	128
418	107		418	128
419	108		419	128
420	108		420	128
421	108		421	129
422	108		422	129
423	108		423	129
424	109		424	129

FLUSH TANK			FLUSH VALVE	
FIXTURE UNITS	GPM		FIXTURE UNITS	GPM
425	109		425	129
426	109		426	129
427	109		427	130
428	109		428	130
429	110		429	130
430	110		430	130
431	110		431	130
432	110		432	130
433	110		433	130
434	111		434	131
435	111		435	131
436	111		436	131
437	111		437	131
438	112		438	131
439	112		439	131
440	112		440	132
441	112		441	132
442	112		442	132
443	113		443	132
444	113		444	132
445	113		445	132
446	113		446	133
447	113		447	133
448	114		448	133
449	114		449	133
450	114		450	133
451	114		451	133
452	114		452	134
453	115		453	134
454	115		454	134
455	115		455	134
456	115		456	134
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475	119		475	137
476	119		476	137
477	120		477	138

FLUSH TANK			FLUSH VALVE	
FIXTURE UNITS	GPM		FIXTURE UNITS	GPM
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479	120		479	138
480	120		480	138
481	120		481	138
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483	121		483	139
484	121		484	139
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525	129		525	145
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527	129		527	146
528	129		528	146
529	129		529	146
530	130		530	146

FLUSH TANK			FLUSH VALVE	
FIXTURE UNITS	GPM		FIXTURE UNITS	GPM
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532	130		532	146
533	130		533	147
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581	139		581	153
582	140		582	153
583	140		583	153

FLUSH TANK			FLUSH VALVE	
FIXTURE UNITS	GPM		FIXTURE UNITS	GPM
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587	140		587	154
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635	150		635	160
636	150		636	161

FLUSH TANK			FLUSH VALVE	
FIXTURE UNITS	GPM		FIXTURE UNITS	GPM
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688	159		688	168
689	160		689	168

FLUSH TANK			FLUSH VALVE	
FIXTURE UNITS	GPM		FIXTURE UNITS	GPM
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FLUSH TANK			FLUSH VALVE	
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FLUSH TANK			FLUSH VALVE	
FIXTURE UNITS	GPM		FIXTURE UNITS	GPM
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FLUSH TANK			FLUSH VALVE	
FIXTURE UNITS	GPM		FIXTURE UNITS	GPM
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901	194		901	196

FLUSH TANK			FLUSH VALVE	
FIXTURE UNITS	GPM		FIXTURE UNITS	GPM
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954	201		954	203

FLUSH TANK			FLUSH VALVE	
FIXTURE UNITS	GPM		FIXTURE UNITS	GPM
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FLUSH TANK			FLUSH VALVE	
FIXTURE UNITS	GPM		FIXTURE UNITS	GPM
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FLUSH TANK			FLUSH VALVE	
FIXTURE UNITS	GPM		FIXTURE UNITS	GPM
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1103	221		1103	221

PART 2

GENERAL CONDITIONS FOR CONSTRUCTION OF WATER FACILITIES

Mesa Water District

1965 Placentia Avenue
Costa Mesa, CA 92627
(949) 631-1291

MESA WATER DISTRICT
APRIL 2018

TABLE OF CONTENTS
PART II – GENERAL CONDITIONS

SECTION 100
DEFINITIONS AND ABBREVIATIONS

100.1 DEFINITIONS

Whenever the words are used in this document or pronouns used in their stead occur in these specifications or other documents, they shall have the meanings here given:

1. Acceptance - The formal action by Mesa Water accepting the dedication of completed facilities.
2. Applicant - An owner, developer, builder, engineer, or other authorized representative who applies as the owner's official agent to Mesa Water for water service.
3. Board or Board of Directors - The Board of Directors of Mesa Water District.
4. City - Incorporated area within the County of Orange having local governing powers.
5. Contractor - The person, firm, or corporation entering into contract with the owner, developer, or Mesa Water for the performance of work required under said contract and Mesa Water's ordinances, rules, regulations, and specifications.
6. County - The County of Orange, State of California.
7. Date of Acceptance - The date Mesa Water formally accepts the dedication of completed facilities.
8. District – Mesa Water District. See Mesa Water.
9. District Engineer - The person holding the position or acting in the capacity of the District Engineer of Mesa Water District.
10. Domestic Water (Potable Water) - That water which is pure and wholesome, does not endanger the lives or health of human beings, and conforms to the latest edition of the United States Public Health Service Drinking Water Standards, the California Safe Drinking Water Act, or other applicable standards.
11. Engineer – Individual or firm authorized by the owner to oversee the execution of the contract, acting either directly or through properly authorized agents, each agent acting only within the scope of authority delegated to them by the Engineer.
12. General Manager - The person holding the position or acting in the capacity of the General Manager of Mesa Water District.
13. Inspector - Any person authorized by Mesa Water to perform inspection of the water facilities prior to construction, during construction, after construction, and during operation.
14. Laboratory - The materials-testing laboratory authorized by Mesa Water to test materials and work involved in the construction governed by these specifications.
15. Mesa Water or Mesa Water District – The Mesa Water District, its authorized employees, Board of Directors, and agents.
16. Mesa Water Standards or Mesa Water Standard Specifications – Mesa Water District "Standard Specifications for the Construction of Water Facilities". These Standards shall apply to all water mains, laterals, and appurtenances whose ownership upon completion is to be transferred to Mesa Water.

17. Offsite Facilities - Shall mean facilities under the control of Mesa Water; including, but not limited to: water mains, reservoirs, pumping stations, fire hydrants, valves, connections, supply interties, treatment facilities, and other appurtenances and property up to the point of connection with the customer's facilities.
18. Onsite Facilities - Shall mean facilities under the control of the applicant, owner or customer; including, but not limited to, residential, commercial, and industrial building water systems. For water, the onsite facilities shall be those downstream of the service connection, which shall normally be the downstream end of the meter tailpiece.
19. Owner - Any holder of legal title, contract purchaser, or lessee of property for which service is requested from Mesa Water.
20. Record Drawings - Drawings which show the facilities, including all revisions to the original plans.
21. Recycled (Reclaimed) Water – Disinfected tertiary recycled water served from Orange County Water District's recycled water distribution system.
22. Subcontractor – Secondary contractor who performs, at the site of the work, some part of the contractor's obligation under the contract.
23. Standard Drawings - The details of standard structures, devices or instructions referred to on the plans or in specifications by title or number; also known as Standard Plans. Mesa Water Standard Drawings are included within the "Standard Specifications for the Construction of Water Facilities".
24. Standard Specifications – Mesa Water's "Standard Specifications for the Construction of Water Facilities".
25. Water Systems - The term "water systems" includes both domestic water and on-site fire water facilities.

100.2 MEANING OF SPECIFIC WORDS

Whenever, in these Specifications or upon the Standard Drawings, the words DIRECTED, REQUIRED, PERMITTED, ORDERED, DESIGNATED, PRESCRIBED, or words of like importance are used, they shall mean directed, required, permitted, ordered, designated, or prescribed by the District Engineer. The words APPROVED, ACCEPTABLE, SATISFACTORY, or words of such importance shall mean approved by, acceptable to, or satisfactory to the District Engineer, unless otherwise expressly stated.

100.3 ABBREVIATIONS

Whenever used in these Specifications, the following abbreviations shall refer to the agency shown:

Abbreviation	Agency	Address
AWWA	The American Water Works Association, Inc.	6666 West Quincy Avenue Denver, CO 80235
ASTM	The American Society for Testing and Materials	1916 Race Street Philadelphia, PA 19103
ANSI	The American National Standards Institute	1430 Broadway New York, NY 10018
ACI	American Concrete Institute	Box 19150 Redford Station Detroit, MI 48219

Abbreviation	Agency	Address
NFPA	National Fire Protection Association	1 Batterymarch Park P.O. Box 9101 Quincy, MA 02269-9101
PFRD	County of Orange Public Facilities & Resources Department	300 North Flower Street, Room 122 Santa Ana, CA 92703-3001
UL	Underwriters' Laboratories, Inc.	333 Pfingsten Road Northbrook, IL 60062 1207 W. Imperial Highway Brea, CA 92621
SSPC	Steel Structures Painting Council	4400 Fifth Avenue Pittsburg, PA 15213
SSPWC	Standard Specifications for Public Works Construction	BNI Building News 1612 S. Clementine St. Anaheim , CA 92802

END OF SECTION

SECTION 200
SCOPE AND CONTROL OF WORK

200.1 RESPONSIBILITY FOR FURNISHING MATERIAL AND INSTALLATION

It will be the responsibility of the applicant and his contractor to furnish all materials that meet the following material specifications and all labor and equipment to install facilities in conformance with approved plans and specifications, including Mesa Water's Standard Specifications.

200.2 GUARANTEE

The applicant and his contractor shall guarantee the work, upon completion, against leaks and breaks due to defective materials or workmanship furnished by the contractor, against settlement of backfill, and damage to resurfacing for a period of one year from the date of completion and acceptance by Mesa Water. Arrangement shall be made for the faithful performance bond to be enforced for a period of one year after the date of final acceptance to cover this guarantee. Damage or leaks due to acts of God, from sabotage, and/or vandalism are specifically exempt from this guarantee.

The date of acceptance by Mesa Water will commence when completion of the entire tract, commercial, or industrial complex is final. Partial releases are not considered to relieve applicant and his contractor of responsibilities under this section.

When defective material or workmanship discovered in the work requires repairs to be made under this guarantee, the applicant shall be notified by telephone and shall make all repairs at their own expense within three calendar days after receipt of such telephoned notice. This telephone notice shall be followed up by written correspondence. Should the applicant or his contractor fail to repair the damage within the three days, Mesa Water may make the necessary repairs and charge the applicant with the actual cost of the repairs. In emergencies demanding immediate attention, Mesa Water shall have the right to repair the defect or damage and charge the applicant with the actual cost of all labor and material required.

200.3 LICENSES, PERMITS, AND FEES

The contractor shall have a valid Contractor's License of the appropriate class (Class "A" or "C-34"). The contractor or applicant shall obtain all permits, pay all fees, obtain business licenses, and give all necessary notices required for the construction of the work. The contractor shall provide proof of licensing to the District Engineer. Class "A" license shall be required for all non-pipeline work.

200.4 PLANS AND SPECIFICATIONS

Prior to the commencement of construction of any pipelines or pipeline structures, the applicant shall furnish to Mesa Water, design drawings showing pipeline plans and profiles and details of pipeline structures. Work shall not be commenced until Mesa Water has approved said design drawings. The contractor shall keep at the worksite a copy of the approved plans and specifications, and a copy of Mesa Water's Standard Specifications to which Mesa Water shall have access at all times.

200.5 SUBMITTALS

Wherever called for in these Standard Specifications or on the drawings, or where required by Mesa Water, the contractor shall furnish, to Mesa Water for review, three prints of each shop drawing.

The term "shop drawing" as used herein shall be understood to include detail design calculations, fabrication and installation drawings, lists, graphs, operating instructions, etc. The shop drawings shall be prepared in accordance with current modern engineering practice and at the contractor's expense. Drawings shall be of a size and scale to show clearly all necessary details. Unless otherwise required, the shop drawings shall be submitted at a time sufficiently early to allow the review of the same, and to accommodate the rate of construction progress required under the contract.

All shop drawing submittals shall be accompanied by a transmittal form using the format bound with the contract or as provided by Mesa Water. Any shop drawing submittal not accompanied by such a form, or where all applicable items on the form are not completed, will be returned for resubmittal. The contractor may authorize a material or equipment supplier to deal directly with Mesa Water with regard to shop drawings, however, ultimate responsibility for the accuracy and completeness of the information contained in the submittal shall remain with the contractor.

A separate transmittal form shall be used for each specific item or class of material or equipment for which a submittal is required. Transmittal of shop drawings on various items using a single transmittal form will be permitted only when the items taken together constitute a manufacturer's "package" or are so functionally related that expediency indicates review of the group or package as a whole.

Within fifteen (15) calendar days after receipt of said prints, Mesa Water will return prints of each drawing to the contractor with his comments noted thereon. It is considered reasonable that the contractor shall make a complete and acceptable submittal to Mesa Water by the second submission of drawings. Mesa Water reserves the right to withhold moneys due to the contractor to cover additional costs of Mesa Water's review beyond the second submission.

If three prints of the drawing are returned to the contractor marked "NO EXCEPTIONS TAKEN", formal revision of said drawing will not be required.

If three prints of the drawing are returned to the contractor marked "MAKE CORRECTIONS NOTED", formal revision of said drawing will not be required.

If one print of the drawing is returned to the contractor marked "REJECTED-RESUBMIT", the contractor shall revise said drawing and shall resubmit six copies of said revised drawing to Mesa Water.

Fabrication of an item shall not be commenced before Mesa Water has reviewed the pertinent shop drawings and returned copies to the contractor marked "NO EXCEPTIONS TAKEN", or "MAKE CORRECTIONS NOTED". Revisions indicated on shop drawings shall be considered as changes necessary to meet the requirements of the contract drawings and specifications and shall not be taken as the basis of claims of extra work. The contractor shall have no claim for damages or extension of the required revisions to shop drawings (unless review by Mesa Water of said drawings is delayed beyond a reasonable period of time and unless the contractor can establish that Mesa Water's delay in review actually resulted in a delay in the contractor's construction schedule).

The review of said drawings by Mesa Water will be limited to checking for general agreement with the specifications and drawings, and shall in no way relieve the contractor of responsibility for errors or omissions contained therein nor shall review operate to waive or modify any provision contained in the specifications or contract drawings. Fabricating dimensions, quantities of material, applicable code requirements, and other contract requirements shall be the contractor's responsibility.

200.6 WORK TO BE DONE

All work shall be performed in a thorough workmanlike and professional manner in accordance with the plans, profiles, and specifications that have been approved by Mesa Water. All work shall conform to the lines, elevations, and grades shown on these plans and profiles.

Mesa Water's approval of the plans prepared by the applicant or the developer's engineer denotes agreement with the plans as prepared and is not an acceptance of responsibility as to their accuracy or completeness. The applicant or the developer's engineer shall be responsible for any error, coordination with other facilities, and interpretation of the plans. The intent is to obtain a completed facility that shall be in conformance with the approved plans and in accordance with Mesa Water's requirements and these specifications. All revisions and changes in the plans must be approved by Mesa Water prior to commencement of work.

200.7 RIGHT-OF-WAY

Rights-of-way or easements for the waterlines or water facilities as shown on the plans will be provided by the applicant. Unless otherwise provided, the contractor shall make arrangements for, pay for, and assume all responsibility for acquiring, using, and disposing of additional work areas and facilities temporarily required. The contractor shall indemnify and hold Mesa Water harmless from all claims for damages occasioned by such actions.

The contractor shall be responsible for all costs associated with Mesa Water's review of the easement documentation and approval process. Costs shall include, but not be limited to:

- Legal review of easement description;
- Surveyor review of legal description; and
- Other miscellaneous review.

200.8 RECORD DRAWINGS

The contractor shall, after the work is completed, furnish Mesa Water with a set of "record drawings" showing the work as actually constructed before acceptance of the project by Mesa Water.

END OF SECTION

SECTION 300
CONTROL OF MATERIALS

300.1 MATERIALS AND WORKMANSHIP

All materials, parts, and equipment furnished by the contractor shall be new, high grade, and free from defects. Workmanship shall be in accordance with the generally accepted standards. Materials and workmanship shall be subject to Mesa Water's approval.

Materials and workmanship not conforming to the requirements of these specifications shall be considered defective and will be subject to rejection. Defective work or material, whether in place or not, shall be removed immediately from the site by the contractor at its expense when so directed by Mesa Water.

300.2 PROTECTION OF WORK AND MATERIALS

The contractor shall provide and maintain storage facilities and employ such measures as will preserve the specified quality and fitness of materials to be used in the work. Stored materials shall be reasonably accessible for inspection. The contractor shall also adequately protect new and existing work and all items of equipment for the duration of the contract.

300.3 INSPECTION REQUIREMENTS

Unless otherwise specified, inspection is required at the jobsite for such typical materials and fabricated items as pipe, valves, fittings, service materials, structural concrete, welding, and protective coating application.

300.4 TESTS OF MATERIALS

Before incorporation in the work, the contractor shall submit samples of materials, as Mesa Water may require, at no cost to Mesa Water. The contractor, at his own expense, shall deliver the materials for testing to the place and at the time designated by Mesa Water. Unless otherwise provided, all initial testing and a reasonable amount of retesting shall be performed under the direction of Mesa Water, at no expense to the contractor. In general, the following summarizes which entity will pay for specific testing unless otherwise agreed upon with the Water Service Agreement.

1. Geotechnical Testing (Private Contract): testing expense shall be borne by the permittee (contractor or the applicant).
2. Geotechnical Testing (Capital Project): testing expense shall be borne by Mesa Water unless otherwise noted in the Project Specifications. All retesting expenses shall be borne by the contractor.
3. Pipe or pump/motor inspection at the manufacturer’s facility shall be borne by Mesa Water unless otherwise noted in the Project Specifications.
4. Valve leakage testing for all butterfly valves 12-inches in diameter and larger shall be borne by the contractor. The test will be witnessed by Mesa Water.
5. Third party inspection shall be borne by Mesa Water unless otherwise agreed upon within the Water Service Agreement.

END OF SECTION

SECTION 400
UTILITIES

400.1 LOCATION

The applicant shall be responsible for searching utility records and indicating the location of all known utilities on the plans. At least two working days (48 hours) before beginning the work, the contractor shall call Underground Service Alert (USA) for all utility owners to mark or otherwise indicate the location of their substructures, except for public sewers and storm drains. It shall be the contractor's responsibility to determine the true location and depth of all utilities and service connections. The contractor shall also familiarize himself with the type, material, age, and condition of any utility that may be affected by the work.

The contractor shall pothole all points of connections, crossing utilities and parallel utilities which may be affected by or affect the work as specified within Section 02223 (Trenching, Backfilling and Compacting) and Section 02222 (Protecting Existing Utilities) of these Technical Specifications.

400.2 PROTECTION

The contractor shall not interrupt the service function or disturb the supporting base of any utility without authority from the owner and order from Mesa Water.

Where protection is required to ensure support of utilities, the contractor shall furnish and place the necessary protection at its expense. The contractor shall maintain a minimum of 12 inches separation at perpendicular crossings between Mesa Water facilities and other utilities.

The contractor shall immediately notify Mesa Water and the utility owner if he disturbs, disconnects, or damages any utility. In the event of necessary repair work on a Mesa Water facility, Mesa Water has the right to hire another contractor to do the repair work. The project contractor will be responsible for the cost of the repair.

END OF SECTION

SECTION 500
PROGRESS, ACCEPTANCE OF WORK, AND PROSECUTION

500.1 CONSTRUCTION SCHEDULE AND COMMENCEMENT OF WORK

Prior to start of any work, the contractor shall submit a proposed construction schedule to Mesa Water for approval. Construction of water facilities will not commence until curb and gutter have been completed.

Before starting construction on all jobs within Mesa Water, a preconstruction conference is to be held at which Mesa Water and its Inspector, the contractor's foreman and/or superintendent for that job, and the applicant's tract superintendent shall be present. Mesa Water Inspector shall review job plans and the contractor's work schedule, answer any questions regarding Mesa Water specifications, verify that all permits have been obtained, and check the contractor's license. Evidence of a performance bond, signed agreement, and applicable Mesa Water-signed plans shall be available to Mesa Water 48 hours before the preconstruction conference.

If the contractor desires to make a major change in the method of operations after commencing construction or if the schedule fails to reflect the actual progress, the contractor shall submit to Mesa Water a revised construction schedule before beginning revised operations.

The District Engineer may waive these requirements for work constructed under permit.

500.1.1 Capital Project Schedule (Non-Complex Projects)

The following construction schedule requirements shall apply for non-complex capital projects, less than $200,000 construction cost, requiring few interfaces and minimal coordination with sub-contractors, material suppliers, and other projects.

The schedule shall be a Gant Chart or CPM (Microsoft Project) based schedule, and shall show the various parts of the work in sufficient detail so as to identify the beginning and end of each of the various construction activities. The schedule shall include, at a minimum, the following:

- Submittal milestones;
- All construction activities;
- Equipment/material procurement and deliveries;
- Permit imposed work times;
- Partial, substantial, and final completion milestones; and
- Critical path activities.

The schedule shall also include any other activities or milestones or scheduling constraints that may impact the construction.

500.1.2 Capital Project Schedule (Complex Projects)

The following construction schedule requirements shall apply for complex capital projects, more than $200,000 construction cost, requiring several interfaces and coordination with sub-contractors, material suppliers, and other projects.

500.1.2.1 Contractor's Project Schedule

1. Seven (7) days after Notice to Proceed, the contractor shall submit the Project Schedule.

2. The Project Schedule shall show the sequence and interdependence of activities required for complete performance of the work, beginning with the date of the Notice to Proceed and concluding with the date of Final Completion of the Contract.

3. Use of float suppression techniques such as preferential sequencing, special lead/lag logic restraints, extended activity times or imposed date shall be cause of rejection of the Project Schedule and any revisions or updates.

4. Any approved schedule, revision, or update having an early completion date shall show the time between the early completion date and the current contract completion date as "project float".

5. Comments made by Mesa Water on the Project Schedule, during review, will not relieve the contractor from compliance with requirements of the Project Specifications. To the extent that there are any conflicts between the approved schedule and the requirements of the Project Specifications, the Project Specifications shall govern.

6. If requested by Mesa Water at any time during the project, the contractor shall provide highly detailed, short-term schedules for specific crucial items (work-arounds, start-up, etc.).

500.1.2.2 Network Details

1. The Project Schedule shall provide Mesa Water with a tool to monitor and follow the progress of all phases of the work. The Project Schedule submitted to Mesa Water shall comply with all limits imposed by the scope of the work, with all contractually specified completion dates, and with all constraints, restraints, or sequences included in the Project Specifications. The degree of detail shall include factors to the satisfaction of Mesa Water, including, but not limited to:

    a. Physical breakdown of the project including a predecessor/successor report or a list showing the predecessor activities and successor activities for each activity in the schedule sorted by Early Start.

    b. Activity report sorted by activity number or a list showing each activity in the schedule.

    c. Contract completion dates, substantial completion dates, constraints, restraints, sequences of work shown in Project Specifications, the planned substantial completion date, and the final completion date.

    d. Type of work to be performed, the sequences, and the labor trades involved.

    e. All purchase, submittals, submittal reviews, manufacturer, test, delivery, and installation activities for all major material and equipment, and a separate list of all major items or items of equipment for which the contractor intends to seek payment prior to installation.

    f. Preparation, submittal and approval of shop and/or working drawings and material samples.

    g. Plans for all subcontract work.

    h. Assignment of responsibility for performing specific activities.

    i. Access to and availability of work areas.

j. Punch list and final cleanup.

2. The activities included in the Project Schedule shall be analyzed in detail to determine activity time durations in units of project working days. Durations shall be based on the labor, equipment, and materials required to perform each activity on a normal work day basis.

500.1.2.3 Weekly Progress Reports

1. Once each week, on a day established by Mesa Water, the contractor shall submit two progress schedules:

   a. The first shall be a progress schedule listing the activities completed and in progress for the previous week and the activities scheduled for the succeeding two weeks. The activity designations shall be consistent with the activity designations in the Current Record Schedule. A bar chart shall be used to display the information in pictorial form. The appropriate schedule activity number shall be listed for each bar.

   b. The second shall be a utility work/access alteration report. This report and schedule shall include any and all work that affects other operations, utilities, equipment, and like detail as well as alterations.

500.1.2.4 Responsibility for Completion

1. Whenever it becomes apparent from the current Project Schedule that Contract completion dates will not be met, the contractor shall execute some or all of the following remedial actions:

   a. Increase construction manpower in such quantities and crafts as necessary to eliminate the backlog of work.

   b. Increase the number of work hours in conformance with the Project Specifications requirements.

2. Prior to implementing any of the above actions, the contractor shall notify and obtain approval from Mesa Water. If such actions are approved, the Project Schedule revisions shall be incorporated by the contractor into the Network Diagram before the next update.

3. Under no circumstances will the addition of equipment or construction forces, increasing the working hours or any other method, manner, or procedure to return to the contractually required completion date be considered justification for a Change Order or be treated as acceleration where the need for a recovery schedule has been caused by the contractor and/or its subcontractors or suppliers, at any tier.

4. Mesa Water may elect to withhold progress payments until the contractor's progress indicates that the Contract completion date will be met.

500.1.2.5 Schedule Time Extensions

1. When Change Orders or delays are experienced by the contractor and a time extension is requested, the contractor shall submit to Mesa Water, a written Time Impact Analysis illustrating the influence of each change or delay on the current Contract schedule completion date utilizing the approved Current Record Schedule. Each Time Impact Analysis shall include a fragnet

demonstrating how the contractor proposes to incorporate the Change Order or delay into the Current Record Schedule. A fragnet is defined as a sequence of new and/or activity revisions that are proposed to be added to the approved Baseline Project Schedule or current Record Schedule in effect at the time the change or delay is encountered to demonstrate the influence of the delay and the method for incorporating the delay and its impact into the schedule as they are encountered.

2. Each Time Impact Analysis shall demonstrate the estimated time impact based on the events of delay, the date the Preliminary Change Order, Emergency Change Authorization, the Time and Materials Change Order, or the Unilateral Change Order was given to the contractor, the status of construction at that point in time, and the event time computation of all activities affected by the change or delay. The event times used in the analysis shall be those included in the latest update of the Current Record Schedule, in effect at the time the change or delay was encountered.

3. Time extensions will be granted only to the extent that equitable time adjustments for the activity or activities affected exceed the total or remaining float along the critical path of activities at the time of actual delay, or at the time the Proposed Change Order, the Emergency Change Authorization, the Time and Materials Change Order, or the Unilateral Change Order was issued. Float or slack time is not for the exclusive use or benefit of Mesa Water, or the contractor but is an expiring resource available to all parties as needed to meet Contract milestones and the contract completion date. Time extensions shall not be granted nor delay damages paid until:

   a. A delay occurs which is beyond the control and without the fault or negligence of the contractor and its subcontractors or suppliers, at any tier; and

   b. Which extends actual performance of the work beyond the applicable current Contract completion date and the most recent date predicated for completion of the project on the approved schedule update current as of the time of the delay or as of the of issuance of the Proposed Change Order, the Emergency Change Authorization, the Time and Materials Change Order, or the Unilateral Change Order.

4. Each Time Impact Analysis shall be submitted in triplicate, within ten (10) days after a delay occurs, or issuance of the Proposed Change Order, Change Authorization, Time and Materials Change Order, or Unilateral Change Order. If the contractor does not submit a Time Impact Analysis for a specific Change Order or delay with the specified period of time, the contractor shall be deemed to have irrevocably waived any rights to additional time and cost.

5. Since float time within the Project Schedule and the Record Schedule is jointly owned it is acknowledged and agreed by the contractor that Owner caused delays on the project may be offset by Owner caused time savings (including, but not limited to: critical path submittals returned in less time than allowed for in the Contract, approval of substitution requests which result in a savings of time along the critical path of the contractor, etc.). In such an event the contractor shall not be entitled to receive an extension of time or delay damages until Owner caused time savings are exceeded and the Contract completion date also exceeded.

6. Approval or rejection of each Time Impact Analysis by Mesa Water shall be made within fifteen (15) days after receipt of each Time Impact Analysis, unless subsequent meetings and negotiations are necessary. Upon approval, a copy of a Time Impact Analysis signed by Mesa Water shall be returned to the contractor for incorporation into the schedule.

7. Upon mutual agreement by both parties, fragnets illustrating the influence of Change Orders and delays shall be incorporated into the Project Schedule or Record Schedule during the first update after agreement is reached.

500.1.2.6 Manpower

The contractor shall submit the initial Project Schedule a histogram depicting total project manpower for its own forces and for each of its subcontractors for each month. The histogram shall be based upon and shall be in substantive agreement with the number of shifts and crew sizes in the Project Schedule.

500.2 PROSECUTION OF WORK FOR OFFSITE CONSTRUCTION

To minimize public inconvenience and possible hazard, and to restore streets and other work areas to their original condition and former state of usefulness as soon as practicable, the contractor shall diligently prosecute the work to completion.

As soon as possible under the provisions of these specifications, the contractor shall backfill all excavations and restore to usefulness all improvements existing before the start of the work.

END OF SECTION

SECTION 600
RESPONSIBILITIES OF CONTRACTOR IN CONDUCT OF WORK

600.1 SUPERVISION

The contractor shall designate and keep on the work at all times during its progress a competent superintendent, who shall not be replaced without written notice to Mesa Water. The superintendent will be the contractor's representative at the site and shall have authority to act on behalf of the contractor. All communications given to the superintendent shall be as binding as if given to the contractor. During periods when the work is suspended, the contractor shall make appropriate arrangements for any emergency work which may be required.

Whenever the contractor's superintendent is not present on any particular part of the work where Mesa Water's representative may desire to inform the contractor relative to interpretation of the plans and specifications or to disapproval or rejection of materials or work performed, Mesa Water's representative may so inform the foreman or other worker in charge of the particular part of the work in reference to which the information is given. Information so given shall be as binding as if given to the superintendent.

600.2 NO PERSONAL LIABILITY

The Board of Directors, Mesa Water District, or any officer, or authorized assistant, or an agent of Mesa Water shall not be personally responsible for any liability arising out of the work performed.

600.3 RESPONSIBILITY FOR DAMAGE

Mesa Water, its officers, employees, and agents; the Board of Directors; and the District Engineer, shall not be answerable or accountable in any manner for any loss or damage that may happen to the work or any part thereof; or for any material or equipment used in performing the work; or for injury or damage to any person or persons, workmen, or the public; or for damage to adjoining property from any cause whatsoever during the progress of the work or at any time before final acceptance.

600.4 LEGAL RELATIONS AND RESPONSIBILITY

The contractor shall keep himself fully informed of all laws, ordinances, and regulations that in any manner affect those engaged or employed in the work or the materials used in the work, or that in any way affect the conduct of the work, and of all such orders and decrees of bodies or tribunals having any jurisdiction or authority over the same. If any discrepancy or inconsistency is discovered in the plans, drawings, specifications, or other documents in relation to any such law, ordinance, regulation, order, or decree, the contractor shall forthwith report the same to Mesa Water in writing. The contractor shall at the time observe and comply with all such existing and future laws, ordinances, resolutions, regulations, orders, and decrees and shall protect and indemnify Mesa Water District, its officers, employees, and agents against any claim or liability arising from or based on the violation of any such law, ordinance, regulation, order, or decree, whether by themselves or their employees.

The contractor shall hold harmless, indemnify, and defend Mesa Water District and its officers, employees, and agents from any and all liability claims, losses, or damages, including attorney's fees, arising or alleged to arise from the performance of the work, provided, however, that if the loss or damage is ultimately determined to be the proximate result of the sole negligence of one or more of the aforesaid, this indemnification shall not apply.

The contractor shall also indemnify and hold Mesa Water District and its officers, employees, and agents harmless from all costs, losses, expenses, damages, attorney's fees, and other costs of defense that any of them may incur with respect to the failure, neglect, or refusal of contractor to faithfully perform the work and all of contractor's obligations under the contract. Such costs, expenses, and damages shall include all costs incurred by Mesa Water District and its officers, employees, and agents to defend against any claims, stop notices, or lawsuits based thereon in which any of them are made a party.

The contractor shall, in general, observe the rules and regulations of the State of California, Department of Industrial Relations, Division of Industrial Safety (CAL/OSHA) and, in particular, rules and regulations relating to shoring of trenches and excavations and confined spaces.

600.5 STORAGE OF EQUIPMENT AND MATERIALS IN PUBLIC STREETS

Construction materials may not be stored in streets, roads, or highways for a period longer than that authorized by the agency having jurisdiction over said street, road, or highway.

Construction equipment shall not be stored at the worksite before its actual use on the work or for a period longer than that authorized by the agency having jurisdiction over said street, road, or highway.

The contractor shall acquire at their own expense any additional storage/staging area of adequate size and access to facilitate contractor's own operations including storing and staging of materials, and contractor/employee vehicle parking. The contractor shall meet all conditions and requirements of the Property Owner. The contractor shall be responsible for securing the site to protect his property from vandalism and loss and to protect the public from possible injury.

The contractor shall inform Mesa Water of his activities for obtaining additional staging area they deem necessary. The contractor is advised that the additional staging area must be obtained directly in writing from the Property Owner by the contractor for use during the construction period. In obtaining such additional staging area, the contractor shall obtain all necessary permits and comply with local ordinances and regulations. The contractor is responsible for any rents, fines, damages, and restoration costs associated with the additional staging area. Mesa Water shall be furnished a copy of the written agreement with the affected Property Owner prior to using the additional staging area. The agreement shall contain a written release statement approved by Mesa Water and shall be executed by the Property Owner that all work including restoration was completed to the Property Owner's satisfaction. Mesa Water shall be provided with a copy of the written release from the Property Owner releasing the contractor from any future claims prior to filing the Notice of Completion.

600.6 STREETS CLOSURES, DETOURS, BARRICADES

The contractor shall comply with all applicable state, county, and city requirements for closure of streets. The contractor shall provide barriers, guards, lights, signs, temporary bridges, flagmen, and watchmen advising the public of detours and construction hazards that may arise during construction and promptly remove all signs and warning devices upon completion of the work. The contractor shall provide a traffic control plan stamped by a Registered Traffic Engineer. The contractor shall also be responsible for compliance with additional public safety requirements that may arise during construction.

At least two working days (48 hours) before closing, partially closing, or reopening of any street, alley, or other public thoroughfare, the contractor shall notify the police, fire, traffic, and engineering department of jurisdictional agencies involved, obtain the necessary permits, and comply with their requirements. Deviations must first be approved in writing by the District Engineer. Traffic control shall be in accordance

with the "Work Area Traffic Control Handbook" (WATCH), unless otherwise specified by the jurisdictional agency.

600.7 PUBLIC SAFETY

600.7.1 Safety Orders

The contractor shall have at the worksite copies or suitable extracts of Construction Safety Orders, Tunnel Safety Orders, and General Industrial Safety Orders as issued by the State Division of Industrial Safety. The contractor shall comply with provisions of these and all other applicable laws, ordinances, and regulations.

600.7.2 Use of Explosives

Explosives may be used only when authorized in writing by the District Engineer. Explosives shall be handled, used, and stored in accordance with all applicable regulations.

The District Engineer's approval of the use of explosives shall not relieve the contractor from his liability for claims caused by blasting operations.

600.8 CAL OSHA REQUIREMENTS

The following are Cal/OSHA requirements as of the printing of these Mesa Water standard specifications. The requirements are listed for information purposes only; work must be in compliance with the current Cal/OSHA requirements. Requirements for construction work for Cal/OSHA are listed in Title 8, Division 1, Chapter 4, Subchapter 4, of the California Code of Regulations.

600.8.1 Trench Work

Division of Occupational Safety and Health (DOSH) requires a DOSH permit for construction of trenches or excavations 5 feet or more in depth into which a person is required to descend.

Each employee in an excavation shall be protected from cave-ins by an appropriate protective system.

A competent person will make daily inspections of excavations, adjacent areas, and protective systems for potential cave-in, failure of protective systems, hazardous atmospheres, or other hazardous conditions.

A competent person must demonstrate:

1. Knowledge of current safety orders pertaining to excavation and trenching.
2. Knowledge of soil analysis and classification.
3. Knowledge of design and use of protective systems.
4. Authority to take prompt corrective action when conditions change.
5. Ability to recognize and test for hazardous atmospheres.

Protective system design will be based on soil classification: Type A, B, or C soils (refer to Section 1541(b) Title 8). Sloping or benching for excavations greater than 20 feet deep shall be designed by a registered professional engineer.

Determine the location of underground utilities and notify the owners.

Inspect the area for hazards from moving ground.

Inspect the excavation after every rainstorm, earthquake, or other hazard-increasing occurrence.

Inspect the face, banks, and top daily when workers are exposed to falling or rolling material.

Shore, bench, slope, shield, or use equivalent methods to protect workers in excavations 5 feet deep or more.

Locate spoil, materials, and equipment at least 2 feet from the edge of excavation.

In trenches 4 feet deep or more, provide safe access within 25 feet of any work area.

Install walkways or bridges with standard guardrails when employees or equipment are required or permitted to cross over.

Do not excavate beneath the level of adjacent foundations, retaining walls, or other structures until a qualified person has determined that the work will not be hazardous.
Shore, brace, or underpin structures when their stability is threatened. Inspect structures daily.

Erect barriers around excavations in remote work locations. Cover or barricade all wells, pits, shafts or caissons.

Note: A shoring detail shall be designed by a registered professional engineer for all excavations 5 feet or more in depth into which a person is required to descend.

600.8.2 Confined Space

The General Industry Safety Orders define a confined space as a space that has the following characteristics:

1. Its size and shape allow a person to enter it.
2. It has limited openings for workers to enter and exit.
3. It is not designed for continuous occupancy.

Attention is directed to the provisions of: Article 108 of the General Industry Safety Orders, Title 8, California Code of Regulations; and Article 4 of the Construction Safety Orders, Title 8, California Code of Regulations.

Confined spaces shall be as described above, and shall include the interior of storm drains, sewers, vaults, utility pipelines, manholes, reservoirs, and any other such structure which is similarly surrounded by confining surfaces so as to permit an oxygen deficient atmosphere or the accumulation of dangerous gases or vapors.

The contractor shall notify in writing the Mesa Water Inspector 48 hours prior to performing work in a Mesa Water facility classified as a confined space.

600.8.3 Permit-required Confined Space

A permit-required confined space has one or more of the following characteristics:

1. Contains or has potential to contain a hazardous atmosphere.
2. Contains a liquid or solid material that can engulf an entrant.
3. Has an internal configuration such that the entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section.
4. Mechanical or electrical hazards.
5. Contains any other recognized serious safety or health hazard.
6. Contains unknown atmospheric environment.

The general industry regulations define a Non-Permit Required Confined Space as a confined space that does not contain or, with respect to atmospheric hazards, have the potential to contain any hazard capable of causing death or physical harm.

Confined spaces shall be considered permit-required confined spaces (PRCS) until proven safe from atmospheric hazards by testing and ventilation; and until evaluated as safe from any other serious safety or health hazards.

No one shall enter a Mesa Water facility that is classified as a permit-required confined space without a Mesa Water Inspector being present. The contractor shall submit the permit to Mesa Water Inspector 48 hours prior to doing work in a Mesa Water confined space facility.

An entry permit is a written or printed document that is provided by the contractor to allow and control entry into a permit-required confined space and that contains, but is not limited to, the following information:

1. Specific permit space identification.
2. Purpose and date of entry.
3. Duration of authorization.
4. Authorized entrants by name.
5. Names of authorized attendant and entry supervisor.
6. Actual hazards of the identified space.
7. Control and isolation methods to be used.
8. Acceptable entry conditions.
9. Results of initial and periodic atmospheric testing.
10. Rescue and emergency services to be summoned.
11. Communication procedures authorized between attendant and entrants.
12. Equipment to be provided.
13. Other information as necessary.
14. Other permits, such as hotwork.

600.8.4 Confined Space Operating Procedures

Contractor shall comply with Mesa Water's Confined Space Entry Procedures.

1. Contractor shall submit confined space operating and rescue procedures to Mesa Water for record keeping purposes. Procedures shall conform to the applicable provisions of Article 108, General Industry Safety Orders, Title 8, California Code of Regulations.
2. Contractor shall test for the presence of combustible or dangerous gases and/or oxygen deficiency in confined spaces using an approved device immediately prior to a worker entering the confined space, and at intervals frequent enough to ensure a safe atmosphere during the time a worker is in such a structure. A record of such tests shall be kept at the jobsite.
3. Employees shall not be permitted to enter a confined space, where tests indicate the presence of a hazardous atmosphere, unless the employee is wearing suitable and approved respiratory equipment, or until such time that continuous forced air ventilation has removed the hazardous atmosphere from the confined space.
4. Confined spaces that contain or that have last been used as containers of toxic gases, light oils, hydrogen sulfide, corrosives, or poisonous substances, shall, in every case, be tested by means of approved devices or chemical analysis before being entered without wearing approved respiratory equipment.
5. Sources of ignition shall be prohibited in any confined space until after the atmosphere within the confined space has been tested and found safe.
6. Reservoirs, vessels, or other confined spaces having openings or manholes in the side as well as in the top shall be entered from the side openings or manholes when practicable.
7. Contractor shall coordinate entry operations with Mesa Water when both the contractor personnel and Mesa Water personnel will be working together as authorized entrants into a permit-required confined space.
8. Contractor shall submit to Mesa Water a photocopy of the canceled permit at the conclusion of the entry operation. This information is for record-keeping purposes only, and is not intended to provide enforcement of confined space regulations.

END OF SECTION

PART 3

TECHNICAL SPECIFICATIONS FOR CONSTRUCTION OF WATER FACILITIES

Mesa Water District

1965 Placentia Avenue
Costa Mesa, CA 92627
(949) 631-1291

MESA WATER DISTRICT
APRIL 2018

MESA WATER DISTRICT

TECHNICAL SPECIFICATIONS

TABLE OF CONTENTS

MESA WATER DISTRICT

TECHNICAL SPECIFICATIONS

TABLE OF CONTENTS (CONTINUED)

SECTION 01045

EXISTING FACILITIES

PART 1 – GENERAL

A. Description

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

B. Related Work Specified Elsewhere

1. Protecting Existing Utilities: 02222.

2. Trenching, Backfilling, and Compacting: 02223.

3. Chlorination of Water Mains for Disinfection: 15041.

4. Hydrostatic Testing of Pressure Pipelines: 15042.

5. Manual Valves: 15100.

C. Location

1. The contractor shall be responsible for potholing and determining in advance the location and elevation of all existing pipelines to which connections are to be made. Discrepancies shall be reported to Mesa Water and/or design engineer, prior to the fabrication of, or purchase of material affected by the discrepancy.

2. The contractor shall notify Underground Service Alert of Southern California (Dig Alert) at least two working days prior to construction at 1-800-422-4133.

D. Condition of Existing Facilities

Mesa Water does not warranty the condition, size, material, and location of existing facilities. The contractor shall be responsible for verifying the properties of the existing pipe that will be connected to the proposed piping.

E. Protection of Existing Utilities and Facilities

1. The contractor shall be responsible for the care and protection of all existing sewer pipe, water pipe, gas mains, culverts, power or communications lines, sidewalks, curbs, pavement, or other facilities and structures that may be encountered in or near the area of the work.

2. It shall be the duty of the contractor to notify Underground Service Alert (USA) and each agency of jurisdiction and make arrangements for locating their facilities prior to pipeline construction.

3. The contractor shall submit a plan as to the method the contractor will use to protect and support any utilities which will become exposed during excavation or that which are vulnerable to failure due to unsupported trenches or other construction activity.

4. In the event of damage to any existing facilities during the progress of the work and of the failure of the contractor to exercise the proper precautions, the contractor will pay for the cost of all repairs and protection to said facilities. The contractor's work may be stopped until repair operations are complete.

F. Protection of Landscaping

1. The contractor shall be responsible for the protection of all the trees, shrubs, irrigation systems, fences, and other landscape items adjacent to or within the work area, unless they are directed to do otherwise on the plans.

2. In the event of damage to landscape items, the contractor shall replace the damaged items in a manner satisfactory to Mesa Water, the owner, or the jurisdictional agency in control, or pay damages to the owner as directed by Mesa Water. The contractor shall verify that any damaged or renovated landscaping shall be replaced with landscaping that meets the current and applicable local landscape standards, codes, and ordinances, including but not limited to AB 1881 (Water Efficient Landscape Ordinance).

3. When the proposed pipeline, vault facility or other appurtenances are to be within planted or other improved areas in public or private easements, the contractor shall restore such areas to the original condition after completion of the work. This restoration shall include grading, a placement of 5 inches of topsoil, resoding, and replacement of all landscape items indicated. All irrigation facilities shall be restored/replaced to a condition equal to or better than existing per the manufacturer's recommendations and/or industry standards.

4. If the contractor does not proceed with the restoration after completion of the work or does not complete the restoration in a satisfactory manner, Mesa Water reserves the right to have the work done and to charge the contractor for the actual cost of the restoration including all labor, material, and overhead required for restoration.

G. Permits

All work shall conform to the specifications and requirements of the city having jurisdiction, the County of Orange, CALTRANS or other affected agencies involved. The contractor shall keep a copy of all required permits at the job site and comply with all the terms and conditions of said permits.

PART 2 – MATERIALS

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

A. Grout

Grout shall consist of Portland cement and water or of Portland cement, sand, and water; and all grout mixtures shall contain 2% of bentonite by weight of the cement. Grout shall be a pump mix with a minimum of six sacks cement (564 lbs) per cubic yard.

Portland cement, water and sand shall conform to the applicable requirements of Section 03300 (Concrete), except that sand to be used shall be of such fineness that 100% will pass a standard 8-mesh sieve and at least 45%, by weight, will pass a standard 40-mesh sieve.

B. Concrete

Concrete used for the replacement of damaged or removed facilities shall be in accordance with Section 03300 (Concrete) and shall match the mix design of the existing facility and per the requirement of the jurisdictional agency.

PART 3 – EXECUTION

A. Connection to Existing Water Lines

1. Notification: The contractor shall give Mesa Water a minimum of five (5) working days notice before the time of any proposed shutdown of existing mains or services.

2. Notice to Proceed: Connections shall be made only in the presence of Mesa Water Representative and no connection work shall proceed until the Mesa Water Representative has given notice to proceed.

3. Material: The contractor shall furnish all pipe and materials including as may be required: labor and equipment necessary to make the connections, all required excavation, backfill, pavement replacement, lights and barricades, water truck, highline hose, and fittings for making the connections. In addition, the Contractor shall assist Mesa Water in alleviating any hardship incurred during the shutdown for connections.

4. Temporary Work: Where connections are made to existing valves, the Contractor shall furnish and install all temporary blocking, steel clamps, shackles, and anchors as required by the Mesa Water Representative. Valve boxes and covers shall be replaced and adjusted to the proper grade in accordance with Section 15100 (Manual Valves).

5. Dewatering: The contractor shall dewater existing mains, as required, in the presence of the Mesa Water Representative. The dewatering shall be discharged to a sewer system, unless the Contractor has obtained a NPDES Permit for discharge to a storm drain. Prior to using existing sanitary sewer systems for disposal, the contractor shall obtain written permission of the owner of the sewer. The contractor will need to coordinate this disposal with the sewer agency to schedule the disposal as well as confirm that the sewer system has adequate capacity to handle the dewatering rate. Obtain a permit, if required, and meet all permit requirements. The contractor

shall notify Mesa Water of the dewatering activities two working days prior to commencing the activity.

6. Inadequate Progress: If progress is inadequate during the connection operations to complete the connection in the time specified, the Mesa Water Representative shall order necessary corrective measures. All costs for corrective measures shall be paid by the contractor.

7. Tapping Sleeves and Valves: Tapping sleeves and valves shall be installed in accordance with Section 15100 (Manual Valves). Tapping connection can be made to the existing water main while it is either in service or shut down depending on Mesa Water's prior direction. A tapping valve shall be used when the existing main is maintained in service during the connection.

8. Connections: Connections shall be made with as little change as possible in the grade of new main. If the grade of the existing pipe is below that of the new pipeline, a sufficient length of the new line shall be deepened so as to prevent the creation of any high spot or abrupt changes in grade of the new line.

   Where the grade of the existing pipe is above that of the new pipeline, the new line shall be laid at specified depth, except for the first joint adjacent to the connection, which shall be deflected as necessary to meet the grade of the existing pipe. If sufficient change in direction cannot be obtained by the limited deflection of the first joint, a fitting of the proper angle shall be installed.

   Where the connection creates a high or low spot in the line, a standard air release or blow-off assembly shall be installed as directed by the Mesa Water Representative.

9. Connection Planning: Connections shall be initiated, scheduled, and coordinated with Mesa Water's field representative. All connections shall be planned and implemented with sufficient time allowances to complete the work within a standard 8-hour work day. Connections that require a main line shutdown shall be coordinated a minimum of five (5) working days in advance with Mesa Water's representative.

10. Testing: The new pipeline shall NOT be connected to an existing facility until the new pipeline has successfully passed all pressure and water quality tests following disinfection in accordance with Section 15041 (Chlorination of Water Mains for Disinfection) and Section 15042 (Hydrostatic Testing of Pressure Pipelines).

B. Removal from Service of Existing Mains and Appurtenances

1. General: Existing mains and appurtenances shall be removed from service at the locations shown on the plans or as directed by the Mesa Water Representative.

2. Method of Abandonment: Existing pipe and appurtenances shall be abandoned by the following methods. In all cases, backfill and repair of surface shall be in accordance with Section 02223 (Trenching, Backfilling, and Compacting).

Item	Allowable Demolition and Abandonment Methods		
	Sealing Ends	Grout Fill	Removal
A. Pressure Mains:			
1. Piping not under roadway:			
a) 12-inch and smaller	X	X	X
b) Larger than 12-inch		X	X
2. Piping under roadway:			
a) 6-inch and smaller	X	X	X
b) Larger than 6-inch		X	X

a. Abandonment by Sealing: Pipe section shall be cut and sealed solid with concrete to a depth of not less than one pipe diameter, forming a solid waterproof plug completely bonded to the pipe.

b. Abandonment by Grout Filling: The abandoned pipe section shall be grout filled by pumping a one-sack sand cement slurry mixture into the pipe. The pipe shall be completely filled, leaving no voids or air space.

The grout shall be pumped into the pipe from the inlet end to the receiving end (exit end). Samples of the outgoing water (at exit end) shall be made until the exiting grout mix is observed as similar to the grout being injected at the inlet end. The cost of the testing, including labor and testing equipment shall be provided by the contractor. The grouting plan, including the grout mix design shall be reviewed and approved by the Mesa Water Representative prior to initiating the work.

c. Abandonment by Removal: Removal of existing pipelines shall mean complete removal of the existing pipeline and disposal of the pipe and appurtenances designated as unsalvageable. Contractor is responsible for disposal of all pipe materials and associated costs.

Where connections or stub-outs are abandoned, all valves shall be removed and the remaining flanged fitting shall be closed/plugged using a blind-flange fitting and thrust block.

3. Storage of Removed Material: Removed pipe and appurtenances may be temporarily stockpiled on the job in a location that will not disrupt traffic or be a safety hazard. In all cases the contractor shall be responsible for the final disposal of all removed materials, including asbestos cement pipe.

4. Asbestos Cement Pipe (ACP): Asbestos cement pipe shall be removed at the joint or fitting, and disposed of in a proper manner. If field cutting of ACP is required by Mesa Water, the removal shall be performed by a contractor registered by CAL/OSHA and certified by the State Contractors Licensing Board for asbestos removal. Snap cutting of the ACP per OSHA requirements will be allowed. The

contractor shall be responsible for the proper manifesting of the ACP at an authorized disposal site.

5. Maintenance of Service: Prior to performing any work to replace existing pipes and/or services, the contractor shall make proper provisions for the maintenance and continuation of service as directed by the Mesa Water Representative.

6. Abandoned Water Services: For a water service to be considered abandoned, all surface fittings, meter, meter box and customer service valves shall be removed.

   As directed by Mesa Water, the service line and corporation stop shall be removed and the service saddle plugged with a brass (with no lead) plug or its service saddle and corporation stop removed and the tap plugged with a repair clamp. If there is no corporation stop on the service, the adapter shall be removed and a brass plug installed in the service saddle. If the water service is a direct tap, the corporation stop shall be removed and a repair clamp shall be installed.

7. Abandoned Meter Vaults, and Other Structures: For meter vaults, PRV vaults, and other structures to be abandoned, the top hatch or covers, cover slab or hatch or box grade ring, manhole/vault grade rings and other structural elements shall be removed and properly disposed of.

   All portions of the vault or structure to be abandoned shall be removed to a point six (6) feet below finished ground surface. The remaining portions of the vault shall be filled with one-sack sand cement slurry. Sufficient quantity of holes shall be provided through the bottom of the vault to allow for water to drain out of abandoned structure.

8. Contractor shall record all abandonment, tie-ins and revision to existing facilities and submit this information to Mesa Water and the design engineer to be incorporated into the Record Drawings.

C. Cutting and Restoring Street Surfacing

1. In cutting or breaking up street surfacing, the contractor shall not use equipment that will damage adjacent pavement.

2. All asphalt and/or Portland cement concrete surfaces shall be scored with sawing equipment of a type meeting the approval of the jurisdictional agency or Mesa Water; providing however, that any cement concrete base under an asphaltic mix surface will not be required to be scored by sawing. Existing paving surfaces shall be saw cut back beyond the edge of the trenches to form neat square cuts before repaving is commenced.

3. Pavement, sidewalks, curbs, or gutters removed or destroyed in connection with performance of the work shall be saw cut to the nearest score marks, if any, and shall be replaced with pavement sidewalks, curbs, or gutters of the same kind, or better by the Contractor in accordance with the latest specifications, rules, and regulations and subject to the inspection of the agency having jurisdiction over the street or highway.

4. Aggregate base shall be placed beneath the restored pavement to the thickness required by the agency having jurisdiction.

END OF SECTION

SECTION 01380

RECORDING EXISTING AND NEW FACILITIES

PART 1 – GENERAL

A. Description

This section specifies photographs and DVD recordings to be provided by the contractor prior to, during, and after construction.

B. Payment

The contractor shall pay costs for specified photography, video tape recording, and prints. Parties requiring additional photography, prints, video tape recordings, or copies of video tapes will pay the photographer or videographer directly.

C. Submittals

The contractor shall submit pre-construction, construction, and post construction photographs and video tape recordings. The contractor shall be responsible for modifications to his equipment and/or inspection procedures to achieve report material of acceptable quality. No construction activities shall commence prior to approval of the pre-construction photographs and video tape recordings by Mesa Water.

PART 2 – MATERIALS

A. General

1. The photographs and color video tapes are intended for use as indisputable evidence in ascertaining the extent of any damage which may occur as a result of the contractor's operations and are for the protection of the property owners, the contractor, and the owner, and will be a means of determining whether and to what extent damage, resulting from the contractor's operations, occurred during the work.

2. The contractor shall maintain a copy of site examination documentation for the duration of the work.

B. Photographs

Photographic prints shall be made from digital SRL camera with a minimum resolution of 8 mega pixels in raw and .JPEG formats and shall indicate on the front of each print the date, name of work, and location where the photograph was taken. A compilation of all digital photos shall be delivered in an electronic, digital format compatible with the latest version of Adobe Lightroom to Mesa Water at the end of each month. The photographer shall be experienced in this type of work and equipped to photograph either interior or exterior scenes, with lenses having diagonal fields of coverage that range at least from 18 degrees to 84 degrees.

C. DVD Tapes

The video shall be provided on DVD or flash drive and shall indicate on the video case and the box the date, name of the contract, and the location where the video was recorded. The video shall contain an audio track, which narrates the progression of the video through the site. Two copies of each DVD or flash drive shall be delivered to Mesa Water within ten working days after a video is completed. The videographer shall be experienced in this type of work and equipped to video either interior or exterior scenes, with lenses having diagonal fields of coverage that range at least from 15 degrees to 65 degrees. The video on the DVD or flash drive shall be write protected.

PART 3 – EXECUTION

A. Pre-construction Photographs And Video

Provide pre-construction photographs and video recording prior to commencement of the work taken along the proposed routing of the entire project, including staging areas, storage areas, nearby existing structures, fences, retaining walls, paved surfaces, access points to the project, primary delivery routes and vegetation. Examination of the existing conditions of the work site, including the areas adjacent to the work area, shall be made by the Contractor and documented with photographs and video recordings.

B. Construction Photographs And Video

1. Photographs and video recording shall be provided during construction to show all utility crossings, tunneling pits, excavations for pipe, installation of structures, pipe and appurtenances, and items of special interest upon the request of Mesa Water. Provide construction photographs during the progress of the work and at all major equipment setups. Take weekly exposures starting one week after the date of acceptance of the pre-construction photographs and video recordings and continuing as long as the work is in progress.

2. Print photograph shall have attached to the backing a paper label containing thereon in neat lettering:

    a. Contractor’s Name and Photographer’s Name
    b. Short Caption – Description of View
    c. Photo ID Number and Date Taken

    Electronic photos shall have the above mentioned information annotated on the photo.

C. Post-construction Photographs And Video

Post-restoration photographs and video recordings shall be taken within seven (7) calendar days from final completion along the routing of the entire project, including staging areas, storage areas, nearby existing structures, fences, retaining walls, paved surfaces, and vegetation. The post-restoration photographs and video recordings shall be submitted to Mesa Water. Mesa Water Representative will ascertain the extent of any damage, and will determine whether improvements, damaged or removed during construction, have been returned to specified or original condition.

END OF SECTION

SECTION 01570

STORM WATER POLLUTION PREVENTION PLAN

PART 1 – GENERAL

A. Description

Contractor shall use appropriate Best Management Practices (BMPs) to reduce construction-related impacts and control runoffs to protect channels, storm drains, and bodies of water from pollution. The following Section applies to projects where Mesa Water is a party to the contract for the construction activities.

For projects that will disturb less than one (1) acre of land, the contractor will not be required to prepare a site-specific Storm Water Pollution Prevention Plan (SWPPP). For projects greater than one (1) acre, a site-specific SWPPP is required.

Disposal of construction water from operations such as groundwater dewatering and water used for testing, disinfecting, and flushing pipelines is not part of the work under this Section.

B. Projects Disturbing Less Than One Acre of Land

If the project disturbs less than one (1) acre of land, the contractor will not be required to prepare a site-specific Storm Water Pollution Plan (SWPPP). The contractor shall implement and maintain such BMP's as are relevant to the work. The BMP's can be found on the internet at http://www.cabmphandbooks.com. Appropriate BMPSs for construction-related materials, wastes, spills or residues shall be implemented to minimize transport from the site to streets, drainage facilities, or adjoining properties by wind or runoff. The contractor shall contain all wastewater or storm water runoff from the project site. This shall include, but not be limited to, the following: no placement of construction materials where they could enter storm drain system; checking construction vehicles for leaking fluids; providing a controlled area for cleaning or rinse-down activities; monitoring of construction activities; minimizing usage of water when saw-cutting and vacuum the residue; providing measures to capture or vacuum-up water contaminated with construction debris; removing any construction related debris on a daily basis; protecting work areas from erosion; sand bags at the catch basins; and desilt/filter the runoff until it meets the Clean Water Act requirements.

C. Projects Disturbing More Than One Acre of Land

For projects disturbing more than one (1) acre of land, the contractor will be required to prepare a site-specific SWPPP. The contractor shall develop, submit, and implement a site-specific SWPPP for the project per this Section. This Section describes the work necessary by the contractor to allow Mesa Water, for projects where Mesa Water is a party of the contract, to comply with the existing California State Water Resources Control Board (SWRCB) General Construction Activity Storm Water Permit No. CAS000002 (general permit) for discharges of storm water associated with construction activities as the permit requirements are edited to fit. Specifically, this includes the development, submittal process, and implementation of the SWPPP and a Monitoring Program (MP).

D. General Construction Activity Storm Water Permit

1. The contractor shall read and be familiar with all requirements contained in the general permit necessary to develop a SWPPP and MP. Attention is directed to the publication entitled "Storm Water Quality Handbooks" which have been prepared by the State and should assist the contractor in the development of the SWPPP. Copies of the handbooks may be purchased by writing the Department of Transportation, Material Operations Branch, Publication Unit, 1900 Royal Oaks Drive, Sacramento, California 95815, telephone 916/445-3520.

2. The contractor shall note that compliance with the requirements contained in the general permit may require the use of erosion and sedimentation control procedures outside the limits of immediate construction activity, and the implementation of Best Management Practices (BMP).

E. Notice of Intent

The general permit requires Mesa Water, for projects where Mesa Water is party to the contract, to file a Notice of Intent (NOI) with the SWRCB. A copy of this NOI must be included in the SWPPP.

F. Submittals

The contractor shall submit the SWPPP and MP following the procedure described for shop drawing submittals. The submittal shall address (among other items) street sweeping, placing silt fences around catch basins, containing lubricants and other equipment maintenance fluids, and covering or protecting stockpiles. Mesa Water may request a re-submittal, in whole or in part, if at any time during construction the protective measures are insufficient to control detrimental impacts of runoff.

G. Measurement and Payment

All costs to the contractor for preparing the SWPPP and MP for Mesa Water's review and approval shall be included as part of the appropriate bid item for developing, submitting and implementing the SWPPP. In addition, the contractor shall be responsible for all of his costs associated with the implementation of the SWPPP and coordination with Mesa Water, including the installation, maintenance, and removal of erosion control practices specified in the SWPPP upon completion of the project or as requested by Mesa Water's Representative. These costs shall be included in the appropriate bid amount as noted above.

PART 2 – MATERIALS

A. Storm Water Pollution Prevention Plan

The contractor shall develop a site-specific SWPPP in accordance with the requirements specified in the general permit. The site-specific SWPPP shall be prepared by a qualified SWPPP developer (QSD) as defined by the Construction General Permit (CGP).

The SWPPP shall be developed to conform to the appropriate Risk Level and the contractor's actual construction practices. A copy of the permit and related documents/attachments may be found on the internet at:

http://www.swrcb.ca.gov/water_issues/programs/stormwater/constpermits.shtml

Prior to commencing the work, the contractor shall electronically submit the required Permit Registration Documents (PRDs) to Mesa Water. If any of the required items are missing, the PRD submittal is considered incomplete and will be rejected.

Upon receipt and acceptance of a complete PRD submittal, Mesa Water will designate the contractor's QSD through the Stormwater Multi-Application Reporting and Tracking System (SMARTS) to submit the project information on Mesa Water's behalf. The contractor's QSD will electronically submit these documents through SMARTS to the State Water Resources Control Board (SWRCB) to obtain coverage under the CGP.

The SWPPP shall be developed and updated using Section 2 and Appendix B of the California Stormwater Quality Association (CASQA) Stormwater Best Management Practice Handbook Web Portal for Construction (requires subscription to access). The CASQA Construction BMP Web Portal required subscription can be purchased from CASQA and can be accessed at the following link:

https://www/casqa.org/LeftNavigation/BMPHandbooksPortal/tabid/200/Default.aspx

The contractor shall implement, maintain and amend the SWPPP as needed during the course of the work to reflect actual construction progress and construction practices. Mesa Water will designate a Qualified SWPPP Practitioner (QSP), as defined by the CGP, who will be responsible for confirming the compliance with CGP requirements on the project at all times.

The SWPPP shall not be construed to be a waiver of the contractor's obligations to review and understand the CGP before submitting a bid. By submitting a bid, the Contractor acknowledges that he has read and understands the requirements of the CGP.

The Contractor shall be responsible for and shall submit to Mesa Water copies of all contractor generated SWPPP documents, including all sampling test results, inspection reports, Rain Event Action Plans (REAP), annual reports, and other time sensitive documents involving monitoring data. Such documentation shall be provided as soon as the information is available and shall be provided within twenty-four (24) hours when requested by Mesa Water. The contractor shall be required to produce such data and documentation at the project site on demand if so requested by the RWQCB during a site inspection.

The contractor shall be responsible to prepare and submit the following, as a minimum: Notice of Intent (NOI), Risk Assessment, Site Map, SWPPP, the Notice of Termination (NOT), and the required components of the PRD.

B. Monitoring Program

The contractor shall develop an MP in accordance with the requirements specified in the general permit.

PART 3 – EXECUTION

A. General

1. The SWPPP and MP shall be developed and submitted by the contractor and accepted by Mesa Water prior to commencement of construction activities.

2. The contractor shall comply with all conditions identified in the general permit, which could apply to the work under this contract.

3. The contractor shall be responsible for the compliance of his personnel and subcontractors with the SWPPP and for cooperation with Mesa Water in the implementation of the MP.

4. The SWPPP shall be kept on site during construction activity and made available upon request of a representative of the Regional Water Quality Control Board (RWQCB) and/or other regulatory agency.

5. The contractor shall amend the SWPPP whenever there is a change in construction or operations which may affect the discharge of significant quantities of pollutants to surface waters, groundwaters, or a municipal storm sewer system.

B. Removal from Service of Existing Mains and Appurtenances

The SWPPP shall provide a description of potential sources which are likely to add significant quantities of pollutants to storm water discharges or which may result in non-storm water discharges from the construction site. A description of the items required to be included in the SWPPP is included in the general permit under Section A, "Storm Water Pollution Prevention Plan."

C. Monitoring Program

1. The contractor shall develop an MP as identified in the general permit under Section B, "Monitoring Program and Reporting Requirements."

2. Mesa Water will implement the MP developed by the contractor once the District accepts all of the work under this contract; however, until the final acceptance of the work, the contractor shall be responsible for monitoring his actions and the activities of those responsible to the Contractor.

3. At any time the contractor shall allow representatives of Mesa Water, RWQCB, and/or other regulatory agencies to enter upon the construction site, inspect the construction site for compliance, and sample and monitor the construction site discharges.

4. If the MP extends past the completion date for the contract, the contractor’s responsibilities for the MP will cease upon acceptance by Mesa Water of all work under the contract.

D. Duty to Comply

1. The contractor shall comply with all conditions identified in the general permit and the SWPPP. Non-adherence with the conditions specified in the general permit may constitute a violation of the Clean Water Act and the Porter-Cologne Water Quality Control Act, and may be grounds for enforcement action by the RWQCB. Any fines incurred by Mesa Water due to the contractor's lack of compliance with the SWPPP, shall be back-charged by Mesa Water to the Contractor.

2. The contractor shall take all reasonable steps to minimize or prevent any discharge in violation of the general permit.

E. Compliance Certification

1. An officer or other authorized representative of the contractor shall certify in writing to Mesa Water annually and at the completion of construction, if it occurs before the next annual report, that its construction activity is and has been in compliance or has been modified to comply with the requirements of the general permit and the SWPPP.

2. If the contractor determines that he cannot certify compliance with any of the general permit and SWPPP requirements, he shall notify Mesa Water immediately. The notification shall identify the type of noncompliance, describe the actions necessary to achieve compliance, and include a time schedule when compliance will be achieved. Each noncompliance notification to Mesa Water shall be submitted within 15 days of identification of the event by the contractor.

END OF SECTION

SECTION 02140

DEWATERING

PART 1 – GENERAL

A. Description

This section includes the general requirements for providing all labor, equipment, materials to perform all of the work necessary to design, construct, operate and maintain effective dewatering system(s) to assure a safe and dewatered condition of all areas on which the work will be performed.

The contractor shall continue the operation of the dewatering system(s) as required to complete the work and to protect adjacent property or construction until danger of damage resulting from the rise and fall of groundwater and/or inflow of surface water is precluded.

The contractor shall remove or relocate the equipment when it is no longer required, or as approved well points and like items may be abandoned in place in accordance with all laws and regulations.

B. Related Work Specified Elsewhere

1. Trenching, Backfilling, and Compacting: 02223.

C. Statutory Requirements

The California Regional Water Quality Control Board governs the discharge of any groundwater or inflow of surface water to a storm drain system. The contractor will not be authorized to discharge groundwater, pipeline dewatering, or water for pressure testing or flushing to the storm drain without obtaining a General Water Discharge Permit for Groundwater Remediation and Dewatering Waste Discharges from the Regional Water Quality Control Board. The contractor will be required to obtain and pay for any NPDES permit required for the temporary dewatering and surface drainage control discharges to a storm drain facility. The NPDES permit shall be prominently displayed on the site prior to constructing dewatering and surface water discharge operations.

D. Quality Assurance

The contractor shall furnish the services of an experienced, qualified and equipped dewatering subcontractor to design and operate the dewatering system(s) required for the work. In lieu of the above, the contractor can implement the dewatering in accordance with a system designed by a Civil Engineer who is registered in the State of California who has a minimum of five (5) years of professional experience in the design and construction of dewatering systems.

E. Submittals

Contractor shall submit a dewatering submittal showing the intended work plan for dewatering operations. The dewatering plan shall include drawings, and data showing the planned method of dewatering, excavation plan, location and capacity of such facilities as dewatering wells, well points, pumps, sumps, collection and discharge lines, standby units proposed, and protective fills and ditches required for control of groundwater and surface water. Included within the plan shall be a summary of the monitoring and settlement measuring equipment, and data collection and dissemination procedures. The submittal will be for information purposes only.

Review by Mesa Water will not relieve the contractor of the responsibility for the adequacy of the dewatering and excavation plan or for furnishing all equipment, labor, and materials necessary for performing the various parts of the work. The dewatering submittal shall be submitted not less than thirty (30) days prior to start of dewatering.

If, during the progress of the work, it is determined in the field that the dewatering system and excavation plan are inadequate or the contractor's plan of construction is inoperative, the contractor shall, at his own expense, furnish, install, and operate such additional dewatering equipment and make such changes in other features of the plan or operation as may be necessary to perform the work in a manner satisfactory to Mesa Water or the agency with jurisdiction.

F. Definitions

Where the phrase "in-the-dry" is used in this Section, it shall be defined as in situ soil moisture content of no more than two (2) percentage points above the optimum moisture content for that soil.

PART 2 – MATERIALS

The contractor shall furnish and maintain all materials, tools, equipment, facilities and services as required for providing the necessary dewater work and facilities. Dewatering may include the use of gravel filled trenches, sumps, well points, sump pumps, temporary pipeline for water disposal, rock or gravel placement, and other means.

The contractor shall provide sufficient pumping equipment and machinery in good working condition and have available, at all times, competent workmen for the operation of the pumping equipment. Adequate standby equipment shall be available at all times to insure efficient dewatering and maintenance of dewater operation during power failure.

PART 3 – EXECUTION

A. General

1. Control surface water and groundwater such that excavation to final grade can be made in-the-dry, and bearing soils are maintained undisturbed. Contractor shall prevent softening, or instability of, or disturbance to, the subgrade due to water seepage.

2. Provide protection against flotation for all work.

3. The impact of anticipated subsurface soil/water conditions shall be considered when selecting methods of excavation and temporary dewatering and surface water control. Where groundwater levels are above the proposed bottoms of excavations, a pumped dewatering system is expected for pre-drainage of the soils prior to excavation to final grade and for maintenance of the lowered groundwater level until construction has been completed to such an extent that the foundation, structure, pipe, conduit, or fill will not be floated or otherwise damaged. Type of dewatering system, spacing of dewatering units and other details of the work are expected to vary with soil/water conditions at a particular location.

B. Surface Water Control

Control surface water runoff to prevent flow into excavations. Contractor shall provide temporary measures such as dikes, ditches, and sumps, as required.

C. Excavation Dewatering

1. Provide and maintain adequate equipment and facilities to remove promptly and dispose of properly all water entering the excavation. Excavations shall be kept in-the-dry, so as to maintain an undisturbed subgrade condition throughout construction below grade, including backfill and fill placement.

2. Collect precipitation or surface runoff in shallow ditches around the perimeter of the excavation, drain to sump and pump from the excavation to maintain in-the-dry conditions.

3. Pipe and conduit shall not be installed in water or allowed to be submerged prior to backfilling. Pipe and conduit which becomes submerged shall be removed and the excavation dewatered and restored to proper conditions prior to reinstalling the pipe and conduit.

4. Excavations for foundations and structures shall be maintained in-the-dry for a minimum of four (4) days after concrete placement. In no event shall water be allowed to enter an excavation and rise to cause unbalanced pressure on foundations and structures until the concrete and mortar has set at least 24 hours.

5. Dewatering and surface water control operations shall at all times be conducted in such a manner as to preserve the natural undisturbed bearing capacity of the subgrade at the bottom of the excavation. If the subgrade becomes disturbed for any reason, the unsuitable subgrade material shall be removed and replaced with compacted granular fill, or other approved material to restore the bearing capacity of the subgrade to its original undisturbed condition.

6. Dewatering and surface water control operations shall be conducted in a manner that does not cause loss of ground or disturbance to the pipe bedding or soil that supports overlying or adjacent structures.

7. At contractor's sole expense and to the owner and/or Mesa Water's satisfaction, the contractor shall repair and make good all damage or settlement to the foundation or other portion of any new or any existing facilities or structures caused by permanent or temporary failure or operation of the dewatering or by failure to maintain the existing groundwater level outside the dewatering areas.

D. Testing and Field Quality Control

Contractor shall observe and record the elevation of the groundwater on a 12-hour or less interval during the period that the dewatering system is in operation.

E. Disposal of Drainage

All water discharged from the temporary dewatering and surface control shall be disposed of in accordance with project permits. Dewatering of non-contaminated or contaminated groundwater via surface erosion is prohibited. All dewatering of groundwater shall be discharged to the nearest sewer facility. Prior to using existing sanitary sewer systems for disposal, the contractor shall obtain written permission of the owner of the sewer. The contractor will need to coordinate this disposal with the sewer agency to schedule the disposal as well as confirm that the sewer system has adequate capacity to handle the dewatering rate. Contractor shall obtain a permit to discharge to the sewer, if required, and meet all permit requirements.

END OF SECTION

SECTION 02200

STRUCTURAL EARTHWORK

PART 1 – GENERAL

A. Description

This section describes excavation, backfilling, materials, testing, and shoring for underground structures, including control valve vaults, pressure reducing stations, meter vaults, and valve vaults.

B. Related Work Specified Elsewhere

1. Protecting Existing Utilities: 02222.

2. Trenching, Backfilling, and Compacting: 02223.

3. Concrete: 03300.

4. Precast Concrete Vaults and Meter Boxes: 03462.

C. Submittals

1. Submit six copies of a report from a testing laboratory verifying that gravel base and structural backfill conforms to the specified gradations or characteristics.

2. Test reports on borrow material.

D. Protection of Existing Utilities and Facilities

Protection of existing utilities and facilities shall conform to Section 02222 (Protecting Existing Utilities) and to Section 02223 (Trenching, Backfilling, and Compacting).

E. Protection of Landscaping

Protection of landscaping shall conform to Section 02223 (Trenching, Backfilling, and Compacting).

F. Testing for Compaction

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

G. Permits

All work shall conform to the specifications and requirements of the jurisdictional agencies. The contractor shall keep a copy of all the required permits in the job site and comply with all the terms and conditions of said permits.

PART 2 – MATERIALS

A. Definition of Zones

1. Pavement and Street Zones: Pavement and street zones shall be as defined in Section 02223 (Trenching, Backfilling, and Compacting).

2. Upper Backfill Zone: The upper backfill zone is defined as the backfill to the full width of the excavation from the top of the structure to the bottom of the street zone in paved areas or to the finished surface in unpaved areas.

3. Structural Backfill Zone: The structural backfill zone is defined as backfill from the top of the structure to the bottom of the excavation, extending the full width of the excavation.

B. Native Earth Backfill – Upper Backfill Zone

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

C. Structural Backfill – Structural Backfill Zone

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

Sieve Size	Percent Passing By Weight
2 inches	100
1-½ inches	95 to 100
¾ inch	50 to 100
3/8 inch	15 to 55
No. 4	0 to 25
No. 8	0 to 5
No. 200	0 to 3

D. Crushed Rock Base

Crushed or natural rock with the following gradation shall be provided as base under the structure:

Sieve Size	Percent Passing By Weight
2-inches	100
1-½ inches	90 to 100
1 inch	20 to 55

Sieve Size	Percent Passing By Weight
¾ inch	0 to 15
½ inch	--
3/8 inch	0 to 5

E. Water for Compaction

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

PART 3 – EXECUTION

A. Compaction Requirements

1. Backfill in Street Zone: minimum per jurisdictional agency or 95% relative compaction.

2. Upper Backfill Zone: 90% relative compaction.

3. Structural Backfill Zone: 95% relative compaction.

4. Crushed Rock Base: 90% relative compaction.

5. Adjacent to existing structure: 95% relative compaction.

B. Sidewalk, Pavement, and Curb Removal

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

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

C. Dewatering

1. Dewatering operations shall continuously remove and dispose of all water entering the excavation during construction of the structure and all backfill operations. Water shall be disposed of in a manner to prevent damage to adjacent property and pipe trenches in conformance with all local regulations. Water shall not be allowed to rise in the excavations until backfilling around and above the structure is complete.

2. Mesa Water shall be notified 48 hours prior to commencement of dewatering operations.

3. The sewer system shall be used as a discharge for the dewatering effort unless the Contractor has obtained a NPDES permit for the dewatering operations. Contractor shall obtain a permit to discharge to the sewer, if required, and meet all permit requirements.

4. Methods employed shall be in compliance with the Contractor's NPDES permit. A copy of the Contractor's NPDES permit shall be on-site at all times.

D. Structure Excavation

1. Structure excavation shall include the removal of all material necessary for the construction of structures and foundations.

2. Unless noted otherwise on the plans, the sides of excavations for structures shall be sufficient to leave at least a 2-foot clearance, as measured from the extreme outside of form work or the structure, as the case may be.

3. Surplus material shall be disposed of by the Contractor in accordance with Section 02223 (Trenching, Backfilling, and Compacting).

E. Correction of Over Excavation

1. Where excavation is inadvertently carried below design depths, suitable provision shall be made by the Contractor to adjust construction, as directed by Mesa Water's Representative, to meet requirements incurred by the deeper excavation.

2. No earth backfill will be permitted to correct over excavation beneath structures.

3. Over excavation shall be corrected by backfilling with crushed rock, as directed by Mesa Water's Representative.

F. Support for Excavations for Structures

1. A safe working area shall be provided for workers. The services of a Registered Civil Engineer shall be obtained to design sheeting, shoring and bracing, or side slopes. The requirements of CAL/OSHA and of these specifications shall be used as minimum design criteria. Sufficient geotechnical data shall be obtained to provide safe design.

2. The Contractor's design and installation of bracing and sheeting shall take the necessary precautions to be consistent with the rules, orders, and regulations of the State of California Construction Safety Orders.

3. Excavations shall be so braced, sheeted, and supported that they will be safe, such that the walls of the excavation will not slide or settle and all existing improvements of any kind, either on public or private property, will be fully protected from damage.

4. The sheeting, shoring, and bracing shall be arranged so as not to place any stress on portions of the completed work.

5. Carefully remove sheeting, shoring, bracing, and timbering to prevent the caving or collapse of the excavation faces being supported.

6. Side Slopes: Minimum side slope shall be per CAL/OSHA but not steeper than:

   a. Clayey soil up to 12-foot depth: ¾ horizontal to 1 vertical (3/4: 1).

   b. Clayey soil more than 12-foot depth: vary from 3/4: 1 for 12-foot depth to 3:1 for 20-foot depth.

   c. Gravelly soil: 2 horizontal to 1 vertical (2:1).

   d. Flatten above slopes if groundwater is present.

7. Traffic Safety: Methods of support or side slopes shall be selected to provide sufficient clearance for traffic safety and convenience.

8. Design Loads: The characteristic of the soil exposed in the excavation, the groundwater conditions, traffic, and other surcharge loads shall be considered when selecting lateral pressures to be used for design of soil supporting systems.

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

	Predominant Soil Type	
	Clayey	Granular
Isolated Soldier Piles	200 Z + 1,870	467 Z
Solid Sheet Piles	67 Z + 633	300 Z

   Where Z = depth in feet below bottom of excavation.

10. Verification of Soil Types: Prior to design and submittal of support system, verification of the type of soil below the bottom of the excavation shall be made.

G. Backfill Against Walls and Over Roof Slabs

1. Backfill over structure shall be placed in a manner so as to not damage the roof membrane and protective cover.

2. Backfill shall not be placed against walls or above buried roof slabs until the concrete has obtained a comprehensive strength equal to the specified 28-day compressive strength.

3. Where backfill is to be placed on both sides of the wall, the backfill shall be placed uniformly on both sides. Where backfill is to be placed around a structure, the backfill shall be placed at a uniform rate around the structure.

4. Backfill shall not be placed against the walls of structures that are laterally restrained or supported by suspended slabs or slabs on grade until the slab is poured and the concrete has reached the specified compressive strength.

5. When backfill is to be placed before 7-day concrete strength tests have been conducted on concrete arches or thrust blocks, the concrete shall have achieved 50 percent of the specified minimum 28-day strength. An additional test cylinder shall be made for this test.

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

H. Compaction

1. Compaction shall be controlled to the percentage of density specified for each zone.

2. When subgrade or soil material layers must be moisture conditioned before compaction, water shall be uniformly applied to the subgrade surface or soil layer material to prevent free water from appearing on the surface during or subsequent to compaction operations. The moisture content of the compacted soil shall be within three (3) percentage points of the optimum.

3. Soil material that is too wet to permit compaction to specified density shall be removed and replaced or scarified and air dried.

4. Soil material that has been removed because it is too wet to permit compaction may be stockpiled or spread within an approved area and allowed to dry. Drying may be assisted by discing, harrowing or pulverizing, until moisture content is reduced to satisfactory value.

5. Backfill or fill material shall not be placed on surfaces that are muddy, frozen, or contain frost or ice.

6. Excavations shall be backfilled as work permits, but not until completion of the following:

   a. Acceptance of construction below finished grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.

   b. Inspection, testing, approval, and recording locations of underground utilities.

   c. Removal of concrete formwork.

   d. Removal of shoring and bracing, and backfilling of voids with satisfactory materials. Cut off temporary sheet piling driven below bottom of the structures and remove in manner to prevent settlement of the structure or utilities, or leave in place, if required.

   e. Removal of trash and debris.

   f. Permanent or temporary horizontal bracing is in place on horizontally supported walls.

7. Backfill and fill materials shall be placed in layers not more than eight (8) inches in loose depth for material compacted by heavy compaction equipment, and not more than four (4) inches in loose depth for material compacted by hand-operated tampers.

8. Unless specified otherwise, jetting techniques shall not be employed to densify granular fill materials.

9. Backfill and fill materials shall be placed evenly adjacent to structures, to required finish elevations. Care shall be taken to prevent wedging action of backfill against structures carrying material uniformly around structure to approximately same elevation in each lift.

I. Pavement Replacement

Pavement replacement shall be in accordance with the requirements of the city or the agency having jurisdiction.

J. Permits

An Encroachment Permit from the jurisdictional agency is required prior to any work within public right-of-way. All traffic control and pavement replacement work shall be in accordance with the requirements of the permit and the agency Inspector.

A permit from OSHA is required of any excavation exceeding 5 feet.

END OF SECTION

SECTION 02222

PROTECTING EXISTING UTILITIES

PART 1 – GENERAL

A. Description

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

B. Related Work Specified Elsewhere

1. Existing Facilities: 01045.

2. Trenching, Backfilling, and Compacting: 02223.

C. Submittals

Contractor shall submit drawings and calculations for support and protection at the pipeline crossings larger than 36-inch in diameter at least thirty (30) calendar days prior to excavation of the crossing.

D. Construction Interferences

1. As used in this Section, the word "utility" shall be understood to include tracks, overhead or underground wires, cables, pipelines, conduits, ducts, sewers, or storm drains. As used in this Section, the term "service connection" shall be understood to mean all or any portion of a pipeline conduit, wire, cable or duct, including meter, between a utility distribution line and an individual customer when served by a single service connection. As used in this Section, the term "construction interference" shall be understood to include any utility or service connection within the limits of excavation or over-excavation required for the work under the contract as shown or as ordered by Mesa Water or the design engineer, or any utility or service connection located in the space which will be required by any of the work under the contract.

2. In the event any utility or service connection is required to be disturbed or removed to permit construction of a pipeline or other structure under the contract, such disturbance or removal shall be done only with the approval of Mesa Water, and following notification to the owner of the interfering utility or service connection. Any such utility or service connection removed or otherwise disturbed shall be reconstructed as promptly as possible in its original or other authorized location in a condition at least as good as prior to such removal or disturbance, subject to the inspection of the owner of same. The contractor's responsibility under this Section to remove or replace shall apply even in the event such damage or destruction occurs after backfilling or is not discovered until after completion of backfilling. The owner of the utility or service connection shall be notified immediately after damage or destruction occurs or is discovered.

3. During the performance of the work under this contract, the owner of any utility affected by the work shall have the right to enter when necessary upon any portion of the work for the purpose of maintaining service and of making changes in or repairs to said utility.

4. The drawings show the approximate positions of known utilities in the immediate vicinity of the work, but Mesa Water does not guarantee that all existing utilities are shown. Service connections normally are not shown on drawings. The contractor, before commencing any excavation, shall ascertain from records or otherwise, the existence, position and ownership of all existing utilities and service connections. If the contractor discovers any utility or sewer house laterals in the line of work which is not shown on the drawings, he shall immediately notify Mesa Water and the design engineer of the existence of same. Mesa Water will not be liable for any consequences arising as a result of a service connection being incorrectly located in the field by the agency having jurisdiction over said service connection.

5. All costs involved in removing, relocating, protecting, supporting, repairing, maintaining or replacing a utility which actually constitutes a construction interference, when said utility is shown on the drawings as an interference, however approximate the location shown may be, shall be borne by the contractor.

6. All costs involved in removing, relocating, protecting, supporting, repairing, maintaining or replacing a utility which actually constitutes a construction interference, when said utility is not shown as an interference or is omitted from the drawings, will be paid for by the developer/owner or by Mesa Water as extra work where Mesa Water is a party to the contract and is determined to have responsibility.

7. All costs involved in removing, relocating, protecting, supporting, repairing, maintaining or replacing a service connection larger than two (2) inches in nominal diameter which actually constitutes a construction interference, when said service connection is shown on the drawings as an interference, however approximate the location shown may be, shall be borne by the contractor.

8. All costs involved in removing, relocating, protecting, supporting, repairing, maintaining or replacing a service connection larger than two (2) inches in nominal diameter which actually constitutes a construction interference, when said service connection is not shown as an interference or is omitted from the drawings, will be paid for by the developer/owner or by Mesa Water as extra work where Mesa Water is a party to the contract and is determined to have responsibility.

9. All costs involved in removing, relocating, protecting, supporting, repairing, maintaining or replacing a service connection two (2) inches or smaller in nominal diameter which actually constitutes a construction interference, whether or not said service connection is shown on the drawings, shall be borne by the contractor.

10. The contractor shall not be assessed liquidated damages for failure to complete the work on time to the extent that such delay was caused by failure of Mesa Water or of the agency having jurisdiction over the utility or service connection to authorize or otherwise provide for its removal, relocation, protection, support, repair, maintenance, or replacement.

11. Mesa Water reserves the right, upon determination of the actual position of existing utilities and service connections, to make changes in alignment or grade of the Mesa Water's pipelines when, by so doing, the necessity for relocation of existing utilities or service connections will be avoided. Such changes will be ordered in writing by Mesa Water. Where applicable, adjustment in contract price will be on the basis on the unit prices stated in the Bidding Schedule where Mesa Water is a party to the contract.

PART 2 – MATERIALS

Except as indicated on the drawings, or as specifically authorized by Mesa Water Representative or the owner of the utility, utilities shall be reconstructed with new material of the same size, type, and original quality as that removed.

PART 3 – EXECUTION

A. General

1. The drawings provide the specific pipeline protection notes required for this project. The following requirements are general and are in addition to the specific requirements noted on the drawings.

2. Where utilities are parallel to or cross the excavation or the pipeline trench, but do not conflict with the permanent work to be constructed, follow the procedures given below and as indicated on the drawings. Notify the utility owner 48 hours in advance of the crossing construction and coordinate the construction schedule with the utility owner's requirements. Contractor shall obtain utility owner approval before submitting shop drawings for review by Mesa Water.

3. Contractor shall determine the true location and depth of utilities, service connections and points of connections which may be affected by or affect the work. The contractor shall determine the type, material, and condition of these utilities. The contractor shall pothole all crossing utilities, closely parallel utilities and all points of connections.

B. Procedures

1. Protect in Place: Protect utilities in place, unless abandoned, and maintain the utility in service, unless otherwise specified on the drawings, or in the project specifications.

2. Cut and Plug Ends: Cut abandoned utility lines (conduits) and plug the ends with brick and mortar wall (a minimum of 8-inches thick) or concrete plug (minimum of 6-inches thick). Dispose of the cut pipe as unsuitable material.

3. Contractor shall provide temporary support for all pipelines crossing the proposed trench. All pipelines 18-inches in diameter or larger crossing over the proposed Mesa Water main with less than four (4) feet of clearance shall have a concrete support

poured as shown on the drawings or as directed by Mesa Water's Representative. All pipelines less than 18-inches in diameter and crossing over the proposed water main with less than two (2) feet of clearance shall be protected by pouring a 1-sack sand/cement slurry from the top of the water main to the bottom of the crossing pipeline.

C. Thrust Blocks on Water Lines

The contractor's attention is called to thrust blocks on existing water lines throughout the project area whose thrust is in the direction of the trench excavation and, therefore, may be affected by the pipeline construction. The contractor shall protect the thrust blocks in place or shore to resist the thrust by a means acceptable to Mesa Water.

If the thrust blocks are exposed or rendered to be ineffective in the opinion of the owner's representative or Mesa Water, the contractor shall reconstruct the thrust block to bear against firm unexcavated or backfill material. Provide firm support by backfilling that portion of the trench for a distance of a minimum of two (2) feet on each side of the thrust block to be reconstructed from the pipe bedding to the pavement subgrade, with one sack sand-cement slurry. Then excavate the backfill material for construction of the thrust block.

D. Abandoned Utilities

The contractor shall remove and dispose of abandoned utilities within the trench excavation.

END OF SECTION

SECTION 02223

TRENCHING, BACKFILLING, AND COMPACTING

PART 1 - GENERAL

A. Description

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

B. Related Work Specified Elsewhere

1. Structural Earthwork: 02200.

2. Protecting Existing Utilities: 02222.

3. Pavement Removal and Replacement: 02578.

4. Concrete: 03300.

C. Submittals

1. Shop drawings shall be submitted showing excavation and shoring, bracing, or sloping for worker protection.

2. Copies of a report from a testing laboratory shall be submitted verifying that backfill material conforms to the specified gradations or characteristics for pea gravel, granular material, imported sand, rock refill for foundation stabilization, and water.

D. Measurement and Payment

1. Payment for the work in this section shall be included within the appropriate pipeline or appurtenance bid item.

2. Payment for over-excavation where the bottom of trench is wet or spongy (Over-Excavation Ordered by Mesa Water) will be paid for at the unit price bid for "Over-Excavation Ordered by Mesa Water". The refilling of the over-excavation with aggregate bedding will be paid for at the unit price bid for "Imported Aggregate Bedding Ordered by Mesa Water".

   The unit price bid amount will hold for any quantity of over-excavation and/or refill material from 0 to 1,000 cubic yards, based on the trench details shown on the plans. This item has been included in the bid schedule for work that may possibly be required to complete the project, but which cannot be reasonably predicted, and shall be the basis of payment for over-excavation and refill material for trench foundation stabilization if authorized in writing by Mesa Water.

The unit price bid shall be for any quantity installed, complete in place, including all additional earthwork, disposal of all excess or waste material, and placing of the refill material. The Mesa Water Representative shall be the sole judge as to the necessity, the amount, and depth that may be required in any given situation. No additional payment shall be made for foundation stabilization that is not authorized in writing by Mesa Water.

3. Any over-excavation which may become necessary due to changes in grade of the pipelines to be constructed, where Mesa Water is a party to the contract, to avoid existing subsurface structures and utilities, as ordered by Mesa Water Representative, in writing, shall be performed by the contractor at his own expense when such over-excavation is less than six (6) inches below the grade of the bottom of the trench.

4. Any excavation carried below the subgrade, or below the grade shown or ordered, shall be refilled to the required grade with selected material and compacted by mechanical means to 90 percent of maximum density. Such work shall be performed by the contractor at his own expense where Mesa Water is a party to the contract.

5. All costs of drying, blending, transporting, and/or importing backfill material and all costs for the removal and disposal of unsuitable material and excess excavated material shall be included in the prices bid for the various items of work.

6. Full compensation for protection of utilities or replacement of utilities and street improvements including, but not limited, to removal and disposal and reconstruction of existing curb, gutter, spandrels, cross-gutters, sidewalks, driveway aprons, and handicapped ramps shall be included in the contract unit prices for which such work is appurtenant thereto, and no additional allowance or payment will be made therefore, where Mesa Water is a party to the contract. Said various contract unit prices shall include all labor, materials, tools, and equipment necessary or incidental to the replacement work.

7. The same shall apply to all costs incurred in exposing or excavating existing utilities and service lines, and no additional allowance will be made therefore, as they shall be included in the prices bid for the various items of work where Mesa Water is a party to the contract.

E. Protection of Existing Utilities and Facilities

1. General: The contractor shall be responsible for the care and protection of all existing sewer pipelines, water pipelines, gas mains, storm drains, culverts, or other facilities and structures that may be encountered in or near the area of work. Unless otherwise indicated on the drawings, all utilities shall be protected in place and service shall be continuously maintained.

   The contractor shall be responsible for the location of and protection in place, of all service connections whether or not shown on the drawings.

Utilities crossing the proposed pipeline alignment or project work (where shown in "plan" and "profile" view) on the drawings are plotted from the information obtained from the respective utility's owner or from available pothole information. The accuracy of the utilities is not guaranteed. Actual locations (not depth) will be provided by utilities through the Underground Service Alert (USA) process.

It shall be the contractor's responsibility to make exploratory excavations (by "hand" where prudent) to determine the true location and depth of all utilities shown on the drawings. The contractor shall also determine the type of material and condition of any utility which may be affected by or affect the work. The contractor shall conduct the exploratory excavations at least 1,500 feet ahead of a pipe trench heading (or a minimum of ten (10) working days in advance of the planned construction, whichever is greater) to provide sufficient lead-time to resolve utility conflicts. For portions of the pipeline where steel pipe is proposed to be used, the potholing shall be completed prior to submittal of the actual pipe laying diagrams. The contractor shall submit a set of potholing plans to Mesa Water or the design engineer prior to submitting the actual line lay diagrams.

2. Notification: It shall be the duty of the contractor to notify each agency of jurisdiction and make arrangements for locating each agency's facilities prior to beginning construction. The contractor shall notify Underground Services Alert (Dig Alert) at least two working days prior to construction at 1-800-422-4133.

3. Damage: In the event of damage to any existing facilities during the progress of the work due to the failure of the contractor to exercise the proper precautions, the contractor shall be responsible for the cost of all repairs and protection to said facilities. The Contractor's work may be stopped until repair operations are complete.

F. Protection of Landscaping

1. General: The contractor shall be responsible for the protection of all the trees, shrubs, fences, and other landscape items adjacent to or within the work area, unless directed otherwise on the drawings. In the event of damage to landscape items, the contractor shall replace the damaged items in a manner satisfactory to owner, the jurisdictional agency and/or Mesa Water.

   The contractor shall verify that any damaged landscaping shall be replaced with landscaping that meets the current and applicable local landscape standards, codes, and ordinances, including but not limited to AB 1881 (Water Efficient Landscape Ordinance).

2. Restoration: After the completion of work in planted or improved areas within public or private easements, the contractor shall restore such areas to original condition. Restoration shall include regrading, placement of 5-inches of topsoil, reseeding, and replacement of landscaping. All irrigation facilities shall be restored/replaced to a condition equal to or better than existing per the manufacturer's recommendations and/or industry standards.

G. Definition of Zones

1. Pavement Zone: The pavement zone shall include the asphaltic concrete and aggregate base pavement section placed over the street zone. This zone is often referred to as the "structural section" of the street or highway.

2. Trench Zone: The trench zone shall include the portion of the trench from the top of the pipe zone to the bottom of the pavement zone in paved areas or to the existing surface in unpaved areas.

3. Street Zone: The street zone is the top 12 inches of the trench zone and is immediately below the pavement zone in paved areas or areas to be paved.

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

5. Pipe Base: The pipe base shall be defined as a 4 or 6-inch layer of material immediately below the pipe zone and extending over the full trench width.

PART 2 - MATERIALS

A. Pavement Zone Materials

Pavement zone materials shall be as required by the jurisdictional agency for trenches in public streets, or as shown on the drawings, or as specified in Section 02578 (Pavement Removal and Replacement). For trenches within public streets, the jurisdictional agency permit requirements will have precedence.

B. Trench Zone

Native or imported backfill shall be excavated, fine-grained non-organic materials free from peat, roots, debris, and rocks larger than 3-inches, and which can be compacted to the specified relative compaction, unless otherwise directed by the jurisdictional agency.

Trench zone backfill for all public streets shall be in accordance with Mesa Water Standard Drawings or as specified by the jurisdictional agency and as shown on the agencies typical trench detail. For trenches within public streets, the jurisdictional agency permit requirements will have precedence on the trench zone backfill unless Mesa Water's requirements are more stringent than the jurisdictional agency permit requirements.

C. Pipe Zone and Pipe Base

The pipe base and pipe zone backfill material shall be imported sand and shall conform to the Standard Specifications for Public Works Construction, Section 200-1.5.1 and shall meet the following gradation:

Sieve Size	Percent Passing by Weight
3/8 - inch	100
No. 4	75-100
No. 30	12-50
No. 100	5-20
No. 200	0-11

Minimum sand equivalent shall be 30 for natural imported material and shall be 40 for screened recycled materials per ASTM D 2419. Certification that the sand meets this requirement shall be provided.

D. Gravel or Crushed Rock

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

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

E. Refill Material for Foundation Stabilization

Refill material below the pipe shall be material conforming to the 1-1/2 inch size requirement for gravel or crushed rock noted above.

F. Sand-Cement Slurry Refill Material for Foundation Stabilization in Pipe Base and Pipe Zone

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

G. Pea Gravel

Pea gravel shall be defined as gravel, uniformly graded from coarse to fine with less than 10% passing a No. 200 sieve, less than 50% passing a No. 4 sieve, and having a maximum particle size of 3/4-inch.

H. Water for Compaction

Water used in compaction shall have a maximum chloride concentration of 500 mg/l, a maximum sulfate concentration of 500 mg/l, and shall have a pH of 7.0 to 9.0. Water shall be free of acid, alkali, or organic materials injurious to the pipe coatings or the environment.

PART 3 - EXECUTION

A. Testing for Compaction

1. Methods: The density of soil shall be determined in place by the sand cone method, ASTM D 1556, or by the nuclear method, ASTM D 2922 or D 3017.

2. Soil Moisture-Density Relationship: The laboratory moisture-density relations of soils shall be determined per ASTM D 1557.

3. Cohesionless Materials: The relative density of cohesionless materials shall be determined by ASTM D 4253 and D 4254.

4. Sampling: Backfill materials shall be sampled per ASTM D 75.

5. Relative Compaction: "Relative compaction" shall be expressed as the ratio, expressed as a percentage, of the in place dry density to the laboratory maximum dry density.

6. Compaction Compliance: Compaction shall be deemed to comply with the specifications when none of the tests falls below the specified relative compaction. When tests are conducted by Mesa Water, the contractor shall notify Mesa Water 24-hours in advance of when backfill lifts are ready for testing, and shall pay the costs of any retesting of work not conforming to the specifications.

7. Testing Intervals: Unless noted otherwise, compaction tests shall be performed at random depths and at 200-foot intervals, and as directed by Mesa Water Representative. The presence of marginal materials, poor soil conditions or a prevalence of failed test results will be cause for substantially increasing the frequency and intervals of required testing.

8. The applicant/developer will secure the services of a soil tester and pay the costs of all compaction testing for developer construction. On Mesa Water projects, Mesa Water will secure the service of a soils tester and pay the cost of the initial testing. The contractor will be responsible for the cost of all retests in failed areas. Test results will be furnished by Mesa Water.

B. Compaction Requirements

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

1. Pipe Base and Pipe Zone: Pipe base and pipe zone--90% relative compaction.

2. Trench Zone - Not Beneath Paving: Backfill in trench zone not beneath paving--90% relative compaction; backfill in trench zone within landscape areas – 85% relative compaction per Section 308 of Standard Specifications.

3. Trench Zone - Paved Areas: Backfill in trench zone in paved areas--90% relative compaction.

4. Street Zone: Backfill in street zone in paved areas--95% relative compaction, or as required by the jurisdictional agency.

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

6. Overexcavation: Rock refill for overexcavation--90% relative density.

7. Material Testing: All imported or native materials shall be tested before the start of compaction operations to determine the moisture density relationship for materials with cohesive components, and the maximum density for cohesionless materials. Variations in imported or native earth materials may require a number of base curves of the moisture-density relationship.

C. Material Replacement

Trenching and backfilling material which does not meet the specifications shall be removed and replaced at no additional expense to Mesa Water where Mesa Water is a party to the contract.

D. Sheeting, Shoring, and Bracing of Trenches

All excavations shall be performed, protected, and supported as required for safety and in the manner set forth in the operation rules, orders, and regulations prescribed by the Division of Industrial Safety of the State of California. If the total amount of the contract, where Mesa Water is a party of the contract, is in excess of $25,000, the contractor shall submit to Mesa Water, in advance of excavation, a detailed plan showing the design of shoring, bracing, sloping, or other provisions to be made for worker protection from the hazard of caving ground during the excavation of any trench or trenches five feet or more in depth. Lateral pressures for design of trench sheeting, shoring, and bracing shall be based on type of soil exposed in the trench, groundwater conditions, surcharge loads adjacent to the trench, and type of shoring that will be used in the trench.

The plan shall be prepared by a registered civil or structural engineer. As part of the plan, a note shall be included stating that the registered civil or structural engineer certifies that the plan complies with the CAL-OSHA Construction Safety Orders. If, however, the plan does

not comply with the Safety Orders, the plan shall include a note stating that the registered civil or structural engineer certifies that the plan is not less effective than the shoring, bracing, sloping, or other provisions of the Safety Orders.

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

E. Sidewalk, Pavement, and Curb Removal

Bituminous and concrete pavements regardless of the thickness and curbs and sidewalks shall be cut prior to excavation of the trenches in accordance with Section 02578 (Pavement Removal and Replacement). Pavement and concrete materials shall be removed from the site and shall not be used for trench backfill.

F. Trench Width

For All Pipe Diameters (except services): Unless shown otherwise on the drawings, trench widths in the pipe zone shall be equal to the pipe outside diameter plus 12-inches minimum and 20 inches maximum on each side of the pipe.

Excavation and trenching shall be true to line so that a clear space is provided in the pipe zone on each side of the largest outside diameter of the pipe. The largest outside diameter shall be the outside diameter of the bell on bell and spigot pipe.

Trench width at the top of the trench shall not be limited except where the width of excavation impact the proposed traffic control plans or would undercut adjacent structures and footings. In such cases, the width of the trench shall be such that there is at least 18-inches between the top edge of the trench and the structure or footing.

G. Grade

Trenches shall be excavated to the lines and grades shown on the drawings with allowance for pipe thickness and for pipe base. If the trench is excavated below the required grade, the portion of the trench excavated below the grade shall be refilled with refill material at no additional cost to Mesa Water. The refill material shall be placed over the full width of trench in compacted layers not exceeding 6-inches deep to the required grade with allowance for the pipe base. Hard spots that would prevent a uniform thickness of pipe base shall be removed. Before laying pipe sections, the grade shall be checked with a straightedge and any irregularities corrected. The trench bottom shall form a continuous and uniform bearing and support for the pipe at every point.

H. Pipe Base Thickness

Thickness of the pipe base shall be as shown on the drawings: 4-inches thick for pipes smaller than 6-inches in diameter and 6-inches thick for pipes 6-inches in diameter or greater.

I. Dewatering

1. Means and Devices: Suitable means and devices shall be provided and maintained to continuously remove and dispose of all water entering the trench excavation during the time the trench is being prepared for the pipe laying, during the laying of the pipe, and until the backfill at the pipe zone has been completed.

   These provisions shall apply during the noon hour as well as overnight. Water shall be disposed of in a manner to prevent damage to adjacent property. Trench water shall not be drained through the pipeline under construction. Groundwater shall not be allowed to rise around the pipe until jointing compound has firmly set.

2. De-watering shall commence when groundwater is first encountered and shall be continuous until such times as water can be allowed to rise. No concrete shall be poured in water, nor shall water be allowed to rise around the concrete or mortar until it has set at least eight (8) hours.

3. Notification: Mesa Water shall be notified 48 hours prior to commencement of dewatering. Water shall be discharged to a sewer system.

J. Storage of Excavated Material

During trench excavation, excavated material shall be stored only within the working area. Roadways or streets shall not be obstructed. The safe loading of trenches with excavated material shall conform to federal, state, and local codes.

K. Length of Open Trench

The maximum allowable length of open trench shall be 300 feet, or the distance necessary to accommodate the amount of pipe installed in a single day, whichever is less. Backfilling and temporary or first layer paving shall be completed so that not more than 200 feet of trench is open in the rear of pipe laying.

No trench or excavation shall remain open during non-working hours. The trench or excavation shall be covered with steel plates, spiked in place, or secured with temporary A.C. pavement around the edges, or backfilled. The maximum amount of steel plates within travel lanes (for the whole project) at one time is 200 feet.

Sidewalks, driveways and other traveled ways shall be backfilled or adequately bridged to provide safe access and egress at the completion of each day's work. The length of open trench may be restricted further as directed by appropriate jurisdictional agency.

L. Foundation Stabilization

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

a wider trench. The width and depth of known areas to be over-excavated shall be shown on the drawings. The over-excavated portion of the trench shall be backfilled to the subgrade of the pipe base with refill material for foundation stabilization.

Foundation stabilization material shall be placed over the full width of the excavation and compacted in layers not exceeding 6-inches in depth, to the required grade.

M. Trench Backfilling and Compaction

1. General: Trench backfill shall conform to requirements of the detailed piping specification for the particular type of pipe and the following.

2. Pipe Base: The specified thickness of pipe base material shall be placed over the full width of trench. The top of the pipe base shall be graded ahead of the pipe laying to provide firm, uniform support along the full length of pipe.

3. Bell Holes: Bell holes shall be excavated at each joint to permit proper assembly and inspection of the entire joint.

4. Pipe Zone: After the pipe has been bedded, pipe zone material shall be placed simultaneously on both sides of the pipe, keeping the level of backfill the same on each side. Material shall be carefully placed around the pipe so that the pipe barrel is completely supported and that no voids or uncompacted areas are left beneath the pipe. Particular care shall be taken in placing material on the underside of the pipe to prevent lateral movement during subsequent backfilling. Material placed within the pipe zone shall be compacted by hand tamping only.

5. Trench Zone: Backfill material shall be carefully deposited onto the backfill previously placed in the pipe zone. Free fall of the material shall not be permitted until at least two (2) feet of cover is provided over the top of the pipe. Sharp, heavy pieces of material shall not be dropped directly onto the pipe or the tamped material around the pipe.

6. Trench Backfill: Trench backfill shall be compacted to the specified relative compaction. Compaction shall be performed by using mechanical compaction or hand tamping equipment. Unless specified otherwise, consolidation by jetting or flooding shall not be permitted. High impact hammer-type equipment shall not be used except where the pipe manufacturer warrants in writing that such use will not damage the pipe.

7. Equipment: Axle-driven or tractor-drawn compaction equipment shall not be used within 5 feet of walls and structures.

8. Street Zone Backfill: Street zone backfill shall be done in accordance with the requirements and to the satisfaction of the City agency having jurisdiction. Street zone backfill can be placed with mechanical compaction.

N. Import or Export of Backfill Material

1. Excess Material: Excess excavated soil material shall be removed and disposed of off the project site at no additional expense to Mesa Water where Mesa Water is party to the contract. Excess soil material shall be disposed of in accordance with local regulations.

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

   The contractor shall obtain a haul route permit from the corresponding city or agency having jurisdiction.

2. Imported Material: Any additional backfill material necessary to return all grades to plus or minus 0.5 feet from the grade encountered at the beginning of construction or as shown on the contract drawings shall be imported, placed, and compacted at no additional cost to Mesa Water where Mesa Water is party to the contract. Only approved imported material is allowed.

O. Moisture Content of Backfill Material

During the compacting operations, optimum practicable moisture content required for compaction purposes shall be maintained in each lift of the backfill material. Moisture content throughout the lift shall be maintained at a uniform level. If placement is discontinued and proper moisture content not maintained, the upper layer shall be brought back to proper moisture content by sprinkling, cultivating and rolling the backfill material before placing new material. At the time of compaction, the water content of the material shall be at optimum water content plus or minus two percentage points.

Material which contains excessive moisture shall not be worked to obtain the required compaction. Material having excessive moisture content may be dried by blading, discing, or harrowing to hasten the drying process.

P. Access

The contractor shall conduct his operation so as not to close or obstruct any portion of any highway, road, or street, or prevent in any way free access to fire hydrants until they have secured permits to do so from the proper authorities.
The contractor shall conduct his operations so as to avoid unnecessary interference with the flow of traffic along highways and streets. Unobstructed access must be provided to all driveways, water valves, hydrants, or other property or facilities that require routine use.

Q. Slope Protection

Slope protection shall be installed where shown on the drawings, wherever the profile of the ground surface above the water main exceeds 20%, and where no pavement or other surfacing is to laid over the facility. The slope protection shall consist of cutoff walls or concrete

anchors with a minimum thickness of 12 inches. The wall shall extend at least twelve (12) inches into undisturbed material on each side of the trench as excavated.

Wall or anchors shall be placed with a minimum horizontal spacing of:

1. Not over 36 feet center to center on grades 25% to 35%.

2. Not over 24 feet center to center on grades 35% to 50%.

3. Not over 16 feet center to center on grades 50% and over.

Materials used for construction of cutoff walls or concrete anchors shall consist of cast-in-place reinforced concrete. They shall have No. 4 reinforcing bars placed at six (6) inches on center each way in the center of the wall. The bars shall extend full length and height of the wall.

The installation of the slope protection shall be considered a part of the work, and the contractor shall include the expense in his cost.

R. Tunneling

Tunneling will not be permitted. The use of jack and bore or hydraulic ram may be employed.

S. Temporary Steel Plates

When the backfilling operations of an excavation in the traveled way, whether transverse or longitudinal cannot be properly completed within a work day, steel plate bridging with a non-skid surface and shoring may be required to preserve unobstructed traffic flow. In such cases, the following conditions shall apply.

1. Steel plates used for bridging shall extend a minimum of twelve (12) inches beyond the edges of the trench.

2. Steel plate bridging shall be installed to operate with minimum noise.

3. The trench shall be adequately shored to support the bridging and traffic loads.

4. Temporary paving with hot mix asphalt concrete shall be used to feather the edges of the plates, if plate installation method (2) described below, is used.
5. Bridging shall be secured against displacement by using adjustable cleats, shims or other devices.

Steel plating bridging and shoring shall be installed using either the following Method (1) or Method (2):

Method (1) (For speeds 45 mph or greater)

The pavement shall be cold planed to a depth equal to the thickness of the plate and to a width and length equal to the dimensions of the plate.

Method (2) (For speeds less than 45 mph)

Approach plate(s) and ending plate (if longitudinal placement) shall be attached to the roadway by a minimum of two (2) dowels pre-drilled into the corners of the plate and drilled two (2) inches into the pavement. Subsequent plates are butted to each other. Fine grade hot mix asphalt concrete shall be compacted to form ramps, maximum slope of 8.5% with a minimum of 12-inch taper to cover all edges of the steel plates.

When the steel plates are removed, the dowel holes in the pavement shall be backfilled with either graded fines or asphalt concrete hot mix, concrete slurry or an equivalent slurry that is satisfactory to the city having jurisdiction. The contractor shall be responsible for maintenance of the steel plates, shoring and asphalt concrete ramps.

The following table shows the advisory minimal thickness of steel plates bridging required for a given width (A-36 grade steel, designed for HS 20-44 truck loading).

Trench Width	Minimum Plate Thickness
10”	½”
1’-11”	¾”
2’-7”	7/8”
3’-5”	1”
5’-3”	1-1/4”

For spans greater than 5’-3”, a structural design prepared by a California registered civil engineer is required.

All steel plates within the public right-of-way whether used in or out of the travel way shall be without deformation. Steel plates shall be non-skid. Advanced warning signs shall be required for steel plates within traveled ways (Type P per the Watch Manual or a “Rough Road” sign (W33) per Caltrans requirements).

END OF SECTION

SECTION 02315

JACKED CASING

PART - 1 GENERAL

A. Description

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

B. Related Work Specified Elsewhere

1. Trenching, Backfilling, and Compacting: 02223
2. Concrete: 03300
3. Hydrostatic Testing of Pressure Pipelines: 15042
4. Installation of Pressure Pipelines: 15051

C. Submittals

1. Submit manufacturer's mill specification sheet listing diameter, thickness, and class of steel used in making the casing, and the mill certification.
2. Submit drawings showing the location of approach trench, jacking pit and receiving pit, and joint type for both casing and carrier pipe. Include the details of all grout couplings and other attachments and appurtenances to the casing.
3. Submit a bore and jack construction schedule which includes casing installation, carrier pipe installation, approach trench backfill and receiving pit backfill.
4. Submit an engineered shoring plan for the bore-pit and receiving pit. Shoring submittals shall be wet-signed and stamped by a California-licensed Civil or Structural Engineer.

D. Permits

For bores exceeding 30-inches in diameter, an Underground Classification from the Division of Industrial Safety shall be obtained. It shall also be the contractor's responsibility to call the required safety meeting with representatives from the State Division of Industrial Safety prior to beginning the construction of the bore.

It shall be the contractor's responsibility to see that the work is done in conformance with the State of California, the Orange County Planning & Development Services, the City or the railroad company requirements, if any are involved in the crossing. The contractor shall secure all required permits for the construction of the casing pipe and its installation.

E. Alternate Methods

For pipelines having a pipe diameter 8-inches and smaller, the contractor may present an alternative detailed proposal in lieu of the methods and material specified herein to jack and bore the casing pipe at the locations shown on the drawings. Any such proposal shall be submitted to Mesa Water a minimum of thirty (30) calendar days in advance of the work to allow for adequate time for review and approval. The alternative method shall be in accordance with all the conditions set forth by the jurisdictional agency controlling the crossing.

F Scheduling

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

G. Line and Grade

The contractor shall continuously survey the jacked casing for conformance with the design line and grade. Survey data shall be taken at a maximum of 40-foot intervals, unless otherwise directed by Mesa Water.

It is the contractor's responsibility to choose a size of casing and thickness of casing at or above the minimum specified on the Standard Drawings, to insure that the jacking is done with the high degree of accuracy to permit the installation of the carrier pipe to the grades shown on the drawings.

PART 2 - MATERIALS

A. Steel Casing

1. Materials: Steel casing shall new and shall be ASTM A 283, Grade C, ASTM A 570 Grade 30, 33, and ASTM A-36 unless noted otherwise. The minimum inside diameter and wall thickness of the casing shall be as shown on the Standard Drawings. Greater casing thickness and diameter may be used as convenient for the method of work and loadings involved, as suitable for the site and as limited by possible interferences, but at no additional cost to Mesa Water where Mesa Water is a party of the contract.

   The contractor shall choose a size of casing and thickness of casing at or above the minimum specified on the drawings, to insure that the jacking is done with a sufficient degree of accuracy to permit the installation of the carrier pipe to the grades shown on the drawings and to properly accommodate the largest dimension of the carrier pipe.

2. Joints and Welding: Casing sections shall be joined by full circumference welding. Field welds shall be full-penetration bevel welds in accordance with the standards of quality as set forth in the Specifications of the American Welding Society. All welding shall be performed by skilled welders qualified under the provisions of ANSI/AWS D1.1.

Welder qualifications shall be certified by an independent local, approved testing agency not more than six (6) months prior to commencing work. Prepare ends of casing for proper bevel by providing a 45-degree bevel on the end of one of the two casing pieces being joined.

3. Wall Thickness: Minimum size and thickness of casing pipes for insertion of the various sizes and types of carrier pipes are shown in Mesa Water's Standard Drawings. However, a larger or heavier wall casing pipe may be required by the agency having jurisdiction over the road or railroad crossing or the contractor requests use of a thicker wall pipe.

B. Casing Seals

Casing seals shall be a pull-on rubber end seal to fit snugly around pipe and casing. Casing seals may be one piece with no field seams or the wrap-around style to facilitate installation after the casing and carrier pipe are already installed. Seamless style is preferred. Bands and hardware for attachment to pipe and casing OD shall be Type 316 stainless steel. Both ends of the casing between the casing and carrier pipe shall be sealed watertight. The casing seals shall be as manufactured by Advanced Products and Systems, Inc., PSI or approved equal.

C. Grout

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

D. Grout Connections

The contractor shall provide 2-inch diameter threaded steel half-couplings on the inside of the casing pipe at the locations, spacing and orientation called for on the Standard Drawings. Longitudinal spacing between grout connections shown on the Standard Drawings may be decreased to provide more frequent grouting, but in no case shall the spacing shown on the Standard Drawings be exceeded.

E. Spacers

Casing spacer skids and blocking shall be bolt-on style with a shell made of at least two halves. The band material shall be manufactured of a minimum 14 gauge T-304 stainless steel and 10 gauge T-304 stainless steel risers when needed. All welds are to be chemically passivated. The runners shall be at least 11 inches long and shall be manufactured of high abrasion resistant and low coefficient of friction, glass filled polymer. Fasteners and hardware for securing the spacers and runners shall be stainless steel. Spacers shall be installed at min-sections if the carrier pipe segment is over ten (10) feet long. Detailed product submittals showing all dimensions shall be provided. Casing spacers shall have a flexible EPDM liner having a minimum thickness of 0.090-inches with a hardness of Durometer "A" 85-90. The liner shall have a rating of no less than 60,000 VPM and water absorption of 1% maximum.

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

PART 3 - EXECUTION

A. Jacking Pit

1. The approach trench for jacking or boring operations shall be adequately shored to safeguard existing substructures and surface improvements and to ensure against ground movement in the vicinity of the casing portal.

2. Heavy guide timbers, structural steel, or concrete cradle of sufficient length shall be placed in the approach trench of jacking pit and firmly bedded on the required line and grade to provide accurate control of jacking alignment. Provide adequate space to insert the casing lengths to be jacked. Anchor the timbers and structural steel sections to ensure action of the jacks in line with the axis of the casing. A bearing block consisting of a timber or structural steel framework shall be inserted between the jacks and the end of the casing to provide uniform end bearing over the perimeter of the casing and distribute the jacking pressure evenly.

3. Provide bracing, shoring and ladders necessary to meet trench safety requirements. Confined space testing may be required as conditions dictate.

B. Sectional Shield or Jacking Head

1. A sectional shield or steel jacking head shall be attached to the leading section of the casing to extend around the outer surface of the upper two-thirds of the casing and to project at least 18 inches beyond the driving end of the casing. It shall not protrude more than ½ inch beyond the outer casing surface.

2. Anchor the head to prevent any wobble or alignment variation during the jacking operation.

3. To avoid loss of ground outside the casing, excavation shall be restricted to the least clearance necessary to prevent binding, and shall be carried out entirely within the jacking head and not in advance of the head. Excavated material shall be removed from the casing as jacking progresses and no accumulation of excavated material within the casing will be permitted.

C. Control of Alignment and Grade

Application of jacking pressure and excavation of material ahead of the casing as it advances shall be controlled to prevent the casing from becoming earthbound or deviating from the required line and grade as shown on the drawings. Allowable grade deviations in horizontal and vertical alignments shall be no greater than 0.2 feet per 100 feet in any direction over the length of the jacking and boring operation. A maximum cumulative deviation shall not exceed 0.5 feet overall. Do not encroach upon the minimum annular space detailed. Restrict the excavation of material to the least clearance necessary to prevent binding to avoid settlement or possible damage to overlying structures or utilities.

D. Sand Backfill for Annular Space in Jacked Casing

1. Use air-blown sand to fill the annular space between the casing and carrier pipe, unless otherwise required by the agency having jurisdiction over the road or railroad crossing.

2. Furnish the necessary sand, air compressor, hoses, pressure gauges, valves, and fittings for the filling operation.

3. Air blown sand shall conform with the requirements for imported sand in Section 02223. Sand shall be free of lumps when put into the hopper. Sand shall be of a consistency to flow unimpeded and completely fill all voids.

4. Place a bulkhead for retaining the sand in the annular space between the casing and the carrier pipe at each end of the jacked casing. At the start of the sand fill operation, extend the sand discharge pipe from the placing equipment, through the inside of the casing, and to the bulkhead at the remote end of the casing. The method used to place the sand shall be such to ensure complete filling of the annular space. During placement, position the sand discharge pipe so that its discharge end shall be kept well buried in the sand at all times after the sand has been built up over the crown of the pipe at the remote end of the section being filled. Install a riser pipe suitable for a vent in the casing adjacent to the bulkhead at the near end of the casing. Plug the vent pipe with grout upon completion of sand filling.

E. Grouting Exterior of Casing

Immediately after completion of the jacking or boring operation, grout shall be injected through the grout connections of casings 30-inches in diameter and larger in a manner that will completely fill all voids outside the casing pipe resulting from the jacking or boring operation. Where loss of ground outside the casing is suspected, additional grout connections shall be welded to the casing. Grout pressure is to be controlled so as to avoid deformation of the casing and/or avoid movement of the surrounding ground. After completion of grouting, the grout connections shall be closed with extra heavy black steel threaded plugs.

F. Installation of Carrier Pipe

1. After grouting the exterior of the casing pipe, the interior shall be cleaned and the carrier pipe installed. The carrier pipe shall be installed on skids of sufficient number and dimensions to prevent the pipe bells from touching the casing pipe and to allow for proper alignment of the carrier pipe to meet the specified grade.

2. The top of the carrier pipe shall be blocked to prevent flotation. The carrier pipe shall be secured in a manner satisfactory to the Mesa Water Representative to prevent floating and subsequent change of grade.

3. The pipe spacers shall be manufactured of stainless steel casing spacers with composite runner skids.

4. The carrier pipe grade shall be adjusted as required by changing the height of the casing spacer riser and/or the thickness of the runner pad skids to compensate for any grade variations of the casing pipe. Care shall be taken to ensure that the carrier pipe does not come in contact with and is insulated from the casing pipe.

5. Failure to Achieve Required Grade: If the alignment of the casing pipe is such that the carrier pipe grade cannot be met, the grade of the casing pipe shall, if required by the Mesa Water, be adjusted. If realignment is not deemed feasible by Mesa Water, another casing pipe meeting the required grade shall be installed. The abandoned casing pipe shall be filled with sand and the ends plugged with twelve (12) inch thick masonry plugs. Realignment or replacement work shall in no way result in additional costs to Mesa Water where Mesa Water is a party of the contract.

6. Before backfilling the jacking and receiving pits, the carrier pipe shall have passed an initial pressure test in accordance with Section 15042 (Hydrostatic Testing of Pressure Pipelines).

G. Closing the Jacking Pit and Receiving Pit

After jacking equipment and muck from the tunnel have been removed from the approach trench of jacking pit, prepare the bottom of the jacking pit as a pipe foundation. Remove all loose and disturbed material below pipe grade to undisturbed earth and recompact the material in accordance with Section 02223 (Trenching, Backfilling and Compacting).

The jacking pit and receiving pit represent an over-width trench condition. Backfill shall be as specified for trench backfill in Section 02223 (Trenching, Backfilling and Compacting) unless the agency having jurisdiction requires special material (one sack slurry for example).

H. Sacrificial Anode

Unless not required by Mesa Water, one sacrificial anode shall be buried at each end of the casing. The sacrificial anode shall be 60 lbs. minimum, prepackaged magnesium anode. The alloy composition of the high potential magnesium anode shall be the following:

Element	Weight %
Al	0.01 Max.
Mn	0.05 to 1.3
Zn	0.002 Max
Cu	0.02 Max
Ni	0.001 Max
Fe	0.03 Max
Si	0.05 Max
Other	0.05 each Max and 0.3 Total Max
Mg	Balance

Special backfill shall be provided for the sacrificial anode and it shall consist of 75% gypsum, 20% bentonite and 5% sodium sulfate.

Anode shall be offset from the pipe a minimum of ten (10) feet. Anode positions can be adjusted slightly to avoid interference. Anodes may be installed in backhoe trench instead or augured hole with Mesa Water's approval.

Anode shall be prepackaged in a permeable cloth bag with a backfill of the above composition or installed bare and filled with the above composition. The packaged weight of the anode and backfill shall be approximately twice the weight of the anode ingot weight.

Anode lead wire shall be cadwelded to the casing in accordance with Erico Engineering Specification No. A160-A05 and shall be #8 AWG stranded copper with HMWPE. Cover each weld with Royston "Handy Cap". The anode lead wire shall be attached to the steel core of the anode with a silver solder by the manufacturer. The connection shall be encapsulated in a heat-shrinkable sleeve.

Each anode shall be saturated with 20 gallons of water, prior to backfill of the trench.

END OF SECTION

SECTION 02528

CONCRETE CURBS, GUTTERS AND SIDEWALKS

PART 1 - GENERAL

A. Description

This section describes materials and construction of concrete curbs, gutters, and sidewalks.

For projects located in the public right-of-way, the respective jurisdictional agency (City of Costa Mesa, the City of Newport Beach, or the County of Orange) permit requirements and specifications shall take precedence over the requirements specified herein.

B. Related Work Specified Elsewhere

1. Trenching, Backfilling, and Compacting: 02223.

2. Concrete Formwork: 03100.

3. Concrete Reinforcement: 03201.

4. Concrete: 03300.

PART 2 - MATERIALS

A. Forms

1. General: Forms shall be as required in Section 03100 (Concrete Formwork). Stakes and braces shall be provided to hold forms securely in place.

2. Sidewalk Forms: Sidewalk forms shall be 2-inch dressed lumber, straight and free from defects, or standard metal forms. Where short-radius forms are required, 1-inch dressed lumber of plywood may be used.

B. Aggregate Base Course

Crushed rock base shall be clean 3/4-inch and smaller crushed rock or crushed gravel, free from foreign material, and conforming to Crushed Aggregate Base as specified by Standard Specifications of Public Works Construction Section 400-2. An acceptable alternative to Crushed Aggregate Base is Crushed Miscellaneous Base as specified by Standard Specifications Section 200-2.4.

C. Expansion Joint Filler

Premolded expansion joint filler shall be 1/4-inch thick for curbs and 1/4-inch thick for sidewalks, or as required or allowed by the permitting agency.

D. Concrete

Conform to Section 03300 (Concrete).

E. Reinforcing Steel

Conform to Section 03201 (Concrete Reinforcement).

F. Excavation and Backfill

Conform to Section 02223 (Trenching, Backfilling, and Compacting).

PART 3 - EXECUTION

A. Preparation of Subgrade

Subgrade shall be excavated and shaped to line, grade, and cross section. The top 12-inches of subgrade shall be compacted to 90% relative compaction. All soft material disclosed by excavating shall be removed and replaced with aggregate base as directed. The finished subgrade shall be within a tolerance of +/-0.02 of a foot of the grade and cross section shown and shall be smooth and free from irregularities at the specified relative compaction. The subgrade shall extend over the full width of construction. The Mesa Water Representative's approval of finished subgrades must be received prior to continuance of the work.

B. Placing Aggregate Base

After the subgrade for curbs, sidewalks, and roadway slabs is compacted and accepted, the contractor shall place and spread aggregate base material, sprinkle with water, and compact to 90% relative density. The surface of the compacted base shall be at the proper level to receive concrete. Curbs and sidewalks shall be underlain by 4-inches or more of compacted aggregate base material.

C. Setting Forms

Forms shall conform to Section 03100 (Concrete Formwork). Forms for a face-of-curb shall not have any horizontal joints within 7-inches of the top of the curb. Forms shall be braced to prevent change of shape or movement in any direction resulting from the weight of the concrete. Short-radius curved forms shall be constructed to exact radius. Tops of forms shall not depart from gradeline more than 1/8-inch when checked with a 10-foot straightedge. Alignment of straight sections shall not vary more than 1/8-inch in 10-feet.

D. Curb Construction

1. Jurisdictional Requirements: Curbs shall be reconstructed to original line and grade if removed. Curbs shall conform to the requirements of the respective jurisdictional agency.

2. Expansion Joints: Preformed asphalt-impregnated expansion joints shall be placed at 20-foot intervals, at the beginning and end of curved portions of the curb, at each change in thickness of section, at the end of curbs at buildings and other structures, and at connections to existing curbs.

3. Notification: The Mesa Water's Representative shall be notified one day in advance of planned concrete placement.

4. Concrete Finish: When the concrete has set sufficiently to support its own weight, the front form shall be removed and exposed surfaces finished. The formed face shall be finished by rubbing with a burlap sack or similar device to produce a uniformly textured surface, free of form marks, honeycomb, and other defects. Defective concrete shall be removed and replaced at no expense to Mesa Water where Mesa Water is a party of the contract. Upon completion of the finishing, curing compound shall be applied to exposed surfaces of the curb. Curing shall continue for a minimum of five days.

5. Backfill: Seven days (minimum) after pouring the concrete, the curb shall be backfilled with earth free from rocks, 2-inches and larger, and other foreign material. Backfill shall be tamped firmly in place.

6. Alignment and Grade: Finished curb shall have a uniform grade and alignment. Any section of curb showing abrupt changes in alignment or grade, or which is more than 1/4-inch away from its intended location, as staked, shall be removed and reconstructed at no additional cost to Mesa Water where Mesa Water is a party to the contract.

7. Protection of Work: All concrete surfaces and/or structures shall be protected until the project containing the work is accepted.

E. Sidewalk Construction

1. General Requirements: Unless shown otherwise, sidewalks shall be placed in a single pour, 4-inches thick. Walks shall slope 1/4-inch per foot upward from the top of curb. Concrete shall be placed, processed, finished, and cured in conformance with the applicable requirements of ACI 614.

2. For sidewalks within a City public right-of-way, sidewalk construction shall be in accordance with the jurisdictional agency’s requirements.

3. New Sidewalk: Where new sidewalk is to abut existing concrete, the existing concrete shall be sawcut to a depth of 2-inches and the concrete chipped out to sound material and a plane surface.

4. Expansion Joints: Preformed expansion joints shall be placed at 20-foot intervals or less to match those in the adjacent curb, where the sidewalk ends at a curb, and around posts, poles, or other facilities located within the sidewalk. Expansion joints shall be placed between sidewalks and buildings or other structures.

5. Contraction Joints: Contraction joints shall be provided transversely to the walks at locations opposite the contraction joints in the curb and at 10-foot intervals along the sidewalk. These joints shall be 3/16-inch by 1-inch weakened plane joints. They shall be straight and at right angles to the top of the walk.

6. Notification: The Mesa Water's Representative shall be notified one day in advance of planned concrete placement.

7. Concrete Finish: The top surface of the sidewalk shall receive a broom finish with a fine-hair broom in line with the length of the walk. All edges, joints, and markings shall be tooled. The walk shall be scored transversely at 5-foot intervals with a jointing tool. Upon completion of the finishing, an approved curing compound shall be applied to exposed surfaces. Sidewalks shall be protected from damage until final acceptance.

END OF SECTION

SECTION 02578

PAVEMENT REMOVAL AND REPLACEMENT

PART 1 - GENERAL

A. Description

This section describes materials, testing, removal, and replacement of asphalt concrete pavement, seal coat, aggregate base course, prime coat, tack coat, and portland cement concrete surfaces.

Work of this section shall be performed in accordance with the Standard Specifications for Public Works Construction (SSPWC), unless otherwise specified herein.

For projects located in the public right-of-way, the respective jurisdictional agency (City of Costa Mesa, City of Newport Beach or County of Orange) pavement specification and/or approved encroachment permit requirements shall take precedence over the requirements specified herein.

B. Related Work Specified Elsewhere

1. Trenching, Backfilling, and Compacting: 02223.

2. Concrete Curbs, Gutters, and Sidewalks: 02528.

C. Submittals

1. Submit asphalt mix design data prepared within the last year by a certified laboratory for each asphalt concrete material type used on the project.

2. Submit materials certificates signed by material producer and contractor, certifying that each material item complies with, or exceeds, specified requirements.

3. Submit materials certificates signed by material producer and contractor, identifying material producer by name, location of material producing plant, and type of plant from which material will be produced and delivered.

4. Submit completed manufacturer's warranty form providing an unconditional installation guarantee for a period of no less than two (2) years beginning from the date of the Notice of Completion.

5. Submit proposed pavement placement sequence and schedule.

PART 2 – MATERIALS

A. Asphalt Concrete Paving

Asphalt Concrete paving shall be as specified in Section 203-6 of the SSPWC. Where construction pavement is to be accomplished in a single course, Class C2 grading shall be used. Where the construction consists of two or more courses, the surface course shall be Class C2 and the lower courses shall be Class B grading.

Asphalt shall be performance grade PG 64-10.

Asphalt binder content in the pavement shall be 4.5% to 5.8% for Class B grading and 4.6% to 6.0% for Class C2 grading. The base course pavement shall be a minimum of 3-inches thick.

B. Emulsion-Aggregate Slurry

Materials for emulsion-aggregate slurry (EAS) shall be as specified in SSPWC Subsection 203-5.4.

C. Aggregate for Asphalt Concrete

Aggregate base shall conform to Section 200-2.2 of the SSPWC, Crushed Aggregate Base. In the absence of available rock dust, sand of comparable gradation will be acceptable. Aggregate shall be asbestos free. Evaluation of gradation and sand equivalent test results shall conform to the provisions of SSPWC.

D. Aggregate Base Course

Aggregate base shall be Crushed Aggregate Base as specified in Section 200-2.2 of the SSPWC. Crushed Miscellaneous Base, in accordance with Section 200-2.4 of the SSPWC is an acceptable alternative for Crushed Aggregate Base. All crushed miscellaneous base material shall have a minimum R-value of 80.

E. Seal Coat

Seal coat material shall be a plant-blended product composed of mineral aggregates uniformly distributed in a petroleum-base asphalt emulsion. The asphalt emulsion shall conform to Section 203-3 of the SSPWC and shall be free of asbestos fibers or coal tar additives.

Seal coat materials shall conform to Section 203-9 of the SSPWC. In complying with the seal requirements, the seal shall have a minimum of 60% non-volatiles at the delivery from the supplier and 48% non-volatiles at the point of seal material placement.

F. Tack Coat

Asphalt emulsion shall be CSS1 or CSS-1h and shall conform to the requirements of SSPWC Section 203-3 Emulsified Asphalt.

G. Crack Treatment

Construction materials shall consist of a combination of a crack filling emulsion and that of asphalt concrete material for filling the milled areas according to the following schedule:

1. Crack widths equal to or greater than ¼-inch but less than ½-inch:
   A hot applied crack fill material shall be placed in all cracks.

2. Crack widths equal to or greater than ½-inch:
   The crack fill material shall be a D2 PG 64-10 asphalt concrete material, per Section 203-6 of the SSPWC.

H. Striping

Paint shall conform to Section 214-4 of the SSPWC. Paint color and type shall be as indicated on the drawings, or if not indicated, shall match as nearly as practical the existing conditions of the site.

I. Redwood Header

Redwood headers shall comply with the material requirements of Section 212-1.5 of the SSPWC.

J. Weed Killer

Weed killer shall be Karmex 80, as manufactured by Dupont Chemical Company, or Diuron 4L, as manufactured by Drexel Chemical Company, or approved equal.

PART 3 – EXECUTION

A. Pavement Removal

1. Asphalt concrete pavement shall initially be cut with a pavement cutter or other equipment at the limits of the excavation before the pavement is removed. After backfilling and compacting the excavation, asphalt concrete pavement shall be saw cut to a minimum depth of 2-inches at a point not less than 9-inches outside the limits of the excavation or the previous pavement cut, whichever is greater, and the additional pavement removed. If the cut is within 3-feet of an existing joint or curb and gutter, the asphalt concrete pavement shall be replaced to the joint or curb and gutter. Saw cut lines shall be parallel or perpendicular to the flow of traffic.

   The original saw cutting of the trench for removal of existing pavement structural section can be either accomplished by saw cutting with a power-driven saw or grinding with an asphalt zipper or cold planer. The final saw cutting, in conjunction with the trench pavement replacement, shall be accomplished by the use of a power-driven saw. The depth of the cut shall be deep enough to produce a clean, straight break without loosening, cracking, or damaging adjoining asphalt so that there will be a good join between the existing pavement structural section and the trench pavement replacement structural section. The use of a grinder (cold planer) shall not be allowed in lieu of power-driven saw.

2. Concrete pavement, cross gutters, curbs and gutters, sidewalks, or driveways, shall be saw cut to a minimum depth of 1-1/2-inches at a point 1-foot beyond the edge of the excavation and the strip of improvement removed. Concrete pavement may initially be cut at the limits of the excavation by other methods prior to removal and the saw cut made after backfilling the excavation. If the saw cut falls within 3-feet of a concrete joint or pavement edge, the concrete shall be removed and replaced to the joint or edge.

3. All pavement and other improvements demolished shall be removed from the site and disposed off the site in a manner acceptable to agencies having jurisdiction over the work and to Mesa Water.

4. Final pavement saw cuts shall be straight along both sides of the trench, parallel to the pipeline alignment, and provide clean, solid, vertical faces free from loose material. Adjoining pavement which has been damaged or disturbed shall also be saw cut and removed. Saw cuts shall be parallel to the pipeline alignment or the roadway centerline or perpendicular to same.

B. Pavement Replacement

1. Producing, hauling, placing, compacting, and finishing of asphalt concrete shall conform to Section 302-5 of the SSPWC. Seal coat shall be applied to all new asphalt concrete paving, except open grade asphalt concrete.

2. Base course paving shall be complete at all times to a point not to exceed 200 feet behind any working heading. The final asphalt surface course shall be at least 2-inch thick and shall be placed within a period of two weeks after traffic has been returned to that portion of the street, unless otherwise noted on the drawings. Temporary striping shall be applied after the base course of asphalt concrete pavement has been placed, in the same configuration as the existing permanent striping, so that traffic can be returned to normal patterns. Temporary striping shall be maintained until permanent striping is applied.

C. Preparation of Subgrade

Subgrade shall be excavated and shaped to line, grade, and cross section. The top 12- inches of subgrade shall be removed and recompacted to 95% relative compaction. All soft material disclosed by the compacting effort shall be removed and replaced. The finished subgrade shall be within a tolerance of +/-0.08 of a foot of the grade and cross section shown, smooth and free from irregularities and at the specified relative compaction. The subgrade shall be considered to extend over the full width of the aggregate base course.

D. Placing Aggregate Base

Aggregate base shall be placed to thickness shown on the drawing, to match existing, or per the applicable permit. Aggregate base shall be compacted to 95% relative compaction and installed in accordance with Section 301-2 of the SSPWC.

E. Placing Tack Coat

Tack coat shall be applied at the rate of 0.05 to 0.10 gallons per square yard to the surfaces to receive finish pavement per Section 302-5.4 of the SSPWC. Tack coat shall be applied to existing asphalt, metal, or concrete surfaces that will be in contact with new asphalt concrete paving.

F. Placing Asphalt Paving

Asphalt paving shall be applied to the thickness shown on the drawing, as listed above, or per the applicable permit. Asphalt paving shall be installed in accordance with Section 302-5 of the SSPWC.

Asphalt concrete shall be placed in lifts having a maximum of 4-inches. A tack coat of SS-1h shall be placed between lifts and on all vertical faces.

The asphalt concrete mat paving machine shall have a vibratory plate in operation during all of the laydown operations. In the case that the plate is non-operational, the contractor shall increase the thicknesses to include an additional 1/16 of an inch for each inch of asphalt concrete material placed.

G. Applying Seal Coat

Pavement seal operations shall be performed in accordance with the manufacturer's recommendations. The material spread rate shall be a minimum of 25 gallons per 1,000 square feet and shall be placed in a minimum of two coats.

The contractor shall black out old striping prior to sealing. This procedure is intended to prevent the shadow effect that occurs due to the old lines or stripes wearing through the new sealed surface. Application of black out paint shall comply with Section 314 of the SSPWC.

H. Compaction of Base and Leveling Courses

Compaction and rolling of base and leveling courses shall begin at the outer edges of the surfacing and continue toward the center. Water shall be applied uniformly throughout the material to provide moisture for obtaining the specified compaction. Each layer shall be compacted to the specified relative compaction before the next layer is placed.

I. Surface Tolerance

Finished grade shall not deviate more than 0.02 foot in elevation from the grade indicated on the drawings. Slopes shall not vary more than 1/8-inch in 10 feet from the slopes shown on the drawings.

J. Concrete Curbs, Gutters, and Sidewalks

Concrete curbs, gutters, and sidewalks shall be replaced in accordance with Section 02528 (Concrete Curbs, Gutters, and Sidewalks).

K. Emulsion-Aggregate Slurry

Certain street sections where shown on the drawing or where required by the jurisdictional agency may be required to receive an asphaltic slurry seal in conformance with Section 302-4 of the SSPWC after the final asphalt surface course. The composition and aggregate grading for slurry shall be Type II of Subsection 203-5.3.

L. Pavement Milling

Areas designated for placement of a asphalt concrete overlay shall have a minimum of six (6) foot tapered cut at roadway edges. At the transition from paving to non-paving, the tapered cut shall be a minimum width of twelve (12) feet wide. At the lip of gutter and asphalt concrete pavement interface, the asphalt concrete overlay shall be 3/8-inch higher than the lip of gutter. The milled surface within the taper shall be uniform, shall not vary from its highs and lows by more than 3/8-inch, and shall be performed in accordance with Section 302 of the SSPWC. A temporary cold mix ramp shall be constructed after the pavement is milled and before the cap is placed.

M. Placing Crack Fill Materials

1. Crack widths greater than ¼-inch but less than ½-inch:

   A hot applied crack fill material shall be placed in all cracks. Hot crack fill material shall be filled to within ¼-inch of the finish surface. The contractor shall take care not to excessively place crack fill material along the edges of the crack at the finish surface. Excessive crack fill over splash shall be removed under the direction of the Mesa Water's Representative. Crack filling operations shall only be performed during the Winter or early Spring months.

2. Crack widths equal to or greater than ½ -inch:

   Prior to crack filling, the existing cracks shall be marked out. Cracked areas shall be milled out to a depth of 3-inches and a width of 18-inches. Each area shall then be cleaned and all vertical and horizontal areas shall then be tack coated with an SS-1h material and permitted to "break" before any new asphalt concrete material is applied. The new asphalt concrete material shall be placed in one lift, compacted and brought to the finish surface of the existing pavement.

N. Painting

Paint, except for black out line paint, shall be placed in a minimum of two coats per Section 314 of the SSPWC. The two coats shall be applied a minimum of one week a part from one another. Black out line paint shall be applied per Section 314 of SSPWC.

O. Redwood Header

Redwood headers shall be placed at a maximum spacing of 48-inches on center. The placement of headers, stakes, and joint spacing shall be in accordance with Section 212-1.5.2 of the SSPWC.

END OF SECTION

SECTION 03100

CONCRETE FORMWORK

PART 1 - GENERAL

A. Description

This section describes materials and installation of concrete forms.

B. Related Specification Sections

1. Concrete Reinforcement: 03201.

2. Concrete: 03300.

C. Submittals

1. If requested by Mesa Water, submit manufacturer's literature for form ties, spreaders, corner form, form coating, and bond breakers.

PART 2 - MATERIALS

A. Form Construction and Design

1. Forms shall be designed according to the applicable portions of ACI 347, "Recommended Practice for Concrete Formwork," and all applicable regulations and codes. All concrete shall be formed unless specified otherwise.

2. Form windows or stage forms shall be provided to allow observation at all times before concrete is poured. Formwork and placement design shall be such as to limit free fall of concrete to 4 feet.

3. The Mesa Water's Representative shall be notified a minimum of one day prior to concrete placement.

B. Classes of Forms

1. Class I Forms: Smooth-surface plywood ¾-inch minimum thickness shall be used for straight surfaces and ½-inch minimum thickness for curved surfaces.

2. Class II Forms: Forms shall be made of plywood in good condition, metal, or smooth-planed boards free from large or loose knots with tongue and groove or ship lap joints. Forms shall be oiled.

3. Application: Class II forms shall be used for exterior concrete surfaces which are 1 foot or more below finished grade. Class I forms shall be used for all other surfaces.

C. Form Material

1. Forms shall be made of plywood, lumber, or steel of sufficient strength and surface smoothness to produce the specified finish. Joints, gaps, and apertures in forms shall be taped, gasketed, plugged and/or caulked so that the joint will remain watertight and withstand placing pressures without bulging outward or creating surface irregularities.

2. Lumber used in form construction shall be standard grade Douglas fir, S4S Standard Grading and Dressing Rules No. 16, West Coast Lumber Inspection Bureau. Boards in contact with concrete shall be 6 inches or more in width.

3. Plywood used in form construction shall be Grade B-B, Class 1 plyform, mill-oiled, and sanded on both sides in conformance with U.S. Product Standard PS-1.

D. Form Ties

1. Form ties shall be located on exposed surfaces in a uniform pattern or as indicated on the drawings. Form ties shall be constructed so that the tie remains embedded in the wall except for a removable portion at each end. Form ties shall have conical or spherical type inserts with a maximum diameter of 1 inch. Form ties shall be constructed so that no metal is within 1 inch of the concrete surface when the forms, inserts, and tie ends are removed. Wire ties shall not be used. Ties shall withstand all pressures and limit deflection of forms to acceptable limits.

2. Flat bar ties for panel forms shall have plastic or rubber inserts having a minimum depth of 1-inch and sufficient dimensions to permit patching of the tie hole.

3. Ties for water-holding structures or dry structures with access, such as basement access shafts or pipe galleries, that are below finish grade, shall have an integral steel waterstop that is tightly and continuously welded to the tie. The waterstop shall be at least two times larger in area than the tie cross-sectional area and shall be oriented perpendicular to the tie and symmetrical about the center of the tie. Ties shall be constructed to provide a positive means of preventing rotation or disturbance of the center portion of the tie during removal of the ends.

4. Tapered form ties shall be tapered through-bolts at least 1 inch in diameter at smallest end, or through-bolts that utilize a removable tapered sleeve of the same minimum size.

E. Bond Breaker

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

F. Form Release Agent

Form release agent shall effectively prevent absorption of moisture and prevent bond with the concrete. Agent shall be nonstaining and nontoxic after 30 days.

For steel forms, release agent shall prevent discoloration of the concrete due to rust.

PART 3 - EXECUTION

A. Form Tolerances

1. Failure of the forms to produce the specified concrete surface and surface tolerance shall be grounds for rejection of the concrete work. Rejected work shall be repaired or replaced at no additional cost to Mesa Water where Mesa Water is a party of the contract.

2. The following table indicates tolerances or allowable variations from dimensions or positions of structural concrete work:

Item	Maximum Tolerance
Sleeves and inserts	+1/4" to -1/4"
Projected ends of anchors	+1/4" to 0.0"
Anchor bolt setting	+1/4" to -1/4"
Finished concrete, all locations	+1/4" to -1/4" in 10 feet
Finished concrete, total length	+1"

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

Sleeves and inserts: Centerline of sleeve or insert.

Projected ends of anchors: Plane perpendicular to the end of the anchor as located on the drawings.

Anchor bolt setting: Centerline of anchor bolt.

Finish concrete: The concrete surface as located on the drawings.

Where equipment is to be installed, the manufacturer's tolerances shall be complied with if more stringent than the above.

B. Form Surface Preparation

1. Form surfaces to be in contact with the concrete shall be cleaned of all previous concrete, dirt, and other surface contaminants prior to preparation by the applicable method below.

2. Wood surfaces and steel surfaces in contact with the concrete shall be coated with a release agent prior to form installation. Release agent shall be submitted to and approved by Mesa Water prior to construction. For water storage facilities, a non-hazardous mineral oil type release agent shall be used.

C. Chamfers

1. 3/4-inch bevels shall be formed at concrete edges except those on top of walls and elevated slabs and beams. Edges at top of walls, slabs, and beams shall be rounded to a 3/4-inch radius.

2. Exterior corners in concrete members shall be provided with 3/4-inch chamfers. Reentrant corners in concrete members shall not have fillets, unless otherwise shown on the drawings.

D. Form Placement

1. Forms shall be provided with adequate means for holding adjacent edges and ends of panels and sections tightly together and in accurate alignment so as to prevent the formation of ridges, fins, offsets, or similar surface defects in the finished concrete. The forms shall be tight and braced to prevent movement and the loss of mortar and fines during placing and vibration of the concrete.

2. Cleanout and inspection openings shall be provided at the bottom of each lift of forms. There shall be one 12-inch-wide by 18-inch-high opening every 7 feet at the bottom of each lift of forms.

3. No part of any form tying device other than metal shall be embedded in the concrete.

4. The large end of taper ties shall be located on the "wet" side of the wall.

5. Only form or form-tying methods which do not cause spalling of the concrete upon form stripping or tie removal shall be allowed.

6. Surfaces of concrete members shall be formed except where placement of the concrete against the ground is shown on the drawings. The dimensions of concrete members shown on the drawings shall apply to formed surfaces, except where otherwise indicated. At least 2 inches of concrete shall be added where concrete is placed against trimmed undisturbed ground in lieu of forms. Placement of concrete against the ground shall be limited to footings and only where the character of the ground is such that it can be trimmed to the required lines and will stand securely without caving or sloughing.

E. Form Reuse

Only forms which maintain a uniform surface texture on exposed concrete surfaces shall be used. Light sanding shall be applied between uses to obtain uniform texture. Unused tie rod holes with corks, shaved flush, and sandpapered on the concrete surface side.

Other than filling tie rod holes, forms shall not be patched except in the case of Class II forms. Metal patching discs shall not be used on Class I forms.

F. Form Removal and Timing

1. Means shall be provided for removing forms without injury to the surface of the finished concrete.

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

Sides of footings and encasements	24 hours
Walls not supporting load	48 hours
Vertical sides of beams, girders, and similar members	48 hours
Slabs, beams, and girders	10 days (forms only)
Shoring for slab, beams, and girders	Until concrete strength reaches specified 28-day strength
Wall bracing	Until top or roof slab concrete reaches 2,500 psi

3. Forms shall not be removed from concrete which has been placed with outside air temperature below 50° F without first determining if the concrete has properly set without regard for time. Heavy loading shall not be applied to green concrete. Immediately after forms are removed, the surface of the concrete shall be carefully examined and any irregularities in the surface shall be repaired and finished as specified.

G. Formed Openings

Openings shall be of sufficient size to permit final alignment of the items within it without deflection or offsets of any kind and to allow space for packing where the items pass through the wall to ensure watertightness around openings so formed. Openings shall be provided with continuous keyways with waterstops where required, and a slight flare to facilitate grouting and the escape of entrained air during grouting. Formed openings shall be provided with reinforcement as indicated in the typical structural details. Reinforcing shall be at least 2-inches clear from the opening.

H. Embedded Items

Anchor bolts and other embedded items shall be set accurately and held securely in position in the forms until the concrete is placed and set.

All special castings, channels, or other metal parts that are to be embedded in the concrete shall be checked prior to and again after concreting. All nailing blocks, plugs, and strips necessary for the attachment of trim, finish, and similar work shall be checked prior to concreting.

I. Pipes and Wall Spools Cast in Concrete

1. Wall spools, wall flanges, and wall anchors shall be installed before placing concrete. Wall spools or anchors shall not be welded, tied, or otherwise connected to the reinforcing steel.

2. Pipe and fabricated fittings to be encased in concrete shall be supported on concrete piers or pedestals. Concrete supports shall be carried to firm foundations so that no settlement occurs during construction.

END OF SECTION

SECTION 03201

CONCRETE REINFORCEMENT

PART 1 - GENERAL

A. Description

This section describes materials, testing, and installation of reinforcing steel for concrete.

B. Related Work Specified Elsewhere

1. Concrete Formwork: 03100.

2. Concrete: 03300.

C. Submittals

1. Submit mill test certificates identifying chemical and physical analyses of each load of reinforcing steel delivered. If mill test reports are unavailable and the quantity of steel for a structure exceeds 5 tons, then provide a laboratory test to prove yield strength and bending.

2. Submit bending lists and placing drawings for all reinforcing steel. Each bending list submitted shall be complete, including corner bars as required. Furnishing such lists shall not be construed that the lists will be reviewed for accuracy. The contractor shall be wholly and completely responsible for the accuracy of the lists and for furnishing and placing reinforcing steel in accordance with the details shown on the plans and as may be specified elsewhere in the contract documents.

PART 2 - MATERIALS

A. Reinforcing Steel

1. Reinforcing steel shall be new material conforming to ASTM A 615, Grade 60, and shall be fabricated in accordance with the current edition of the Manual of Standard Practice, published by the Concrete Reinforcing Steel Institute. Reinforcing steel shall be bent while cold. Reinforcing steel which is to be welded, shall conform to ASTM A 706, Grade 60.

2. Reinforcing steel shall be delivered to the site bundled and with identifying tags.

B. Welded Wire Fabric

Welded wire fabric shall conform to ASTM A 185. The minimum gauge of the welded wire fabric shall be 6 x 6 – W1.4 x W1.4. The welded wire fabric shall be determined by the design/structural engineer and approved by Mesa Water.

C. Tie Wire

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

D. Bar Supports

Bar supports in beams and slabs exposed to view after form stripping shall be non-metallic and of sufficient strength to properly secure the reinforcement bars during the placement of concrete. Concrete supports shall be used for reinforcing in concrete placed on grade.

PART 3 - EXECUTION

A. Placing

1. Reinforcing steel shall be placed in accordance with ACI and the current edition of Recommended Practice for Placing Reinforcing Bars, published by the Concrete Reinforcing Steel Institute.

2. Reinforcing steel, before being positioned, shall be free from loose mill and rust scale and from any coatings that may destroy or reduce the bond. Where there is delay in depositing concrete, reinforcement steel shall be cleaned by abrasive sandblasting to remove mortar, oil, dirt, excessive mill scale, scabby rust, and coatings of any character that would destroy or reduce the bonding capability.

3. Reinforcing steel shall not be straightened or reshaped in a manner that will injure the material. Bars with bends not shown on the drawings shall not be used. Bars that are partially embedded in concrete shall not be bent.

4. Reinforcing steel shall be positioned in accordance with the drawings and secured by using annealed wire ties or clips at inter-sections and support by concrete or metal supports, spacers, or metal hangers. Metal clips or supports shall not come in contact with the forms. Tie wires shall be bent away from the forms to provide the specified concrete coverage. Bars in addition to those shown on the drawings, which may be found necessary or desirable for the purpose of securing reinforcement in position, may be provided, at no additional expense to Mesa Water where Mesa Water is a party of the contract.

5. Reinforcing steel shall be placed a minimum of 2 inches clear of any metal pipe or fittings. Unless otherwise indicated on the drawings, reinforcement shall be placed so as to provide the thickness of protective concrete covering as indicated on the Typical Details, and or drawings. If not indicated on the drawings or Standard Drawings, protective covering shall be in accordance with ACI 318.

B. Splices

Unless otherwise shown, splices in adjacent horizontal bars shall be staggered 48 bar diameters.

END OF SECTION

SECTION 03260

CONCRETE JOINTS

PART 1 - GENERAL

A. Description

This section describes materials, testing, and installation of construction and expansion joints, premolded joint filler, joint sealant, and bond breaker tape.

B. Related Work Specified Elsewhere

1. Concrete Formwork: 03100.

2. Concrete Reinforcement: 03201.

3. Concrete: 03300.

C. Submittals

1. Submit manufacturer's literature, catalog data, and statement of compliance with referenced standards and specifications.

PART 2 - MATERIALS

A. Joint Sealant for Concrete Structures

The joint sealant shall be a two-part, gray, nonstaining, nonsagging, polyurethane sealant, which cures at ambient temperature to a firm, flexible, tear-resistant rubber. The sealer shall be resilient and have excellent recovery characteristics after extended periods of compression or elongation. Sealant shall be PRC 270, Vulkem 227, Sika 2C or approved equal.

Technical Requirements

Consistency	Gun grade
Tack free time	24 hours at 75°F and 50% R.H.
Pot life	1 to 3 hours
Hardness	30 Shore A, +/-5
Elongation	750%
Tensile Strength, ASTM D 412	325 psi
Peel strength on concrete	18 psi cohesive
Temperature service range	-40°F to +175°F
Immersion in water	Continuous

B. Neoprene Rods for Precast Slab Joints

Neoprene rods shall be of the indicated diameter, 50 durometer.

C. Premolded Joint Filler

Joint filler shall be preformed, nonextruded type, constructed of closed-cell neoprene conforming to ASTM D 1752, Type I, as manufactured by W. R. Grace Company of Cambridge, Massachusetts; W. R. Meadows, Inc., Elgin, Illinois; or approved equal.

D. Neoprene Bearing Pads

Neoprene bearing pads for precast concrete slabs shall be of the indicated size, thickness, and length, 60 durometer.

E. Bond Breaker Tape

Bond breaker tape shall be an adhesive backed glazed butyl or polyethylene which will adhere to the premolded joint material or concrete surface. The tape shall be the same width as the joint. The tape shall be compatible with the sealant.

PART 3 - EXECUTION

A. Construction Joints

1. Construction joints shall be provided where shown on the drawings. In case of emergency, additional construction joints shall be placed. An interval of 45 minutes between two consecutive batches of concrete shall constitute cause for an emergency construction joint. All emergency construction joints are subject to final approval by Mesa Water.

2. Construction joints shall be keyed, if indicated on the drawings. Keyways shall be formed by beveled strips or boards placed at right angles to the direction of shear. Except where otherwise shown on the drawings or specified, keyways shall be at least 1-1/2 inches in depth over at least 25% of the area of the section.

3. When an emergency joint is necessary, the joint shall be keyed and reinforcing dowels shall be furnished and placed across the joint. These dowels shall be embedded 60 bar diameters into each side of the joint. Size and number of dowels shall match reinforcing in the member. Furnishing and placing such reinforcing steel shall be done at no additional expense to Mesa Water where Mesa Water is a party of the contract.

4. After the pour has been completed to the construction joint and the concrete has hardened, the entire surface of the joint shall be thoroughly cleaned of surface laitance, loose or defective concrete, and foreign material, and clean aggregate shall be exposed by sandblasting the surface of construction joints before placing the new concrete.

Horizontal construction joints shall be covered with mortar. Mortar shall be spread uniformly and worked thoroughly into all irregularities of the surface. The mortar shall be flowable and shall consist of sand, water, and a minimum of 12 sacks of cement per cubic yard. A positive measuring device, such as a bucket, or other device shall be provided that will contain only enough mortar for depositing in one place in the wall or column to ensure that portion of the form does not receive too much mortar. Mortar shall not be deposited from pump hoses or large concrete buckets unless inspection windows close to the joint are available to allow visual measurement of mortar thickness and means for mortar removal is available for removal of any excess. The water-cement ratio of the mortar in place shall not exceed that of the concrete to be placed upon it. The consistency of the mortar shall be suitable for placing and working.

B. Installation of Premolded Joint Filler

Premolded joint filler shall be installed in joints accurately as shown. Joint filler shall be attached to concrete with a bonding agent recommended by the joint sealant and joint filler manufacturer for compatibility.

C. Installation of Joint Sealants

1. Immediately before installing the joint sealant, the joint cavity shall be cleaned by sandblasting or power wire brushing. Bond breaker tape shall be installed per manufacturer's instructions.

2. After the joints have been prepared as described above, the joint sealant shall be applied. Primer, if required, and joint sealant shall be applied only with the equipment and methods recommended by the joint sealant manufacturer. Application criteria for the sealant materials, such as temperature and moisture requirements and primer cure time, shall be in accordance with the recommendations of the sealant manufacturer.

3. Masking tape shall be applied along the edges of the exposed surface of the exposed joints. Joints shall be troweled smooth with a tuck pointing tool wiped with a solvent as recommended by the sealant manufacturer.

4. After the sealant has been applied, masking tape and any sealant spillage shall be removed.

D. Installation of Neoprene Rods in Precast Slab Joints

Neoprene rods shall be forced down to the bottom of the shaped joint prior to placing drypack in the joint.

E. Installation of Neoprene Bearing Pads

Neoprene bearing pads shall be placed in the indicated position on the concrete walls and glued to the wall with suitable adhesive.

END OF SECTION

SECTION 03300

CONCRETE

PART 1 - GENERAL

A. Description

This section describes materials, mixing, and placing of concrete and grout. All portland cement concrete shall conform to the provisions of Section 201 of the Standard Specifications for Public Works Construction (SSPWC) except as herein modified.

B. Related Work Specified Elsewhere

1. Concrete Formwork: 03100.

2. Concrete Reinforcement: 03201.

3. Concrete Joints: 03260.

C. Submittals

1. Shop drawings shall be submitted in accordance with ACI 318, and the following.

2. Mix design with proof of design by laboratory 7-day and 28-day compressive tests, or test reports of 7-day and 28-day compressive tests of the mix where the same mix was used on two previous projects, shall be submitted in writing for review by Mesa Water at least 15 days before placing of any concrete.

3. Certificate that cement used in the concrete complies with ASTM C 150 and these specifications shall be submitted.

4. Aggregates: Certificate of compliance with ASTM C 33 shall be provided. Weathering region limits of coarse aggregates: severe, moderate, or negligible shall be stated. Basis of determining that potential reactivity is negligible shall be stated.

5. Ready Mix Concrete: Delivery tickets or weighmasters certificate per ASTM C 94, including weights of cement and each size aggregate, volume of water in the aggregate, and volume of water added at the plant shall be provided. The volume of water added on the job shall be written on the ticket or certificate.

6. Concrete admixtures: Manufacturer's certificate of compliance with these specifications shall be provided.

7. Epoxy Bonding Compound: Manufacturer's specific instructions for use shall be provided.

8. Nonshrink Grout: Manufacturer's certificate of compliance with these specifications and specific instructions for use shall be provided.

PART 2 - MATERIALS

A. Cement

Cement shall conform to ASTM C 150, Type II or Type V, with maximum tricalcium aluminate content not to exceed 6%. The maximum percent alkalies shall not exceed 0.6%.

B. Aggregates

Aggregates shall comply with ASTM C 33 and shall be free from any substances that will react with the cement alkalies.

C. Water and Ice

Water and ice that is clean and free from objectionable quantities of organic matter, alkali, salts, and any other impurities which might reduce the strength, durability, and quality of the concrete shall be used in the concrete mix.

D. High-Early Strength Concrete

Admixtures for high-early strength concrete shall be non-chloride admixtures which meet the requirements of ASTM C494. Acceptable products are Pozzutec 20 and Pozzolith NC 534, by Master Builders, Inc. or approved equal. Concrete shall reach 2,500 psi by eight (8) hours of being placed.

E. Concrete Admixtures

1. Air Entraining Admixture: Concrete may contain an air-entraining admixture which shall conform to ASTM C 260, except it shall be nontoxic after 30 days and shall contain no chlorides. Admixture shall be Master Builders MB-VR, Sika AER (Sikamix 104), or approved equal.

2. Water Reduction Admixture: Concrete may contain a water-reducing admixture which shall conform to ASTM C 494, Type A or Type D, except it shall contain no chlorides, shall be nontoxic after 30 days, and shall be compatible with the air-entraining admixture. The amount of admixture added to the concrete shall be in accordance with the manufacturer's recommendations. Admixture shall be Master Builders Pozzolith polymer-type normal setting, Plastocrete (Sikamix 160) Normal Set, Sika Chemical Corporation, or approved equal.

3. Restrictions: Accelerating water-reducing admixtures or any other type of admixture that contains chlorides or other corrosive elements shall not be used in any concrete.

F. Nonshrink Grout

Nonshrink grout shall conform to the Corps of Engineers Specification for Nonshrink Grout, CRD-C588-78, and to these specifications. Use a non gas-liberating type, cement base, premixed product requiring only the addition of water for the required consistency. Grout shall be UPCON High Flow, Master Flow 713, or approved equal. All components shall be inorganic.

G. Ordinary Type Grout (Dry Pack)

Ordinary type grout shall consist of one part portland cement to two parts sand (100% passing a No. 8 sieve). Sufficient water shall be added to produce damp formable consistency.

H. Epoxy Bonding Compound

Manufacturer's certifications as to suitability of product to meet job requirements with regard to surface, pot life, set time, vertical or horizontal application, and forming restrictions shall be provided. Bonding compound shall be Concresive 1001 LPL, Adhesive Engineering Company, San Carlos, California; Sikadur Hi-Mod (Sikastix 370), Sika Chemical Corporation, Lyndhurst, New Jersey; or approved equal.

I. Concrete Mix Design

1. General: Concrete mix design shall conform to ASTM C 94 and ACI 318, except as modified by these specifications.

2. Fly Ash: Fly ash shall not be used in the mix as a partial substitute for cement.

3. Air Content: Air content as determined by ASTM C 231 shall be 4% +/-1%.

4. Water-Cement Ratio: Maximum water-cement ratio for Class A concrete shall not exceed 0.44 by weight.

5. Classes: Classes of concrete shall be used as described in the following table:

Class	Type of Work	28-Day Compressive Strength (in psi)	Minimum Cement Content (in lbs. Per C.Y.)
A (560-C-3250) *	Concrete for all reinforced concrete, piers, vaults, thrust blocks, encasements, and site work	3,250	564 (6 sack)
B (520-C-2500)*	Concrete for all curb, gutters, alley aprons, and sidewalks	2,500	470 (5 sack)
C (450-C-2000) * (100-E-100)*	Pipe bedding, fill for foundations, cradles, supports across pipe trenches, anchors, and miscellaneous unreinforced concrete.	2,000	376 (4 sack)

*concrete class per SSPWC

6. Slump: Slump shall be measured in accordance with ASTM C 143. Slump shall be as follows:

Slab on grade or heavy sections wider (in plan view) than 3 feet	3 inches maximum
Footings, walls, suspended slabs, beams, and columns	4 inches maximum

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

7. Aggregate Size: Aggregate size shall be ¾-inch maximum for slabs and sections 8 inches thick and less. Aggregate size shall be 1-1/2 inches maximum for all larger slabs and sections. Combined aggregate grading shall be as shown in the following table:

Maximum Aggregate Size – Percentage Passing

Sieve Sizes	**1-1/2”**	**3/4”**
2”	100	--
1-1/2”	90 – 100	--
1”	50 – 86	100
3/4”	45 – 75	90 – 100
3/8”	38 – 55	60 – 80
No. 4	30 – 45	40 – 60
No. 8	23 – 38	30 – 45
No. 16	17 – 33	20 – 35
No. 30	10 – 22	13 – 23
No. 50	4 – 10	5 – 15
No. 100	1 – 3	0 – 5
No. 200	0 – 2	0 – 2

8. Pumped Concrete Design Mix: Mix design for pumped concrete shall produce a plastic and workable mix. The percentage of sand in the mix shall be based on the void volume of the coarse aggregate.

J. Workability

1. General: Concrete shall be of such consistency and composition that it can be worked readily into the forms and around the reinforcement without excessive spading and without permitting the materials to segregate or free water to collect on the surface. The proportions shall be adjusted to secure a plastic, cohesive mixture, and one which is within the specified slump range.

2. Aggregate: To avoid unnecessary changes in consistency, aggregate shall be obtained from a source with uniform quality, moisture content, and grading. Materials shall be handled in such a manner that variations in moisture content will not interfere with production of concrete of the specified degree of uniformity and slump.

K. Color Additive

For exterior electrical duct concrete encasements, a color additive shall be used for identification purposes. Color additive shall be: brick red “Colorfull”, as manufactured by

Owl Manufacturing Company, Arcadia, California; coral red "Chromix C-22", as manufactured by L.M. Scofield Company, Los Angeles, California; or approved equal.
The color additive shall be added while the concrete is being mixed using the quantity per cubic yard of concrete recommended by the manufacturer for the class of concrete indicated.

PART 3 - EXECUTION

A. Site-Mixed Concrete

1. Site-mixed concrete shall conform to ACI 304 as modified by these specifications.

2. Batching and Mixing Equipment: A batch-type mixer shall be used that is capable of combining the aggregates, cement, and water within the specified time into a thoroughly mixed and uniform mass and discharging the mixture without segregation. Supporting equipment shall be used that can accurately proportion the cement, the coarse and fine aggregates, the admixtures, and the water which enters the mixing drum. Cement and aggregate shall be proportioned by weight. Each entire batch shall be discharged before recharging. The volume of the mixed materials per batch shall not be allowed to exceed the manufacturer's rated capacity of the mixer.

3. Mixing Time: Mixing time shall be as follows:

   a. For mixer of a capacity of 1 cubic yard or less, one and one-half minutes after batching is completed.

   b. For mixers of capacities larger than 1 cubic yard, one and one-half minutes plus one-half minute for each additional 1/2-cubic-yard capacity or fraction thereof in excess of 1 cubic yard.

   c. The mixer shall revolve at a uniform rate as specified by the manufacturer for the mixing equipment.

B. Ready-Mixed Concrete

1. Ready-mixed concrete shall conform to ASTM C 94 as modified by these specifications.

2. Haul Time Requirements: The haul time of ready-mixed concrete shall be limited so that the specified slump is attained without the onsite addition of water, which may cause the mix design water-cement ratio to be exceeded. In no case shall the time between the time when the concrete is batched and it is placed exceed 90 minutes. When haul time is excessive, truck-transported, dry-batched concrete shall be used and mixed on the jobsite. Partially hardened concrete shall not be retempered.

C. Placing Concrete

1. Concrete placement shall conform to ACI 304 as modified by these specifications.

2. Placement Sequence: The sequence of concrete placement shall be coordinated in advance of actual placement to assure that construction joints will occur only as designed.
   The Mesa Water's Representative shall be furnished a copy of the sequence of placement in advance of actual placement. Alternate sections of concrete walls and slabs shall be placed monolithically. Concrete for walls and slabs shall not be placed until seven days after placement of concrete for adjacent walls and slabs.

3. Notification: The Mesa Water's Representative shall be notified of readiness, not just intention, to place concrete in any portion of the work. This notification shall be such time in advance of the operation as the Mesa Water's Representative deems necessary for him to observe the preparations at the location of the proposed concrete placing. All forms, steel, screeds, anchors, ties, inserts and other items to be embedded shall be in place before notification of readiness is given to the Mesa Water's Representative.

4. Equipment Readiness: Sufficient primary and backup equipment shall be scheduled for continuous concrete placement, and anticipate what actions will be taken during interruption. Extra concrete vibrators shall be provided. Concrete vibrators shall be tested the day before placing concrete.

5. Removal of Water from Areas to Receive Concrete: Concrete shall not be placed until all water entering the space to be filled with concrete has been properly cut off or has been diverted by pipes or other means and carried out of the forms, clear of the work. Concrete shall not be placed underwater, nor shall still water be allowed to rise on any concrete until the concrete has attained its initial set. Water shall not be permitted to flow over the newly deposited concrete in such manner and of such velocity that will damage the surface finish.

6. Moisture Barriers: Where a moisture barrier is installed, the moisture barrier shall not be punctured by stakes or any other concrete accessories.

7. Concrete Pours and Freefall: Concrete shall be deposited at or near its final position to avoid segregation caused by rehandling or flowing. Concrete shall not be deposited in large quantities in one place to be worked along the forms with a vibrator. Concrete shall not be dropped freely into place from a height greater than 4 feet. Tremies shall be used where the drop could exceed these limits.

8. Consolidation of Concrete: Mechanical vibrators shall be used while placing concrete to eliminate rock pockets and voids, to consolidate each layer with that previously placed, to completely embed reinforcing bars and fixtures, and to bring just enough fine material to exposed surfaces to produce a smooth, dense, and even texture. Vibrators shall be of the high-frequency internal type, and the number in use shall be able to consolidate the incoming concrete to a proper degree within 15 minutes after it is deposited in the forms. In all cases, at least two vibrators shall be available at the site. External vibrators shall be used for consolidating concrete only when the concrete is otherwise inaccessible for adequate internal consolidating.

9. Protection of Concrete: Concrete shall not be placed during wet weather events. Concrete placed immediately before rain shall be protected to prevent rainwater from

coming in contact with it. Sufficient protective covering shall be kept on hand at all times for this purpose.

D. Concrete Tests

1. Strength tests shall be performed on the concrete by the Mesa Water's Representative as follows:

   a. Mold and cure three concrete test cylinders from each 50 cubic yards, or fraction thereof, of each class of concrete placed in any one day. Mold and cure the cylinders in accordance with ASTM C 31.

   b. Test cylinders in accordance with ASTM C 39. Test two cylinders at 28 days for acceptance, and test one at 7 days for information. Hold one cylinder for verification. The test results shall be the average of the strengths of the two cylinders tested at 28 days. If one cylinder in a test manifests evidence of improper sampling, molding, or testing, other than low strength, discard it and use the strength of the remaining cylinder for the test result. Should both cylinders in a test show any of the above defects, discard the entire test.

   c. Determine slump of the concrete using ASTM C 143 for each strength test sample and as required to establish consistency.

   d. Determine air content of the concrete using ASTM C 231 for each strength test sample and as required to establish consistency.

2. Notification and Handling of Samples: To facilitate testing and inspection:

   a. Mesa Water shall be advised in advance of concrete placing operations to allow for completion of quality tests.

   b. Labor necessary to assist the Mesa Water’s Representative in obtaining and handling samples at the project shall be furnished by the contractor.

   c. Facilities for safe storage and proper curing of concrete test specimens on the project site, as required by ASTM C 31 shall be provided and maintained by the contractor for the sole use of Mesa Water.

3. Requirements for Attainment of Compressive Strength: Concrete specified by compressive strength shall attain the 28-day strength specified in Part 2, Paragraph I of this section. The average of any three consecutive strength tests shall be equal to or greater than the specified 28-day strength. Not more than 10% of the tests shall be less than specified 28-day strength. No test shall be less than 90% of the specified 28-day strength.

4. Failure to Attain Specified Strength: If the 28-day tests fail to meet the specified minimum compressive strength, the concrete will be assumed to be defective and one set of three cores from each area may be taken as selected by Mesa Water and in accordance with ASTM C 42. If the average compressive strength, of the set of three concrete cores fails to equal 85% of the specified minimum compressive strength or if

any single core is less than 75% of the minimum compressive strength, the concrete will be considered defective and shall be removed and replaced, all at no cost to Mesa Water where Mesa Water is a party of the contract.
Costs of coring, testing of cores, and all required repairing pertaining thereto shall be the responsibility of the contractor.

E. Pumping Concrete

1. Equipment Capacity Requirements: Pump size shall be determined by the rate of concrete placement, length of delivery pipe or hose, aggregate size, mix proportions, vertical lift, and slump of concrete.

   Minimum inside diameter of pipe or hose shall be based on the maximum aggregate size as follows:

3/4-inch-max aggregate:	2 inches min ID
1-1/2-inch-max aggregate:	4 inches min ID

2. Disallowance of Aluminum Pipe: Aluminum pipes shall not be used for delivery of concrete to the forms.

3. Priming: Before pumping is started, the delivery pipe or hose shall be primed by pumping mortar through the line using 5 gallons of mortar for each 50 feet of delivery line. Mortar shall be pumped to waste and not deposited in the forms.

F. Hot Weather Requirements

1. General: During hot weather, proper attention shall be given to ingredients, production methods, handling, placing, protection, and curing to prevent excessive concrete temperatures or water evaporation in accordance with ACI 305 and the following. There shall be no additional reimbursement for costs incurred for placing concrete in hot weather.

2. Cooling Methods: When the weather is such that the temperature of the concrete as placed would exceed 90°F, ice or other effective means of cooling the concrete during mixing and transportation shall be used so that the temperature of the concrete as placed will not exceed 90°F.

3. Prevention Against Early Setting of Concrete: Precautions shall be taken when placing concrete during hot, dry weather to eliminate early setting of concrete. This includes protection of reinforcing from direct sunlight to prevent heating of reinforcing, placing concrete during cooler hours of the day, and the proper and timely application of specified curing methods.

G. Cold Weather Requirements

1. General: Adequate equipment shall be provided for heating concrete materials and protecting concrete during freezing or near-freezing weather in accordance with ACI 306 and the following. There shall be no additional reimbursement for costs incurred for placing concrete during cold weather.

2. Heated Mixing Water: When the temperature of the surrounding atmosphere is 40°F or is likely to fall below this temperature, the mixing water shall be heated to, but not exceed, 140°F. The heated water shall not be allowed to come in contact with the cement before the cement is added to the batch.

3. Temperature Requirements: When placed in the forms during cold weather, the concrete temperature shall be maintained at not less than 55°F. All materials shall be free from ice, snow, and frozen lumps before entering the mixer.

4. Curing Requirements: The air and the forms in contact with the concrete shall be maintained at temperatures above 40°F for the first five days after placing, and above 35°F for the remainder of the curing period. Thermometers shall be provided by the Contractor to indicate the ambient temperature and the temperature 2 inches inside the concrete surface.

H. Bonding to Existing Concrete

Existing concrete to which new concrete is to be bonded shall have the contact surfaces coated with epoxy bonding compound. The method of preparation and application of the bonding compound shall conform to the manufacturer's printed instructions and recommendations for specific application for this project.

I. Grouting Machinery Foundations

During placement of machinery, concrete shall be blocked out or finished off a sufficient distance below the bottom of the machinery base to provide for the thickness of grout shown on the drawings. After the machinery has been set in position and wedged to the proper elevation by steel wedges, the space between the bottom of the machinery base and the original pour of concrete shall be filled with a pourable nonshrink grout.

END OF SECTION

SECTION 03462

PRECAST CONCRETE VAULTS AND METER BOXES

PART 1 - GENERAL

A. Description

This section describes the materials, manufacture, and installation of precast concrete vaults, precast concrete manholes, manhole frame and covers, and meter boxes.

B. Related Work Specified Elsewhere

1. Structural Earthwork: 02220.
2. Trenching, Backfilling and Compacting: 02223.
3. Concrete: 03300.
4. Structural Steel and Miscellaneous Metalwork: 05120.

C. Submittals

1. Submit manufacturer's catalog data on precast concrete vaults and meter boxes. Show dimensions and materials of construction by ASTM reference and grade.
2. Submit manufacturer's catalog data on precast concrete manholes, frames and covers. Show dimensions and materials of construction by ASTM reference and grade. Show manhole cover lettering and pattern.

PART 2 – MATERIALS

A. Precast Concrete Vault

1. Manufacturers: Precast concrete vaults and covers shall be manufactured in a plant especially designed for that purpose and shall conform to the size, shape and dimensions indicated on the detailed plans. Vaults and covers shall be Jensen Precast, Eisel Enterprises, Inc., Inland Concrete Enterprises, Inc., J&R Concrete Products, Inc., Christy Concrete, Olson Precast, or approved equal.
2. Design Loads: Design loads shall consist of dead load, live load, impact, and in addition, loads due to water table and any other loads which may be imposed upon the structure. Live loads shall be based on H-20 loading per AASHTO standard specifications for highway bridges. Design wheel load shall be 16 kips. The live load shall be that which produces the maximum shear and bending moments in the structure.

3. Concrete: Concrete for vaults shall be Class A conforming to Section 03300, Concrete.

4. Sectional Vaults: Sectional precast concrete vaults may be used where specified on the drawings or approved by Mesa Water

B. Precast Concrete Manholes

1. General: Precast reinforced concrete manholes shall comply with ASTM C 478, with a minimum wall thickness of 6-inches.

2. Design Loads: Manhole components shall be designed for H-20 highway loads and site soil conditions.

3. Concrete: Precast reinforced concrete manhole risers and tops shall be constructed of Class A concrete conforming to Section 03300, Concrete.

4. Manhole Section Configuration: Manholes shall be fabricated only from eccentric sections and standard cylinder units of the proper internal diameter.

5. Manufacturers: Precast reinforced concrete manholes shall be manufactured by Associated Concrete Products, Inland Concrete Products, Olson Precast Company, Precon Products, Southwest Concrete Products, or approved equal.

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C. Manhole Frames and Covers

1. General Requirements: Manhole frames and covers shall be made of ductile iron conforming to ASTM 536, Class 400, or cast iron conforming to ASTM A 48, Class 30. Castings shall be smooth, clean, and free from blisters, blowholes, and shrinkage. Frames and covers shall be of the traffic type, designed for H-20 loading.

2. Fit and Matchmarking: Each manhole cover shall be ground or otherwise finished so that it will fit in its frame without rocking. Frames and covers shall be matchmarked in sets before shipping to the site.

3. Cover Inscription: Covers shall have the words “MESA WATER” and “BLOWOFF” cast as shown on the Standard Drawings or on the drawings. No other lettering on the top side shall be permitted. Cast letters shall be 3-inches and the relief depth shall be at least 3/16-inch. Top surface of the letters and diamond tread pattern shall be flush with the outer ring edge and the frame top surfaces.

4. Inspection and Coating: Before leaving the foundry, castings shall be cleaned and subjected to a hammer inspection. Castings shall then be dipped twice in a preparation of asphalt or coal tar and oil applied at a temperature of not less than 290° F, not more than 310° F, and in such a manner as to form a firm and tenacious coating.

5. Manufacturers: Manhole frames and covers shall be manufactured by Alhambra Foundry, National Casting, Neenah Foundry, Pont-A-Mousson, South Bay Foundry, or approved equal.

D. Meter Boxes and Covers

1. Materials: Meter boxes and covers shall be manufactured of reinforced polymer/plastic mortar.

2. Meter Box Covers: Meter box covers with reading lid shall be manufactured of reinforced polymer/plastic mortar in two separate rectangular pieces.

3. Traffic Covers: Meter box covers within roadways or driveways shall be one lipped cast-iron or steel lid piece, designed to withstand H-20 highway loading, and may only be used where specifically specified on the plan or approved by Mesa Water in the field.

4. Meter Box Size:

Meter Size(s)	Nominal Inside Dimensions
5/8" and 3/4" Meters:	12"W x 20"L x 12"D
1" Meter:	13"W x 24"L x 12"D
1-1/2" and 2" Meters:	17"W x 30"L x 12"D

5. Manufacturers: Meter boxes shall be manufactured of reinforced polymer/plastic mortar by J&R, Inc. (J&R P-W4 ½ or P-W5 ½) or Armorcast Products Company A6000485/A6000484R or A6001946PCX12/A6001866R. No approved equal.

E. Vault Frames and Covers

1. Materials: Unless noted otherwise, vault frames and covers shall be fabricated of aluminum in accordance with the requirements of Section 05120 (Structural Steel and Miscellaneous Metalwork).

2. Covers shall be fabricated with supports to prevent permanent deflection.

F. Joint Sealing Compound

The joint sealing compound shall be permanently adhesive flexible plastic material complying in every detail to Federal Specification SS-S-00210 (GSA-FSS). Joint sealing compound shall be Quickseal by Associated Concrete Products, or approved equal.

G. Cement-Mortar Grout

Grout for watertight joints between precast sections of manholes shall be composed of one part portland cement to two parts of clean well-graded sand of such size that all pass a No. 8 sieve. Cement, aggregate, and water for mortar shall conform to the applicable provisions of Section 03300 (Concrete).

PART 3 – EXECUTION

A. Earthwork

1. General: Excavation and backfill for precast concrete vaults and meter boxes shall be in accordance with Section 02220 (Structural Earthwork), and the requirements herein. Excavation limits shall be large enough to accommodate the structure and permit grouting of openings and backfilling operations.

2. Sub-base: The bottom of the structure shall be placed on 6-inches of compacted, crushed rock sub-base, graded level and to the proper elevation as shown on the Standard Drawings and shall conform to the specifications in Section 02220 (Structural Earthwork).

B. Vault Installation

1. Vault Wall Openings: Openings or "knockouts" in precast concrete vaults shall be located as shown on the drawings and shall be sized sufficiently to permit passage of the largest dimension of pipe and/or coupling flange. Upon completion of installation, all voids or openings in the vault walls around pipes shall be filled with the following:

    a. 3-inches outside diameter and smaller: Fill with Class A concrete or mortar, using an epoxy for bonding concrete surfaces, as specified in Section 03300 (Concrete).

    b. Larger than 3-inches outside diameter: Annular openings shall be sealed with rubber linked mechanical sealing mechanism such as Leak-Seal or Inner-Linx in accord with the Standard Drawings. The vault wall opening shall be round and lined with a wall sleeve and integral water stop ring. The rubber linked mechanical sealing mechanism shall be used to seal the annual space between the outside of the pipe penetrating the vault wall and the inside of the wall sleeve. Wall sleeves may be coated steel pipe or pre-molded high density polyethylene.

2. Backfill: After the structure and all appurtenances are in place and approved, backfill shall be placed to the original groundline or to the limits designated on the plans.

3. Watertightness: All joints between precast concrete vault sections shall be made watertight. The sealing compound shall be installed according to the manufacturer's recommendations to provide a watertight joint.

4. Installed Elevation: Vaults shall be built up so that the cover is flush with the surrounding surface unless otherwise specified on the drawings or by the Mesa Water's Representative in the field. The Contractor is responsible for placing the cover at the proper elevation and slope where paving is to be installed, and shall make all necessary adjustments so that the cover meets these requirements.

C. Meter Box Installation

1. Line and Grade: Meter boxes shall be set true to line and to the grade of the top of the curb, sidewalk, or surrounding graded area. For landscaped, or other unpaved surfaces, the meter box shall be set with the top 0.1 foot above the adjacent surrounding area, or as directed by the Mesa Water's Representative in the field. The contractor is responsible for placing the cover at the proper elevation and slope, and shall all necessary adjustments so that the cover meets these requirements.

2. Sequence of Installation: Meter boxes shall not be set until fine grading or landscape grading in the vicinity has been completed.

D. Installing Manholes

1. Precast concrete manhole units shall be set in a bed of grout to make a watertight joint at least ½-inch thick with the concrete base or with the preceding unit. Manhole sections shall be set perfectly plumb. Joints shall be pointed and trowelled and smooth inside and outside of the manhole shaft joint. The excess grout shall be wiped off and removed.

2. Precast sections shall be assembled so that the cover conforms to the elevation determined by the manhole locations as follows, but limited to maximum of 18-inches of grade ring unless otherwise instructed by Mesa Water. In paved areas, the top of cover shall be flush with the paving surface. In unpaved areas, the top of cover shall be flush with the existing surface where it is in the "traveled way" or shoulder and the concrete pad shall be two (2) inches above the adjacent unpaved surface.

3. The manhole frame shall be secured to the grade ring with grout and cement mortar. After the frames are securely set, the frames and the covers shall be cleaned and scraped free of foreign materials, and shall be ground or otherwise finished as needed so the cover fits in its frame without rocking.

4. A concrete collar shall be cast around manhole frames that are flush with the surface. The collar shall be placed after final grading or paving together with final cleanup.

END OF SECTION

SECTION 05120

STRUCTURAL STEEL AND MISCELLANEOUS METALWORK

PART 1 - GENERAL

A. Description

This section describes materials and installation of structural steel, connecting bolts, stainless-steel fasteners, ladders, access hatches, and gratings.

B. Related Work Specified Elsewhere

1. Concrete: 03300.

2. Painting and Coating: 09900.

C. Submittals

1. Submit drawings of fabricated items, such as pipe supports, bolts, ladders, concrete anchors, grating, and access hatches. Show dimensions and reference materials of construction by ASTM designation and grade.

PART 2 - MATERIALS

A. Structural Steel

Material for all-purpose bolted or welded construction shall conform to ASTM A 36.

B. Aluminum

Structural shapes shall conform to ASTM B 308, Alloy 6061-T6. Plates and sheets shall conform to ASTM B 209. Tubing shall conform to ASTM B 241.

C. Steel Bolts

Steel anchor and connection bolts shall conform to ASTM A 307, Grade A4 and shall be fitted with self-locking nuts or lockwashers and plain nuts, and shall be galvanized. Flange nuts, bolts, and washers, except where otherwise specified, shall be Type 316, Stainless Steel.

D. Beveled Washers

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

E. Galvanizing

Zinc coating for all plates, bolts, anchor bolts, and threaded parts shall be hot-dipped coated in accordance with ASTM A 153. Structural steel and pipe shall be zinc coated in accordance with ASTM A 123.

F. Stainless Steel

Except where otherwise specified, stainless steel plate, members, and washers shall be Type 316, ASTM A 167. Bolts shall be ASTM A 193, Grade B8M. Nuts shall be ASTM A 194, Grade 8M.

G. Welding Electrodes

Welding electrodes for structural steel shall conform to AWS A5.5. Use electrodes in the E-70 series. Welding electrode for aluminum shall be 4043 filler metal and Type 347 electrode for stainless steel.

H. Ladders

1. General: Ladders shall be fabricated as shown on the drawings and shall comply with OSHA Safety Standards. Ladders shall be of welded steel construction and galvanized after fabrication or stainless steel where indicated on the drawings.

2. Safety Devices: When indicated on the plans, a safety climb device (ladder fall prevention device) shall be provided, consisting of a SAF-T-NOTCH rail, standard attaching parts, SAF-T-LOK sleeve, SAF-T-CLIMB removable extension, and two complete safety belt assemblies. The device shall comply with OSHA requirements and shall be SAF-T-CLIMB as manufactured by Air Space Devices Norton Co., Paramount, California, or approved equal. All safety climb device assemblies and parts shall be fabricated of Type 316 stainless steel.

3. Side-rail Extensions: All ladders shall have side-rail extensions fabricated onto the ladder.

I. Concrete Anchors

Drilled anchors shall be Type 316, stainless steel wedge anchors, unless otherwise indicated, as manufactured by Phillips Drill Company, or approved equal. Where steel anchors are indicated, they shall be one-piece design with expander ring consisting of steel zinc coated and chrome plated as manufactured by McCullough Industries, Inc., Kwik Bolt, or approved equal.

J. Access Hatches

Hatches may be of aluminum or stainless steel construction, as called for and specified on the project plans. In general aluminum hatches may be used in applications of parkway loading (i.e., low-volume traffic with H-5 loading), and where a severe corrosion environment is not present. In every case, hinges, hardware and all threaded pieces and connectors shall be Type 316 stainless steel.

Aluminum or stainless steel access hatches shall be of the size and type indicated on the drawings. Hardware shall be 316 stainless steel and shall include but not be limited to hinges, hold-open arms, springs, and spring covers. Hatches shall be equipped with extruded aluminum or stainless steel channel trough frames with 1-1/2 inch drain coupling, flush aluminum or stainless steel drop handles which do not protrude above the cover, a recessed padlock box and stainless steel staple sized for a No. 6 padlock, and shall be as manufactured by BILCO, U. S. Foundry, INRYCO, or approved equal.

K. Grating

Unless noted otherwise, grating shall be aluminum. Main bars shall be of the size and thickness indicated on the drawings.

PART 3 - EXECUTION

A. Fabrication and Erection

1. General: Miscellaneous metal items shall be fabricated to straight lines and true curves. Drilling and punching shall not leave burrs or deformations. Permanent connections shall be welded continuously along the entire area of contact. Exposed work shall have a smooth finish with welds ground smooth. Joints shall have a close fit with corner joints coped or mitered and shall be in true alignment. Unless specifically indicated, there shall be no bends, twists, or open joints in any finished member nor any projecting edges or corners at intersections. Fastenings shall be concealed wherever possible. Built-up parts shall be free of warp. Exposed ends and edges of metal shall be slightly rounded. All boltholes shall be 1/16-inch in diameter larger than bolt size. Cast-in-place bolt locations shall be measured in the field before drilling companion holes in structural steel beam or assembly.

2. Surfaces in Contact with Concrete: Surfaces of metalwork to be in contact with concrete shall be cleaned of rust, dirt, grease, and other foreign substances before placing concrete.

3. Embedded Metalwork: Embedded metalwork shall be set accurately in position when concrete is placed and supported rigidly to prevent displacement or undue vibration during or after the placement of concrete. Unless otherwise specified, where metalwork is to be installed in recesses in formed concrete, said recesses shall be made, metalwork installed, and recesses filled with dry-pack mortar in conformance with Section 03300 (Concrete).

B. Ladders

Ladder rungs shall have a minimum diameter of 3/4-inch. The distance between rungs, cleats, and steps shall not exceed 12-inches and shall be uniform throughout the length of the ladder. The minimum clear length of rungs or cleats shall be 16-inches. Ladders shall be mounted to provide clearance in back of ladder so that the distance from the centerline of rungs, cleats, or steps to the nearest permanent object in back of the ladder shall be not less than 7-inches.

C. Common Machine Bolts and Nuts

1. General: Bolts shall be inserted accurately into the boltholes without damaging the thread. Boltheads shall be protected from damage during driving. Boltheads and nuts shall rest squarely against the metal. Where bolts are to be used on beveled surfaces having slopes greater than 1 in 20 with a plane normal to the bolt axis, beveled washers shall be provided to give full bearing to the head or nut. Where self-locking nuts are not furnished, bolt threads shall be upset to prevent the nuts from backing off.

2. Bolt Insertion: Bolts shall be of the length that will extend entirely through but not more than 1/4-inch beyond the nuts. Boltheads and nuts shall be drawn tight against the work. Boltheads shall be tapped with a hammer while the nut is being tightened. After having been finally tightened, the nuts shall be locked.

D. Anchor Bolts and Anchors

1. General: Bolts and anchors shall be preset by the use of templates. Concrete anchors shall not be used where cast-in-place anchor bolts are called for.

2. Protection of Anchor Bolts: After anchor bolts have been embedded, bolt threads shall be protected by applying grease and be having the nuts screwed on until the time of installation of the equipment or metalwork.

E. Control of Flame Cutting

The use of a gas-cutting torch in the field for correcting fabrication errors on any member in structural framing shall not be permitted. A flame-cutting torch shall be used only on minor members, when the member is not under stress.

F. Repair of Galvanized Surfaces

Damaged galvanized metal surfaces shall be repaired or replaced at no additional cost to the District. Repair of galvanized surfaces shall be accomplished by use of DRYGALV as manufactured by the American Solder and Flux Company; Cold Galvanizing Repair Compound as manufactured by Rust-Oleum, applied in accordance with the manufacturer's instructions; or approved equal.

G. Storage of Materials

All material, either plain or fabricated, shall be stored above ground on platforms, skids, or other supports. Material shall be kept free from dirt, grease, and other foreign matter and protect from corrosion.

H. Welding

1. Steel: Welding of steel shall be performed by the Shielded Metal Arc Welding (SMAW) process. Welding procedures shall comply with AWS D1.1.

2. Aluminum: Welding of aluminum shall be performed by the Gas Metal Arc (MIG) or Gas Tungsten Arc (TIG) process, per the AWS Welding Handbook.

I. Grating

1. Measurement: Grated areas shall be field measured for proper size.

2. Banding: Grating shall be completely banded.

3. Grating Angles: Seat angles for grating shall be set so that the top of the vertical leg is flush with the concrete floor. Seat angles and anchors shall be stainless steel.

J. Corrosion Protection

Aluminum surfaces that are in contact with or embedded in concrete shall be coated in accordance with Section 09900 (Painting and Coating). Coating shall be allowed to dry before placing in or against concrete.

END OF SECTION

SECTION 09900

PAINTING AND COATING

PART 1 - GENERAL

A. Description

This section describes materials and application of painting and coating systems for submerged metal surfaces, exposed metal surfaces, buried metal surfaces, and metal surfaces in contact with concrete, submerged concrete, exposed PVC, and valve interiors.

Coating thicknesses specified herein are given as "dry-film thickness" in mils. Mil thicknesses specified are minimums.

B. Related Work Specified Elsewhere

1. Structural Steel and Miscellaneous Metalwork: 05120.
2. Cement-Mortar Lined and Coated Steel Pipe: 15076.
3. Air Release and Vacuum Relief Valves: 15089.
4. Manual Valves: 15100.
5. Fire Hydrants: 15139.
6. Flexible Pipe Couplings and Expansion Joints: 15162.
7. Cathodic Protection and Joint Bonding: 16640

C. Submittals

1. Submit manufacturer's data sheets showing the following information:
    a. Recommended surface preparation.
    b. Minimum recommended dry-film thicknesses per coat for prime, intermediate, and finish coats.
    c. Percent solids by volume.
    d. Recommended thinners.
    e. Statement that the selected prime coat is recommended by the manufacturer for use with the selected intermediate and finish coats.
    f. Application instructions including recommended application, equipment, humidity, and temperature limitations.

g. Submit the Material Data Sheets (MSDS) for each coating material.

h. For all coatings that will be in contact with potable water, provide a certification or statement that the coating is NSF 61 certified.

3. Submit certification that all coatings conform to South Coast Air Quality Management District Rules and Regulations for products and application.

D. Air Quality Requirements

Materials shall comply with South Coast Air Quality Management District's Rule 1107 for shop coating and Rule 1113 for field coating.

E. Painting Systems

All paints shall be delivered to the jobsite in the original, unopened containers. All materials of a specified painting system, including primer, and finish coats, shall be produced by the same manufacturer. Thinners, cleaners, driers, and other additives shall be as recommended by the paint manufacturer for the particular coating system.

PART 2 - MATERIALS

A. Color System for Coatings and Coating System Summary

Unless noted otherwise, colors for surfaces that are to be coated shall be defined as follows:

Color	Pantone ID No. (closest match in sunlight)	Amershield Color Designation
Dark Blue	2776 C	Newport Coast #33
Olive Light	451 C	PMS 451 C
Purple	512 C	PMS 512 C
Safety Red	485 C 2X	RO-1 Bright Red
Safety Yellow	U2X	Safety Yellow
White (Fire Hydrant)	--	--
Factory Finish	N/A	No Color Coating

The following table provides a summary of the coating systems and the various surfaces to be coated:

Application (Potable or Recycled)	Coating System No.
Public Fire Hydrants (Potable)	A-1
Submerged Metal (Potable)	B-2
Submerged Metal (Recycled)	B-1

Exposed Metal (Both)	C-1 and C-2
Application (Utility)	**Coating System No.**
Buried Metal (Both)	D-1
Metal in Contact with Concrete (Both)	E-1
Exposed PVC (Both)	F-1
Valves (Both)	G-1 and G-2

B. Specialty Items

Surfaces shall be coated as described below:

1. Valve Can and Test Box Lids: Valve can and test box lids shall be coated per System C-2.

2. Buried Items: Buried flanges, nuts and bolts, valves, flexible pipe couplings, exposed rebar from thrust blocks, and valve boxes shall be coated per System No. D-1 unless otherwise specified in the particular specifications for these items.

3. Above Ground Structural Steel and Structural Steel in Vaults: Above ground structural steel or structural steel located in vaults and steel structures shall be coated as described in the exposed metal coating system section.

4. Pipe Supports: All non-galvanized and non-stainless steel pipe supports in vaults shall be coated the same as the adjacent piping. If pipe is PVC, pipe supports shall be coated per System No. C-1.

C. Public Fire Hydrant Coating Systems

1. System No. A-1 -– Public Fire Hydrants

   a. Type: Water-based low Volatile Organic Compound (VOC) acrylic coating. Thinners, cleaners, driers, and other additives shall be as recommended by the paint manufacturer. A total dry-film consisting of the combined thickness of both a prime coat and finish coat is described herein. The total dry-film thickness of this system shall be 5 mils.

   b. Surface preparation: Remove oil, grease, and chalking. Abrade existing paint and visible rust areas. Do not sandblast or prepare more surface area than can be coated in one day. Surface preparation shall conform to the Society of Protective Coatings (SSPC) specifications: SP-1 Solvent Tool Cleaning; SP-2 Hand Tool Cleaning; and SP-3 Power Tool Cleaning.

   c. Color: White Frazee Gloss Enamel MIRRO GLIDE GLOSS.

   d. Prime Coat: Apply to a dry-film thickness of 2 to 3 mils. Primer shall be synthetic. Approved manufacturers for previously paint surfaces include: Carboline Carbocrylic 120; Sherwin Williams Zero VOC Acrylic; Tnemec

Series 1028 Enduratone; International/Devoe Devflex 4216 HP; or approved equal.

e. Finish Coat: Apply to a dry-film thickness of 3 to 4 mils. Approved manufacturers for finish coats include: Carboline Carbocrylic 3359 MC; Sherwin Williams Zero VOC Acrylic; Tnemec Series 1028 Enduratone; International/Devoe Devflex 4216 HP; or approved equal.

D. Submerged Metal and Concrete Coating Systems

1. System No. B-1--Submerged Metal, Recycled

Type: Two part low VOC epoxy-polyamide. A total dry-film consisting of the combined thickness of both a prime coat and finish coat is described herein. The total dry-film thickness of this system shall be 20 mils.

Service Conditions: Shall be used on metal structures, pipes, or equipment including, but not limited to tanks, slide gates and other miscellaneous metal exposed to recycled water.

Surface Preparation: SSPC SP-10

Prime Coat: Apply to a dry-film thickness of 8 mils. Approved manufacturers for prime coat include: PPG Ameron Amerlock VOC; Carboline Carboguard 890 VOC; Tnemec Series L69 Hi-build Epoxoline II; International/Devoe 233H; or approved equal.

Finish Coats: Apply two coats, each with a 6 mil dry-film thickness to achieve the total dry-film thickness. The coating material shall be the same material as the prime coat.

2. System No. B-2--Submerged Metal, Potable Water

Type: Two part low VOC epoxy-polyamide, or two-part amido-amine epoxy. A total dry-film consisting of the combined thickness of both a prime coat and finish coat is described herein. The total dry-film thickness of this system shall be 15 mils. Coating shall be NSF 61 approved.

Service Conditions: Shall be used on surfaces including, but not limited to, structural steel, tank interiors and piping exposed to potable water.

Surface Preparation: SSPC SP-10

Prime Coat: Apply to a dry-film thickness of 5 mils. Approved manufacturers for prime coat include: PPG Ameron Amerlock VOC; Tnemec Series L140F Pota Pox; Sherwin Williams Macropoxy 646-100PW; International/Devoe 233H; or approved equal.

Finish Coats: Apply two coats, each with a 5 mil dry-film thickness, to achieve the total dry-film thickness. The coating material shall be the same material as the prime coat.

E. Exposed Metal Coating Systems

1. System No. C-1--Exposed Metal, Severely Corrosive Environment

Type: Low VOC Inorganic zinc prime coat with low VOC epoxy-polyamide finish coat. A total dry-film consisting of the combined thickness of both a prime coat and finish coat is described herein. The total dry-film thickness of this system shall be 12 mils.

Service Conditions: Shall be used on metal surfaces including, but not limited to, structures, piping, fittings, and appurtenances subjected to continuous water condensation, occasional immersion or splashing. Below grade vaults shall be considered as severely corrosive environments.

Surface Preparation: Surface preparation shall be SSPC SP-10 for steel surfaces. Surface preparation shall be NAPF 500-03-05 Clean No. 2 for ductile iron or cast iron surfaces.

Prime Coat: Apply to a dry-film thickness of 3 mils. For ductile iron surfaces, the ductile iron shall have an asphaltic free surface with a factory applied prime coat the same as the finish coat. For all other surfaces, a two-component inorganic zinc rich primer shall be used with a minimum zinc content of 14 pounds per gallon. Approved zinc primer manufacturers include: Ameron Amercoat 68HS VOC; Tnemec Series 94-H20 Hydro-zinc; International/Devoe Cathacoat 302V; Sherwin Williams Zinc Clad XI; Carboline Carbozinc 11; or approved equal.

Finish Coats: Apply two coats, each with a 4 to 5 mil dry-film thickness, to achieve the total dry-film thickness. Approved manufacturers include: Ameron Amerlock VOC; Tnemec Series L69 Hi-build Epoxoline II; International/Devoe Devran 224 HS VOC; Sherwin Williams Macropoxy 646-100; Carboline Carboguard 890 VOC; or approved equal.

2. System No. C-2--Exposed Metal, Atmospheric Weathering Environment

Type: Low VOC Aliphatic Polyurethane with low VOC epoxy-polyamide or amino-amine epoxy primer. A total dry-film consisting of the combined thickness of both a prime coat and finish coat is described herein. The total dry-film thickness of this system shall be 8 mils.

Service Conditions: Shall be used on metal surfaces including, but not limited to, structures, piping, fittings, and appurtenances subjected to atmospheric elements and weathering.

Surface Preparation: Surface preparation shall be SSPC SP-6 for steel surfaces. Surface preparation shall be NAPF 500-03-05 Clean No. 2 for ductile iron or cast iron surfaces. Surface preparation shall be SSPC SP-1 for galvanized surfaces and shall be brush blasted or acid etched surface prior to application of prime coat.

Prime Coat: Apply one or two coats to a dry-film thickness of 5 mils.
For ductile iron surfaces, the ductile iron shall have an asphaltic free surface with a factory applied prime coat the same as the finish coat. Approved manufacturers include: Ameron Amerlock VOC; Tnemec Series 135 Chembuild with low VOC thinner or L69 Epoxyline; Sherwin Williams Macropoxy 646-100; International/Devoe BarRust 231; Carboline Carboguard 890 VOC; or approved equal.

Finish Coats: Apply one coat to a dry-film thickness of 3 mils to achieve the total dry-film thickness. Approved manufacturers include: Ameron Amershield VOC; Tnemec Series 1080 Endura-shield; International/Devoe Devthane 379; Sherwin Williams Hi-Solids Polyurethane 100; Carboline Carbothane 134 MC; or approved equal.

F. Buried Metal Coating Systems

1. System No. D-1--Buried Metal

Type: Low VOC epoxy coating. A total dry-film consisting of the combined thickness of both a prime coat and finish coat is described herein. The total dry-film thickness of this system shall be 24 mils.

Service Conditions: Shall be used to coat buried metal including, but not limited to, valves, flanges, bolts and nuts, fittings, flexible pipe couplings, and structural steel.

Surface Preparation: SSPC SP-10.

Prime Coat: Apply to a dry-film thickness of 8 mils. Approved manufacturers include: Ameron Amerlock VOC; Tnemec Series L69F; International/Devoe BarRust 231; Carboline Carboguard 890 VOC; or approved equal.

Finish Coats: Apply two coats, each with an 8 mil dry-film thickness, to achieve the total dry-film thickness. The coating material shall be the same material as the prime coat.

G. Coating System for Metal in Contact with Concrete

1. System No. E-1--Aluminum and Galvanized Surface in Concrete

Type: Low VOC epoxy coating. A total dry-film consisting of the combined thickness of both a prime coat and finish coat is described herein. The total dry-film thickness of this system shall be 15 mils.

Service Conditions: Shall be used to coat buried areas including, but not limited to, gates, stairs, or structural members in contact with concrete.

Surface Preparation: Apply synthetic resin wash primer (phosphoric acid or vinyl butyral acid) to surface. Surface preparation shall comply with SSPC SP-1.

Prime Coat: Apply to a dry-film thickness of 5 mils.

Approved manufacturers include: Ameron Amerlock VOC; Tnemec Series L69F; International/Devoe BarRust 231; Carboline Carboguard 890 VOC; or approved equal.

Finish Coats: Apply two coats, each with a 5 mil dry-film thickness, to achieve the total dry-film thickness. The coating material shall be the same material as the prime coat.

H. PVC Pipe Coating System

1. System No. F-1--Exposed PVC Pipe, Atmospheric Weathering Environment

Type: Low VOC Aliphatic Polyurethane with low VOC epoxy-polyamide primer. A total dry-film consisting of the combined thickness of both a prime coat and finish coat is described herein. The total dry-film thickness of this system shall be 6 mils.

Service Conditions: Shall be used to coat PVC piping exposed to atmospheric elements and weathering.

Surface Preparation: Surface shall be cleaned and dried prior to application of coating.

Prime Coat: Apply one coat to a dry-film thickness of 3 mils. Approved manufacturers include: Ameron Amerlock VOC; Tnemec Series 135 Chembuild with low VOC thinner or L69 Epoxyline; Sherwin Williams Macropoxy 646-100; International/Devoe BarRust 231; Carboline Carboguard 890 VOC; or approved equal.

Finish Coats: Apply one coat to a dry-film thickness of 3 mils to achieve the total dry-film thickness. Approved manufacturers include: Ameron Amershield VOC; Tnemec Series 1080 Endura-shield; International/Devoe Devthane 379; Sherwin Williams Hi-Solids Polyurethane 100; Carboline Carbothane 134 MC; or approved equal.

I. Valve Coating System

1. System No. G-1--Surface of Ferrous-Metal Valves

Type: Thermosetting powdered epoxy coating.

Service Conditions: Shall be used to coat interior surfaces of ferrous metal valves, excluding seating areas and bronze and stainless steel pieces.

Surface Preparation: Protuberances which may produce pinholes in the coating shall be removed. Sharp edges shall be rounded. Surface contaminants which may prevent bonding of the coating shall be removed. Surface preparation shall comply with SSPC SP-5.

Coating: Apply to a dry-film thickness of 12 mils in accordance with manufacturer's recommendation.

Approved manufacturers include: 3M Scotchkote 134; or approved equal.

2. System No. G-2 – Surfaces of Ferrous-Metal Valves (Alternative)

General: This is an alternative to System No. G-1 when specified in the Technical Specifications.

Type: Two part low VOC epoxy-polyamide coating. A total dry-film consisting of the combined thickness of both a prime coat and finish coat is described herein. The total dry-film thickness of this system shall be 15 mils. Coating shall be NSF 61 approved.

Service Conditions: Shall be used to coat interior surfaces of ferrous metal valves, excluding seating areas and bronze and stainless steel pieces.

Surface Preparation: Protuberances which may produce pinholes in the coating shall be removed. Sharp edges shall be rounded. Surface contaminants which may prevent bonding of the coating shall be removed. Surface preparation shall comply with SSPC SP-10.

Prime Coat: Apply to a dry-film thickness of 5 mils in accordance with manufacturer's recommendation. Approved manufacturers include: Ameron Amerlock VOC; Tnemec Series L140F Pota Pox; Sherwin Williams Macropoxy 646-100PW; International/Devoe 233H; or approved equal.

Finish Coats: Apply two coats, each with a 5 mil dry-film thickness, to achieve the total dry-film thickness. The coating material shall be the same material as the prime coat.

PART 3 - EXECUTION

A. General

1. Quality assurance procedures and practices shall be utilized to monitor all phases of surface preparation, application, and inspection throughout the duration of the project. Procedures or practices not specifically defined herein may be utilized provided they meet recognized and acceptable professional standards and are approved by Mesa Water.

2. Worked accomplished in the absence of prescribed inspection may be required to be removed and replaced under the proper inspection, and the entire cost of removal and replacement, including the cost of all materials, shall be borne by the contractor, regardless of whether the work removed is found to be defective or not. Work covered up within the authority of Mesa Water, shall, upon order of Mesa Water, be uncovered to the extent required, and the contractor shall similarly bear the entire cost

of accomplishing all the work and furnishing all the materials necessary for the removal of the covering and its subsequent replacement, as directed and approved by Mesa Water.

3. Mesa Water will make, or have made, such tests as it deems necessary to assure the work is being accomplished in accordance with the requirements of the specifications. Unless otherwise specified, the cost of such testing will be borne by Mesa Water. In the event such tests reveal non-compliance with the requirements of the specifications, the contractor shall bear the cost of such corrective measures deemed necessary by Mesa Water, as well as the cost of subsequent retesting and re-inspection. Tests shall not constitute an acceptance of any portion of the work, nor relieve the contractor from compliance with the terms of the specifcations.

4. Application: No coating shall be applied under the following conditions:

   a. When the surrounding air temperature or the temperature of the surface to be coated or painted is below 55° F for epoxy coatings, below 45° F for epoxy low temperature cure coatings, or above 125° F for all materials;

   b. To wet or damp surfaces or in rain, snow, fog or mist;

   c. When the air temperature is less than 5° F above the dew point;

   d. When it is expected the air temperature will drop below 55° F for epoxy coating; or 45° F for epoxy low temperature cure coatings; or less than 5° F above the dew point within two hours after application of coating or paints.

5. Overspray and Dust Control: The contractor shall conduct all operations so as to confine abrasive blasting debris and coating and paint overspray to within the bounds of the site. The contractor shall take all precautions necessary to prevent adverse off-site consequences of application operations.

6. Inspection Devices: Contractor shall furnish, until final acceptance of coatings and paints, inspection devices in good working condition for detection of holidays and measurement of dry-film and wet-film thickness. Dry film thickness gauges and holiday detectors shall be available at all times until final acceptance of application. Inspection devices shall be operated by, or in the presence of Mesa Water Representative with location and frequency basis determined by Mesa Water.

7. All surface preparation, coating and paint application shall conform to applicable standards of the SSPC, Mesa Water's Representative and the manufacturer's printed instructions. Material applied prior to approval of the surface, by Mesa Water's Representative, shall be removed and reapplied to the satisfaction of Mesa Water at the expense of the contractor.

8. All work shall be accomplished by skilled craftsman qualified to accomplish the required work in a manner comparable with the best standards of practice.

9. The contractor shall provide a supervisor to be at the work site during cleaning and application operations.

10. The contractor’s equipment shall be designed for application of materials specified and shall be maintained in first class working condition.
Compressors shall have suitable traps and filters to remove water and oils from the air. Blotter test shall be accomplished at each start-up period and as deemed necessary by Mesa Water.

11. Because of presence of moisture and possible contaminants in the atmosphere, care shall be taken to ensure previously coated or painted surfaces are protected or re-cleaned prior to application of subsequent coat(s). Methods of protection and re-cleaning shall be approved by Mesa Water.

B. Surface Preparation

1. General: Sandblast or prepare only as much surface area as can be coated in one day. All sharp edges, burrs, and weld spatter shall be removed. Epoxy-coated pipe that has been factory coated shall not be sandblasted.

2. SSPC Specifications: Wherever the words "solvent cleaning," "hand tool cleaning," "wire brushing," or "blast cleaning" or similar words are used in these specifications or in paint manufacturer's specifications, they shall be understood to refer to the applicable SSPC (Steel Structures Painting Council, Surfaces Preparation Specifications, ANSI A159.1) specifications listed below:

SP-1	Solvent Cleaning
SP-2	Hand Tool Cleaning
SP-3	Power Tool Cleaning
SP-5	White Metal Blast Cleaning
SP-6	Commercial Blast Cleaning
SP-7	Brush-Off Blast Cleaning
SP-8	Pickling
SP-10	Near White Blast Cleaning

3. The contractor shall provide suitable enclosure, exhaust system, and bag house for sandblasting operations to prevent violations of applicable air quality requirements.

4. Surface preparation shall be based upon comparison with “Pictorial Surface Preparation Standards for Painting Steel Surfaces”, SSPC-Vis 1, ASTM Designatio D2200, NACE Standard TM-01-70. Anchor profile for prepared surfaces shall be measured by using a non-destructive instrument such as a K-T Surface Profile Comparator or Testex Press-O-Film System. Temperature and dew point requirements shall apply to all surface preparation operations.

5. Dust, dirt, oil, grease or any foreign matter which will affect the adhesion or durability of the finish must be removed by washing with clean rags dipped in an approved commercial cleaning solution, rinsed with clean water and wiped dry with clean rags. Abrasive blasting nozzles shall be equipped with “deadman” emergency shut-off nozzles. Blast nozzle pressure shall be a minimum of 95 psi and shall be verified by using an approved nozzle pressure gauge at each start-up period or as directed by Mesa Water Representative.

6. All blast hose connections shall be tethered and secured to prevent separation during blast cleaning operations, and shall be taped with duct tape prior to pressurizing.

   All taped connections shall be visually inspected for leaks within five minutes after start of blast cleaning operations and at the end of blast cleaning operations.

7. Particle size of abrasives used in blast cleaning shall be that which will produce a 2 mil surface profile or in accordance with recommendations of the manufacturer of the specified coating system to be applied.

8. Abrasive used in blast cleaning operation shall be new, washed, graded and free of contaminants which would interfere with adhesion of coatings and shall not be reused unless specifically approved by Mesa Water. Abrasives shall be certified for unconfined dry blasting pursuant to the California Administrative Code, Section 92520 of Subchapter 6, Title 17, and shall appear on the current listing of approved abrasives.

9. During blast cleaning operations, caution shall be exercised to ensure existing coatings and paint are not exposed to abrasion from blast cleaning.

10. Blast cleaning from rolling scaffolds shall only be accomplished within confines of interior perimeter of scaffold. Reaching beyond limits of perimeter will be allowed only if blast nozzle is maintained in a position which will produce a profile acceptable to Mesa Water's Representative.

11. The contractor shall keep the area of his work in a clean condition and shall not permit blasting materials to accumulate as to constitute a nuisance or hazard to the prosecution of the work or the operation of the existing facilities. Spent abrasives and other debris shall be removed at the contractor's expense as directed by Mesa Water.

12. Blast cleaned and coated/painted surfaces shall be cleaned prior to application of specified coatings/paints via a combination of blowing with clean dry air, brushing/brooming and/or vacuuming as directed by Mesa Water's Representative. Air hose for blowing shall be at least ½-inch in diameter and shall be equipped with a shut-off device. Tests on surfaces of abrasively blast cleaned steel shall be accomplished to detect oil and other contaminants which might be deposited on surfaces. This will include chemical tests or ultraviolet (black light) tests, as required.

C. Application

1. Multiple-component coatings shall be prepared using all the contents of each component container as packaged by the paint manufacturer. Partial batches shall not be used. Multiple-component coatings shall have been mixed beyond their pot life shall not be used. Small quantity kits for touch-up painting and for painting other small areas shall be provided. Only the components specified and furnished by the paint manufacturer shall be mixed. For reasons of color or otherwise, additional components shall not be intermixed even with the same generic type of coating.

2. Application of the first coat shall follow immediately after surface preparation and cleaning within an eight hour working day. Any cleaned areas not receiving first coat within an eight hour period shall be re-cleaned prior to application of first coat.

3. Coating and paint application shall conform to the requirements of the Society of Protective Coating Paint Application Specification SSPC-PA1, latest revision, for "Shop, Field and Maintenance Painting", Mesa Water, the manufacturer of the coating and painting materials printed literature and as specified herein.

4. All coating components shall be mixed in exact proportions specified by the manufacturer. Care shall be exercised to ensure all material is removed from containers during mixing and metering operations.

5. All coatings shall be thoroughly mixed, utilizing an approved slow-speed power mixer until all components are thoroughly combined and are of a smooth consistency.

6. Thinning shall only be permitted as recommended by the manufacturer and approved by the Mesa Water's Representative and shall not exceed limits set by applicable regulatory agencies. If the contractor applies any materials which have been modified or thinned to such a degree as to cause them to exceed established VOC levels, the contractor shall be responsible for any fines, costs, remedies, or legal action and costs that may result.

7. Each application of coating or paint shall be applied evenly, free of brush marks, sags, runs and no evidence of poor workmanship. Care should be exercised to avoid lapping on glass or hardware. Coatings and paints shall be sharply cut to lines. Finished surfaces shall be free from defects or blemishes.

8. Protective coverings or drop cloths shall be used to protect floors, fixtures, equipment, prepared surface and applied coatings or paints. Care shall be exercised to prevent coating or paint from being spattered onto surfaces which are not to be coated or painted. Surfaces from which such material cannot be removed satisfactorily shall be refinished.

9. All welds and irregular surfaces specified by Mesa Water shall receive a brush coat of the specified product prior to application of each coat. Coating shall be brushed in multiple directions to ensure penetration and coverage. Care shall be exercised to ensure dry film thickness of coatings and paints do not exceed the maximum thickness allowed by the manufacturer of the specific product being applied.

10. At the conclusion of each day's blast cleaning and coating operations, a 6-inch wide strip of blast cleaned substrate shall remain uncoated to facilitate locating point of origin for successive day's blast cleaning operations.

11. Epoxy coated surfaces or other multi-component materials exposed to excessive sunlight or an excessive time element beyond manufacturer's recommended recoat cycle, shall be scarified by Brush-Off Blast Cleaning (SSPC SP-7), prior to application of additional coating or paint. Scarified coating or paint shall have sufficient depth to assure a mechanical bond of subsequent coat.

12. When two or more coats are specified, where possible, each coat shall contain sufficient approved color additive to act as an indicator of coverage or the coats must be of contrasting color.

13. Care shall be exercised during spray operations to hold the spray nozzle perpendicular and sufficiently close to surfaces being coated, to avoid excessive evaporation of volatile constituents and loss of material into the air or the bridging of cracks and crevices. Reaching beyond limits of scaffold perimeter shall not be permitted. All overspray identified by Mesa Water's Representative shall be removed by hand or pole sanding prior to application of subsequent coat.

D. Surfaces Not To Be Painted

Unless noted otherwise, the following surfaces shall not be painted and shall be fully protected when adjacent areas are painted.

1. Mortar-coated pipe and fittings.

2. Stainless Steel surfaces.

3. Aluminum guardrails and handrails.

4. Galvanized pipe supports and ladders.

5. Nameplates and grease fittings.

6. Brass and copper tubing.

7. Aluminum grating.

E. Protection of Surfaces Not To Be Painted

Hardware, lighting fixtures, switch plates, aluminum surfaces, machined surfaces, couplings, shafts, bearings, nameplates on machinery, and other surfaces not intended to be painted shall be removed, masked, or otherwise protected. Drop cloths shall be provided to prevent paint materials from falling on or marring adjacent surfaces. Working parts of mechanical and electrical equipment shall be protected from damage during surface preparation and painting process. Openings in motors shall be safely masked to prevent paint and other materials from entering the motors. All masking materials shall be completely removed and surfaces cleaned at completion of painting operations.

F. Color Schedule

1. Color Guidelines: Unless noted otherwise, surfaces that are to be coated and which require a color designation for any of the following uses, shall be coated to match the colors listed below. Final color selection shall be determined by Mesa Water.

2. Definitions:

At Grade: Facilities that are flush with streets, sidewalks, parking lots, green belts or graded areas. This also includes pipelines and other facilities that are protruding through and are located above finish grade, out of doors and not enclosed by a shelter, cover, vault or housing.

Enclosed: Pipeline and other facilities that are located above or below grade and are enclosed within a shelter, covers, or vaults.

N/A: Not Applicable.

I.D. Mark: System identification marker as described herein. The I.D. Mark shall identify the system of which the facility is a part.

3. Potable Water System:

Facility	**Enclosed Color**	**At Grade Color**
Airvac Assemblies	Dark Blue	Olive Light (w/ ID Mark)
Airvac Covers (metallic)	N/A	Light Blue (w/ ID Mark)
Backflow Devices	Olive Light	Olive Light
Piping	Olive Light (ID Mark)	Olive Light (w/ ID Mark)
Valves (all types)	Olive Light	Olive Light
Valve Can Lids		
Normally Open	N/A	Safety Yellow
Normally Open (Fire Hydrants)	N/A	Dark Blue
Normally Closed	N/A	Safety Red

4. Recycled Water Systems shall be the same as Potable Water Systems except that the various facilities painted “Dark Blue” or “Light Blue” shall be painted “Purple”.

5. Test station box lids for cathodic protection shall be painted safety orange.

6. Identification (I.D.) Mark:

Certain facilities listed above to be coated shall have an identification system applied by the contractor at Mesa Water’s direction. Vault hatches (coated or uncoated) shall be identified with MESA WATER initials. The identification mark shall be able to stand up to traffic and not pose a tripping hazard.

Other facilities listed above that are to be coated and/or provided with an I.D. mark shall receive a Mesa Water supplied identification decal that consists of Mesa Water’s logo, phone number, system identification color, and the system the facility serves.

G. Field Touch Up of Shop-Applied Prime Coats

1. Organic Zinc Primer: Surfaces that are shop primed with inorganic zinc primers shall receive surface preparation and a field touchup of organic zinc primer to cover all scratches or abraded areas. Organic zinc coating system shall have a minimum volume solids of 70%. Finish coats shall be in accordance with System No. C-1. Organic zinc primer shall be manufactured by the prime coat and finish coat manufacturer.

2. Other Surfaces: Other surfaces that are shop primed shall receive surface preparation and a field touchup of the same primer used in the original prime coat.

H. Dry-Film Thickness Testing

1. Coating Thickness Testing: Coating thickness specified herein is "dry-film thickness" in mils. Mil thicknesses specified are minimums. Coating thickness specified for steel surfaces shall be measured with a magnetic-type dry-film thickness gage. Dry-film thickness gage shall be provided as manufactured by Mikrotest, Positector, Quanix or Elcometer.

   Each coat shall be checked for the correct dry-film thickness. Measurement shall not be made until a minimum of eight hours after application of the coating. Non-magnetic surfaces shall be checked for coating thickness by micrometer measurement of cut and removed coupons. Contractor shall repair coating at all locations where coupons are removed.

2. Holiday Testing: The finish coat (except zinc primer and galvanizing) shall be tested for holidays and discontinuities using only the specified high voltage instrument , with a wire brush electrode, at a minimum of 100 volts per mil in accordance with AWWA Standard C203 Detector shall be provided as manufactured by Tinker and Rasor, Models AP and AP-W holiday detector or K-D Bird Dog.

3. Repair: If the item has an improper finish color, insufficient film thickness, or holidays, the surface shall be cleaned and top-coated with the specified paint material to obtain the specified color and coverage. Visible areas of chipped, peeled, or abraded paint shall be hand or power-sanded, feathering the edges. The areas shall then be primed and finish coated in accordance with the specifications. Work shall be free of runs, bridges, shiners, laps, or other imperfections.

END OF SECTION

SECTION 15041

CHLORINATION OF WATER MAINS FOR DISINFECTION

PART 1 - GENERAL

A. Description

This section describes the disinfection of potable water mains, services, appurtenances, and connections by chlorination, in accordance with ANSI/AWWA B300, B301, C651 and C652 and as specified herein. All chlorine products shall be NSF 60 certified.

B. Related Work Specified Elsewhere

Hydrostatic Testing of Pressure Pipelines: 15042.

C. Job Conditions

1. Discharge of chlorinated water into watercourses or surface waters is regulated by the National Pollutant Discharge Elimination System (NPDES). Contractor shall procure an NPDES permit prior to beginning of work if he plans to discharge water into watercourses, stormdrains, or surface waters.

2. The rate of flow and locations of discharges shall be scheduled in advance to permit review and coordination with Mesa Water and cognizant regulatory authorities.

    a. Orange County EMA--Flood Control.

    b. Cities of Costa Mesa and Newport Beach and portions of unincorporated County of Orange.

3. Potable water shall be used for chlorination.

4. Requests for use of water from Mesa Water lines shall be submitted 48 hours in advance.

5. Chlorination shall be performed prior to hydrostatic testing for pipelines having a diameter of 10-inches and larger. See Part 3, Paragraph A-9 for concurrent testing of smaller diameter pipelines.

PART 2 - MATERIALS

A. Liquid Chlorine Solution

Liquid chlorine solution shall be in accordance with the requirements of ANSI/AWWA B301, and shall be injected with a solution feed chlorinator and a water booster pump or a sufficiently pressurized source of water to provide an adequate flow to inject and disperse the chlorine solution.

B. Calcium Hypochlorite (Dry)

Calcium Hypochlorite shall be in accordance with the requirements of ANSI/AWWA B300, and shall be dissolved in water to a known concentration in a container and pumped into the pipeline at a measured rate.

C. Sodium Hypochlorite (Solution)

Sodium Hypochlorite shall be in accordance with the requirements of ANSI/AWWA B300, and shall be diluted in water to desired concentration and pumped into the pipeline at a measured rate.

D. Calcium Hypochlorite Tablets and Adhesive

The use of calcium hypochlorite tablets for disinfection will not be allowed.

E. Chlorine Residual Test Kit

For measuring chlorine concentration, a medium range, drop count, titration kit or an orthotolidine indicator comparator with wide range color discs shall be used. The kit shall be capable of determining chlorine concentration in the range 1.0 to 25 mg/L. Test kits shall be Hach Chemical, Hellige, or approved equal. An adequate number of kits shall be maintained by the contractor in good working order and available for immediate test of residuals at points of sampling.

PART 3 - EXECUTION

A. PIPELINES

1. General: Before being placed into service, all pipelines and appurtenances shall be chlorinated. All pipelines shall be disinfected by direct chlorine solution injection. Bacteriological testing after disinfection shall be performed by Mesa Water or an approved laboratory.

2. Chlorination Contractor: Chlorination shall be performed by a certified chlorination and testing contractor. Chlorination shall be in accordance with the instructions of the chlorinator manufacturer.

3. Groundwater: In the event groundwater is encountered and it is impossible to prevent its entrance into the mains, or the mains are not free from dirt, they shall be thoroughly flushed prior to disinfection. Disinfection shall be by direct chlorine solution injection.

4. Services: Every service connection served by a main being disinfected shall be tightly shutoff at the curb stop before water is applied to the main. Care shall be taken to expel all air from the main and services during the filling operation.

5. Pipeline Flushing:

   a. Before chlorinating pipeline, flush pipes with water to remove dirt and debris. Maintain a flushing velocity of at least 3 feet per second. Flush pipes for a minimum of the time period calculated from the formula: $T = 2/3L$ in which:

      T = flushing time in seconds
      L = pipe length in feet

6. Chlorine Solution Injection by the Continuous Feed Method

   a. Chlorine solution shall be applied by means of a vacuum-operated chlorinator and a booster pump or a sufficiently pressurized source of water to provide an adequate flow to operate the eductor system and properly disperse the chlorine solution. Direct-feed chlorinators, which operate from gas pressure in the chlorine cylinder, without a vacuum regulator, shall not be used for application of a chlorine solution.

   b. Chlorine solution shall be applied at the beginning of the section to be chlorinated and shall be injected through a corporation stop, a hydrant, or other approved connection to ensure treatment of the entire system being disinfected. All required corporation stops and other plumbing materials necessary for chlorination or flushing of the main shall be installed by the contractor.

   c. Potable water shall be introduced into the pipeline at a constant measured rate. Chlorine solution shall be injected into the potable feed water at a measured rate. The two rates shall be proportioned so that the chlorine concentration in the pipeline is maintained at a minimum concentration of 50 mg/L to 100 mg/L, with a chlorine residual of 25 mg/L after 24 hours in the pipe. The concentration at points downstream shall be checked periodically during the filling to ascertain that sufficient chlorine is being added.

7. Disinfection by Calcium Hypochlorite Tablets: This will not be allowed.
8. Disinfection of Valves and Appurtenances: During the period that the chlorine solution or slug is in the section of pipeline, valves shall be opened and closed to obtain a chlorine residual at hydrants and other pipeline appurtenances. Care shall be taken to ensure that no chlorinated water enters any active pipeline.

9. Concurrent Testing (for Pipelines with Diameter of 8-inches or Less): Disinfecting mains and appurtenances, and hydrostatic testing may run concurrently for the required 24-hour test period. In the event there is leakage and repairs are necessary, disinfection of the pipeline shall be repeated by injection of chlorine solution into the line as provided in this section.

10. Confirmation of Residual: After the chlorine solution applied by the continuous feed method has been retained in the pipeline for 24 hours, samples shall be taken at air valves and other points of access to confirm that a chlorine residual of 25 mg/L minimum exists along the pipeline.

With the slug method, samples shall be taken as the slug passes each access point and as it leaves the pipeline to confirm that a chlorine residual of 25 mg/L minimum is present.

11. Water Quality Samples and Testing: The contractor shall provide adequate and convenient means for a certified contract lab, hired by the contractor, to collect and appropriate number of water samples for each segment of pipeline tested. A bacteriologic test will be performed by Mesa Water (or at an approved laboratory) to demonstrate the absence of coliform organisms in each separate section of the pipeline after chlorination and refilling.

12. Repetition of Procedure: If the initial chlorination fails to produce required residuals and bacteriologic results, chlorination and testing shall be repeated until satisfactory results are obtained.

13. Pipeline Flushing: After confirming the chlorine residual, excess chlorine solution shall be flushed from the pipeline until the chlorine concentration in the water leaving the pipe is within 0.5 mg/L of the replacement water. See Part 3, Execution, Sub-part B. (Disposal of Chlorinated Water for other requirements).

14. Test Facility Removal**:** After satisfactory disinfection, all temporary disinfection and test facilities shall be removed and restored to the satisfaction of Mesa Water.

B. Disposal of Chlorinated Water

1. Disposal to Local Sewer System: Unless noted otherwise in the contract, or directed by Mesa Water Representative, chlorinated water shall be disposed of into the local sewer collection system. The contractor shall contact and coordinate this disposal with the local sewer agency to schedule the disposal as well as confirm that the sewer system has adequate capacity to handle the flushing rate. All costs for disposing of or reutilizing the water shall be paid for by the contractor at his sole expense.

   The contractor shall submit a "Flushing Plan" to Mesa Water for review and approval. The plan shall indicate the following, as a minimum: source of flushing water; type and configuration of connection required to introduce the flushing water into the proposed water main; method of disposal of flushed water; total number and locations of sampling points; and types of testing to be performed.

2. De-chlorination Prior to Disposal: If discharge to sewer collection system is not permitted, chlorinated water shall be de-chlorinated during flushing, prior to disposal. De-chlorination shall be performed by a certified chlorination and testing company. De-chlorination water shall have a total chlorine residual concentration of less than 0.1 mg/L. The disposal of the de-chlorinated water shall be performed in compliance with the NPDES permit conditions.

C. Connections to Existing System

Where connections are to be made to an existing water system, the interior surfaces of all pipe and fittings used in making the connections shall be swabbed or sprayed with a one percent hypochlorite solution before they are installed. Contractor shall place about two ounces of HTH (High Test Hypochlorite) at each point where the existing main is cut. Thorough flushing shall be started as soon as the connection is completed and shall be continued until discolored water is eliminated.

END OF SECTION

SECTION 15042

HYDROSTATIC TESTING OF PRESSURE PIPELINES

PART 1 - GENERAL

A. Description

This section describes pressure and leakage testing of all pressure pipelines, in accordance with ANSI/AWWA C600 and as specified herein.

B. Related Work Specified Elsewhere

Chlorination of Water Mains for Disinfection: 15041.

C. Submittals

1. Hydrostatic Testing Plan including locations of all test bulkhead locations.

D. Job Conditions

1. Obtain and use only potable water for hydrostatic testing.

2. Submit request for use of Mesa Water to Mesa Water 48 hours in advance.

3. Hydrostatic testing and disinfection shall be successfully completed before new pipelines are connected to existing Mesa Water pipes and mains.

E. Testing Company

All testing shall be performed by independent testing companies with a Class A license, and/or are certified and Mesa Water approved to perform the required pressure testing and disinfection. Testing companies will be required to provide the Mesa Water Representative with certified testing results. The testing company shall provide gauges and meters which have been calibrated and certified at least quarterly.

PART 2 - MATERIALS

A. Test Bulkheads

Test bulkheads shall be designed and tested in accordance with Section VIII of the ASME Boiler and Pressure Vessel Code. Materials shall comply with Part UCS of said code. Bulkhead design pressure shall be at least two (2) times the specified test pressure for the section of pipe containing the bulkhead. Stress shall be limited to 70% of yield strength of the bulkhead material at the bulkhead design pressure. Air-release and water drainage connections shall be included.

The contractor shall prepare and submit a Hydrostatic Testing Plan showing the proposed location and length of each test section for Mesa Water's review and approval. The plan shall also show the locations of the source of potable water and the air valves (permanent or temporary) to be used to remove air from the pipeline being tested.

B. Manual Air-Release Valves

Temporary manual air-release valves shall be provided as necessary for pipeline test. The number and location of release valves shall be subject to the review and approval of the Mesa Water Representative. The pipe outlet shall be constructed in the same manner as for a permanent air valve. After use, the connection shall be sealed with a blind flange, pipe cap, or plug in a manner and with the fittings satisfactory to Mesa Water. All connections and exposed fittings which are installed shall be coated equivalently to the adjacent pipe and in accordance with Mesa Water Specifications.

C. Water

The same water used for chlorination of the pipeline may be used to fill the line for testing. Make up water for testing shall also be potable water.

PART 3 - EXECUTION

A. General

All labor, materials, tools, and equipment for testing shall be furnished by the contractor. The test shall be conducted with valves in the test section open. Ends of each test section, open ends of pipes, valves, and fittings shall be suitably closed. Valves in the test section shall be operated during the test period.

B. Testing and Disinfection Sequence

See Section 15041 (Chlorination for Disinfection of Water Mains).

C. Isolation of Test Pipe Section from Existing Pipelines

Test bulkheads, valves, connections to existing pipelines, and other appurtenances shall be located and installed in a manner to provide air gap separation between existing pipelines and pipeline being tested.

D. Length of Test Section

The maximum length of test section for pipe of 12-inches or smaller in diameter shall be 3,500 feet; for pipe larger than 12-inches, 1 mile. Test bulkheads shall be provided where the distance between valves exceeds these limits.

E. Requirements Prior to Testing

1. Backfill: The pipe trench shall be backfilled with a minimum of 2 ½ feet of material.

2. Concrete Anchor and Thrust Blocks: All concrete anchor blocks shall be allowed to cure a sufficient time to develop the designed minimum strength before testing.

3. Mortar Lining: Steel pipelines shall not be tested before the mortar lining and coating on all of the pipe lengths in the line have attained an age of fourteen (14) days. Cement-mortar lined pipe shall not be filled with water until a minimum period of eight (8) hours has elapsed after the last joint in any section has been made.

4. Flushing: All pipelines shall be flushed prior to hydrostatic testing and disinfection. Flushing shall be performed via Mesa Water's Flush-out assemblies constructed in accordance with Mesa Water's Standard Drawings. Velocities shall be sufficient to achieve a minimum of 2 feet per second (fps) velocity in the pipeline. Refer to the table herein below in Section F.1 (Filling/Flushing Rate).

F. Field Test Procedure

1. Filling / Flushing Rate: The pipeline shall be filled at a rate such that the average velocity of flow is no greater than 3 fps. At no time shall the maximum velocity of flow exceed 2 fps. The following table gives filling and flushing rates to provide 3 fps velocity for various pipe diameters.

Filling/Flushing Rates in gpm
Equivalent to Velocities of 3 fps, for Pipes Flowing Full

Nominal Size (inches)	Flow Rate Q (gpm)
4	120
6	260
8	470
10	730
12	1,060
16	1,880
18	2,380
20	2,940
24	4,230
30	6,610
36	9,510

2. Air Removal: All air should be purged from the pipeline before checking for leaks or performing pressure tests on the system. To accomplish this, if air valves or other outlets are not available at high points, taps shall be made to expel the air, and these taps shall be tightly plugged after testing.

3. Pressurization: After the pipeline has been filled and allowed to sit a minimum of 48 hours (72 hours for mortar-lined pipelines), the pressure in the pipeline shall then be pumped up to the specified test pressure.

If a large quantity of water is required to increase the pressure during testing, entrapped air, leakage at joints, or a broken pipe may be suspected. TESTS SHOULD BE DISCONTINUED until the source of trouble is identified and corrected.

4. Field Test Pressure: Unless otherwise specified, the pipeline shall be subjected to a field hydrostatic pressure of 200 psi (or 50 psi in excess of operating pressures greater than 150 psi).

G. Allowable Leakage

1. Pipelines of Diameter 10-inches and Under

   a. When the test pressure has been reached, pumping shall be discontinued until the pressure in the line has dropped 5 psi, at which time the pressure shall again be pumped up to the specified test pressure. This procedure shall be repeated until four hours have elapsed from the time the specified test pressure was first applied. At the end of the four-hour period, the pressure shall be pumped up to the test pressure for the last time.

   b. The leakage shall be considered as the total amount of water pumped into the pipeline during the four-hour period, including the amount required in reaching the test pressure for the final time. Leakage shall not exceed the rate of 30 gallons per inch of diameter per mile of pipe per 24 hours for test pressure of 250 psi. The following table indicates the leakage allowance for various sizes of pipe for test pressure of 200 psi and 250 psi:

LEAKAGE ALLOWANCE

	Allowable Leakage Gallons per Four Hours per 1,000 feet of Pipe	
	Test Pressure: 200 psi	***Test Pressure: 250 psi***
4”	0.38 gal	0.43 gal
6”	0.57 gal	0.61 gal
8”	0.76 gal	0.85 gal
10”	0.96 gal	1.07 gal

2. Pipelines Diameter 12-inches and Larger.

   a. The test pressure shall be maintained for the following duration by restoring it whenever it falls an amount of 5 psi: pipe of 18-inches in diameter and smaller, 4 hours; over 18-inches to 36-inches in diameter, 8 hours; and over 36-inches in diameter, 24 hours.

   b. One to three days shall be allowed for the filled pipeline to soak and to release entrapped air. The test pressure shall be applied with a positive displacement pump.

A snubber and dampener shall be provided between the pump and the pipeline to reduce instantaneous pressure pulses to 10% of the specified test pressure. Water shall be drawn from containers in which the volume of water can be readily measured or through a positive displacement meter. The amount of water used to maintain the test pressure during the test period shall be considered the leakage. The allowable leakage shall be determined by the following formula:

$$L = \frac{ND(P)^{1/2}}{7400}$$

where L is the allowable leakage in gallons per hour,
N is the number of rubber-gasketed pipe joints in the test section
D is the inside pipe test diameter in inches,
P is the pipe test pressure (psig), which is defined as the average of the highest and lowest test pressures in the pipe section being tested.

Note the allowable leakage rate for pipeline sections with flanged, welded, and/or grooved-end joints shall show zero.

H. Repetition of Test

If the actual leakage exceeds the allowable, the faulty work shall be located and corrected and the test repeated. The work shall be restored, and all damage resulting from leaks repaired. All visible leakage shall be eliminated.

I. Bulkhead and Test Facility Removal

After a satisfactory test, water shall be drained, test bulkheads and other test facilities removed, pipe coatings restored, and the section of pipe shall be connected to the adjacent piping.

END OF SECTION

SECTION 15051

INSTALLATION OF PRESSURE PIPELINES

PART 1 - GENERAL

A. Description

This section describes the installation of: pressure pipelines fabricated of polyvinyl chloride, ductile iron, CML & C steel, including pipeline closures, connections and encasement.

B. Related Work Described Elsewhere

1. Trenching, Backfilling, and Compacting: 02223.
2. Concrete: 03300.
3. Painting and Coating: 09900.
4. Chlorination of Water Mains for Disinfection: 15041
5. Hydrostatic Testing of Pressure Pipelines: 15042.
6. Air-Release and Vacuum-Release Valves: 15089.
7. Manual Valves: 15100.
8. Domestic and Recycled Water Facilities Identification: 15151.
9. Cathodic Protection and Joint Bonding: 16640.

C. Submittals

1. An installation schedule (tabulated layout) shall be submitted for CML &C steel pipe which includes:
    a. Order of installation and closures.
    b. Pipe centerline station and elevation at each change of grade and alignment.
    c. Elements, curves, and bends, both in horizontal and vertical alignment including elements of the resultant true angular deflections in cases of combined curvature.
    d. The location, length, size, design designation, and number designation of each pipe section and pipe special.
2. Welder qualification certificates shall be submitted.

D. Definitions

1. Buried piping is piping buried in the soil, or encased in concrete, commencing at the inside face of the wall or top of the slab of a structure. Where a coating is specified, and pipe enters or leaves the ground, extend the coating a minimum of six (6) inches above the ground surface. Where a coating is specified, extend the coating up to three (3) inches inside of the structure.

2. Exposed piping is piping in any of the following conditions or locations: above ground; and inside vaults or other structures.

PART 2 - MATERIALS

A. Installation Material

Refer to the various referenced sections on pipe by type for material requirements.

B. Piping Schedule

Unless noted otherwise on the drawings or in the specifications, pipe shall be furnished in accordance with the following materials schedule.

Diameter	**Potable Water**
2-inch and smaller	Copper (below ground) or Brass (above ground)
4-inch through 12-inch	AWWA C-900 PVC Pipe, SDR-14
16-inch through 20-inch	AWWA C-905 PVC Pipe, SDR-18 Ductile Iron Pipe, Class 200 CML&C Steel Pipe
24-inch and larger	CML&C Steel Pipe

Notes: Copper – per Section 15057 (Copper Pipe and Fittings)

PVC Pipe – per Section 15064 (PVC Pressure Pipe and Fittings)

Ductile Iron Pipe – per Section 15056 (Ductile-Iron Pipe and Fittings)

CML&C Steel Pipe – per Section 15057 (Cement-Mortar Lined and Coated Steel Pipe)

PART 3 - EXECUTION

A. Delivery and Temporary Storage of Pipe at Site

1. Onsite Storage Limitation: Onsite pipe storage shall be limited to a maximum of one week, unless exception is approved by Mesa Water.

2. Care of Pipe: Care shall be taken to avoid cracking of the cement mortar coating and/or lining on steel pipe. If necessary, plastic sheet caps shall be used to close pipe ends and keep coatings and linings moist.

B. Handling of Pipe

1. Moving Pipe: Pipes shall be lifted with handling beams or wide belt slings as recommended by the pipe manufacturer. Cable slings, chains or other equipment likely to cause damage to the pipe coating shall not be used. Pipe shall be handled in a manner to avoid damage to the pipe and pipe coating. Pipe shall not be dropped or dumped from trucks or into trenches under any circumstances.

2. Internal Pipe Braces: Internal braces placed in steel pipes shall be maintained until backfilling is completed. After backfill braces are removed, the bracing shall become the contractor's property.

3. Pipe Caps: Plastic caps placed over the ends of steel pipe shall not be removed until the pipe is ready to be placed in the trench. Plastic caps may be opened temporarily to spray water inside the pipe for moisture control.

4. Inspection of Pipe: The pipe and accessories shall be inspected for defects prior to lowering into the trench. Any defective, damaged or unsound pipe shall be repaired or replaced. All foreign matter or dirt shall be removed from the interior of the pipe before lowering into position in the trench.

C. Placement of Pipe in Trench

1. General: Dewatering, excavation, shoring, sheeting, bracing, backfilling material placement, material compaction, compaction testing, and pipe laying requirements and limitations shall be in accordance with Section 02223 (Trenching, Backfilling and Compacting).

2. Sanitation of Pipe Interior: During laying operations, tools, clothing, or other materials shall not be placed in the pipe.

3. Prevention of Entry into Pipe: When pipe laying is not in progress, including lunch-hour, the ends of the pipe shall be closed using plugs constructed in a manner to prevent entry by any child, debris, animal or vermin.

4. Laying Pipe on Grades over 5 Percent: Pipes shall be laid uphill with the bell or collared joints on the uphill end of each pipe length, whenever the grade exceeds five (5) percent.

5. Pipe Base Thickness: Pipe base thickness and material shall be as specified in Section 02223 (Trenching, Backfilling, and Compacting).

6. Depressions at Joints and Pipe Sling Points: Depressions shall be dug into pipe base material to accommodate the pipe bell and external joint filler form ("diapers"), and to permit removal of the pipe handling slings.

7. Placement of Pipe on Pipe Base: Pipe shall be lowered onto the bedding and installed to line and grade its full length on firm bearing except at the bell and at sling depressions. Unless specified otherwise, the tolerance on grade shall be ¼-inch; the tolerance on line shall be 1-inch. Grade shall be measured along the pipe invert.

8. Pipe Installation: Pipe shall be installed without springing, forcing, or stressing the pipe or any adjacent connecting valves or equipment. Precautions shall be taken to prevent pipe from being displaced by water entering trench. Damaged or displaced pipe shall be replaced or returned to specified condition and grade.

9. Trench Curvature and Pipe Deflection: The radius of curvature of the trench shall be determined by the maximum length of pipe section that can be used without exceeding the allowable deflection at each pipe joint and without causing deviation from Mesa Water's trench width requirements. Refer to the various referenced sections on pipe by type for allowable deflection. The deflection at any flexible joint shall not exceed that prescribed by the manufacturer of the pipe. The manufacturer's printed installation guide outlining the radius of curvature that can be negotiated with pipe sections of various lengths shall be followed. When installing beveled pipe, do not deviate the pipe top mark by more than ½ inch from the vertical line passing through the pipe center.

10. Equipment for Installation of Pipe: Proper implements, tools, and facilities as recommended by the pipe manufacturer's standard printed installation instructions shall be provided and used by the contractor for safe and efficient execution of the work. All pipe, fittings, valves, and accessories shall be carefully lowered into the trench using suitable equipment in such a manner as to prevent damage to pipe and fittings. Under no circumstances shall pipe or accessories be dropped or dumped into the trench. Do not use dog clips, lugs or other devices welded to the pipe to force it into position.

11. Cutting and Machining Pipe: Cutting and machining of the pipe shall be accomplished in accordance with the pipe manufacturer's standard procedures for this operation. Pipe shall not be cut with a cold chisel, standard iron pipe cutter, nor any other method that may fracture the pipe or produce ragged, uneven edges.

D. Assembling Rubber Ring Joints

1. Cleaning Ends of Pipe: The ends of the pipe to be joined shall be cleaned of foreign material.

2. Lubrication: After placing pipe in trench, a nontoxic water soluble vegetable soap solution shall be applied to the inside of the bell of the pipe in the trench and to the rubber gasket and spigot groove of the pipe to be installed. The rubber gasket shall be stretched into the groove of the bell-end of the pipe and distributed uniformly around the circumference.

3. Joint Assembly: Without tilting the pipe to be installed, the spigot shall be inserted into the bell of the pipe. Come-a-longs or pipe jacks shall be used to drive spigot end into the bell until properly seated. The joint recess recommended by pipe manufacturer for made-up joints shall be maintained.

Where deflections at joints are required for curved alignment, the manufacturer's recommended allowable joint opening on one side shall not be exceeded. A feeler gauge shall be used to verify proper placement of each gasket.

E. Flanged Connections

1. Bolthole Alignment: Pipe shall be set with flange boltholes straddling the pipe horizontal and vertical centerlines. Inspect gasket seating surfaces, gasket, each stud or bolt, each nut, each washer, and the facing on which the nuts will rotate. Repalce any damaged item.

2. Nuts and Bolts: Nuts and bolts shall be lubricated with anit-seize prior to installation. Assemble all bolts on flange, then tighten bolts in the sequence and to the torque as recommended by the manufacturer. Retighten the bolts after 24 hours. Replace galled, cracked or distorted bolts and nuts. Do not reuse bolts or nuts.

3. Flange Wrapping: Flanges which connect with buried valves or other equipment shall be wrapped with sheet polyethylene film as specified for the valves and equipment. The wrap shall be extended over the flanges and bolts and secured around the adjacent pipe circumference with tape.

4. Coating: Buried flanges and non-stainless steel bolts shall be completely coated as specified in Section 09900 (Painting and Coating). For above ground applications, the flanges and bolts shall be painted as specified in Section 09900 (Painting and Coating).

F. Installation of Bends, Tees, and Reducers

Fittings shall be installed utilizing standard installation procedures. Fittings shall be lowered into trench by means of rope, cable, chain, or other acceptable means without damage to the fittings or its interior coating. Cable, rope, or other devices used for lowering fitting into trench, shall be attached around exterior of fitting for handling. Under no circumstances shall the cable, rope or other device be attached through the fittings interior for handling. Fittings shall be carefully connected to pipe or other facility, and joint shall be checked to insure a sound and proper joint.

G. Installing Threaded Piping

Threaded piping shall be reamed, deburred, and cleaned before making up joints. Thread lubricant shall be applied to threaded pipe ends before installing fittings, couplings, unions, or joints.

H. Completion of Interior Joints for Mortar-Lined Pipes 20-Inches in Diameter and Smaller

1. Preparation: A tight-fitting swab or squeegee shall be inserted in the joint end of the pipe to be joined.

2. Application of Cement Mortar: When ready to insert the spigot, the face of the cement mortar lining at the bell shall be coated with a sufficient amount of stiff cement mortar to fill the space between adjacent mortar linings of the two pipes to be joined.

3. Removal of Excess Mortar: Immediately after joining the pipes, the swab or squeegee shall be drawn through the pipe to remove all excess mortar and expel it from the open pipe end.

4. Where bends or other fittings preclude the use of balls or squeegees, detail fabrication and assembly drawings shall be prepared showing the location of handholes or butt straps required to finish interior mortar joints.

I. Completion of Interior Joints for Mortar-Lined Pipes 24-Inches in Diameter and Larger

1. Backfill Requirement: The trench shall be backfilled, compacted and meet the compaction requirements before applying mortar at joints.

2. Cleaning and Application of Cement Mortar: Working inside the pipe, foreign substances which adhere to the steel joint rings shall be removed, the surface cleaned, and stiff cement mortar packed into each joint. The mortar shall be finished with a steel trowel to match the lining in the adjoining pipes.

3. Removal of Excess Mortar: Excess mortar and other construction debris shall be removed from the pipe interior.

J. Pipeline Closure Assemblies

1. General: Pipeline closure assemblies shall be employed to unite sections of pipeline laid from opposite directions; to adjust the field length of the pipeline to meet structures, other pipelines, and points established by design stations; and to close areas left open to accommodate temporary test bulkheads for hydrostatic testing. Either follower ring design or butt strap design shall be used. Follower ring closures shall be installed as recommended by the pipe manufacturer. Minimum length of pipe closure sections shall be four (4) feet.

2. Butt Straps: Shaped steel butt straps, a minimum of 14-inches in width, shall be centered over the ends of the pipe sections they are to join. Butt straps shall be welded to the outside of the pipes with complete circumferential fillet welds equal in size to the thinnest part being joined. The details shown on the drawings shall be referred to when joining pipes larger than 36-inches in diameter.

3. General Requirements for Cement Mortar Lining for Closure Assemblies: Closure assemblies shall be cement-mortar lined to a mortar thickness at least equal to the adjoining standard pipe sections. The steel shall be cleaned with wire brushes and a cement and water wash coat applied prior to applying the cement mortar. Where more than a 4-inch joint strip of mortar is required, welded wire mesh reinforcement having a 2-inch by 4-inch pattern of No. 13 gage shall be placed over the exposed steel.

The mesh shall be installed so that the wires on the 2-inch spacing run circumferentially around the pipe. The wires on the 4-inch spacing shall be crimped to support the mesh 3/8-inch from the metal surface. The interior mortar shall have a steel-trowled finish to match adjoining mortar lined pipe sections.

4. For lining of closure assemblies on pipelines 20-inches in diameter and smaller, butt straps with 6-inch diameter hand holes with plugs shall be provided around the perimeter of the closure at third-point intervals to facilitate mortar lining of the interior surface.

5. Mortar Coating Exterior Surfaces of Closure Assemblies: The exterior of closure assemblies shall be reinforced with wire mesh as described in Paragraph 3 above. The surface shall be coated with mortar, or a poured concrete encasement to cover all steel to a minimum thickness of 1-1/2 inches. Exterior mortar shall be protected to retard drying while curing. Concrete shall be poured and vibrated on one side of the closure assembly only, until mortar is visible on the opposite side, after which the coating can be completed over the top of the assembly.

K. Welded Joints

1. Locations: Welded joints shall be provided where detailed on the plans.

2. Reference Standard: Welding shall be in accordance with AWWA C206. Welder's qualification shall be in accordance with Section IX of the ASME Boiler and Pressure Vessel Code. Current certifications shall be provided for all welders.

3. Sequence: Interior joints shall not be welded before backfilling, compaction and compaction testing are successfully completed.

4. Joint Rings: Joint rings (butt-straps or weld collars) that are rusted or pitted where weld metal is to be deposited shall be cleaned by brushing or sand blasting.

5. Restrictions: Concrete or other coating adjacent to the joint rings shall not be heated.

6. Cleaning Requirements: Each layer of deposited weld metal shall be cleaned using a power-driven wire brush prior to depositing the next layer of weld metal.

L. Field Welding Joints

1. Field welding shall be in accordance with AWWA C206, except as modified herein.

2. Welder's qualification shall be in accordance with Section IX, Part QW, of the ASME Boiler and Pressure Vessel Code. Any welder performing field work shall have been qualified for the process involved within the past three years.

3. Provide single-welded lap joints, butt-welded joints and butt-strap joints where called for on the drawings. The minimum overlap of the assembled bell and spigot sections of the lap joints shall be as shown on the drawings.

4. Prior to welding interior joint shade pipe to 60 degrees except at the joints. Complete the interior weld prior to coating the outside joint.

5. If joint laying surfaces are rusted or pitted where weld metal is be deposited, clean them by wire brushing or sand blasting.

6. Complete the butt-welded longitudinal seams of butt straps before completing circumferential fillet welds. Grind the backing bar clear of abutting pipe section prior to completing the circumferential fillet welds. Backing bars shall be left in place.

7. Completed fillet welds shall be convex with a maximum reinforcement of 1/8 inch. Minimum leg length shall be the sum of the greatest abutting plate thickness plus joint clearance. Equalize joint clearance around entire circumference prior to welding. Remove all tack welds prior to the start of joint welding.

8. Preheat the joints to be welded where required in accordance with Table 1 of AWWA C206.

9. Where weld metal is to deposited, clean joints by wire brushing or sand blasting. Clean each layer of deposited weld metal prior to depositing the next layer of weld metal, including the final pass, by a power-driven wire brush.

10. No welding ground shall be made on the coated part of the pipe.

11. In all hand welding, the metal shall be deposited in successive layers so that there will be at least as many passes or beads in the completed weld as indicated in the following table;

Steel Cylinder Thickness (inches)	Fillet Weld Minimum Number of Passes
3/16 or less	1
7/32 through ¼	2
9/32 through 3/8	3
13/32 through ½	4

12. The plate edges shall be so prepared that there will be sufficient angle in the welding groove to prevent side arching of the electrode and to permit penetration at the deepest point of the groove. All such welds shall be back-chipped with a round-nosed tool to clean metal on the reverse side from the side of the deepest penetration before any welding is done on said reverse side. Each hand pass and each back-chipped welding groove shall be subject to inspection before the ensuing pass is made. Each hand pass shall be the full width of the weld.

13. Not more than 1/8 inch of metal shall be deposited in each pass. Each pass except the final one, whether in butt or fillet welds, shall be thoroughly bubbed or peened to relieve shrinkage stresses and to remove dirt, slag, or flux before the succeeding bead is applied.

Each pass shall be thoroughly fused in the plates at each side of the welding groove or fillet and shall not be permitted to pile up in the center of the weld. Undercuting along either side will not be permitted.

14. Complete each pass around the entire circumference of the pipe before commencing the next pass. Use the electrodes recommended by the pipe fabricator. Do not deposit more than 1/8 inch of throat thickness per pass.

15. During welding exterior welds, the coating of the steel pipe shall be protected by draping an 18-inch wide strip of heat-resistant material over the top half of the pipe on each side of the coating holdback to avoid damage to the coating by hot weld splatter.

16. Test all butt-strap joints by the soap and compressed air test after the steel is cool to the touch and before completing joint coating and lining. Test the longitudinal sears of butt-strap joints, single-welded lap joints and all butt-welded joints by the liquid penetrant method. Test to be conducted and interpreted by skilled staff certified in dye testing per ASTM E165.

M. Operations Incidental to Joint Completion

1. Hydrostatic Testing: Joint completion shall be planned to accommodate temporary test bulkheads for hydrostatic testing.

2. Bonding Pipe: Metallic jumper bonds or bars shall be installed on all metallic pipe, as shown on plans and as specified within Section 16640 (Cathodic Protection and Joint Bonding).

N. Completion of Exterior Pipe Joint for Cement-Mortar Coated Pipe

Outside joint recess shall be filled with cement-mortar grout using a fabric form (joint diaper) placed around the joint and secured with steel straps. Grout shall be poured and rodded from one side only until it is visible on the opposite side. After approximately one hour, the joint shall be topped off with additional grout.

Grout used for completion of the exterior pipe joint shall be mixed in proportion of one part cement, by weight, to not more than two parts, by weight, of sand passing a No. 16 mesh screen and thoroughly mixed with water to the consistency of rich cream. A cloth band nine (9) inches wide shall be placed around the outside of the pipe and centered over the joint. The joint band shall be bound to the pipe by use of steel box strapping. The band shall completely and snugly encase the joint except for an opening at the top through which to pour the grout. The outside grout space, prior to filling with grout, shall be flushed with water so that the surfaces of the joint to be in contact with the grout filling will be thoroughly moistened when the grout is poured.

Fluid grout shall be poured in only one opening in this joint and pouring shall be continuous until grout appears at the other side. The grout shall be rodded on both sides of the pipe, if necessary to settle the grout, and more grout added to fill the joint completely. The bands shall not be removed from the joint, and exposed portions of the joint, after filling, shall be covered with wet burlap or moist earth.

O. Thrust Restraint and Anchor Blocks

1. Location: Thrust restraint and anchor blocks shall be provided on all pressure pipelines, and shall be installed as shown on the plans and at all rubber gasketed fittings that are not otherwise restrained. Thrust restraint blocks or anchor blocks shall be installed at all valves, tees, crosses, ends of pipelines, and at all changes of direction of the pipeline greater than 5 degrees deflection either vertically or horizontally when joints are not otherwise restrained.

2. General Requirements: Thrust restraint and anchor blocks shall be of not less than 3,250 psi concrete (Class A); and shall provide a thrust bearing area to resist horizontal or downward thrust; and shall be of sufficient gross weight and area to give bearing against undisturbed vertical earth banks sufficient to absorb the thrust, allowing an earth bearing of 1500 pounds per square foot maximum.

3. Thrust Restraint not Called for on the Plans: Thrust restraint elements, where not called for on the plans, shall be sized for 150 percent of operating pipeline pressure or the pipeline test pressure, whichever is greater. Prior to construction, thrust and anchor block sizing shall be submitted to Mesa Water for approval. Pipe clamps, tie-rods, and their assembly shall meet the requirements of the National Fire Protection Association Bulletin No. 24, latest edition.

4. Concrete Placement: Concrete shall be placed against wetted and undisturbed soil, and the exterior of the fitting shall be cleaned and wetted to provide a good bond with the concrete. The concrete interface with the fitting shall be an area of not less than the projected area of the fitting normal to the thrust resultant and centered on the resultant.

5. Accessibility to Joints and Fittings: Unless otherwise directed by Mesa Water, thrust restraint and anchor blocks shall be placed so that the pipe and fitting joints are accessible for repair. Placement shall include isolation of adjacent utilities and shall ensure that bearing is against undisturbed soil.

6. Harness and Tie-Rods: Metal harness or tie-rods and pipe clamps shall be used to prevent movement if shown on the plans or directed by Mesa Water. The rods and clamp harnessing arrangement shall be installed utilizing flanged harness hold-downs or lugged fittings and pipe with saddle clamps placed (where feasible and practical) to bear against the pipe bells. Saddle clamps around the barrel of the pipe, which depend on friction or setscrews to prevent sliding of the clamp, are not acceptable. However, restraints with pointed set-screws which bear into the pipe wall, are not acceptable and shall not be used. All surfaces of exposed and buried steel rods, reinforcing steel, bolts, clamps, and other metal work shall be coated before installation and touched up after assembly as specified in Section 09900 (Painting and Coating).

7. In-line Valves: Reinforcing steel tiedown rods shall be used on all in-line valves. See Mesa Water Standard Drawings for typical valve anchor and thrust restrain details. Exposed metal portions shall be coated as specified in Section 09900 (Painting and Coating).

P. Blowoff Assemblies

1. General: In-line type or end-of-line type blowoff assemblies shall be installed in accord with the plans at the locations noted, and at such additional locations as required by Mesa Water for removing water or sediment from the pipeline.

2. Location: The assembly shall be installed in a level section of pipe. The tap for blowoff in the line shall be no closer than 18 inches to a valve, coupling, joint, or fitting unless it is at the end of the main. No tap will be permitted in any existing machined section of asbestos cement pipe.

Q. Combination Air and Vacuum Release Valves

1. General: Air release valve assemblies and combination air and vacuum valves shall be installed at each point in the pipeline as shown on the drawings or as specified by the Mesa Water, and in accordance with Section 15089 (Combination Air-Release and Vacuum-Relief Valves).

2. Location: The tap for the air valves shall be made in a level section of pipe no closer than 18 inches to a bell, coupling, joint, or fitting. No tap shall be permitted in any existing machined section of asbestos cement pipe.

R. Aboveground Piping Installation/Support

1. General: Installation of aboveground pipeline materials and appurtenances include requirements for buried pipeline materials and appurtenances as applicable.

2. Supports: All exposed pipe shall be adequately supported with devices of appropriate design. Where details are shown, the supports shall conform thereto and shall be placed as indicated; provided, that the support for all piping shall be complete and adequate as herein specified, whether or not supporting devices are specifically called for. Pipe hangers and supports shall conform to the requirements of the latest editions of the MSS-SP58 and SP69 and ANSI/ASME B31.1.

3. Grooved-End Pipe and Fittings: Grooved-end pipe and fittings shall be installed in accordance with the coupling manufacturer's recommendations and the following:

    a. Loose scale, rust, oil, grease, and dirt shall be cleaned from the pipe or fitting groove. The coupling manufacturer's gasket lubricant shall be applied to the gasket exterior including lips, pipe ends, and housing interiors.

    b. Coupling shall be tightened alternately and evenly until coupling halves are seated properly.

S. Cathodic Protection and Joint Bonding

All ferrous metal pipes and all pipes specified or shown on the plans to be cathodically protected shall be completed in accordance with Section 16640 (Cathodic Protection and Joint Bonding).

T. Warning and Locator Tape

Warning tape shall be installed on all pipelines. For non-metallic pipelines, pipe locater tape and copper wire shall also be provided. The pipe identification shall be in accord with Section 15151 (Domestic and Recycled Water Facilities Identification).

U. Disinfection

All potable water pipelines shall be disinfected in accordance with Section 15041 (Chlorination of Water Mains for Disinfection).

V. Testing

All pressure piping shall be hydrostatically pressure tested in accordance with Section 15042 (Hydrostatic Testing of Pressure Pipelines).

END OF SECTION

SECTION 15056

DUCTILE-IRON PIPE AND FITTINGS

PART 1 – GENERAL

A. Description

This section describes materials, installation, and testing of ductile-iron pipe and fittings.

B. Related Work Specified Elsewhere

1. Trenching, Backfilling, and Compacting: 02223.
2. Chlorination of Water Mains for Disinfection: 15041.
3. Hydrostatic Testing of Pressure Pipelines: 15042.
4. Installation of Pressure Pipeline: 15051.
5. Manual Valves: 15100.
6. Cathodic Protection and Joint Bonding: 16640.

C. Submittals

1. Affidavits of compliance with standards referenced in this specification, e.g., AWWA C151, shall be provided.
2. Layout drawings showing the locations and dimensions of pipe and fittings shall be submitted where the proposed pipeline is to be placed along streets or alignments with a radius of curvature which dictates the use of shorter-than-standard pipe lengths. In cases where restrained joint pipe is specified, lay drawings shall clearly identify the joints, lengths, fittings, and deviations from the curved centerline of the pipe trench. Consideration for adjacent parallel utility conflicts is important in developing the lay diagrams to avoid conflicts and encroaching into adjacent trench areas.
3. Lining, coating and wall thickness for all piping shall be provided.
4. Joint details for all types of joints used, e.g., push-on joints shall be submitted.
5. Calculations and/or test data proving that each proposed restrained joint arrangement can transmit the required forces shall be submitted.

PART 2 - MATERIALS

A. Ductile-Iron Pipe

1. AWWA Reference Standard: Ductile-iron pipe shall be manufactured in accordance with ANSI/AWWA C151/A21.51.

2. Minimum Wall Thickness: The minimum wall thickness for ductile-iron pipe shall be as specified in AWWA C150 for the design pressure class for bell and spigot pipe, thickness Class 53 for flanged spools, and design pressure class 350 for plain end pipe, unless indicated otherwise on the plans. Unless otherwise noted on the drawings, ductile iron pipe shall be Pressure Class 200.

3. Joints: Unless otherwise called out on the plans, push-on type joints shall be used. The joint dimension and gasket shall be as specified in ANSI/AWWA C111/ A21.11. At the direction of Mesa Water, ductile iron pipe joints shall be bonded to provide electrical continuity for corrosion monitoring and future cathodic protection. For joint-bonding details and requirements refer to Mesa Water Standard Drawings and Section 16640 (Cathodic Protection and Joint Bonding).

4. Flanges: Flanges for ductile-iron pipe, when required, shall be "screwed-on" type in accordance with ANSI/AWWA C115/A21.15.

5. Restrained Joints: Where called for on the plans, pipe and fittings shall be restrained. Joint restraint type shall be as specified in this Section and shall be one of the following types:

    a. Flanged fittings per Part .A.4 above and Part 2.B.8 below.

    b. Where restrained joints are called for on 10-inches in diameter and larger pipe, use a manufactured locking restraint pipe with fittings: “TR-Flex” restrained joint pipe as manufactured by U.S. Pipe & Foundry Company; “Flex-Ring (only) as manufactured by American Cast Iron Pipe Company; “Thrust-Lock” manufactured by Pacific States Cast Iron Pipe Company; “F-128 Super-lock” pipe as manufactured by Clow Water Systems Company, or approved equal. The restrained joint shall be a boltless restrained push-on joint design and shall contain a positive axial locking restrained system and be capable of deflection after assembly. Restraint of field cut pipe by using U.S. Pipe’s “TR Flex Gripper Ring” or approved equal will be permitted as long as the “TR Flex” pipe field weldments are not required. Any restrained joint fitting which will require a pipe field weldment will **not** be permitted under any circumstances. Restraint of field cut pipe shall be kept to a minimum.

    c. Where restrained joints are called for on 8-inches in diameter and smaller pipe, push-on joints shall be restrained with locking gasket rated for 250 psi operating pressure.

Joint restraint shall be push-on joint with "Field-Lok" gaskets as manufactured by U.S. Pipe & Foundry Company, Perma-Lock Joint as manufactured by Pacific States Cast Iron Pipe Company or approved equal. "TR-Flex" restrained joint pipe as manufactured by U.S. Pipe or approved equal is also an acceptable option for restraint of push-on joints.

d. Mechanical Joints with Mechanical Joint Restraints per Part 2.B. 6 and 7 herein below.

e. Push-on joint pipe with restrained harness assembly (for use within steel casing applications only). Shop drawings reflecting every part, material and dimension of the restraint assembly shall be submitted to Mesa Water for approval. Restraint of push-on joints shall be of the type utilizing cast lugs, or retainer rings bearing against the pipe shoulders at the bell or fitting. All threaded harness parts shall be manufactured of type 316 stainless steel.

Restraint systems using lugs integral to the pipe shall be cast with the pipe or fitting by the pipe manufacturer. Attachment of angle iron: angle-clips; harness-lugs or tabs by field welding to the ductile iron pipe or fitting is strictly prohibited.

f. Grooved pipe and fittings (for un-buried installations only), per sub-section No. 2.E. herein below. Wall thickness beneath the groove shall be equal to or greater than the minimum specified wall thickness and shall be sufficient to meet the maximum pressure.

6. Outlets for DIP shall be as follows:

2” or smaller:	brass saddle with stainless steel bands
2-1/2”:	brass saddle with stainless steel bands or tapped tee
4” and larger:	D.I. tee fitting

7. Manufacturers: Ductile-iron pipe shall be as manufactured by: American Cast Iron Pipe Company; Pacific States Cast Iron Pipe Company; U.S. Pipe and Foundry Company; Griffin Pipe Products Company; McWane Cast Iron Pipe Company; Clow Water Systems Company; or approved equal.

B. Ductile-Iron Fittings

1. AWWA Reference Standard: Ductile-iron fittings shall be manufactured in accordance with ANSI/AWWA C110/A21.10. Ductile iron compact body fittings may be used for fitting sizes 4-inches through 12-inches in diameter and shall be manufactured in accordance with ANSI/AWWA C153/A21.53.

2. Push-on Joints: All fittings shall be made with push-on joints designed for use with the type of pipe to be joined unless noted otherwise on the plans.

3. Restrained Joints: Restrained fittings shall be used only as shown on the plans. Joint restraint type shall be as specified in this Section for ductile iron pipe, and shall be either:

   a. Flanged fittings per Part .A.4 above and Part 2.B.8 below.

   b. For pipe sizes 10-inches in diameter and larger, restrained joint fittings shall either be "TR-Flex" restrained joint fitting as manufactured by U.S. Pipe or approved equal, or mechanical joint ductile iron fittings fitted with joint restraints. Mechanical joint restraint shall be incorporated with the design of the follower gland and shall include a restraining mechanism which, when activated, imparts multiple wedging action against the pipe, increasing its resistance as the pressure increases. The joint shall maintain flexibility after burial. Follower glands shall be manufactured of ductile iron conforming to ASTM A536-80. Torque off bolts shall be tightened per manufacturer's recommendations and shall be inspected by Mesa Water prior to backfill.

      The mechanical joint restraint shall be EBBA IRON, Inc., MEGALUG, UNIFLANGE Series 1400, The Ford Meter Box Co., Inc. or approved equal. Any restrained joint fitting which will require a pipe field weldment will not be permitted.

   c. For pipe sizes 8-inches in diameter and smaller, push-on joint fittings shall be restrained with locking gasket rated for 250 psi operating pressure. Joint restraint shall be push-on joint with "Field-Lok" gaskets as manufactured by U.S. Pipe, Perma-Lock Joint as manufactured by Pacific States Cast Iron Pipe Company or approved equal. "TR-Flex" restrained joint fitting as manufactured by U.S. Pipe or approved equal is also an acceptable option for restraint of push-on joint fittings in this size.

   d. Push-on joint pipe with restrained harness assembly (for use within steel casing applications only). The pipe manufacturers' standard restraint joints shall be of the type utilizing cast lugs, or shop welded retainer lugs bearing against the pipe shoulders retainer rings in pipe grooves. All threaded harness parts shall be manufactured of type 316 stainless steel.

   e. Grooved pipe and fittings (for un-buried installations only), per sub-section No. 2.E. herein below. Wall thickness beneath the groove shall be equal to or greater than the minimum specified wall thickness and shall be sufficient to meet the maximum pressure.

4. Hydrostatic Pressure Test: Each fitting shall be tested before lining to one and one-half times the operating pressure for a duration of 10 seconds. Suitable controls and recording devices shall be provided so that the test pressure and duration may be adequately ascertained. Any fitting that does not withstand the test pressure shall be rejected.

5. Bell Ends: Bell ends shall be compatible with the pipe ends so as to provide confinement of the rubber rings and prevent damage to the ends of the pipe.

Ring grooves and interior surfaces of the bell shall be smooth and free from ridges, notches, or uneven surfaces.

6. Mechanical Joints: Mechanical joint fittings will be allowed only in areas specifically called for on the plans or as approved by Mesa Water as a substitute for other types of fittings. Mechanical joint fittings may be used in areas where there is limited room for a thrust block and restrained joints are required, or in cases where the pipeline needs to be activated in a short time period so thrust blocks will not be feasible.

   Ductile iron mechanical joint fittings shall comply with AWWA C-111/A-21.11, with a pressure rating of 250 psi and ANSI Class 125 and Class 150 bolt pattern. Tee bolts for mechanical joint fittings shall be Type 316 stainless steel.

   Field applications where speed of construction to facilitate tie-ins and where there is limited space available for concrete thrust blocks, are examples of where mechanical joint fittings with retainer glands are appropriate.

7. Flanged Fittings: All fittings with flanged ends shall comply with AWWA C110/A21.10, with a pressure rating of 250 psi and a Class 125 ASME/ANSI B-16.1 flange or AWWA C-115/A-21.15 Class 125 flange. The contractor shall be careful to confirm the mating flange, especially of valves, to make sure the compatibility of the two flanges.

   The gasket surface shall have a serrated finish of approximately 16 serrations per inch, approximately 1/32-inch deep, with serrations in either a concentric or spiral pattern. In addition, all flanges shall meet the following tolerances:

Bolt circle drilling	±1/16 inch
Bolthole spacing	±1/32 inch
Eccentricity of both circle and facing with respect to bore	±1/32 inch maximum

9. Manufacturers: Fittings shall be manufactured by American Pipe, Pacific States, Sigma, Star Pipe Produces, U.S. Pipe, Tyler, Pipeline Components, Inc. (PCI) or approved equal.

C. Gaskets

1. Gaskets for Flanged Joints: Gaskets for flanged joints shall be 1/8-inch thick, cloth-inserted rubber. Gaskets shall be suitable for a water pressure of 350 psi at a temperature of 180°F.

2. Full Face Type Gaskets or Ring Gaskets for Flanged Joints: Full face type gaskets with pre-punched holes shall be used where both flanges are flat face. Ring gaskets extending to the inner edge of the bolts may be used where a raised face flange is present.

3. Gaskets for Push-on, Mechanical, and Restrained Joints: Gaskets for push-on, mechanical, and restrained joints shall be synthetic or natural rubber in accordance with AWWA C111.

4. Manufacturers: Gasket shall be John Crane Company Style 777, Johns Manville No. 109, or approved equal.

D. Bolts, Nuts, and Washers

1. General: Bolts and nuts for buried flanges, flanges located outdoors above ground, flanges located in open vaults and structures, and submerged flanges shall be Type 316 stainless steel conforming to ASTM A 193, Grade B8M for bolts, and ASTM A 194, Grade 8M for nuts.

2. Washers: A washer shall be provided for each nut. Washers shall be Type 316 stainless steel.

3. Bolt Projection: The length of each bolt or stud shall be such that between 1/4 inch and ½ inch will project through the nut when drawn tight.

E. Grooved-End Fittings and Couplings

Grooved-end fittings shall conform to AWWA C-6-6, rigid radius-cut groove. Grooved-end couplings shall be ductile iron, ASTM A-536, Grade 65-45-12. Bolts shall be Type 316 stainless steel and conform to ASTM A-183, minimum tensile strength of 110,000 psi. Gaskets shall be EPDM and shall conform to ASTM D-2000. Coupling shall be Victualic Style 77, Gustin-Bacon, Grinnel or approved equal. All of the threaded parts shall be Type 316 stainless steel and shall be lubricated with anti-seize compound. Where the restraint joint is of the grooved type, the wall thickness beneath the groove shall be equal to or greater than the minimum specified wall thickness.

F. Lining for Pipe and Fittings

The interior of all pipe and fittings shall be lined with cement-mortar per ANSI/AWWA C104/A21.4. Lining shall be the double thickness listed in AWWA C104, Section 4.8. Lining materials shall conform to ASTM C150, Type II.

G. Coating for Pipe and Fittings

1. Exterior Surfaces: Exterior surfaces of pipe and fittings shall be coated with an asphaltic material in conformance with ANSI/AWWA C110/A21.10, and ANSI/AWWA C151/A21.51. The coating shall be free from blisters and holes; shall adhere to the metal surface at ambient temperatures encountered in the field.

2. Coating for Bolts, Nuts, and Glands: Buried mechanical joint bolts, nuts and glands, and restrained joint bolts for field-cut closure pipe shall be coated per Section 09900 (Painting and Coating). Stainless steel parts shall not be coated except for the threaded portion, which shall be assembled with a liberal coat of anti-seize compound.

H. Polyethylene Encasement

Pipe and fittings shall be polyethylene encased in accordance with ANSI/AWWA C105/A21.5. Contractor shall encase the pipe and fittings in **two layers** of polyethylene.

I. Flange Insulation Kit

Flange insulation kits, suitable for the design pressure of the pipeline, shall be provided where shown on the drawings, and shall be as specified in Section 16640 (Cathodic Protection and Joint Bonding).

J. Joint Bonding

As directed by Mesa Water, provide joint bonding for each fitting and pipe joint with bonding wires as specified in Section 16640 (Cathodic Protection and Joint Bonding).

PART 3 - EXECUTION

A. General

Ductile-iron pipe and ductile iron fittings shall be installed in accordance with the applicable sections of AWWA C600 and as specified in Section 15051 (Installation of Pressure Pipelines).

B. Installation

1. Allowable Joint Deflection for Restrained Joint Pipe and Fittings: For restrained joints, deflection of the joint shall not exceed 80% of the manufacturer's recommended maximum deflection.

2. Acceptable Line and Grade for Piping: The pipe shall be laid true to the line and grade shown on the plans within acceptable tolerances. The tolerance on grade is 1-inch. The tolerance on line is 2-inches.

3. Touch-Up Coating: All exposed flanges and other metal surfaces and all damaged coatings shall be coated after assembly per Section 09900 (Painting and Coating). Stainless steel bolts shall not be coated.

C. Wrapping pipe with Polyethylene Encasement

All ductile-iron pipe and ductile iron fittings buried underground shall be protected with a **double layer** of polyethylene encasement wrap in accordance with the latest revision of AWWA C105. Each layer of polyethylene encasement shall be a loose 8-mil-thick minimum LLD polyethylene tube or loose 4-mil thick minimum HDCL polyethylene tube. All joints between plastic tubes shall be wrapped with 2-inch-wide, 10-mil thick, polyethylene adhesive tape, Polyken 900, Scotchwrap 50, or approved equal. Installation of plastic film shall conform to the following procedure, and wrapping shall be applied to the pipe in the field in the following manner:

1. Placement of Polyethylene Encasement: Using a sling, the pipe shall be picked up with a crane at the side of the trench and raised about 3 feet off the ground. The polyethylene tube, cut approximately 2 feet longer than the length of pipe, shall be slipped over the spigot end of the pipe and bunched up, accordion fashion, between end of the pipe and the sling. The Contractor shall place **two layers (double bag)** of polyethylene tube over the pipe.

2. Placement of Pipe into Trench: The pipe shall be lowered into the trench. The spigot shall be seated into the bell of the adjacent installed pipe, and the pipe lowered into the trench bottom. A shallow bell hole shall be provided in the trench bottom to facilitate the wrapping of the joint.

3. Joint Assembly: The pipe joint shall then be made up as described herein.

4. Adjustment of Polyethylene Encasement: The sling shall be removed from the center of the pipe and hooked into the bell cavity. The bell shall be raised approximately 12 inches and the tube of polyethylene film slipped along the full length of the pipe barrel. Enough of the film shall be left bunched up, accordion fashion, at each end of the pipe to overlap the adjoining pipe about 1 foot. Care shall be taken to ensure that soil that adheres to the pipe is removed as the polyethylene film is placed around the pipe.

5. Overlapped Joints: To make the overlapped joint wrap, the film shall be pulled over the bell of the pipe, folded around the adjacent spigot, and wrapped with about three circumferential turns of the plastic adhesive tape to seal the tube of film to the pipe. The tube on the adjacent pipe shall be then pulled over the first wrap on the pipe bell and sealed in place behind the bell, using about three circumferential turns of the polyethylene adhesive tape.

6. Attachment of Encasement: The resulting loose wrap on the barrel of the pipe shall be pulled snugly around the barrel of pipe, the excess material folded over the top and the fold held in place by means of short strips of 2-inch wide, 10-mil thick polythlene adhesive tape at intervals 3 feet apart along the pipe barrel.

D. Flanged Connections

Flanged pipe and fittings shall be shop fabricated, not field fabricated. Threaded flanges shall comply with AWWA C115 and shall be individually fitted and machine tightened in the shop.

E. Mechanical Joint Connections with Retainer Gland Restraints

Mechanical joint connections with retainer glands shall be assembled in accord with the manufacturer's recommendations for the specific fitting and retainer gland being used. Torquing of break-off gland bolts shall be done in the presence of Mesa Water's field representative. Each fitting shall be observed by Mesa Water's field representative prior to bagging and backfill. Any such fittings not observed by Mesa Water's field representative shall be excavated and exposed for detailed re-inspection of the fitting and bolt torque.

END OF SECTION

SECTION 15057

COPPER PIPE AND FITTINGS

PART 1 - GENERAL

A. Description

This section describes materials, installation, and testing of copper and brass pipe, and copper, and brass fittings and appurtenances.

B. Related Work Specified Elsewhere

1. Trenching, Backfilling, and Compacting: 02223.
2. Painting and Coating: 09900.
3. Hydrostatic Testing of Pressure Pipelines: 15042.
4. Installation of Pressure Pipelines: 15051.
5. Manual Valves: 15100.

C. Submittals

1. Submit detailed layout if pipe runs in copper exceeding 50 lineal feet.
2. Submit catalogue order sheets for materials of pipe, flanges, flange insulation kits, companion flanges and unions, showing metal composition and conformance to industry standards (ASTM, etc.) specified.

PART 2 - MATERIALS

A. Copper Pipe and Tubing

Copper piping shall conform to ASTM B 88. Copper pipe and tubing shall be cylindrical, of uniform wall thickness, and shall be free from any cracks, seams, or other defects. Piping located above floors or suspended from ceilings shall be Type L. Piping buried or located beneath floor slabs shall be Type “K”.

1-inch and 2-inch in diameter copper pipe shall be Type “K” soft copper pipe.

Copper pipe shall be as manufactured by Anaconda, Phelps-Dodge, Revere, Cambridge-Lee Industries, Inc., Cerro Copper Products Company, Halstead Industries, Inc., IUSA/Reading, Mueller Manufacturing Entities c/o Mueller Industries, Inc., or approved equal.

B. Copper Fittings

Copper fittings shall be copper conforming to ASTM B 75 and ANSI B16.22, with solder end joints. Fittings 3/8-inch and smaller may have flared end connections or compression joint connections.

C. Solder

Solder shall be tin-silver solder conforming to ASTM B 32, Grade Sn94, Sn95 or Sn96. Cored solder shall not be used. Solder and flux used in joints of potable waterlines shall contain no more than 0.2 percent lead. All potable water facilities shall be provided with materials that meet the lead free requirements as defined in AB 1953.

D. Brass Pipe and Nipples

Short threaded nipples and brass pipe shall conform to ASTM B 43, Schedule-40 thickness, except that nipples and pipe of sizes 1 inch and smaller shall be Schedule-80. Threads shall conform to ANSI B1.20.1. Brass material shall conform to ANSI/AWWA Standard C800 with a maximum lead content of 0.25% by average weight. All potable water facilities shall be provided with materials that meet the lead free requirements as defined in AB 1953.

E. Brass and Bronze Appurtenances

1. General: All items specified herein shall be manufactured of brass conforming to AWWA C800 with a maximum lead content of 0.25% by average weight. All potable water facilities shall be provided with materials that meet the lead free requirements as defined in AB 1953.

2. Service Saddles: Service saddle bodies shall be manufactured of brass, and/or stainless steel as called for on Mesa Water's Standard Drawings for the various types of pipe connections. Saddles shall be tapped with a female iron pipe thread outlet (to receive a corporation stop thread). The seal with the outer wall of the pipe shall be effected with either a rubber gasket or an O-ring, except for the stainless steel full-circle style repair clamp connection, which shall have a full-circle rubber gasket. Service saddles shall be as manufactured by Jones, Mueller, Ford, Romac, Rockwell, Smith-Blair, or approved equal.

    a. Service Saddles shall be double strap type for all sizes of ductile iron pipe. The straps (or bails) shall be flat and shall be manufactured of Everdur or Silicon bronze or 316 stainless steel.

    b. Service saddles for C900 PVC pipe shall be manufactured of brass with stainless steel band. The strong, extra wide fabricated stainless steel band will conform to the PVC pipe surface resulting in nearly 360 degree contact. Each saddle shall accurately fit the contour of the pipe O.D. without causing distortion of the pipe. The saddle shall be securely held in place with Type 316 stainless steel hex-head screws or bolts. The brass service saddle for C900 PVC shall be as manufactured by Ford Styles 202BS, Smith-Blair Series 325, A.Y. McDonald Model 3845, or approved equal.

3. Corporation Stops: Corporation stops shall be manufactured of brass. The inlet fitting shall be corporation stop thread when used with saddle and the outlet connection shall be a compression type or flare for 1" valves and compression type only for 2-inch valves. For 1-inch hot taps, the outlet connection for the corporation stop shall be flare. Corporation stops shall be "ball style" and shall be rated for 300 psi. Corporation stops shall be as manufactured by Jones, Mueller, Ford, McDonald, or approved equal.

4. Angle Meter Stops: Angle meter stops shall be manufactured of brass and shall be of the "ball valve" style and shall be rated for 300 PSI. The inlet connection shall be flare inlet for 1-inch valve and female iron pipe thread for 2-inch valve. The outlet fitting 1-inch and 2-inch valves shall be a meter flange or meter coupling. The inlet and outlet shall form an angle of 90 degrees on a vertical plane through the centerline of the meter stop. A rectangular lug and lock wing shall be provided on the top of the fitting to operate the shutoff mechanism. Two-inch angle meter stops shall be with "slotted" holes for 1 ½-inch or 2-inch meters. Angle meter stops shall be as manufactured by Jones, Mueller, Ford, McDonald, or approved equal.

5. Customer Service Valve: Customer service valves shall be manufactured of brass, and shall be "ball valve" style with lever-type turn handle. The inlet connection shall be a meter flange or a meter coupling and the outlet female iron pipe. Customer service valves shall be as manufactured by Jones, Ford, Mueller McDonald, or approved equal. Customer service valves shall be purchased from Mesa Water.

F. Insulating Bushings and Unions

Pipe fittings, and appurtenances (air vacs, pressure gauges, etc.) made of dissimilar metals shall be isolated from each other. For applications where pipeline pressures exceed 150 psi, and where the pipe tap for the appurtenance into the main is larger than 1-inch in diameter, a 2½-inch extra heavy carbon steel coupling shall be provided as the outlet, and the fitting/ appurtenance shall be isolated from the main by means of a 2 ½ by 2 -inch 316 stainless steel bushing, 2-inch 316 stainless steel nipple, and 2-inch stainless steel ball valve.

G. Flanges, Gaskets, Bolts and Nuts

1. Flanges for Valves and Fittings: Copper pipe shall be connected to flanged valves and fittings with bronze flanges conforming to ANSI B16.24, Class 125 (150 ob. Rating) to match the connecting flange. Solder end companion flanges shall be used for copper and threaded companion flanges shall be used for brass or stainless steel pipe connections.

2. Gaskets: Gaskets for flanged-end fittings shall be made of synthetic rubber binder and shall be fullface, 1/8-inch thick Johns-Manville 60, John Crane Co. "Cranite", or approved equal.

3. Flange Connections: All flanged connections shall be made using Type 316 stainless-steel bolts and nuts conforming to ASTM A 193, Grade B8M, for bolts and ASTM A 194, Grade 8M, for nuts shall be used. Washers shall be provided for each nut. Washers shall be Type 316 stainless steel.

4. Flange Insulating Kits: Flange insulation kits suitable for the design pressure of the pipeline, shall be provided where shown on the drawings and/or wherever pipelines of dissimilar metals are joined together. Insulation kits and materials shall be as specified in Section 16640 (Cathodic Protection and Joint Bonding).

F. Union

Union for copper piping systems (non-buried applications) shall conform to the following: Unions shall be the same size as the pipe, and shall be of the three part type, with silver soldered "sweat" hub-end connections. Unions shall be brass conforming to AWWA C800. Unions shall be Mueller, Ford, Jones or approved equal.

PART 3 - EXECUTION

A. General

Pipe shall be installed without springing, forcing, or stressing the pipe or any adjacent connecting valves or equipments. Pipe hangers and supports, and pipe penetrations through walls, slabs, and floors shall be as detailed on the drawings.

B. Installing Flange Bolts and Nuts

1. Bolt Thread Lubrication: Bolt threads shall be lubricated with an anti-seize compound prior to installation. Anti-seize compound shall be as manufactured by Tri-Flow, Permatex or Crouse-Hinds.

2. Flange Alignment: Flanges pipe shall be set with the flange boltholes straddling the pipe horizontal and vertical centerlines. This is referred to as the "two holing".

C. Installation

1. Related Installation Specification: Pipe shall be installed in accordance with the requirements of Section 15051 (Installation of Pressure Pipelines).

2. Pipe/Tubing Preparation: Tubing shall be cut square and burrs removed. Both the inside and outside of fitting and pipe ends shall be cleaned with steel wool and muriatic acid before soldering. Care shall be taken to prevent annealing of fittings and tubing when making connections. Miter joints shall not be permitted in lieu of elbows. Notching straight runs of pipe in lieu of tees is prohibited.

3. Pipe Bends: Bends in soft copper tubing shall be long sweep. Bends shall be shaped with shaping tools. Bends shall be formed without flattening, buckling, or thinning the tubing wall at any point.

4. Brazing: Brazing procedures shall be in accordance with Articles XII and XIII, Section IX, of the ASME Boiler and Pressure Vessel Code. Solder shall penetrate to the full depth of the bell in joints and fittings. Solders shall comply with ANSI B31.3, paragraph 328.

5. Pipe Flexibility and Minimum Cover for Service Laterals: Buried piping shall be installed with some slack to provide flexibility in the event of a load due to settlement, expansion or contraction. A minimum cover of 36-inches below the finished street grade shall be adhered to. The tubing is to be bedded and covered with sand in accordance with Section 02223 (Trenching, Backfilling and Compacting).

6. Copper Service Laterals: All copper service laterals shall be either 1-inch diameter or 2-inch diameter copper tubing. Refer to Mesa Water's Standard Drawings. For 1-inch angle stops the inlet shall be a flare connection. For 2-inch angle stops, the inlet shall be an FIP connection. All other couplings, fittings and joints shall be silver soldered. Piping for 1-inch and 2-inch size services shall be Type "K" soft.

D. Service Saddles

1. Proximity to Valves, Couplings, Joints, and Fittings: Service saddles shall be no closer than 18-inches to valves, couplings, joints, or fittings unless it is at the end of the main. The installation of a service saddle on any existing machined section of asbestos cement pipe will NOT be permitted.

2. Pipe Surface Preparation: The surface of the pipe shall be cleaned, smoothed and de-burred to remove all loose material and to provide a hard, clean surface before installing the service saddle.

3. Installation: The service saddle shall be tightened firmly to ensure a tight seal; however, care shall be used to prevent damage or distortion of the pipe by over-tightening.

4. Pipe Tap: The tap into the pipe shall be made in accordance with the pipe manufacturer's recommendation. Tap hole diameter shall be 7/8-inch for 1-inch service taps and shall be 1 7/8-inch for 2-inch service taps.

END OF SECTION

SECTION 15064

PVC PRESSURE DISTRIBUTION PIPE AND FITTINGS

PART - 1 GENERAL

A. Description

This section includes materials, installation, and testing of polyvinyl chloride (PVC) pipe for 4-inch through 24-inch diameter domestic water lines, in accordance with the applicable provisions of AWWA C900 and AWWA C905.

B. Related Work Specified Elsewhere

1. Trenching, Backfilling, and Compacting: 02223.
2. Chlorination of Water Mains for Disinfection: 15041.
3. Hydrostatic Testing of Pressure Pipe: 15042.
4. Installation of Pressure Pipelines: 15051.
5. Ductile-Iron Pipe and Fittings: 15056.
6. Copper Pipe and Fittings: 15057.
7. Domestic and Recycled Water Facilities Identification: 15151.

C. Submittals

1. Submit materials list showing material of pipe and fittings with ASTM reference and grade.

D. Reference Standard

1. Pipe sizes 4-inch through 12-inch shall conform to AWWA C900, "Polyvinyl Chloride (PVC) Pressure Pipe, 4-inch through 12-inch for Water Distribution", unless noted otherwise below.
2. Pipe sizes 14-inch and larger in diameter shall conform to AWWA C905, "Polyvinyl Chloride (PVC) Pressure Pipe, 14-inch through 48-inch for Water Transmission and Distribution", unless noted otherwise below.

PART 2 - MATERIALS

A. PVC Pipe

1. General: PVC pipe shall be manufactured in accordance with AWWA C900 and AWWA C905, and shall be of the sizes and pressure classes shown on the plans. The standard dimension ratio (SDR) for C900 PVC pressure pipe shall be DR-18 (150 psi pressure rating) or DR 14 (200 psi pressure rating). The standard dimension ratio (SDR) for C905 PVC pressure pipe shall be DR 25 (165 psi pressure rating) or DR 21 (200 psi pressure rating). The pipe shall have gasket bell end or plain end with elastomeric gasket coupling. All PVC pressure pipe for domestic water applications shall be blue.

2. Material: Material used to produce the pipe and couplings shall be made from Class 12454-A or B virgin compounds as defined in ASTM D 1784, with an established hydrostatic design basis rating of 4,000 psi for water at 73.4°F (23°C).

3. Pipe Lengths: Laying lengths shall be 20 feet with the manufacturer's option to supply up to 15% random (minimum length 10 feet).

4. Pipe Marking: Each pipe length shall be marked showing the date of manufacture, nominal pipe size and O.D. base, the AWWA pressure class, and the AWWA specification designation (AWWA C900/C905). For potable water application, the seal of the testing agency that verified the suitability of the material for such service shall be included.

5. Manufacturers: Pipe shall be as manufactured by Certainteed Corporation, Ipex, Inc., Vinyltech Corporation, and Diamond Plastics Corporation, or approved equal.

B. Fittings

1. Materials: Fittings shall be ductile-iron conforming to Section 15056 (Ductile-Iron Pipe and Fittings).

2. Bell Sizes: Bell size shall be for Class 200 cast-iron equivalent PVC pipe, including the rubber-ring retaining groove.

3. Reference Standard: All castings shall be marked “DI” or “Ductile” and ANSI/AWWA C153/A21.53 or CI/PVC AWWA C110.

4. All fittings shall be thrust-blocked and anchored in accordance with the plans.

C. Rubber Rings

Rubber rings for use in the PVC couplings and fittings shall conform to the requirements of ASTM D 1869. Rubber rings shall be stored and protected in a manner to prevent deterioration. Lubricant for pipe insertion shall be food grade, and biodegradable.

D. Service Saddles

Service saddles shall be designed for use on C900/C905 PVC pipe and shall conform to the requirements of Section 15057 (Copper Pipe and Fittings). Service saddles for service sizes up to 2-inch on pipe nominally sized up to 12-inch. For outlets of larger than 2-inch in diameter and for all outlets on larger diameter pipelines, ductile iron tees with flanged outlets shall be used.

PART 3 - EXECUTION

A. General

1. Related Installation Specification: PVC pipe shall be installed in accordance with the requirements of Section 15051 (Installation of Pressure Pipelines).

2. 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 trenches or structure shall be kept tightly closed to prevent the entrance of animals and foreign materials. The contractor shall maintain the inside of the pipe clean, sanitary, and free from foreign materials until its acceptance by Mesa Water.

3. The pipe sections shall be laid in the trench to true alignment and grade in accordance with the drawings.

4. Cover: Where the grade is not shown, or when there is a conflict with the design, the pipe shall have a cover of 42-inches in paved areas and 48-inches in unpaved areas.

5. Closure Sections: Where closure sections are required, the sections shall be installed in accordance with the applicable sections of these specifications. Closures shall be made using gasketed-PVC closure collars.

6. High Deflection Couplings: Where called for on the drawings or where required to meet the line and grade shown on the drawings, the Contractor can provide and install high deflection couplings. The high deflection couplings shall be PVC couplings, meeting the requirements of AWWA C900, with twin elastomeric gaskets which allow two (2) degrees of deflection at each gasket for a total of four (4) degrees per coupling. The couplings shall be provided for cast iron equivalent outside diameter and have a 200 psi working pressure rating. The high deflection couplings shall be High Deflection (HD) Stop Couplings as manufactured by CertainTeed, or approved equal.

7. Closure Couplings: For closure applications, PVC couplings, meeting the requirements of AWWA C900, with twin elastomeric gaskets which are designed to connection plain ends of pipe can be used. The closure couplings shall be provided for cast iron equivalent outside diameter and have a 200 psi working pressure rating. The closure couplings shall be Closure/Repair Couplings as manufactured by CertainTeed, or approved equal. Do not deflect pipe in these couplings.

8. Curved Alignment: The pipe shall not be laid along curves at a radius less than that listed below. The minimum-radius curves are determined by the limit of 1-degree deflection for C-900 and C-905 PVC pipe joints with factory-assembled bell couplings:

Length of Pipe Section	Minimum Curve Radius
20 feet	1146 feet
10 feet	573 feet

For integral bell PVC pipe, the minimum radius curves obtained by deflecting joints shall not exceed the manufacturer's recommendation (which may be less than 1 degree). Pipe may not be offset to a degree such that the spigot end of the pipe deflects (touches) against the end of the pipe bell. Pipe sections shall not be bent to achieve a curve. For curves of smaller radius, ductile-iron fittings or high deflection couplings shall be used. High deflection couplings may be used for angles of 4° or less.

B. Installation

1. Trenching, backfilling and compacting shall be in accordance with Section 02223.

2. Pipe Cutting: When pipe is cut and is to be joined to a ductile-iron fitting or another piece of pipe, the end shall be beveled in the field or shop to create a beveled end equal in shape, and quality to the machined ends of the pipe as furnished by the manufacturer. Such machining shall not result in undercutting the wall thickness and must be approved by the Mesa Water's Representative before installation. Pipe shall be cut by a method recommended in the pipe manufacturer's installation guide.

3. Joints: Connecting parts of pipe, rings, couplings, and castings shall be cleaned before assembly. After bearing has been obtained, couplings shall be assembled in a workmanlike manner. The use of excessive lubricant will not be permitted, and the assembly of the couplings and rings shall be in accordance with the manufacturer's recommendations. Lubricant and rubber rings shall be supplied by the pipe manufacturer. All fittings and valves shall have joints that are compatible for use with the adjoining pipe.

4. Pipe Storage: Pipe shall not be stored in direct sunlight. Pipe stored outdoors shall be protected from discoloration by covering it with opaque material such as canvas. The covering shall be placed in such a way as to allow adequate air circulation between the cover and the pipe. Discolored pipe shall be rejected.

6. All fittings and valves shall be supported so that the pipe is not subjected to the weight of these appurtenances.

7. Concrete thrust blocks of the size shown on the construction plans shall be provided at the location of all fittings, valves, fire hydrants, and end of line plugs.

8. Imported sand shall be used for backfill per Section 02223.

C. Pipe Identification

Warning and identification tape shall be installed on all potable water piping in accordance with Section 15151 (Domestic and Recycled Water Facilities Identification). Detector tape shall also be installed above the pipe.

D. Locator Wire

Copper tracer wire shall be placed continuously at the top of the pipe for the purpose of providing a continuous signal path for electronic pipe locators used to determine the pipe alignment after installation. The copper wire shall be No. 14 AWG. with HMWPE insulation.

The wire shall be electrically continuous throughout the entire pipe system including adjacent service line assemblies. The ties or hitches shall be spaced not more than 13 feet apart. At service lines and air-vacuum assemblies, the wire shall extend up into the meter box. The wire shall be brought to the surface at valve locations and shall be accessible by removing the valve can cover. At blow-offs assemblies, the wire shall extend up into the blow-off cover. All splices shall be wrapped with PVC tape and the wire shall be tied to the pipe at 10 foot intervals with plastic adhesive tape.

The contractor shall provide Mesa Water with the results of an electrical continuity test. The contractor shall perform the initial electrical continuity test at the expense of the contractor. All corrective work and subsequent testing required due to failure of the tracer wire to be electrically continuous, shall be also at the expense of the contractor.

END OF SECTION

SECTION 15076

CEMENT-MORTAR LINED AND COATED STEEL PIPE

PART 1 - GENERAL

A. Description

The Contractor shall furnish and install cement mortar lined and coated steel pipe, complete in place, in accordance with the requirements of the Contract Documents. This section describes the materials, fabrication, installation, and testing of cement-mortar lined and coated steel pipe in accordance with the applicable requirements of AWWA C-200, C-205, C-206, C-207 and C-208.

B. Related Work Specified Elsewhere

1. Trenching, Backfilling and Compacting: 02223.

2. Painting and Coating: 09900.

3. Chlorination of Water Mains for Disinfection: 15041.

4. Hydrostatic Testing of Pressure Pipelines: 15042.

5. Installation of Pressure Pipe: 15051.

6. Cathodic Protection and Joint Bonding: 16640.

C. Submittals

1. Piping layout drawings showing location and dimensions of all pipe and fittings. Include laying lengths of valves, and other equipment which determine piping dimensions. Label or number each fitting or piece of pipe and provide the following information for each item:

    a. Materials of construction, including references to industry standards being met (i.e. ASTM, ANSI, AWWA, etc.).

    b. Inside diameter, steel wall thickness, internal design pressure (cement-mortar lining and coating thicknesses) for each class of pipe to be furnished.

    c. Order of installation and closure locations for length adjustment and for construction convenience.

    d. Pipe invert station and elevation of each change of grade and alignment.

    e. Elements of curves and bends, both in horizontal and vertical alignment, including elements of the resultant true angular deflections in cases of combined curvature.

    f. Paint primer type and thickness where joints and other cement-mortar holdbacks occur.

g. Call out types and sizes, and dimensions of grooved-end collars, flanges, reinforcing collars, wrapper plates, and crotch plates.

h. Limits of each reach of field-welded joints and of concrete encasement.

i. Locations of manways and other points of access.

j. Location of valves and other mechanical equipment.

k. Locations and calculations of bulkheads, pipe restraints and all methods required to prevent excessive pipe wall stresses for hydrostatic testing of pipeline.

2. Manufacturer's certificates of compliance with prescribed industry standards (i.e. AWWA C200, C205, C-206, C-207 and C208, ASTM C150, etc.)

3. Detail drawings of:

a. Fittings
b. Joints
c. Butt Straps
d. Bulkheads and means of attachment to pipe.

4. Mill test reports on each heat from which steel is rolled.

5. Test reports on physical properties of elastomeric material used in gaskets.

D. Quality Assurance

1. Inspection: All pipe shall be subject to inspection at the place of manufacture in accordance with the provisions of ANSI/AWWA C200 and C205, respectively, as supplemented by the requirements herein. Only pipe manufacturers with continuous experience for the past five years who provide completed lined and coated pipe are qualified for this project.

2. Tests: Except as modified herein, all materials used in the manufacture of the pipe shall be tested in accordance with the requirements of ANSI/AWWA C200 and C205, as applicable.

a. After the joint configuration is completed and prior to lining with cement-mortar, each length of pipe of each diameter and pressure class shall be shop-tested and certified to a pressure of at least 80 percent of the yield strength of the pipe steel.

b. In addition to the tests required in ANSI/AWWA C200, weld tests shall be conducted on each 5,000 feet of production welds and at any other times there is a change in the grade of steel, welding procedure, or welding equipment.

3. Welding Requirements: All welding procedures used to fabricate pipe shall be prequalified under the provisions of ANSI/AWS D1.1. Welding procedures shall be required for, but not necessarily limited to, longitudinal and girth or spiral welds for pipe cylinders, spigot and bell ring attachments, reinforcing plates and ring flange welds, and plates for lug connections.

4. Welder Qualifications**:** All welding shall be done by skilled welders, welding operators, and tackers who have had adequate experience in the methods and materials to be used. Welders shall be qualified under the provisions of ANSI/AWS D1.1 by an independent local, approved testing agency not more than 6 months prior to commencing work on the pipeline. Machines and electrodes similar to those used in the WORK shall be used in qualification tests. The contractor shall furnish all material and bear the expense of qualifying welders.

E. Design Criteria

1. The nominal diameter or inside diameter of the pipe and other fabricated steel sections as shown on the Plans is the clear diameter of the lined pipe after the application of the interior mortar lining.

2. Obtain the following information from the Plans: elevation of the pipe invert and of the final ground surface; alignment of the pipeline; nominal internal diameter, after cement-mortar lining; minimum pipe wall thickness; and location of welded joints.

3. Unless otherwise noted on the Plans, the working pressure of the pipeline shall be assumed to be 150 psi.

4. The proportioning and detailing of fabricated fittings, manholes, outlets and pass holes and the fabrication thereof, shall be performed in accordance with the requirements of the latest edition of the ASME Boiler and Pressure Vessel Code, Section VIII, Pressure Vessels; provided, that if the details shown on the Plans are better suited for the work, in the opinion of the Engineer, such details shall be controlling. Where not detailed on the Plans, the design of wyes, tees and fitting reinforcement shall be in accordance with the applicable procedures of AWWA manual M11.

F. Inspection

Mesa Water reserves the right to inspect materials, production, or testing of the pipe at the manufacturer's plant.

PART 2 - MATERIALS

A. Steel Pipe

1. Pipe shall conform to AWWA C-200, AWWA M-11, latest edition. Steel shall be ASTM A-36, ASTM A-1011 or A-1018, Grade 36, having a 0.25% maximum carbon content.

   Cylinders shall be fabricated from hot-rolled carbon steel sheets or plates conforming to ASTM A570 or ASTM A283, with a minimum yield point of 33,000 psi, or shall conform to ASTM A53, Type E or S, Grade B.

2. Steel cylinder thickness shall be minimum of 0.188 inch for straight runs of distribution and transmission pipe with diameters less than 30-inches and shall be a minimum of ¼-inch (0.25 inches) for diameters 30-inches and larger.

3. Additionally, the minimum wall thickness shall be ¼ -inch (0.25 inches) for all pipe specials, and all pipes regardless of size, within ten (10) feet of structures, vaults, and other significant pipe appurtenances (such as blow-offs, manways, PRV vaults, valve vaults, meter vaults, pump stations, etc.); wherever the pipe is to be installed or jacked inside pipe casings; and wherever pipe penetrations are required.

B. Cement

Cement for cement-mortar lining shall be ASTM C 150, Type II or V. Cement for cement-mortar coating shall be ASTM C 150, Type V.

C. Fittings

1. Definition: A fitting shall be defined as a piece of pipe other than a straight full length joint. Elbows, manhole sections, reducers, and sections of pipe with outlets shall be considered fittings. Dimensions shall be per AWWA C-208. Minimum wall thickness of all fittings (pipe specials) shall be 0.25 inch.

2. Pressure Rating: Fittings 4 through 10-inches shall be designed for 250 psi and conform to ANSI B16.9. Fittings 12-inches diameter and larger shall comply with AWWA C208. Note, the minimum plate thickness required for the steel pipe shall also apply to fittings. Reinforcement of fittings shall be in accordance with AWWA M11.

3. Materials: Material for fittings 4 through 10-inches shall comply with ASTM A-234, Grade WPB. Material for fittings larger than 10-inches but less than or equal to 30-inches in diameter shall be the same as the pipe. Cement-mortar lining and I.D. dimensions shall be the same as the specified pipe.

4. Allowable Stresses: Allowable circumferential stress at the design internal pressure shall not be greater than 40% of minimum yield stress. Minimum wall thickness of steel fitting shall be the same as the pipe of same size per ANSI B36.10 and as required for the steel pipe (Section A, above).

   a. Allowable circumferential stress at the design internal pressure shall not exceed 40% of minimum yield stress.

   b. Outlet reinforcement at branches and openings shall be determined by the procedure given in ANSI B31.3, paragraph 304.3, and Appendix H. If reinforcement is required, it shall be accomplished as described below.

      i. The type of reinforcement for fittings with outlets shall be selected from the following table:

R	Type of Reinforcement
Max. 0.5	Collar
Max. 0.7	Wrapper Plate
To. 1.0	Crotch Plate

Calc. $R = \frac{\text{I.D. Outlet}}{\text{I.D. Main run x sin (B)}}$

Where B = Angle between the longitudinal axis of the main run and the branch.

ii. For collar reinforcement, select an effective shoulder width "W" of a collar from the inside surface of the steel outlet to the outside edge of the collar, measured on the surface of the cylinder of the main run, shall be selected such that:

$$W = \frac{(1/3 \text{ to } 1/2) \times \text{I.D. outlet}}{\text{Sin (B)}}$$

The minimum thickness "T" of the collar is determined by:

$$T = \frac{P \times \text{I.D. main run} \times \text{I.D. outlet} \times [2 - \sin (B)]}{4 \times F \times W \times \sin (B)}$$

Where P = Design internal pressure, psi.
F = Allowable design stress = 40% of minimum yield stress
B = As in part C.i.

Collars may be oval in shape or rectangular with rounded corners.

iii. For a wrapper plate, the above collar formula shall be used except that the wrapper is of thickness "T", its total width is (2W + ID outlet/sin (B)), and it wraps entirely around the main pipe.

iv. Base crotch plate design on Swanson, H. S. et al., DESIGN OF WYE BRANCHES FOR STEEL PIPES, summarized in AWWA Manual M 11.

v. Long Radius Curves and Vertical Curves:

For curved alignment, straight or beveled pipe of normal or one-half normal lengths pulled partially open on one side of the joint may be used with a welded mitered bend of up to 10 degrees next to the joint ring. Pipes with a bend in excess of 10 shall be designed as fittings.

Joints shall not be pulled more than one-half of the watertight extensibility provided by the bell and spigot design.

5. Grooved End Fittings: Fittings smaller the 24-inches in diameter with grooved ends shall have rolled grooves, flexible type, with dimensions as shown in AWWA C-606, Table 3. Steel wall thickness shall be standard weight, ANSI B36.10. Cement-mortar lining and I.D. dimensions shall be same as the specified pipe.

6. Welded Fittings: Welded fittings shall be standard weight, Tube Turns, Ladish, or approve equal.

D. Flanges

Flanges shall be in accordance with AWWA C207, Class E, flat face, except depending on the connecting flange of the adjacent fitting, valve or piece of equipment. Flanges shall match the connecting flanges on the adjacent fitting, valve, or piece of equipment.

For valves or fittings with ANSI B16.5, Class 150 flanges, the steel pipe flange shall be Class E.

Slip-on or weld-neck flanges shall be provided for piping larger than 3-inches in diameter.

E. Bolts, Nuts, and Gaskets for Joints and Flanges

Rubber gaskets shall be furnished for all joints, along with other parts, including flange gaskets, bolts, nuts, washers, jumper rods, and flange insulation kits. One bolt/gasket set shall be provided for each flange.

1. Materials: Bolts and nuts for flanges located indoors, buried flanges, flanges located outdoors above ground, flanges located in underground vaults, and submerged flanges shall be Type 316 stainless steel. Bolts shall conform to ASTM A-193, Grade B8M, and nuts to ASTM A-194, Grade 8M.

2. Washers: A washer shall be provided for each nut. Washers shall be of the same material as the nuts.

3. Gaskets: Gaskets shall be composed of synthetic fiber with rubger binder and shall be "full faced", 1/16-inch thick Garlock 3400, Anchor 441, or approved equal. Gaskets shall conform dimensionally to ANSI B16.21. Ring gaskets extending to the inner edge of flange bolts may be used where a raised face flange is present.

4. Bolts for Flange Insulation Kits: Bolts and nuts for flange insulation kits shall conform to the same requirements as outlined in item 1, above.

F. Flange Insulation Kits

Flange insulation kits suitable for the design pressure of the pipeline shall be provided where shown on the drawings and shall be as specified in Section 16640 (Cathodic Protection and Joint Bonding).

G. Grooved-End Couplings

Grooved-end couplings shall be malleable iron, ASTM A-47, or ductile iron, ASTM A-536. Bolts and nuts for couplings shall be type 316 stainless steel and shall conform to ASTM A-193 and A-194. Gaskets shall be EPDM and shall conform to ASTM D-2000. Couplings for pipe 24-inches in diameter and smaller shall be flexible type, rolledgroove, per AWWA C-606, and shall be Victualic Style 77, Gustin-Bacon Figure 100, or approved equal.

H. Outlets

1. Outlets 2-inches in Diameter and Smaller: Outlets of sizes 2-inches in diameter and smaller shall be of the "Thread-o-let" type, per AWWA Manual M-11, Figure 13.26. Outlets shall be 3,000 pound WOG forged steel per ASTM A 105 or ASTM A 216, Grade WCB. Threads shall comply with ASNI B2.1. Outlets shall be Bonney Forge Co. "Thread-o-let", Allied Piping Products Co. "Branch-let", or approved equal.

2. Outlets Larger than 2-1/2 inches in Diameter: For outlet larger than 2-1/2-inches in diameter, flanged tees shall be used. Structural steel for outlet reinforcement shall conform to the

requirements of ASTM A36.

I. Length of Pipe Sections

Pipe sections shall be limited to 40 feet or less. For sections longer than 30 feet, spreader beams, and lifting straps shall be used to lift pipe sections and prevent sagging or deflection of the pipe and preserve the integrity of the mortar lining.

J. Joints

1. Above Ground Joints: Joints above ground or in vaults and structures shall be flanged or grooved end, unless specifically indicated otherwise on the project plans.

2. Buried Joints: Buried joints shall be:

   a. Bell and Carnegie shape spigot with rubber gaskets.

   b. Bell and spigot lap welded joints for field welded joints, except where butt-strap joints, butt-welded joints, or flanged joints are used. Lap joints shall be in accordance with AWWA C-200. The method used to form, shape and size bell ends shall be such that the physical properties of the steel are not substantially altered.

   c. Provide plain-end pipe for flexible pipe couplings.

   d. Butt-strap joints. Closure pieces may also require butt-strap joints with "hand-holes" and threaded steel plugs welded into place (for proper repair of the lining of the interior pipe joints).

3. Grooved-End Joints: Grooved-end joints shall be flexible, rolled grooves, per AWWA C-606, Table 5.

K. Product Marking

Each length of straight pipe and each special shall be plainly marked inside and out at the bell end to identify the design pressure or head, the steel wall thickness, the date of manufacture, and the proper location of the pipe item by reference to the layout schedule. For beveled pipe, the degree of bevel and the point on the circumference to be laid uppermost shall be shown.

L. Painting and Coating

1. General: Unless noted otherwise, buried pipe shall be cement-mortar coated per AWWA C205. Cement-mortar coating shall be ¾ inch, minimum thickness for all sizes of pipe unless otherwise specified on the contract plans. The tolerance for the coating is -0.0" to +1/4".

2. Exposed Pipe: Pipe located above ground or in vaults and structures shall be painted in accordance with Section 09900 (Painting and Coating). Primer shall be shop applied.

3. Grooved-End Couplings: Grooved-end couplings shall be coated the same as the adjacent pipe.

M. Lining

Unless noted otherwise, pipe and fittings shall be cement-mortar lined per AWWA C205.

The minimum lining thickness shall be per AWWA C205 and are summarized below:

Nominal Pipe Diameter	Lining thickness	Tolerance
4" to 10"	¼"	-1/16" to +1/8"
11" to 23"	5/16"	-1/16" to +1/8"
24" to 36"	3/8"	-1/16" to +1/8"

N. Epoxy Lining

Epoxy lined pipe shall be per AWWA C213 where called for on the plans. Epoxy lining shall be two-part low VOC epoxy-polyamide or two-part amido-amine epoxy as specified as System B-2 of Section 09900 (Painting and Coating). Epoxy lining shall be Tnemec Series L140F Pota Pox, PPG Ameron Amerlock VOC; International/Devoe 233H; Sherwin Williams Macropoxy 646-100PW; or approved equal.

PART 3 - EXECUTION

A. Fabrication

1. Reference Standards: Fabrication shall comply with ANSI B31.3, Chapter V. Welding procedure and performance qualifications shall be in accordance with Section IX, Articles II and III, respectively, of the ASME Boiler and Pressure Vessel Code.

2. Welding

   a. The pipe cylinder shall be fabricated by butt welding, spiral seam, or straight seam. Girth welds shall be limited to two per pipe section, butt welded. Longitudinal welds shall be limited to one seam. Longitudinal joints of adjacent shell courses shall be staggered.

   b. For field welding, the shielded metal arc welding (SMAW) process shall be used. For the shop fabrication of special fittings and appurtenances, the submerged arc welding (SAW) process and the flux cored arc welding (FCAW) process are acceptable alternatives. All welding shall be done by qualified, certified welders.

   c. Welds shall be in accordance with ANSI B31.3, paragraph 327.4.

   d. Welding preparation shall comply with ANSI B31.3, paragraph 327.3. Limitations on imperfections in welds shall conform to the requirements in ANSI B31.3.

   e. For the SMAW process, welding electrodes shall comply with AWS A5.1. For the SAW process, welding electrodes shall comply with AWS A5.17. For the FCAW process, welding electrodes shall comply with AWS A5.20.

   f. Each layer of deposited weld metal shall be cleaned using a power-driven wire brush

prior to depositing the next layer of weld metal. The final pass shall be cleaned by a power-driven wire brush.

g. For field welds using the SMAW process, a minimum of three passes shall be used for welded joints on 36-inches in diameter and larger. Welds shall be full circumferential. For controlled shop welding processes using SAW or FCAW, weld joints may be made with two passes.

h. Beveled ends for butt welding shall conform to ANSI B16.25. Slag shall be removed by chipping or grinding. Surfaces shall be clean of paint, oil, rust, scale, slag, and other material detrimental to welding. When welding the reverse side, slag shall be chipped out before welding.

B. Joint Ring Protective Coating

The exposed portion of joint rings shall be coated with a 3-mil minimum thickness organic zinc pigmented coating meeting U.S. Federal Specification TT-P-641.

C. Shop Hydrostatic Test

After completion of fabrication and welding in the shop, and prior to the application of any lining and coating, each section of steel pipe shall be shop tested. The steel cylinder with joint rings shall be stressed to 75% of the minimum yield stress of the steel.

D. Shop Testing of Fittings

1. Dye Penetrant Test: Seams in fittings which have not been previously shop hydrostatically tested shall be tested by the dye penetrant method as described in ASME Boiler and Pressure Vessel Code Section VIII, Appendix B.

2. Air-Soap Test: In addition to the dye penetrant method of testing, the air-soap method with air at 5 psi shall be used on joints susceptible to being tested by such a method.

3. Pressure Test in Lieu of Dye Penetrant Test: In lieu of the dye penetrant method of testing, completed fittings may be hydrostatically tested using the field hydrostatic test pressure or 125% of the design pressure, whichever is higher.

E. Pipe Bracing

1. Adequate pipe bracing shall be provided on all specials, fittings and straight pipe so as to avoid damage to the pipe and fittings during handling, storage, and hauling. The pipe bracing shall be placed as soon as practical and shall remain in place while the pipe is loaded, transported, and unloaded at the job site. Pipe sections shall be braced within 12 inches of each end with two 2 x 4's wedged in the pipe at right angles to each other for 18 inch diameter pipe and larger.

2. Piping shall be transported with vertical and horizontal bracing per manufacturer's plan. Any pipe damaged during handling, hauling, or storage due to improper bracing shall be repaired or replaced.

F. Delivery of Small Parts

Small parts, consisting of gaskets, bolts, nuts, washers, jumper rods, and flange insulation kits, shall be delivered to the job site in suitable containers, each marked to identify the contents.

G. Installation

Pipe shall be installed in accordance with the requirements of Section 15051 (Installation of Pressure Pipelines).

H. Field Inspection of Cement Mortar Lining and Interior Pipe Joints

Mesa Water my require the contractor to perform closed circuit television (CCTV) inspection of the interior of all pipeline segments with diameters less than 30-inches; and for all sections of pipe, regardless of diameter, which are deemed not readily accessible for inspection by Mesa Water's personnel. Mesa Water will provide the specifications and requirements for the interior pipe inspection on a case by case basis.

END OF SECTION

SECTION 15089

COMBINATION AIR RELEASE AND VACUUM RELIEF VALVES

PART 1 - GENERAL

A. Description

This section describes materials and installation of combination air release and vacuum relief valves, air-release valves, and air and vacuum valves.

B. Related Work Specified Elsewhere

1. Painting and Coating: 09900.
2. Hydrostatic Testing of Pressure Pipelines: 15042.
3. Copper Pipe and Fittings: 15057.
4. Manual Valves: 15100.

C. Submittals

1. Submit manufacturer's catalog data. Show dimensions, materials of construction by ASTM reference and grade, and coatings.

D. Application

1. Combination air release and vacuum relief valves (combination air valves) shall be installed at high points on the pipelines and as shown on the plans.
2. If the profile changes during construction from that shown on the drawings, combination air valve assemblies shall be installed at the high points on the pipelines as constructed. The location of the valve cover shall be coordinated with Mesa Water’s field representative.
3. Combination air valve assemblies shall function to slowly release pockets of air which accumulate at high points, changes in line gradient, exhaust large quantities of air from pipeline while being filled and admit large quantities of air into the pipeline when being drained to prevent air lock or vacuum collapse of the pipe.

PART 2 – MATERIALS

A. Coating

Valves shall be coated on the exterior in accordance with Section 09900 (Painting and Coating). Prime coat shall be shop-applied at the place of manufacture. Color of finish coat shall match the color of the adjacent piping. Finish coat shall be applied in the field.

B. Lining

The interior surfaces of the combination air valves shall be coated per Section 09900 (Painting and Coating), System G-1. Seating areas and plastic, stainless steel, or other high alloy parts shall not be coated. Internal lining for potable water facilities shall be NSF 61 approved epoxy to a minimum thickness of 12 mils (DFT) and shall be Holiday tested.

C. Bolts and Nuts for Flanged Valves

1. Bolts and nuts for flanged valves and flanges shall be Type 316 stainless steel conforming to ASTM A 193, Grade B8M, for bolts and ASTM A 194, Grade 8M, for nuts. The length of each bolt or stud shall be such that between ¼ inch and ½ inch will project through the nut when drawn tight.

2. Washers: Washers shall be provided for each nut; shall be of the same material as the nuts; and shall be installed adjacent to the nut, between the nut and the flange.

D. Gaskets

Gaskets for flanged end valves shall be as described in the detailed, individual piping specifications.

E. Valves

1. Valves shall be manufactured in accordance with AWWA C-512.

2. Air Release Valves, 1-Inch and 2-Inch.

   a. Air-release valves for water service shall function to slowly release pockets of air which accumulate at high points in piping systems. Valves shall have a float-actuated compound lever with linkage mechanism to release air. Float shall withstand an external pressure of 1,000 psig without collapsing.

   b. Air-release valves shall incorporate a body with flanged top cover and replaceable orifice and a synthetic rubber needle or disc actuated by the float and linkage mechanism. Top cover or near the bottom of the valve body shall include a 3/8-inch threaded outlet with stainless steel plug.

   c. Materials of construction for air release valves shall be as follows:

Component	**Material**	**Specification**
Body and cover	Cast iron	ASTM A 126, Class B
Float	Stainless-steel	AISI Type 316, ASTM A 240 or A 276
Linkage, orifice air-release mechanism	Stainless-steel	AISA Type 316, ASTM A 240 or A 276
Seat	EPDM	--

d. Valves shall be designed for an operating pressure of 150 psi. Valves shall be APCO, ValMatic, Crispin or approved equal.

3. Air and Vacuum Valves, 3-Inch and greater.

a. Air and vacuum valves for water service shall have a float assembly and large venting orifice to exhaust large quantities of air from pipelines when being filled and to admit large quantities of air when pipelines are being drained. The float shall rise with the water level in the valve body to close the orifice by sealing against a synthetic rubber seat. Float shall withstand an external pressure of 1,000 psig without collapsing.

b. Air and vacuum valves 3-inches and smaller shall have 1/2-inch threaded outlets with stainless steel plugs in the top cover and near the bottom of the valve body. Air and vacuum valves larger than 3-inches shall have a 1-inch threaded drain outlet with stainless steel plug near the bottom of the valve body and a 1-inch threaded outlet with stainless steel plug on the side of the valve body above the minimum water level. Float shall be able to withstand an external pressure of 1,000 psig without collapsing.

c. Materials of construction for air and vacuum valves for shall be as follows:

Component	**Material**	**Specification**
Body and cover	Cast iron	ASTM A 126, Class B
Float, guide rod, guide bushings	Stainless-steel	AISI Type 316, ASTM A 240 or A 276
Seat	EPDM	---

d. Valves shall be designed for an operating pressure of 150 psi. Valves shall be APCO, Crispin, Val-Matic or approved equal.

4. Combination Air Release and Vacuum Relief Valves, 1-Inch Through 4-Inch

a. Combination air-release valves for water service shall consist of both an air and vacuum valve and air-release functions contained in one body. The air and vacuum shall serve to release and admit large quantities of air when pipelines are filled and drained. The air-release shall serve to release small quantities of air that accumulate during pipeline operation.

b. Valves shall have an operating pressure of 150 psi. Valves shall be APCO 140C/150C Series; Val-Matic 200C Series, Crispin UL Series or approved equal.

c. Materials of construction for the combination air valves shall be as follows:

Materials of construction for	Material	Specification
Body and cover	Cast iron	ASTM A 126, Class B
Float, float arm, poppet	Stainless-steel	AISI Type 316, ASTM A 240 or A 276
Valve Trim	Stainless-steel	AISI Type 316, ASTM A 240 or A 276
Seat, orifice button	EPDM	--
Cover Bolts	Stainless-steel	AISI Type 316

F. Valve End Connections

1. Applications: Valves smaller than 3-inches shall have threaded ends. Valves 3-inches and larger shall have flanged ends.

2. Flanged Connections: Flanges for Class 150 valves shall comply with ANSI B16.1, Class 125.

3. Threaded Connections: Threaded ends shall comply with ANSI B1.20.1.

G. Service Piping

Water service piping utilized in the installation of the 2" and smaller combination air release and vacuum relief valves shall be Type K copper with brass accessories per Section 15057 (Copper Pipe and Fittings).

H. Vented Cover

1-inch and 2-inch valves shall be enclosed inside a removable, cylindrically-shaped, vented cover as shown on Mesa Water's Standard Drawings. Vented covers shall be manufactured of linear-low-density polyethylene (LLDPE) as made by Amorcast Products, Pipeline Products, Inc. or approved equal. The color of the vented cover shall be selected by Mesa Water. The cover shall be 18-inch diameter by 30-inches high vented enclosure.

3-inch and 4-inch valves shall be enclosed inside a removable, cylindrically-shaped, vented cover fabricated of welded steel pipe, hot dip galvanized after fabrication and painted in accordance with Section 09900 (Painting and Coating).

PART 3 – EXECUTION

A. Installation

1. Combination air valve assemblies shall be installed in accordance with the details on Mesa Water's Standard Drawings.

2. The tap for the air valves shall be made in a level section of pipe no closer than 18-inches to a bell, coupling, joint, or fitting.

3. Flanged Connections: Flanges shall be cleaned by wire brushing before installing flanged valves. Flange bolts and nuts shall be cleaned by wire brushing, and threads lubricated with oil and graphite. Nuts shall be tightened uniformly and progressively. If flanges leak under pressure testing, nuts and bolts shall be loosened or removed, the gasket reseated or replaced, the bolts and nuts reinstalled or retightened, and joints retested. Joints shall be watertight.

4. Threaded Connections: Threaded joints shall be cleaned by wire brushing or swabbing. Teflon joint compound or Teflon tape shall be applied to pipe threads before installing threaded valves. Joints shall be watertight.

B. Valve Pressure Testing

Valves shall be tested at the same time that the connecting pipelines are pressure tested. See Section 15042 (Hydrostatic Testing of Pressure Pipelines) for pressure testing requirements. Protect or isolate any parts whose pressure rating is less than the test pressure.

END OF SECTION

SECTION 15100

MANUAL VALVES

PART 1 - GENERAL

A. Description

This section includes materials, testing, and installation of manually operated valves and check valves.

B. Related Work Specified Elsewhere

1. Painting and Coating: 09900.

2. Hydrostatic Testing of Pressure Pipelines: 15042.

C. Submittals

1. Submittals shall include the following minimum information. Factory signed and dated certification of compliance shall accompany all submittals. Signatures of agents or distributors of the factory will not be accepted.

    a. Manufacturer's catalog data and detail construction sheets showing all valve parts and describing material of construction by material and specification (such as AISI, ASTM, SAE, or CDA).

    b. Show valve dimensions including laying lengths. Show dimensions and orientation of valve operators, as installed on the valves.

    c. Show valve linings and coatings.

    d. Factory torque sheets minimally supplying actuator output and valve input torque requirements. Method for calculating input torque shall be the same as per AWWA Class 150B designation.

    e. Manufacturer’s warranty.

D. Valve Selection

For 4-inch through 12-inch diameter valves, the contractor shall provide resilient-seated gate valves rated for 250 psi working pressure. For valves larger than 12-inches in diameter, the contractor shall provide butterfly valves or resilient-seated gate valves.

PART 2 - MATERIALS

A. General

Valves shall be provided complete with operating hand-wheels, levers, chain-wheels, extension stems, floor stands, worm gear operators, operating nuts, chains, and wrenches required for operation.

Valves shall have the name of the manufacturer and the size of the valve cast or molded onto the valve body or bonnet or shown on a permanently attached corrosion-resistant plate.

The flanges of valves may be raised or plain faced. Flanges of valves designed for a working pressure of 150 psi or less shall be faced and drilled to a 125 pound American Standard dimension. Flanges of all valves designed for a working pressure of greater than 150 psi shall be faced and drilled to 250 pound American Standard dimensions.

Body bolts for all valves shall be Type 316 stainless steel.

The contractor or developer shall choose an approved valve manufacturer and then use it throughout the development.

B. Butterfly Valve Actuators

1. Actuators for Exposed Valves Smaller Than 6-Inches: See section on gate valves.

2. Actuators for Buried Valves

    a. Valves for buried and submerged applications shall be provided with a direct acting 2-inch square AWWA wrench nut. The wrench nut shall have an arrow cast thereon, indicating the direction of opening. All valves shall be open by turning the nut counter-clockwise and close by turning the nut clockwise. The wrench nut shall be suitably fastened to the actuator input shaft. If the shaft is smooth, the wrench nut shall be fastened to the input shaft by means of a 5/16-inch diameter stainless steel pin passing entirely through the shaft and the wrench nut. Key with keyway shall also be acceptable. If the shaft is splined, the wrench nut shall be formed to fit the splined shaft.

    b. Provide totally enclosed operators designed for buried service with watertight shaft seals and watertight valve and actuator cover gaskets.

    c. Buried valves shall have a water tight seal plate in place of the valve position indicator. No rotating part indicating position shall be allowed for valves intended for buried service.

3. Actuators for Valves 4-Inches and Larger

Gear actuators shall be provided on all butterfly valves,12-inches. Butterfly valves less than 24-inch in diameter shall have gear actuators of the "traveling nut type". Traveling-nut actuators shall be furnished on all valves in this size range unless torque or pressure conditions dictate a "worm gear type". Gear actuators for valves 24-inch in diameter and larger shall be of the "worm gear type". Worm gear actuators shall be furnished on all valves in this size range.

4. General Requirements for Gear Actuators

   a. Gear actuators shall be enclosed, suitable for running in grease with seals provided on shafts to prevent entry of dirt and water into the actuator. External trim and all threaded parts of the actuator shall be Type 316 stainless steel material.

   b. Gear actuators shall be of the totally enclosed design, proportioned to permit operation of the valve under full operating head in either direction, with a maximum pull of 80 pounds on the hand-wheel or with a maximum input of 150 ft-lbs applied to the AWWA wrench nut. Design and torque capacity shall consider flow and shut-off in "Both" directions.

   c. Actuators shall be provided with "open" and "closed" position stop limiting devices. Actuators shall be of the self-locking type to prevent the disc or plug from creeping.

5. Specific Requirements for Traveling Nut Gear Actuators

   a. Traveling nut actuators shall withstand 450 foot pounds of input torque against the stop limiting devices without causing damage.

   b. Signed factory compliance shall accompany submittals stating that these specifications and the applicable standards have been adhered to.

   c. All exposed threaded parts, including cap screws, case bolts, carriage bolts, cover screws, machine screws, set screws, bonnet bolts on the worm gear housing or any other exterior location of the actuator, its cover or housing shall be Type 316 stainless steel.

   d. Traveling nut type gear actuators shall be able to rotate the valve element (disc, plug, or ball) from the fully "closed" position to the fully "open" position with a number of turns of the actuator nut or wheel. For 4-inch through 10-inch valves, the number of turns shall not be fewer than 29 turns. For 12-inch through 20-inch valves, the number of turns shall not be fewer than 29 turns and not more than three (3) times the number of diameter inches. Where the number of turns may fall outside of the range for turn limits above, the use of a factory attached spur gear reducer shall be used to provide the appropriate number of rotations from the fully "open" to the fully "closed" position.
   Spur gear assemblies shall be mounted integrally to the actuator by approved means and shall meet all of the other component and torque requirements listed herein.

e. Actuators shall be Pratt Series MDT, Dezuirk M-Series, Mueller MDT, or approved equal.

6. Specific Requirements for Worm Gear Actuators

a. Worm gears shall be of the "self-locking" one-piece design of gear bronze material (ASTM B-427), accurately machine cut.

b. The worm shall be hardened alloy steel (ASTM A 322, Grade G 41500; or ASTM A 148, Grade 105-85), with thread ground and polished.

c. The reduction gearing shall run in a proper lubricant inside a ductile iron housing.

d. All exposed (at the exterior of the actuator) threaded parts, including cap screws, case bolts, carriage bolts, cover screws, machine screws, set screws, bonnet bolts on the worm gear housing or any other exterior location of the actuator, its cover or housing shall be Type 316 stainless steel.

e. Actuator components shall be designed to withstand a pull of 200 pounds for hand-wheel or chain-wheel actuators between the input and stop limiting devices without damage, and an input torque of 300-foot-pounds for operating nuts when operating against the stops.

f. Gear actuators shall be able to rotate the valve element (disc, plug or ball) from the fully "closed" position to the fully "open" position with a number of turns of the operator nut or wheel, not fewer than one-and-a-half (1.5) times the number of diameter inches and not more than three (3) times the number of diameter inches.

Where the number of turns may fall outside of the range for turn limits above, the use of a factory attached spur gear reducer shall be used to provide the appropriate number of rotations from the fully "open" to the fully "closed" position. Spur gear assemblies shall be mounted integrally to the actuator by approved means and shall meet all of the other component and torque requirements listed herein.

g. Actuators shall be Limitorque Model HBC or PT Series, EIM Model WB Series, or Auma GS Series. There are no known equals.

7. Operating Torque Requirement for Buried Valves: Actuators on buried valves shall be designed to produce the specified torque with a maximum input of 150 ft-lbs applied to the wrench nut (at the maximum rated pressure and a velocity of 15 fps). Submittals shall include factory torque sheets minimally supplying operator output and valve input torque requirements. Torque safety factors shall comply with the latest versions of AWWA Standards.

8. Hand wheels: Valves for above-ground applications shall be provided with a hand-wheel. Minimum hand-wheel diameter shall be 12-inches. The hand-wheel shall have

an arrow thereon, indicating the direction of the opening. The hand-wheel shall be suitably fastened to the actuator input shaft.

Actuators equipped with hand-wheels shall be designed to produce the specified torque with a maximum pull of 80 pounds of the hand-wheel rim. Submittals shall include factory torque sheets minimally supplying operator output and valve input torque requirements. Torque safety factors shall comply with the latest versions of AWWA Standards.

9. Opening Direction: Valve actuators, hand-wheels, or levers shall open by turning counterclockwise. (Commonly stated as, "open-left – close-right").

10. Position Indicators: Valve position indicators shall be provided for all above ground valves.

C. Valve Boxes for Buried Valves

1. General: Valve risers shall be 8-inch SDR 35 or Schedule 40 PVC pipe.

2. Valve Box Lids: Valve box lids shall be for traffic use, and shall be concrete and cast-iron, and shall be designed to rest without a frame on a cast-in-place concrete ring surrounding the valve extension pipe. The lid skirt shall be tapered for a close fit inside the upper sleeve portion of the valve box. Lids shall be triangular with the word "Water" cast into the top surface of the valve box lid. Lids shall be coated and colored in accordance with Section 09900 (Painting and Coating), System No. C-1.

3. Manufacturers: Valve boxes shall be triangular in shape and shall be Brooks 4-TT, Eisel Enterprises, Inc. No. 4TT, H&C 4TT. There are No Equals.

D. Extension Stems for Buried Valve Actuators

Where the depth of the valve is such that its operating nut is more than 4-feet below grade, operating extension stems shall be provided to bring the operating nut to a point between 24 to 36-inches below the surface of the ground and/or box cover. Extension stems shall be solid Type 316 stainless steel, and shall be complete with 2-inch-square operating nut. Stem shall be provided with a 1/8-inch centerguide to keep stem centered. Pinned couplings are not permitted. Extension stems shall conform to Mesa Water's Standard Drawings.

E. Bolts, Nuts, and Gaskets for Flanged Valves

Bolts and nuts for flanged valves shall be heavy hex head Type 316 stainless steel (B8M) described in the detailed individual piping specifications.

F. Painting and Coating for Valves

1. Exterior Coating for All Metallic Valves: All valves (except bronze and stainless-steel valves) whether they are to be installed above ground, in vaults, in structures, or they are to be buried, shall be coated in accordance with Section 09900 (Painting and Coating), System No. C-1 or System No. G-1 and shall be Holiday free. The specified prime coat shall be applied at the place of manufacture. Intermediate and finish coats shall be applied in field. Finish coat shall match color of the adjacent piping. Hand-wheels shall receive the same coating as the valves. Exposed portions of the valve shaft shall not be coated.

2. Interior Coating: Metal valves 4-inches and larger shall be coated on the interior metal parts, excluding seating areas and bronze and stainless-steel pieces, per Section 09900 (Painting and Coating), System No. G-1 or System No. G-2. Coating shall be factory applied by the valve manufacturer. Valve coatings shall be field spark tested and shall be Holiday-free.

G. Valves

1. Resilient Seated Gate Valves, 4-Inches Through 12-Inches: Resilient seated wedge-type, gate valves shall conform to AWWA 509 and the following requirements. Valve shall have a wedge-type resilient seat, fully encapsulated in peroxide-cured EPDM. Valves shall be designed for a minimum working pressure of 200 psi, and shall be bubble-tight at that pressure. Valves shall have non-rising stems fabricated of Type 304 or Type 316 stainless steel. As an alternative stem material may be high strength bronze alloy. Stem nuts shall be independent of the gate and shall be made of bronze.

   Materials of construction shall be as follows:

Component	**Material**	**Specification**
Body operating nut, bonnet, seal plate	Ductile Iron	ASTM A-536, Grade 65-45-12
Gate	Ductile iron	ASTM A536, Grade 65-45-12
Stem	Stainless Steel Or high-strength Low zinc Bronze	AISI 430F, ASTM A-582 Type 304 or Type 316 ASTM B-584 CDA 867
Stem Nut	Bronze	ASTM A-116 CDA 844
Bonnet and seal plate or Gland Nuts and Bolts	Stainless-steel	ASTM A276, Type 316
Valve Seat	EPDM Rubber	ASTM D-412
O-rings	Synthetic-rubber	ASTM D2000

   Low friction, torque reduction thrust bearings shall be provided both above and below the stem collar. Stuffing boxes shall be O-ring seal type with two rings located in stem above thrust collar.

Each valve shall have a smooth unobstructed waterway free from any sediment pockets.

Valves shall be Clow Resilient Wedge Gate Valve, Mueller A2360, American AVK, M&H Style 4067, or approved equal.

2. Butterfly Valves: Butterfly valves shall be short body, flanged type, conforming to AWWA C504, Class 150B. Wafer style valves are not permitted. The minimum working differential pressure across the valve disc shall be 150 psi.

Valve ends shall be as shown on the drawings and in all cases shall match the class rating of the valve. Class 150 valves shall have 150-lb flanges and Class 250 valves shall have 250 lb. flanges. Flanged ends shall be Class 125, ANSI B-16.1 unless otherwise specified.

Valve shafts shall be Type 304 or 316 stainless steel for Class 150 valves and 17-4 PH stainless steel for class 250 valves. Valve shafts shall be stub shaft or one-piece units extending completely through the valve disc.

Valve bodies shall be tested at a pressure equal to twice the design working pressure. Gears shall be sized for bi-directional flow at 15 fps and at full rated pressure differential.

Materials of construction shall be as follows:

Component	**Material**	**Specification**
Body	Ductile iron	ASTM A536, Grade 65-45-12
Valve Shaft (CL 150)	Stainless Steel	Type 304 or Type 316
Valve Shaft (CL 250)	Stainless Steel	Type 17-4 PH
Exposed body capscrews, bolts & nuts (including squeeze-pins)	Stainless-steel	ASTM A276, Type 316
Discs	Ductile iron	ASTM A536, Grade 65-45-12
Valve Seat	EPDM Rubber	ASTM D-412
O-Rings	Synthetic Rubber	ASTM D-2000

The rubber seat shall be made from peroxide-cured EPDM rubber and shall be fastened integrally with the valve body. Rubber seats fastened to the disc by any means shall not be allowed.

Valves shall be Pratt Groundhog, Dezurik BAW, Mueller Lineseal, or approved equal.

3. Ball Valves 2-Inches and Smaller: Ball valves, 2-inches and smaller, for water service shall be three-piece body style and shall be manufactured of Type 316 stainless steel. The minimum design operating pressure rating shall be 300 psi WOG at a temperature of 150°F. Valves shall have plastic coated lever operators with a locking mechanism. Valves shall have full bore ports, female iron pipe thread screwed ends, and non-blowout stems.

   Materials of construction shall be as follows:

Component	**Material**	**Specification**
Body, ball, stem	Stainless-steel	Type 316, ASTM A276
Seat, seals	Teflon	

   Valves shall be Apollo, Sharpe, Xomox, or Stockham Figure S-127 or approved equal.

4. Check Valves 4-inches and Larger:

   a. Swing Check Valves: Swing check valves shall conform to AWWA C-508, and shall be iron body, mounted with the following materials of construction:

Component	**Material**	**Specification**
Disc	Ductile Iron	ASTM A-536, Grade 65-45-12
Body and Cap	Ductile Iron	ASTM A-536, Grade 65-45 -12
Hinge or Arm	Cast Iron	ASTM A-126, Class B
Hinge Pin	Stainless Steel	ASM A-276, Type 304 or 410
Cover Bolts & Nuts	Stainless Steel	ASTM A276, Type 316

      Ends shall be flanged, Class 125, ANSI B-16.1. Valves shall be designed for a minimum working pressure of 150 psi. Valves shall be equipped with outside lever and spring.

      Valves shall be Clow 1106, M&H Style 259, Pratt Series 8001, or approved equal.

   b. Silent Check Valves, Class 150: Silent check valves shall be flanged. Valves shall be equipped with a spring mechanism to provide for non-slam closure of the valve without backflow, in any position, and shall not be dependent on gravity or backflow for closure.

Materials for construction shall be as follows:

Component	Material	Specification
Disc	Aluminum Bronze	ASTM B-148
Body	Ductile Iron	ASTM A-536, Grade 65-45 -12
Spring, Pin, Stops	Stainless Steel	ASM A-276, Type 316
Cover Bolts & Nuts	Stainless Steel	ASTM A276, Type 316
Seat	EPDM Rubber	ASTM D-412

Ends shall be flanged, Class 125, ANSI B-16.1.

Valves shall be APCO Series 600, Pratt Series 821, Val-Matic or approved equal.

5. Solenoid Valves 1-1/2 inch and Smaller:

Solenoid valves of sizes ¼-inch through 1-1/2 inch for water and air service shall have forged brass (Alloy C-23000) or bronze (ASTM B-62) bodies with Teflon main seats. Valve components in contact with potable water shall be NSF 61 certified. Internal plunger, core tube, plunger spring, and cage assembly shall be stainless steel (Types 302, 304, or 305). Solenoid enclosures shall be NEMA Type 4. Valve actuators shall be 120-volt AC or 24-volt DC as stated on the plans. Seals shall be Teflon. Valves shall have a maximum operating pressure and a maximum differential pressure of 250 psi.

Solenoid valves shall be energized to open or close, as required, and as noted on the plans. Valves shall be ASCO "Red Hat" only. There are no equals.

6. Tapping Valves

Tapping valves shall conform with the requirements for resilient seated gate valves. Valve ends shall be flanged, and the flange at one end shall have slotted bolt holes to fit standard tapping machines. Seat rings shall be oversized to permit the use of full-size cutters. Tapping valves shall be Clow Resilient Wedge Gate Valve, Mueller, American AVK, M&H, or approved equal.

7. Tapping Sleeves

Tapping sleeves shall be either the "mechanical joint" type with stainless steel plug, or stainless steel full-circle style sleeves. Gaskets shall be EPDM rubber with a wide cross-section. Bolts, nuts, and washers shall be Type 316 stainless steel. Mechanical

joint tapping sleeves shall be JCM Industries, Inc., JCM 414, Mueller H-615, or approved equal. Stainless steel full-circle tapping sleeves shall be JCM Industries, Inc., JCM 432, Mueller H-304SS, Romac SST111 or approved equal. All tapping sleeves for use on Asbestos Cement Pipe shall be mechanical joint type.

PART 3 - EXECUTION

A. Joints

1. Flanged Joints: Boltholes of flanged valves shall straddle the horizontal and vertical centerlines of the pipe run to which the valves are attached. Flanges shall be cleaned by wire brushing before installing flanged valves. Flange bolts and nuts shall be cleaned by wire brushing, threads shall be lubricated with oil and graphite, and nuts shall be tightened uniformly and progressively. If flanges leak under pressure testing, nuts and bolts shall be loosened or removed, the gasket shall be reseated or replaced, the bolts and nuts shall be reinstalled or re-tightened, and the joint retested. Joints shall be watertight.

2. Threaded Joints: Threaded joints shall be cleaned by wire brushing or swabbing. Teflon joint compound or Teflon tape shall be applied to pipe threads before installing threaded valves. Joints shall be watertight.

B. Valve Installation

1. Buried Valves: Buried valves shall be wrapped with two layers of 8-mil polyethylene wrap per AWWA C105.

2. Valve Supports: Valves shall be anchored in concrete as shown on Mesa Water's Standard Drawings. Supports are not required for buried valves bolted to flanged pipe or fixed or supported fittings. Supports shall be installed prior to pressurizing the system.

3. Backfill: Backfill within 24-inches of valves shall be clean washed sand in accordance with the requirements of Section 02223 (Trenching, Backfilling, and Compacting).

4. Valves in horizontal runs of pipe shall be installed with their operating stems horizontal.

5. Valves on vertical runs of pipe that are next to wall shall be installed with their stems horizontal, away from the wall. Valves on vertical runs of pipe that are not located next to walls shall be installed with their stems horizontal, oriented to facilitate valve operation.

C. Valve Boxes

Valve boxes shall be firmly supported and shall be kept centered and plumb over the operating nut of the valve. Beveled sections of pipe will not be allowed at the top of the valve riser pipe. The top cut shall be square and machine made.

In new tracts, and where pavement has not been placed, the valve extension risers for "key valves" shall extend well above the ground level to permit ease of location in the event of the need for emergency shut-off. The final valve box elevation shall be flush with the finished pavement surface.

D. Valve Leakage Testing

1. Valves shall be tested for leakage at the same time that the connecting pipelines are tested. See Section 15042 (Hydrostatic Testing of Pressure Pipelines) for pressure testing requirements.

2. Valve Leakage Witness – Pressure Testing:

   All butterfly valves 12-inches in diameter and larger, shall be flanged to facilitate testing. Valves may be tested in a horizontal position. All valves shall be tested bi-directionally after the actuator is installed and the adjustment stops are set. Each side of the valve is to be tested for a duration of at least five (5) minutes at the pressure class rating of the valve with zero loss or leakage.

   The pressure test shall be witnessed by Mesa Water's field representative. Final tests shall be performed within 20 miles of the project site. A minimum of 72 hours advance notice to Mesa Water for testing scheduling is required.

E. Tapping Sleeves

Tapping sleeves shall be installed in accordance with the manufacturer's instructions. The pipe barrel shall be thoroughly cleaned with a wire brush to provide a smooth, hard surface for the sleeve. The sleeve shall be supported independent of the pipe during the tapping operations. The sleeve shall be pressure tested in the presence of Mesa Water's Representative prior to tapping. The stainless steel bolts on the tapping sleeve shall be tightened with 85 to 125 foot-pounds of torque, and retightened after tap is completed. Thrust blocks shall be provided at the tapping sleeve.

END OF SECTION

SECTION 15112

BACKFLOW PREVENTERS

PART 1 - GENERAL

A. Description

This section includes materials, installation, and testing of backflow prevention assemblies.

B. Related Work Specified Elsewhere

1. Copper Pipe and Fittings: 15057.

2. Manual Valves: 15100.

3. Meters: 15150.

C. Submittals

1. Submit certification showing that the backflow device is approved by the Foundation for Cross-Connection Control and Hydraulic Research, University of Southern California, School of Engineering.

PART 2 - MATERIALS

A. Shut-Off Valves

1. Gate Valves: The shut-off valves shall be resilient seated gate valves conforming to Section 15100 (Manual Valves), except that these valves shall have outside stems and yokes.

2. Ball Valves: Valves two-inches and smaller shall be ball valves and shall conform to the requirements of Section 15057 (Copper Pipe and Fittings).

B. Fireline By-Pass Piping

By-pass piping shall be copper or brass conforming with Section 15057 (Copper Pipe and Fittings). The by-pass shall include a meter conforming to the requirements of Section 15150 (Meters) and an approved backflow prevention assembly.

C. Backflow Prevention Assembly

Backflow prevention assemblies shall conform to the latest edition of AWWA C510 or C511 and the "Manual of Cross-Connection Control", Foundation for Cross-Connection Control and Hydraulic Research, University of Southern California, School of Engineering.

D. By-Pass Meter and Backflow Prevention Assembly

The by-pass meter shall conform with the requirements of Section 15150 (Meters), and shall be compatible with the main backflow device to which it is installed. Mesa Water has standardized with Badger M25 Meter. A Badger M25 meter shall be supplied unless otherwise approved by Mesa Water. The backflow prevention assembly and the by-pass meter and backflow prevention assembly shall be furnished as one complete unit. All by-pass meters shall be 5/8-inch or 3/4-inch in size and shall read in cubic feet.

E. Pipe and Fittings

Riser pipe and fittings for residential, commercial and irrigation backflow prevention assemblies shall be consistent with the pipe materials specified within Section 15051 (Installation of Pressure Pipelines).

Pipe and fittings smaller than 4-inches in diameter shall be brass. Short threaded nipples and brass pipe shall conform to ASTM B 43, regular wall thickness, except that nipples and pipe of sizes 1-inch and smaller shall be extra strong. Threads shall conform to ANSI B1.20.1. Brass material shall conform to ANSI/AWWA Standard C800, with a maximum lead content of 0.25% by average weight.

Pipe and fittings for 4-inch diameter and larger backflow prevention assemblies shall be ductile iron or cement-mortar lined steel pipe.

PART 3 - EXECUTION

A. Installation

Installation shall comply with the requirements of the latest edition of the Manual of Cross-Connection Control, and with the latest plumbing codes and applicable local agency requirements. All backflow prevention devices shall be accessible. Backflow devices shall not be installed in pits, vaults, or similar potential for submergence locations.

B. Testing

1. Testing should be performed according to Mesa Water Rules & Regulations.

2.

END OF SECTION

SECTION 15120

DIAPHRAGM-ACTUATED CONTROL VALVES

PART 1 - GENERAL

A. Description

This section includes materials and installation of hydraulically controlled diaphragm-actuated control valves acting as pressure reducing valves, pressure sustaining valves, solenoid control valves, booster pump control valves, and altitude valves.

B. Related Work Specified Elsewhere

1. Painting and Coating: 09900.

2. Hydrostatic Testing of Pressure Pipelines: 15042.

C. Submittals

1. Submit dimensional drawings for each size and type of valve provided.

2. Provide listing of materials of construction, with ASTM reference and grade. Show valve lining and paint primer coating with coating manufacturer and coating system number or designation.

3. Submit electrical drawings, showing wire and terminal connections, for valves that are electrically controlled.

4. Submit manufacturer's recommended maximum operating pressure and maximum recommended flows.

PART 2 - MATERIALS

A. Valve Design

1. General: Valves shall be hydraulically actuated diaphragm type. The body shall contain a removable seat insert. A resilient rubber disc shall form a drip-tight seal with the valve seat when pressure is applied above the diaphragm. The diaphragm assembly shall form a sealed chamber in the upper portion of the valve, separating operating pressure from line pressure.

2. Component Parts: The pilot control system shall include a fixed or variable orifice, and all major components of this system, except solenoid pilots, shall be manufactured by the same company that manufactures the main valve.

   Elastomers shall be EPDM rubber material. The diaphragm shall not be used as a seating surface.

The valve stem shall be center guided or top and bottom guided. The stem orientation is to be vertical. For top and bottom stem guides, bearings in the valve cover and in the valve seat shall be provided. For center guided valve stems, a bearing in the valve cover shall be provided. Stem sleeves or bearings shall have an anti-scale treatment or shall be Delrin.

A valve position indicator shall be provided. Repairs and modification other than the replacement of the main valve body shall be possible without removing the main valve from the line.

B. Materials of Construction

Materials of construction for Class 125 and Class 250 valves larger than 1 inch in size shall be as follows:

Item	**Material**
Main valve body and cover	Ductile Iron, ASTM A 536 Grade 60-40-18
Main valve trim and seat	Type 303 stainless steel, ASTM A 276, or A351
Pilot control system	Cast bronze, ASTM B 62, with Type 303 stainless-steel trim
Piping and tubing	Copper (ASTM B 75 and B 88) and brass (ASTM B 43)
Bonnet Studs	Type 304 Stainless Steel
Bonnet nuts and body plugs	Type 316 Stainless Steel

C. Valve End Connections

1. General: Valves 2-inches and smaller shall have threaded ends. Valves larger than 2-inches shall have flanged ends.

2. Flanged Ends: Flanges for valves shall be ductile iron meeting the requirements of ASTM A 536. Flanges shall be Class 125 flanges (for 150 psi) and Class 250 flanges (for 300 psi0 conforming to ANSI B16.1.

3. Threaded Ends: Threaded ends shall comply with ANSI B1.20.1.

D. Interior Valve Lining

Interior surfaces of the valve shall be coated in accordance with Section 09900 (Painting and Coating), System No. G-1. Seating areas, stainless steel, or other alloy parts shall not be coated.

E. Coating

Valves shall be coated on the exterior the same as the adjacent piping, and in accordance with Section 09900 (Painting and Coating).

Prime coat shall be shop applied at the place of manufacturer. Finish coats shall be applied in the field. Paint system and color of finish coat shall match that of connecting piping.

F. Valves

1. Class 125 (150 psi) or Class 250 (300 psi) Pressure-Reducing Valves: Pressure reducing valves shall automatically maintain a constant downstream pressure regardless of changing flow rates and/or varying inlet pressures. The pilot control shall be direct-acting, spring loaded, diaphragm valve, designed to permit flow when controlled pressure is less than the spring setting. The pilot control system shall be provided with a strainer, isolation valves, opening speed control, closing speed control, and, where required for low flow, a flow stabilizer or V-port throttling plug. Consult Mesa Water for pressure ranges and initial pressure settings. The valve shall be globe pattern Cla-Val 90-01 Series, Ames ACV 910 Series "Mustang Valve", Watts ACV 115 Series, or approved equal.

2. Class 125 (150 psi) or Class 250 (300 psi) Pressure Sustaining or Pressure Relief Valves: Pressure sustaining/relief valves shall maintain a constant upstream pressure by relieving excess pressure without causing surges. The pilot control system shall operate such that as excess line pressure is dissipated, the valve shall slowly close. The pilot control shall be a direct acting, spring-loaded, diaphragm valve, designed to permit flow when controlling pressure exceeds a spring setting. The pilot control system shall be provided with a strainer, isolation valves, opening speed control (pressure sustaining valves only), and closing speed control. Consult Mesa Water for pressure ranges and initial pressure settings. The valve shall be globe pattern Cla-Val 50-01 Series, Ames ACV 920 Series "Mustang Valve", Watts ACV 116 Series, or approved equal.

3. Class 125 (150 psi) or Class 250 (300 psi) Solenoid Control Valves: Solenoid control valves shall provide on or off service for controlling flow. The pilot control shall be a three-way solenoid valve as specified herein. The pilot control system shall be provided with strainers, isolation valves, opening speed control, and closing speed control. Consult Mesa Water for energized-to-open or de-energized-to-open requirements. The valve shall be globe pattern Cla-Val Series 136-03, Ames ACV 300 Series, "Mustang Valve", Watts ACV 113 Series, or approved equal.

4. Class 125 (150 psi) or Class 250 (300 psi) Booster Pump Control Valve: Booster pump control valves shall be designed for installation on the discharge of booster pumps to eliminate pipeline surges caused by starting and stopping of pumps. Control of valve operation shall be by means of an externally mounted solenoid pilot valve. The solenoid pilot valve shall be as specified herein. Self-cleaning strainers shall be used to protect the control system. Valves shall utilize line pressure for operation. A limit switch shall be provided to be adjustable over entire valve travel. Valve shall be equipped with a check feature to prevent reversal of flow. The valve shall be globe pattern Cla-Val 60-11 Series, ACV 980 Series "Mustang Valve", Watts ACV 113-21, 413-21, or 513-5 Series, or approved equal.

5. Class 125 (150 psi) or Class 250 (300 psi) Altitude Valve: Altitude valves shall be designed to control the high water level in reservoirs. The valve shall be a non-throttling type, remaining fully open until the set-point in the reservoir is reached. Unless noted otherwise, the valve shall provide one-way flow, opening when the water level in the reservoir lowers below the set-point level, and shall be equipped with a check feature to prevent reverse flow. The pilot control shall be a three-way diaphragm valve that operates on the differential force between the height of the water in the reservoir and an adjustable spring load. The valve shall be globe pattern Cla-Val 210 Series, Ames ACV 960 Series, "Mustang Valve", Watts ACV 127 Series, or approved equal.

G. Bolts, Nuts and Washers for Flanged Valves

Bolts and nuts for flanged valves shall be as specified for the piping to which the valves are connected. Washers shall be provided for each nut. Washers shall be of the same material as the nuts.

H. Gaskets

Gaskets for flanged end valves shall be as specified for the piping to which the valve is connected.

PART 3 - EXECUTION

A. Valve Installation

1. Flanged Connections: Boltholes of flanged valves shall straddle the horizontal and vertical centerlines of the pipe run to which the valves are attached. Flanges shall be cleaned by wire brushing before installing flanged valves. Flange bolts and nuts shall be leaned by wire brushing, threads lubricated with oil and graphite, and nuts tightened uniformly and progressively. If flanges leak under pressure testing, the nuts and bolts shall be loosened or removed, the gasket reseated or replaced, bolts and nuts reinstalled or retightened and the joints retested. Joints shall be watertight.

2. Threaded Connections: Threaded joints shall be cleaned by wire brushing or swabbing. Teflon joint compound or Teflon tape shall be applied to pipe threads before installing threaded valves. Joints shall be watertight.

B. Valve Pressure Testing

Valves shall be tested at the same time that the connecting pipelines are pressure tested. See Section 15042 (Hydrostatic Testing of Pressure Pipelines), for pressure testing requirements. Valves, operators, or control and instrumentation systems whose pressure rating is less than the test pressure shall be protected or isolated during pressure testing.

END OF SECTION

SECTION 15139

FIRE HYDRANTS

PART 1 - GENERAL

A. Description

This section includes materials, installation, and testing of wet-barrel type fire hydrants.

B. Related Work Specified Elsewhere

1. Trenching, Backfilling, and Compacting: 02223.
2. Concrete: 03300.
3. Painting and Coating: 09900.
4. Hydrostatic Testing of Pressure Pipelines: 15042.
5. Ductile-Iron Pipe and Fittings: 15056.
6. Manual Valves: 15100.

PART 2 - MATERIALS

A. Hydrant Top Section

1. General: Fire hydrants shall be of the wet barrel type, with individual valves for each outlet, and shall conform with the requirements of AWWA C503.
2. Outlets: Hydrants shall have two (2) 2-1/2-inch outlets and one 4-inch outlet. All outlets shall have National Standard Hose Threads. For residential areas, one (1) 2-1/2-inch outlet and one (1) 4-inch outlet.
3. Materials of Construction: The hydrant top section shall be manufactured of bronze conforming to ASTM B62 or type 304 stainless steel conforming to CF-8 ASTM-A-351. All interior working parts, including stem, shall be of bronze containing no more than 7% zinc or 2% aluminum and NSF61 compliant.
4. Operating Nuts: Hydrants are to be provided with 1-1/2-inch sized pentagon-shaped operating nut, and 1-1/2-inch capnuts.
5. Outlet Caps: Plastic outlet nozzle caps shall be provided for all outlets. Caps shall be securely chained to the barrel with non-kinking metal chain in a manner to permit free rotation of the cap.
6. Flanges: Hydrant flanges shall be drilled with a 6-hole pattern. The flange shall be drilled with 3/4-inch diameter holes located on a 9-3/8-inch bolt circle.

7. Manufacturer Identification: All fire hydrants shall have the name of the manufacturer cast or welded onto the fire hydrant body.

B. Bury Section

1. Materials: The bury section shall be ductile iron and shall be cement lined in conformance with Section 15056 (Ductile Iron Pipe and Fittings).

2. Inlet Connection: Inlet size is to be a 6-inch push-on joint (for short-side hydrant installations) and shall be flanged (for long-side hydrant installations), unless otherwise specified on the plans.

3. Bury Depth: Bury depth will normally be 42-inches for distribution mains and 48-inches for transmission mains, but different depth buries on fire hydrant buries may be required to fit abnormal pipe depths depending upon field conditions.

4. Flanges: Bury flanges shall be drilled with 3/4-inch diameter holes in a 6-hole pattern on a 9-3/8-inch bolt circle.

5. Break-off Check Valve: All fire hydrants shall be bolted to a positive break-off check valve as shown on Mesa Water Standard Drawings. The break-off check valve will completely shut off flow when a wet barrel hydrant is hit and broken off. The break-off check valve shall consist of a ductile iron body, brass check valve and stainless steel break-off rod. Break-off check valve shall be Clow Model LBI 400A, or James Jones Break-off Check Valve. There are no equals.

6. Approved Manufacturers: Bury and extension sections shall be as manufactured by Clow, Tyler, South Bay Foundry, or approved equal.

C. Break-Away Bolts

Type 316 stainless steel break-away bolts shall be used to join the break-away spool section to the hydrant top section.

D. Shut-Off Valve

The shut-off valve shall be a resilient-seated gate valve per Section 15100 (Manual Valves).

E. Gaskets

Gaskets shall be full face, and of rubber composition, 1/8-inch thick. Full face type gaskets with pre-punched holes shall be used where both flanges are flat face. Ring gaskets extending to the inner edge of the bolts may be used where a raised face flange is present.

F. Manufacturers

Fire hydrants shall as manufactured by James Jones Company, Series 3765, or Series 3700 for residential, Clow Corporation, Series 2060, Model 130. There are no equals.

G. Residential Fire Service Type

Meters serving residential buildings designed to meet NFPA 13D Fire Sprinkler Systems in One and Two Family Dwellings and Manufactured Homes shall be in compliance with applicable sections of AWWA Standard C701, and shall hold a current UL Fire Service Approval. Refer to Section 15150 (Meters) for the specific specification requirements.

PART 3 - EXECUTION

A. General

Fire hydrant assemblies shall be installed in accordance with Mesa Water Standard Drawings, and as specified herein, and shall include the connection to the main, the fire hydrant, hydrant bury, break-away spool, shutoff valve, valve box, connection piping, concrete thrust blocks, and appurtenances.

B. **Location**: Fire hydrant assemblies shall be located as shown on Mesa Water's Standard Drawings, detail drawings, or as approved by the Mesa Water Representative. Spools less than 6-inches in length will not be permitted when correcting the flange elevation.

C. Valve and Valve Box

The valve and valve box shall be installed in accordance with Section 15100 (Manual Valves).

D. Break-Away Bolts

Break-away bolts shall be installed with the threads toward the top of the hydrant. Bolts shall be packed with clear silicon sealant.

E. Concrete

The concrete pad and thrust blocks shall be Class C concrete placed per Section 03300 (Concrete).

F. Painting

All above ground portions of the fire hydrant and bury shall be painted with one prime coat and two finish coats of paint in the field, in accordance with Section 09900 (Painting and Coating), after the fire hydrant has been installed. The second finish coat shall be applied just prior to the final inspection.

G. Testing

Hydrants shall be tested at the same time that the connecting pipeline is pressure tested. See Section 15042 (Hydrostatic Testing of Pressure Pipelines), for pressure testing requirements.

END OF SECTION

SECTION 15150

METERS

PART 1 - GENERAL

A. Description

This section describes the materials, installation, and testing of meter assemblies.

B. Related Work Specified Elsewhere

1. Structural Earthwork: 02200.
2. Concrete: 03300.
3. Precast Concrete Vaults and Meter Boxes: 03462.
4. Painting and Coating: 09900.
5. Copper Pipe and Fittings: 15057.
6. Manual Valves: 15100.

PART 2 - MATERIALS

A. General

This specification covers Positive Displacement Meters, Compound Meters, and Turbine Meters. Positive Displacement Meters shall be used for small diameter applications (5/8" through 2-inch) requiring very accurate low-flow ranges. For larger metered connections (2-inch through 8-inch) low-flow applications (non-irrigation) shall be metered by Compound Meters. For irrigation applications 2-inch and larger, Turbine Meters shall be used.

All meters shall be new and of current design, and all parts of the meters of the same size and model shall be interchangeable. All meters shall be NSF 61 approved.

All meters shall be purchased from Mesa Water. All residential meters 5/8 inch through 2-inch will be furnished and installed by Mesa Water. All industrial, commercial, and larger individual service meters 3-inches and larger will be furnished by Mesa Water and installed by the contractor.

All meters shall read in cubic feet.

B. End Connections

Unless otherwise specified herein, all meters shall have standard flanged connections, with Type 316 stainless steel bolts, nuts, capscrews, studs, and washers.

C. Fire Line Meter Assembly

1. Fire line meter assemblies may be required for residential structures and commercial and industrial installations where separate fire service installations are not provided.

2. Fire line meter assemblies shall be furnished as complete units by the manufacturer. Each fire line meter assembly shall consist of a U.L. approved strainer, a turbine meter sized for fire flow, a positive displacement or turbine meter sized for maximum demand without fire flow, positive displacement meter piping, lockable ball valves to isolate the positive displacement meter, a check valve downstream of the positive displacement meter, and an internally weighted check valve adjusted to open prior to exceeding the maximum flow range of the positive displacement meter. The positive displacement meter piping shall extend from the outlet of the strainer to the downstream side of the swing check valve.

3. Ductile iron or steel components shall be epoxy lined and coated per Section 09900 (Painting and Coating).

4. Each fire line meter assembly shall conform to AWWA C703 and shall be U.L. listed, and shall be F.M. approved for fire service.

5. Manufacturer: Fire line meter assemblies shall be Sensus Fireline. There is no approved equal.

D. Residential Fire Service Meter

1. Meters serving residential buildings designed to meet NFPA 13D Fire Sprinkler Systems in One and Two Family Dwellings and Manufactured Homes shall be in compliance with applicable sections of AWWA Standard C701, and shall hold a current UL Fire Service Approval.

2. Meters shall have a minimum strainer open area of four times the inlet pipe diameter and shall be capable of providing full meter flows under a “locked” measuring element condition.

3. All meters shall be provided with materials that meet the lead free requirements as defined in AB 1953.

4. All meters shall be stamped with serial numbers on the main case.

5. All meters shall read in cubic feet.

6. Manufacturer: Residential fire service type meters shall be Hershey Meters Model RFM or approved equal.

E. Manual Valves

Valves shall conform with Section 15100 (Manual Valves). Valves on by-pass shall be lockable in the closed position. On 4-inch and larger by-pass lines, outside stem and yoke valves with a chain and lock are permitted.

PART 3 - EXECUTION

A. Meter Installations

1. Residential Meters: Residential meters shall be installed as shown on the plans, or per Mesa Water's Standard Drawings.

2. Commercial/Industrial Meters: Commercial/Industrial meters shall be installed as shown on the plans or per Mesa Water's Standard Drawings.

B. Service Piping

All piping for service lines and by-pass lines shall be installed in conformance with Section 15057 (Copper Pipe and Fittings), and Section 15051 (Installation of Pressure Pipelines).

C. Test Tap

On services 3-inches and larger, a 2-inch service saddle and corporation stop shall be installed on the spool downstream of the meter. The tap shall be located a minimum of two pipe diameters downstream of the meter. In lieu of a test tap, a tee with a tapped blind flange may be installed immediately downstream of the meter. On propeller meter installations, the location of the test tap will be determined by Mesa Water.

D. Painting and Coating

Exposed and buried piping, and meter lids on all potable and reclaimed water services shall be painted or coated in accordance with Section 09900 (Painting and Coating).

E. Testing

Meter services shall be hydrostatically pressure tested during the testing of pipeline in accordance with Section 15042 (Hydrostatic Testing of Pressure Pipelines). Meters 3-inches and larger will be tested by Mesa Water to verify accuracy prior to being put into service.

END OF SECTION

SECTION 15151

DOMESTIC AND RECYCLED WATER FACILITIES IDENTIFICATION

PART 1 – GENERAL

A. Description

This section describes materials and installation of domestic and recycled water facilities identification for pipe, valves, valve boxes, and other pipeline appurtenances.

This section describes special identification, markings, materials and their installation procedures for recycled water facilities. All domestic water systems and appurtenances shall be identified as herein described.

B. Related Work Specified Elsewhere

1. Painting and Coating: 09900

2. Ductile Iron Pipe & Fittings: 15056

3. PVC Pressure Distribution Pipe: 15064

4. Manual Valves: 15100

C. Recycled Water Identification

For buried PVC pipe carrying recycled water:

1. Purple colored pipe marked with the wording "CAUTION: RECYCLED WATER, DO NOT DRINK" on opposite sides of the pipe. Lettering shall be a minimum of ½-inch high black letters, and shall be repeated every 12-inches.

2. Purple identification tape with the wording "CAUTION: RECYCLED WATER, DO NOT DRINK" may be attached directly to the top of the pipe with plastic adhesive tape.

3. Encase PVC pipe with purple colored polyethylene encasement with the wording "CAUTION: RECYCLED WATER, DO NOT DRINK".

For buried Ductile Iron and Copper Pipe:

1. Attach purple colored identification tape with the wording "CAUTION: RECYCLED WATER, DO NOT DRINK" directly to the top of the ductile iron and polyethylene encasement and copper pipe with plastic adhesive tape.

2. Encase ductile iron pipe with purple colored polyethylene encasement with the wording "CAUTION: RECYCLED WATER, DO NOT DRINK". Polyethylene encasement shall conform to the requirements of Section 15056.3.C "Wrapping pipe with Polyethylene Encasement".

D. Recycled Water Warning Tape

For PVC, ductile iron or copper pipe, all pipelines shall have purple colored warning tape placed in the trench 12-inches above the pipe with the wording, "CAUTION: RECYCLED WATER LINE BURIED BELOW".

The warning tape shall extend up into the meter box, air-vacuum release assembly or other appurtenances a minimum of 12-inches, so that it can be read clearly by opening the box or enclosure.

E. Valve Boxes

Valve boxes shall be as specified in Section 15100 (Manual Valves).

F. Color and Painting Schedule

Recycled water facilities shall be painted purple (Pantone 512) per Section 09900 (Painting and Coating). Potable water facilities shall be painted blue per Section 09900 (Painting and Coating).

G. Warning Signs and Labels

1. Mesa Water requires warning labels on all appurtenances in vaults, such as air release valves, blow offs, and meters, and on designated facilities, such as, but not limited to, pressure reducing valves, above ground valves, and controller panels.

2. Each and every pipe shall be identified with a painted label. In a fenced area, at least one sign shall be posted on the fence which can be readily seen by all operations personnel using the facilities.

3. Painted labels may, at Mesa Water Representative's discretion be acceptable in lieu of plastic labels.

H. Domestic Water Piping

1. All buried domestic water piping shall be installed with domestic water identification.

2. All PVC domestic water piping shall be blue with stenciling appearing on both sides of the pipe with the marking "DOMESTIC WATER" in 5/8-inch letters repeated every 12 inches.

3. Blue warning tape identifying it as a domestic water line and stating "CAUTION: DOMESTIC WATER-LINE BURIED BELOW" shall be used as well if requested by Mesa Water. The tape shall run continuously for the entire length of the main line piping.

I. Submittals

Submit shop drawings on the following materials: warning tape, tags, and labels.

PART 2 – MATERIALS

A. <u>Buried Piping Warning and Locator Tape</u>

Warning tape shall be an inert virgin low-density polyethylene specifically formulated for prolonged underground use. The minimum thickness shall be 4 mils and the overall width of the tape shall be 12 inches (for 8-inch pipe and larger) and 6 inches (for 6-inch and smaller pipe).

Locator tape shall be installed over non-metallic pipe, in addition to the warning tape placed on the pipe. It shall be similar to the warning tape, and shall include a metallic substance that can be registered by a magnetic field location device. Locator tape shall be 3-inches wide.

Warning and locator tape shall be as supplied by T. Christy Enterprises, Inc. (714/507-3300; Griffolyn Co., Inc. (800/213-6074); Terra Tape, Division of Reef Industries (800/231-2417); or approved equal.

1. For potable water pipelines: Blue warning tape with white lettering identifying the potable water line, shall be used on all metallic pipelines 1-inch and larger. For copper services, warning tape shall be placed over the top of the pipe and shall be taped to the copper pipe at five (5) foot intervals. The warning tape shall extend up into the meter box, combination air valves, or other appurtenances a minimum of 12-inches, so that it can be read clearly by opening the box or enclosure. Lettering shall be a minimum of 2-inch high letters with the wording: "CAUTION: DOMESTIC WATERLINE BURIED BELOW".

2. For recycled water pipelines: Purple (Pantone 512) warning tape with black lettering identifying the recycled water line, shall be used on all metallic pipelines 1-inch and larger. For copper services, warning tape shall be placed over the top of the pipe and shall be taped to the copper pipe at five (5) foot intervals. The warning tape shall extend up into the meter box, combination air valves, or other appurtenances a minimum of 12-inches, so that it can be read clearly by opening the box or enclosure. Lettering shall be a minimum of 2-inch high letters with the wording: "CAUTION: RECYCLED WATER – DO NOT DRINK".

B. Warning Tags

Warning tags shall be inert plastic film or polyurethane specifically formulated for prolonged exposure. The warning tag shall incorporate an integral attachment neck and reinforced attachment hole. The size of the tag shall be 3-inch by 4-inch with a minimum thickness of 10 mils. Warning tags shall be attached with heavy-duty nylon fasteners. The size, type of label and location will be dictated by each individual application and subject to acceptance by Mesa Water Representative. The minimum size shall be 1/2-inch letters.

Potable water identification tags shall be prepared on blue field, and shall have the words: "POTABLE WATER" printed on the field in black letters. Minimum letter height shall be ½-inch.

Recycled water warning tags shall be prepared on purple field, and shall have the words: "CAUTION: RECYCLED WATER – DO NOT DRINK" printed on the field in black letters. Minimum letter height shall be ½-inch.

C. Warning Labels

Warning labels shall be a minimum 3.5 mil flexible vinyl base with a permanent acrylic adhesive backing on a 90# stayflat liner. Both the background and legend are printed with a UV cured

vinyl ink. The entire decal shall be clear flood over-printed for superior weathering and UV protection. The size shall be 3.5-inch by 4.3-inch for controllers, 2.5-inch by 8.25-inch for pumping equipment, and 1.25-inch by 5.75-inch for potable water decals.

In all cases the warning labels must be approved prior to installation. Failure to receive prior approval may result in the contractor removing and providing approved replacement(s). All costs shall be borne by the contractor for the replacements.

PART 3 – EXECUTION

A. Installation of Pipe Warning Tape and Locator Tape

Warning tape shall be installed directly on the top of the pipe longitudinally and shall be centered. The warning tape shall be installed continuously for the entire length of the pipe and shall be fastened to each pipe length by plastic adhesive tape banded around the pipe and warning tape at no more than five (5) foot intervals. Taping attached to the sections of pipe before laying in the trench shall have five (5) foot minimum overlap for continuous coverage. All risers between the main line and control valves shall be installed with warning tape.

Locator tape shall be installed directly on top of the pipe zone backfill layer, and shall be centered over non-metallic pipelines. This is in addition to the warning tape installed on the top of the pipe.

B. Installation of Warning Tags and Labels

Warning tags shall be firmly attached to all appurtenances using heavy-duty nylon fasteners. One warning tag shall be attached to each appurtenance as follows: attach to valve stem directly or with plastic tie wrap; attach to solenoid wire directly or with plastic tie wrap; attach to valve cover with existing valve cover bolt; or attach to the body of the relative appurtenance with a plastic tie-wrap. Warning labels (decals) shall be placed on all controllers and pumping equipment.

-END OF SECTION-

SECTION 15162

FLEXIBLE PIPE COUPLINGS AND EXPANSION JOINTS

PART 1 - GENERAL

A. Description

This section describes materials and installation of flexible gasket sleeve-type compression pipe couplings for steel, PVC, ACP, and ductile iron pipe.

B. Related Work Specified Elsewhere

1. Painting and Coating: 09900.

2. Hydrostatic Testing of Pressure Pipelines: 15042.

C. Submittals

1. Submit manufacturer's catalog data on flexible pipe couplings. Show manufacturer's model or figure number for each type of coupling or joint for each type of pipe material for which couplings are used.

2. Submit manufacturer's recommended torques to which the coupling bolts shall be tightened for the flexible gasket sleeve-type compression pipe couplings.

3. Show materials of construction by ASTM reference and grade. Show dimensions.

4. Show number, size, and material of construction of the rods and lugs for each thrust harness on the project.

PART 2 - MATERIALS

A. Flexible Pipe Couplings for Steel Pipe

1. General: Steel couplings shall have center sleeves of steel conforming to ASTM A 36, A 53 (Type E or S), or A 512 having a minimum yield strength of 30,000 psi. Follower rings shall be malleable iron (ASTM A 47, Grade 32510), ductile iron (ASTM A 536), or steel (ASTM A 108, Grade 1018, or ASTM A 510, Grades 1018 or 1021). Follower ring material shall match that of the pipe being joined: i.e.: steel follower rings on steel pipe; malleable iron rings for ductile iron pipe. Minimum center sleeve length shall be 5-inches for pipe sizes 1-inch through 3-inches; 7-inches for pipe size 4-inches; and 10-inches for pipe sizes larger than 4-inches.

2. Sleeve Bolts: Sleeve bolts shall have a minimum yield strength of 40,000 psi, an ultimate strength of 60,000 psi, shall be Type 316 stainless steel conforming to ASTM A 193 (Grade B8M) for bolts and ASTM A 194 (Grade 8N) for nuts, and shall conform to AWWA C111.

3. Manufacturers: Flexible pipe couplings for steel pipe shall be steel, and shall be Dresser Style 38, Smith-Blair Type 411, Baker Series 200, Ford, Romac or approved equal.

B. Joint Harness

1. Tie Bolts or Studs: Tie bolts or studs shall be as shown in AWWA Manual M11, Table 13-6, 13-7, and 13-7A. The minimum numbers and sizes of tie bolts or studs shall be as shown in the table below. Bolt or stud material shall conform to ASTM B 193, Grade B7. Nuts shall conform to ASTM A 194, Grade 2H. Lug material shall conform to ASTM A 36, ASTM A 283, Grade B, C, or D, or ASTM A 285, Grade C. Lug dimensions, plate thickness, and weld dimensions shall be as shown in AWWA Manual M11, Figure 13-17.

TIE BOLTS OR STUD REQUIREMENTS FOR FLEXIBLE PIPE COUPLINGS

Tie Bolt or Stud Minimum Requirements

	150 psi		250 psi	
Nominal Pipe Size (inches)	**No. Bolts or Studs**	**Size (inches)**	**No. Bolts or Studs**	**Size (inches)**
2	2	5/8	2	5/8
3	2	5/8	2	5/8
4	2	5/8	2	5/8
6	2	5/8	2	5/8
8	2	5/8	2	5/8
10	2	5/8	2	3/4
12	2	3/4	2	7/8
14	2	3/4	2	1
16	2	7/8	2	1-1/8
18	2	1	2	1-1/4
20	2	1	2	1-1/4
24	4	7/8	4	1-1/8
30	4	1-1/8	4	1-3/8
36	4	1-1/4	4	1-5/8

2. Criteria for Number and Size of Tie Bolts or Studs: The number and size of bolts shall be selected based on the test pressure shown in Section 15042 (Hydrostatic Testing of Pressure Pipelines). For test pressures less than or equal to 150 psi, the 150-psi design in the table above shall be used. For test pressures between 150 and 250 psi, the 250-psi design in the table above shall be used.

3. Washers: Stainless steel, Type 316, washers shall be provided for each lug. Washer material shall be the same as the nuts. Minimum washer thickness shall be 1/8-inch.

4. Wall Thickness Requirement for Welded Lugs: Pipe wall to which lugs are welded shall be adequate to resist stresses. If necessary, the pipe wall thickness shall be increased.

C. Flexible Couplings for Ductile Iron Pipe

1. General: Ductile iron pipe couplings shall have sleeves of ASTM A 126 Class B ductile iron with a minimum yield strength of 30,000 psi. Follower rings shall be malleable iron ASTM A 47 Grade 32510 or ductile iron ASTM A 536. Minimum center sleeve length shall be 7-inches for pipe sizes up to 6-inches in diameter; 10-inches for pipe sizes larger than 6-inches pipe diameters.

2. Sleeve Bolts: Sleeve bolts shall be corrosion resistant Type 316 stainless steel with minimum yield strength of 45,000 psi and shall conform to ASTM-A-193 and AWWA C111.

3. Manufacturers: Flexible couplings for ductile iron pipe shall be ductile iron: Dresser Style 153, Smith-Blair Type 442, Baker Series 228, Ford Style FCI, Romac Style 501, or approved equal.

D. Transition Couplings

1. Steel Pipe: Transition couplings for connecting steel pipe having different outside diameters shall be steel: Dresser Style 62 or 162, Smith-Blair Type 413, Baker Series 212 or 240, Romac 501, or approved equal.

2. Ductile Iron Pipe, PVC Pipe, and Asbestos Cement Pipe: Transition couplings for connecting ductile iron pipe, PVC pipe, and asbestos cement pipe having different outside diameters shall be ductile iron, and shall be Smith-Blair Type 441, Baker Series 236, Ford Style FC2A, Romac and Dresser or approved equal.

3. Sleeve Bolts: Sleeve bolts shall have a minimum yield strength of 40,000 psi, an ultimate strength of 60,000 psi, shall be Type 316 stainless steel conforming to ASTM A 193 (Grade B8M) for bolts and ASTM A 194 (Grade 8N) for nuts, and shall conform to AWWA C111.

E. Reducing Couplings

Reducing couplings for steel pipe shall be steel. Reducing couplings for ductile iron pipe, PVC pipe, and asbestos cement pipe shall be ductile iron. Couplings shall be Dresser Style 62, Baker Series 220 or 240, Smith-Blair Type 415 or R441, Romac, Ford, or approved equal.

F. Flanged Coupling Adapters

Flanged coupling adapters may be used to install valves, meters, and other types of flanged fittings to plain end pipe of diameter 10-inches and smaller. Flanged coupling adapters shall be Smith-Blair Type 912, Baker Series 601 or 604, Dresser Style 127, Ford Style FFCA, Romac Style FAC501, Romac Alpha, or approved equal.

G. Expansion Joints

1. General: Expansion joints shall have body, flanges, and slip pipe of carbon steel. Packing shall consist of a minimum of four rubber rings, each separated by jute packing.

For installation in steel pipelines, expansion joint shall have plain ends, beveled for welding. For installation in ductile iron pipelines, expansion joint shall have plain ends. Slip pipe shall have a machined surface, and body shall be equipped with pipe stops. Where called for on the plans, limit or stop rings and limit rods shall be provided to prevent the slip pipe from pulling out of the joint.

2. Limit Rods and Body Studs, Bolts and Nuts: Limit rods and body studs, bolts, and nuts shall be Type 316 stainless steel conforming to ASTM A 193 (Grade B8M) for rods and bolts, and ASTM A 194 (Grade 8M) for nuts.

3. Manufacturers: Expansion joints shall be Baker Series 403 or 404, Smith-Blair Type 611 or 612, Romac EJ400, or approved equal.

H. Sleeve Bolts and Nuts for Flanges

1. Stainless Steel Bolts: Bolts and nuts for buried and submerged flanges, flanges in underground vaults and structures, and flanges located outdoors above ground shall be Type 316 stainless steel conforming to ASTM A 193 (Grade B8M) for bolts and ASTM A 194 (Grade 8M) for nuts.

2. Washers: Washers shall be provided for each nut. Washers shall be of the same material as the nuts.

PART 3 - EXECUTION

A. Installation of Flexible Pipe Couplings and Expansion Joints

1. General: Oil, scale, rust, and dirt shall be cleaned from pipe ends. Gaskets in flexible pipe couplings shall be cleaned before installing. Expansion joints shall be installed per manufacturer's recommendations. Expansion joints shall be installed so that 50% of total travel is available for expansion and 50% is available for contraction.

2. Bolt Thread Lubrication: Bolt threads shall be lubricated with graphite and oil prior to installation.

B. Painting and Coating

1. Flexible Couplings: Flexible pipe couplings (including joint harness assemblies), transition couplings, flanged coupling adapters, and expansion joints shall be coated per Section 09900 (Painting and Coating); sleeves shall be coated per System G-1. After installation couplings shall be wrapped with 8-mil polyethylene wrap per AWWA C105.

2. Interior Surface Coating: Interior surfaces of flexible coupling and transition coupling sleeves, and the body of expansion joints shall be coated per Section 09900 (Painting and Coating), System G-1.

C. Bonding Flexible Pipe Couplings

Buried flexible pipe couplings that are connected to ductile-iron, cast-iron, or steel pipe shall be bonded to adjacent piping as described in Section 16640 (Cathodic Protection and Joint Bonding).

D. Hydrostatic Testing

Flexible pipe couplings, expansion joints, and expansion joints shall be hydrostatically tested in place with the pipe being tested. Test shall be performed in accordance with Section 15042 (Hydrostatic Testing of Pressure Pipelines).

END OF SECTION

SECTION 16640

CATHODIC PROTECTION AND JOINT BONDING

PART 1 - GENERAL

A. Description

This section describes materials and installation of cathodic protection and testing equipment including wiring, zinc anodes, joint bonding, test stations, reference cells, alumino-thermic welds, and flange insulation kits. As directed by Mesa Water, the developer, applicant or his design engineer shall complete soils testing to determine the level of cathodic protection required for each project. This Section will only be applicable to projects noted or specified by Mesa Water.

B. Related Work Specified Elsewhere

1. Trenching, Backfilling, and Compacting: 02223.

2. Painting and Coating: 09900.

C. Submittals

1. Submit manufacturer's catalog data on wire and cables, test stations, reference cells, thermic welds, insulation kits, dielectric coatings, and anodes.

2. Submit qualifications of company performing required testing and record keeping. The testing shall be performed under the direction and oversight of a registered corrosion engineered or certified NACE Cathodic Protection (CP) specialist.

PART 2 - MATERIALS

A. Alumino-Thermic Weld Materials

Cartridges and sleeves for welding test lead wires, joint bonding wires and anode lead wires to the pipe, shall be "Cadweld," "Thermoweld," or approved equal. Cartridge type, size and weight shall be as recommended by the manufacturer for the type of pipe (steel, ductile iron, or cast iron) to which the wire is to be welded, size of wire, and welder mold being used.

B. Alumino-Thermic Weld Caps

Alumino-thermic weld caps shall incorporate a high-density polyethylene plastic sheet, 10 mils (minimum) thick, with a protective adhesive, 165 mils (minimum) thickness, as manufactured by Farwest Corrosion Control Company, Chase Corporation’s Royston Products, or approved equal. Design shall incorporate an elastomeric or a mastic-filled dome and a tunnel portion to contain lead wire from the alumino-thermic weld connection.

The mastic coating shall be Carboline Bitumastic 50, Tnemec 46-465, Tnemec 46H413, or approved equal. Prior to application of the mastic coating, the manufacturer's recommended primer shall be applied to exposed metal.

Weld caps shall be Royston Handy Cap IP, Royston Handy Cap XL, or approved equal.

C. Test Stations Boxes

Test station boxes shall be a minimum of 10-inch diameter, 12-inch deep, precast concrete meter boxes with a cast iron lids designed for H-20 traffic loading. Cast on the lid shall be the words "CPTS". Test box shall be Brooks Products 3RT, Christy G05T, Eisel Enterprises, or approved equal. Test boxes with terminal boards for anodes shall be rectangular in accordance with Section 03462 (Precast Concrete Vaults and Meter Boxes). Test box lids shall be painted.

D. Pipe Leads

Unless noted otherwise, pipe leads shall be stranded copper wire with high molecular weight polyethylene (HMW/PE) insulation specifically designed for cathodic protection service and suitable for direct burial in corrosive soil or water. Wire gauge shall be as shown on the plans. Polyethylene insulation shall conform to ASTM D 1248, Type 1, Class C, Grades E-4 and E-5. Each pipe lead shall be of sufficient length to extend from the attachment to the pipe to the text box or anode test box without a splice. Wires with cut or damaged insulation shall be rejected. Insulation color shall be as shown on the plans.

E. Joint Bonding Wires

Pipe joint bonding wires shall be AWG No. 4 stranded copper wire with minimum 7/64-inch thick high molecular weight polyethylene (HMW/PE) insulation rated for 600 volts. The number of conductors shall be as shown on the plans. Polyethylene insulation shall conform to ASTM D1248, Type 3, Class C, Grade 5. Each bond wire shall not exceed 18-inches in length for 18-inch pipes or less and 24 inches for pipes larger than 18-inch.

F. Flange Insulation Kits

Insulating material shall be of the type designated by the manufacturer as suitable for the operating temperature and pressure of the service. Flange insulation kits shall consist of:

1. Insulating Gaskets: Gaskets shall be Type E fullfaced, 1/8-inch-minimum thickness, dielectric neoprene faced phenolic. Gaskets shall be Pipeline Seal & Insulator, Inc. (PSI), Advance Products & Systems, Inc. (APS) George Fischer Central Plastics, or approved equal.

2. Insulating Sleeves and Washers: Insulating stud sleeves and washers shall be one-piece and full length, made of Minlon or Mylar. One 1/8-inch thick gasket shall be attached to the sleeve, while the other shall be loose. Single insulating washers and sleeves shall be used on buried insulating flanges. Double insulating washers and sleeves shall be used on insulating flanges above ground, in structures, or in vaults.

3. Insulating Washers for Bolts: Insulating washers shall be 1/8-inch thick glass-clad phenolic. Single insulating washers shall be used on buried insulating flanges. Double insulating washers and full length sleeves shall be used on insulating flanges above ground, in structures, or in vaults.

4. Steel Washers Over Insulating Washer: Steel backing washers shall be 1/8-inch-thick Type 316 stainless steel.

5. Compatibility with Valves: Insulating flange kits are not typically compatible with most valve flanges. Where cathodic isolation is required near a valve, a flanged spool shall be installed adjacent to the valve; and the required insulating joint shall be installed at the opposite end of the spool from the valve.

6. Manufacturers: Flange Insulation Kits shall be as manufactured by Pipeline Seal & Insulator, Inc. (PSI), George Fischer Central Plastics, Advance Products & Systems, Inc. (APS), or approved equal.

G. Buried Insulating Flange External Coating

1. Primer: Primer shall be a blend of microcrystalline waxes, plasticizers and corrosion inhibitor having a paste-like consistency. The material shall have the following properties:

Pour Point	100°F -115°F
Flash Point	350°F min
Coverage (approx.)	1 gal/100 sq. ft.
Color	Brown

The primer shall be Trenton Wax-Tape Primer, or approved equal.

2. Wax-Tape: Flange covering material shall be a plastic-fiber felt tape, saturated with a blend of microcrystalline waxes, plasticizers and corrosion inhibitors that is easily formable over irregular surfaces. The tape shall have the following properties:

Tape Width	6-inches
Saturant Pour Point	115-125°F
Thickness	70-90 mils
Dielectric Strength	170 Volts/mil
Weight	4 lbs/sq yd
Color	Brown

The Wax-Tape shall be Trenton #1 Wax-Tape, or approved equal.

3. Outer Covering: The primed and wax-tape wrapped flange shall be covered with a plastic wrapper consisting of three (3) each of 50 gauge, clear, polyvinylidene chloride, high cling membranes wound together as a single sheet. The material shall have the following properties:

Width	6-inches
Thickness	1.5 mils
Dielectric Strength	2000 Volts/mil
Water Absorption	negligible
Color	Clear

The outer covering shall be Trenton Poly-Ply, or approved equal.

H. Above Ground Insulating Flange External Coating

Above ground insulating flange coating shall consist of self fusing elastic putty tape and vinyl plastic electrical tape. The self fusing elastic putty tape shall be Scotchfil Electrical Insulation Putty. There is no equal. The vinyl plastic electrical tape shall be 7 mil thick premium grade vinyl adhesive electrical tape, brand Scotch #33 + Vinyl Electrical Tape. There is no equal.

I. Internal Insulating Flange Coating

Coating for the interior lining of the pipeline at the insulating flange shall be a two-part smooth white, thixotropic liquid epoxy consisting of 100 percent solids. Coating shall be Aquatapoxy Paint as manufactured by American Chemical Corporation, or approved equal.

J. Zinc Anodes

1. Zinc Anode: Anode shall conform to ASTM B 418, Type II and shall be a prepackaged zinc alloy ingot having a chemical composition not exceeding the following limits:

Lead	0.003% Max.
Aluminum	0.005% Max.
Cadmium	0.003% Max.
Iron	0.0014% Max.
Copper	0.002% Max.
Zinc	Remainder

2. Anode Weight and Dimensions: Ingot weight and dimensions of the prepackaged zinc anode shall be as listed in the table below: Weights are minimum.

ZINC ANODE SIZES FOR 1-INCH AND 2-INCH BARE COPPER PIPE SERVICES

Copper Pipe Size (inches)	Copper Pipe Length (feet)	Zinc Anode Size (inches)	Zinc Anode Weight (lbs)
1	0 to 45	1.4x1.4x30	15
1	45 to 90	2.0x2.0x30	30
2	0 to 22	1.4x1.4x30	15
2	22 to 45	2.0x2.0x30	30
2	45 to 70	2.0x2.0x48	40
2	70 to 90	2.0x2.0x60	60

Note: For copper pipe length greater than that listed above, an additional Zinc Anode of appropriate size shall be added.

3. Anode Backfill: Each zinc anode shall be prepackaged in a permeable cloth bag with a backfill of the following composition or installed bare and backfilled with material having the following composition:

Gypsum	75%
Powdered Bentonite	20%
Anhydrous Sodium Sulfate	5%

Backfill grains shall be capable of 100% passing through a 20 mesh screen and 50% passing through a 100 mesh screen. The backfill shall be firmly packed around the anode by mechanical vibration to density which will maintain the zinc ingot in the center of the cloth bag and surrounded by at least 1-inch of backfill. The packaged weight of the zinc anode and backfill shall be approximately twice the weight of the zinc anode ingot weight.

4. Steel Core: Anode shall be cast full length with an electrogalvanized 1/4-inch diameter steel core which shall be exposed at one end for connection of the anode lead wire.

5. Anode Lead Wire: Anode lead wire shall be AWG No. 8 stranded copper wire with high-molecular weight polyethylene (HMW/PE) insulation suitable for direct burial use. HMW/PE insulation shall conform to ASTM D-1248, Type 1, Class "C", Category 5, Grades E4 and E5 with tensile strengths J1, J3. Wire shall be attached to the steel core with silver solder by the manufacturer. The connection shall be encapsulated in a heat-shrinkable sleeve. Anode lead wire shall be of sufficient length of extend from the anode to the designated termination point without a splice, minimum of 15 feet long and a minimum of 3-feet of coiled wire provided in the test box. Wires with cut or damaged insulation will not be accepted and replacement of the entire lead will be required at the contractor's expense.

6. Anode Manufacture's: Pre-packaged anodes, with lead wire and bagged backfill shall be supplied by Northtown Company, Far West Corrosion Control Company or Galvotech Alloys, Inc. or approve equal.

K. Brass Identification Tags

Identification tags shall be rotary engraved with identifying letters and numbers. The circular plastic tag shall be 1/16-inch thick, 2-inch in diameter, and the exterior shall be UV resistant ply (color on both sides) lamicoid plastic by Rowmark, Gravoply, or approved equal. Color shall be Blue with a white core for potable water. There shall be a small hole in the tag for attachment to the wires in the various test boxes.

L. Warning Tape

Warning tape shall be 3-inch wide red detectable metallic utility warning tape. The tape shall be inductively locatable and conductively traceable using a standard pipe and cable locating device.

The tape shall be composed of one layer of aluminum foil laminated between two layers of inert plastic film resulting in a minimum thickness of 4.5 mils. The tape shall have the following custom message printed at minimum 36-inch intervals: "CAUTION CATHODIC PROTECTION CABLE BURIED BELOW." The tape shall have a minimum tensile strength of 60 pounds per 3-inch wide strip. The tape shall be inert and not degrade when exposed to alkalis, acids, and other destructive elements commonly found in soil. The ink used to print the message on the tape shall be permanent and not be removable by normal handling or upon prolonged underground burial. The warning tape shall be "Terra Tape Sentryline Detectable 620" as manufactured by Reef Industries, Inc., or approved equal.

M. Mortar

Mortar used to repair concrete coated pipe after attachment of the various bond or test wires shall be fast drying, non-shrinkable type.

N. Marker Paddles – Utility Marker

Brown colored polycarbonate marker paddles shall be installed adjacent to the location of each test station, anode bed, shunt box, and reference cell location. Marker paddles shall be as manufactured by Carsonite Composites, a Phillips Group Brand, or approved equal. Marker paddles shall have a Mesa Water logo and 1-inch high yellow letters affixed, indicating the particular cathodic appurtenance. Logos are available from Mesa Water.

O. Pipe Clamps

Pipe clamp used to attach the zinc anode lead wire to the above ground copper riser portion of the copper water tubing shall be brass or copper and of a size to fit the tubing. The pipe clamp shall have a screw terminal suitable for an AWG No. 8 copper stranded wire.

P. Insulating Blanket

The insulating blanket shall be a 1/8-inch thick neoprene or butyl insulating material. The width and length of the blanket will vary due to diameter of the pipelines to be insulated. The width and length shall be 12-inches larger than the diameter of the largest pipeline to be insulated.

Q. Casing Seal

The casing seal shall be composed of an irradiated, semi-rigid polyolefin sleeve which when exposed to temperatures in excess of 250°F will shrink from its original diameter to a predetermined recovered diameter. Casing seal shall be as manufactured by Pipeline Seal & Insulator, Inc. (SI), Advance Products & Systems (APS), or approved equal.

R. Reference Electrodes

Reference electrodes shall be copper-copper sulfate (CSE) suitable for direct burial, and shall remain stable for at least ten years. The reference cell shall be capable of maintaining a potential within 15 millivolts of a freshly made cell while drawing 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 #8 AWG, stranded copper, with high-molecular weight polyethylene (HMW/PE) insulation suitable for direct burial use. The lead wire shall be silver soldered to the copper core of the reference cell with the connection epoxy sealed according to the manufacturer's recommendation. Copper-copper sulfate reference cells shall be located next to the pipe in "native soil" near the "spring line" of the pipe.

The reference cells shall be EDI Model UI-CUG manufactured by Electrochemical Devices, Inc.; IonX40 Catalogue No. 14669 by M.C. Miller Company; Model CU1-UG by GMC Electrical, Inc.; Stelth Model SRE-002-CFY by Borin Manufacturing, Inc. or approved equal.

PART 3 - EXECUTION

A. General

Cathodic protection installation shall conform to NACE Publication RP0169 (Latest Revision) - Recommended Practice, Control of External Corrosion on Underground and Submerged Metallic Piping Systems and to NACE Publication RP0286 (Latest Revision) - Recommended Practice, Electrical Insulation of Cathodically Protected Pipelines.

B. Pipe Lead Attachments

Pipe leads shall be attached to the pipe and shall terminate at the test box without a splice. A minimum of 3-feet of slack wire from each lead shall be coiled and remain in each test box.

C. Attachment of Wire to Pipe

1. Surface Preparation for Alumino-Thermic Welding: Any existing coating on the pipe shall be removed by making a 3-inch square window in the coating. The exposed metal surface shall be cleaned to produce a bright metal finish, equivalent to SSPC SP-10, "near white".

2. Alumino-Thermic Weld: The attachment of copper wire shall be made using an alumino-thermic weld. Remove only enough insulation from the wire to allow the weld connection to be made. The wire shall be held at a 30°-45° angle to the surface when welding. One wire only shall be attached to each weld.

3. Weld Test: As soon as the weld is cool, the weld shall be tested by striking a sharp blow with a 2-pound hammer while pulling firmly on the wire. All unsound welds shall be rewelded and retested.

4. Wire Locations: Wires shall be attached to the top (horizontal) surface of the pipe. Where two or more wires are required welds shall be at least 6-inches apart.

D. Dielectric Coating Over Thermic Weld Connection

After completing the thermic weld connection between the wire and the pipe, the connection shall be coated in accordance with the following table:

Pipe Material	Connection Coating
Cement-mortar coated steel	Carboline Bitumastic 50, Tnemec Series 46H-413 or approved equal and cement mortar.
Carbon steel, Ductile iron	Thermic weld cap, Royston Handy Cap XL IP or Royston Handy Cap IP

Cement mortar coating shall be of the same material and thickness as specified for the pipe.

E. Backfill Over Wire

Buried wire shall be installed at a minimum depth of 36-inches. The trench bottom shall be free of exposed rocks. The first 12-inches of backfill above and the first 12-inch below the cable shall be sand per Mesa Water bedding requirements. The remainder of the trench shall be backfilled with stone-free soil in accordance with Section 02223 (Trenching, Backfilling and Compaction). Plastic warning tape shall be installed 12-inches above the wire.

F. Test Stations

1. At Grade Test Boxes: Concrete test boxes shall be located as shown on the plans, and shall be positioned in the parkway or raised median, as close to above the pipeline as practical. Concrete boxes shall be installed on a 6-inch deep base of 3/4-inch crushed rock.

3. Two-Wire Test Box Spacing: Two-wire test boxes shall be placed at intervals not to exceed 500 feet and at the end-points of all metallic pipelines and casings.

G. Joint Bonding Wires

Joint bonding wires shall be installed on ferrous metal pipelines at all unwelded joints, fittings, valves, and flanges (excluding insulating flanges). Two bond wires shall be welded across joints for pipe diameters under 18-inches. Three bond wires shall be welded across joints for pipe diameters 18-inches and larger. Bond wires shall be attached using the alumino-thermic weld process. Bond wires shall not be attached to valve bodies, but instead to the valve flanges.

H. Flange Insulation Kits

Flange Insulation Kits shall be installed as follows:

1. Cleaning: Faces of flange pairs shall be cleaned of all dirt, rust or fouling materials which would interfere with a watertight joint and insulating properties of the flange kit.

2. Alignment: Alignment pins shall be used to properly align the flange and gasket. The manufacturer's recommended bolt tightening sequence shall be followed. Bolt insulation sleeves shall be centered within the insulation washers so that the insulating sleeve is not compressed and cracked.

3. Locations: A cathodic protection bonding test station shall be installed at each buried flange insulation. Two test wires shall be installed on each side of the buried insulator according to this specification and details of the plans.

I. External Insulating Flange Coating

1. Buried Insulating Flange Coating:

   a. Primer: Surface shall be cleaned of all dirt, dust, and loose rust or mill scale by wire brush and by wiping with a clean cloth. The surface shall be dry. Apply primer by hand or brush. A thick coating of primer shall be worked into all crevices, around bolts and in threads, and shall completely cover all exposed metal surface. The primer should overlap the pipe coating by 3-inch minimum.

   b. Wax-Tape: The wax-type can be applied immediately after primer application. Short lengths of tape shall be cut and formed completely around each individual bolt and stud-end. After all bolts are covered, the tape shall be applied circumferentially and formed by hand into all voids and spaces. There shall be no gaps or air spaces under the tape. The tape shall be applied with at least 55% overlap.

   c. Outer Covering: The clear plastic outer covering shall be applied by hand such that the material conforms and adheres to the wax-tape surface. Two layers of plastic outer wrapping shall be applied.

2. Above Ground Insulating Flange Tape Coating: All flange and pipe surfaces shall be clean and free of all dirt, grease, water, and other foreign material prior to installation of tape coating. The two separate tapes shall be half-lapped twice over the outer surface of the flange.

J. Internal Coating at Insulating Flange

The interior of the pipeline shall be coated for a distance of two pipe diameters in each direction away from the insulating flange. At an insulated valve flange, interior of pipeline shall be coated away from the valve for a distance of two pipe diameters. Coating shall be as specified in Section 09900 (Painting and Coating), System B-1 or B-2 as appropriate.

1. Surface Preparation: The surface preparation of the mortar lining shall consist of wire brushing to remove all loose mortar to provide a suitable surface for adhesion of the coating.

2. Application: Coating shall be applied by brushing until a minimum coating thickness of 20 mils is achieved. Each ensuing coat shall be applied before subsequent coat cures, usually within 3 to 6 hours after subsequent coat has been applied.

K. Zinc Anodes

Where called for on the drawings, prepackaged zinc anodes shall be installed in excavated, drilled, or punched holes a minimum of 3-inches larger in diameter than the prepackaged

anode diameter. Anodes shall be installed below the level of the service main, with a minimum separation of 2-feet between the copper water tubing and the zinc anode maintained at all times. Anodes shall not be lowered, transported, handled, or lifted by the lead wire.

1. Backfilling: After the prepackaged anode is placed in the hole, water shall be poured into the hole so that the anode is completely covered with water. Stone-free native soil shall then be used to backfill the anode hole. Imported sand shall not be used for backfilling. The anode hole shall be backfilled in stages and carefully compacted to ensure that no voids exist around the bag and that the bag and anode wire are not damaged. After backfill is level with the top of the anode, a minimum of 15 gallons of water shall be poured into the hole to completely saturate the soil backfill. More water shall be added if it is suspected that the backfill is not completely saturated. Care shall be taken to avoid damage to the anode and anode lead wires.

2. Anode Lead Wire: The anode lead wire shall run to the point of connection at the end of the pipe run in the meter box. The anode lead wire shall be clamped to the copper tubing riser. Sufficient slack shall be provided in the wire, and it shall be coiled in the meter box for attachment to a future point of connection at the water meter. At air releases and sample points, the anode lead wire shall run through the concrete pad in a 1/2-inch diameter PVC conduit clamped to the riser. At blow-offs and manual air releases, anode lead wire shall be coiled in the valve box and clamped to the riser.

L. Identification Tags

Identification tags shall be securely attached to each of the wires in the test box using UV rated zip ties rated to hold 50 pounds. Tags shall be stamped "P" for pipe, “C” for casing, and "A" for anode to indicate to which structure each wire attached. Tags on wires in the test box at insulating flanges shall be stamped "N", "S", "E", or "W" for North, South, East, or West and with the pipeline diameter to indicate on which side of the insulating joint and to which pipeline the wires are attached.

M. Insulating Blanket

Install an insulating blanket as shown on the plans between any metallic pipelines that cross or parallel each other when the distance between the two pipelines is less than 18-inches.

N. Casing Seal

The casing seal shall be installed wherever a metallic pipeline passes through a casing. The casing seal shall be installed according to the manufacturer's recommendations.

O. Earthwork

Trenching, backfilling, and compacting shall be in accordance with Section 02223 (Trenching, Backfilling and Compacting).

P. Required Test and Record Keeping

The contractor shall furnish all necessary equipment, material and qualified personnel required to perform all tests described herein.

1. Continuity Tests: The contractor shall notify Mesa Water's Representative when continuity bonding has been completed and all test boxes have been completed. A registered corrosion engineer or certified NACE CP specialist retained by the contractor shall oversee certify the testing and measuring of the electrical continuity of metallic pipelines. The pipeline shall be considered electrically continuous when the measured longitudinal resistance of the pipeline between each pair of adjacent test stations is no greater than 20 percent higher than the theoretical resistance of that section of pipeline.

   If tests indicate that adequate electrical continuity has not been achieved, the contractor shall excavate to investigate and locate improperly bonded joints and shall make repairs until electrical continuity is achieved to the satisfaction of Mesa Water.

2. Test Stations: The contractor shall notify Mesa Water's Representative when insulator test box wires, two and four wire test station wires are ready for testing. The wires shall remain disconnected to facilitate testing. A registered corrosion engineer or certified NACE CP specialist retained by the contractor shall oversee and certify the tests to certify that none of the wires were damaged or broken during the installation. If test indicate damage, the entire wire shall be replaced and retested at the contractor's expense.

   Records shall be made of all test stations and reference electrode tested and submitted to Mesa Water.

3. Insulation Joints: The contractor shall test each insulated joint with the insulator tester in accordance with the manufacturer's written instructions. All damaged or defective insulation parts shall be replaced and retested. Records shall be kept of all insulated joint tests and shall be submitted to Mesa Water.

4. Anode and Pipe Lead Wire Integrity Tests: After the pipe and anodes are buried, the pipe lead wire and anode lead wire trenches are backfilled, and the test boxes are installed, the contractor shall notify Mesa Water's Representative that the anode and pipe lead wires are ready for hookup and testing. The wires shall remain disconnected to facilitate testing. A registered corrosion engineer or certified NACE CP specialist retained by the contractor shall oversee and certify the tests to check that none of the anode wires or pipe lead wires were damaged or broken during the installation. Each anode lead wire will be tested for electrical continuity to the anode by measuring the anode's potential with respect to a copper copper-sulfate reference electrode. The measured open circuit potential of the anode shall be as specified in the project technical specifications, and a potential less than that indicates a broken wire or faulty anode installation in which case the anode shall be replaced.

5. Acceptance: The contractor shall submit a certified report by the corrosion engineer stating that the facilities are performing satisfactorily. All test made must be reviewed and approved by Mesa Water before the corrosion control work is accepted. Mesa Water reserves the right to spot check any or all tests performed by the contractor.

   All construction defects must be repaired and retested before the final acceptance is made. All unacceptable test must be re-performed by the contractor at no additional cost to Mesa Water.

END OF SECTION

STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

FOR

THE CONSTRUCTION OF

WATER FACILITIES

MESA WATER DISTRICT

1965 Placentia Avenue
Costa Mesa, CA 92627
(949) 631-1291

MESA WATER DISTRICT
APRIL 2018

MESA WATER DISTRICT

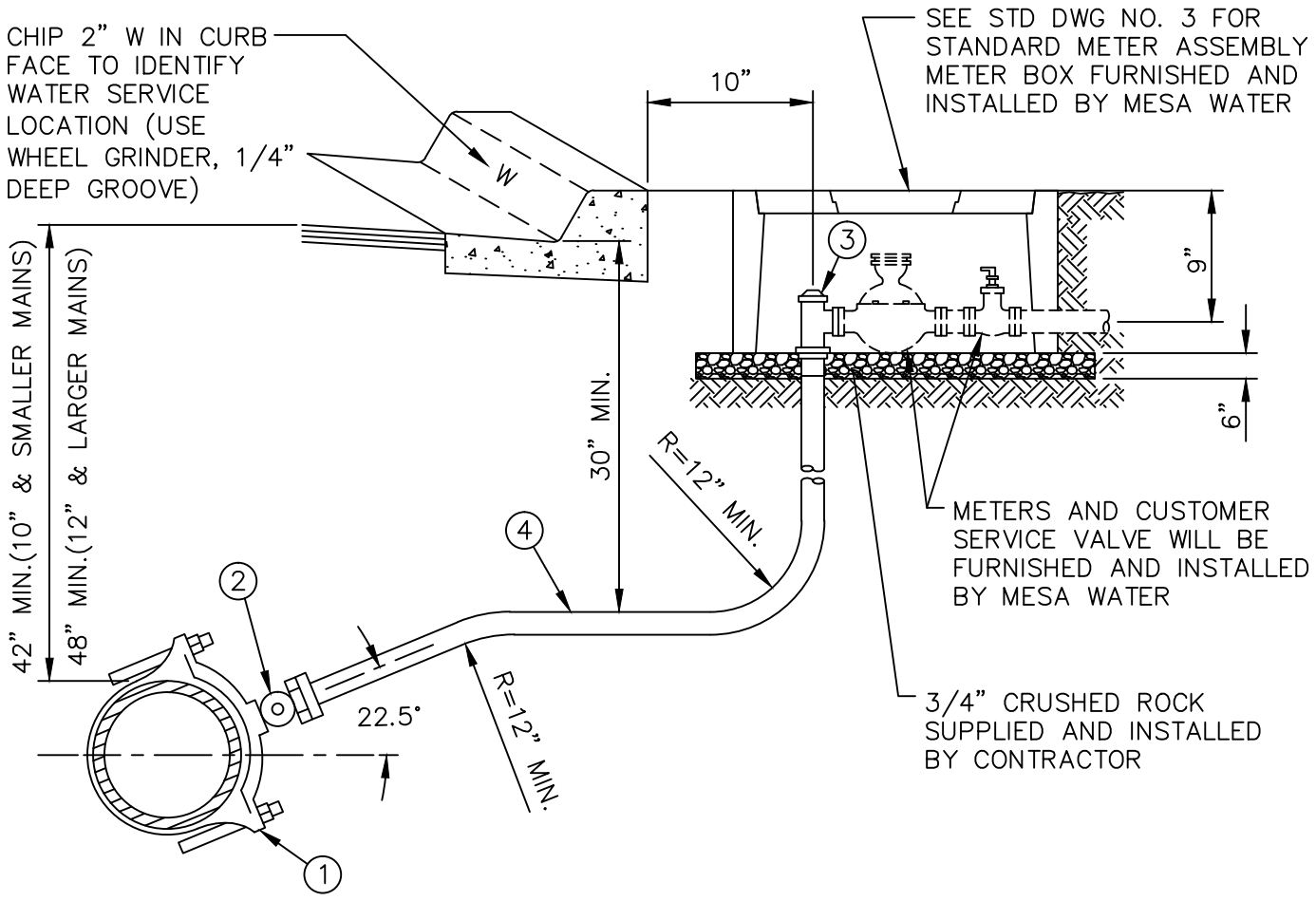
STANDARD DRAWINGS

TABLE OF CONTENTS

MESA WATER DISTRICT

STANDARD DRAWINGS

TABLE OF CONTENTS (Cont.)



GENERAL NOTES:

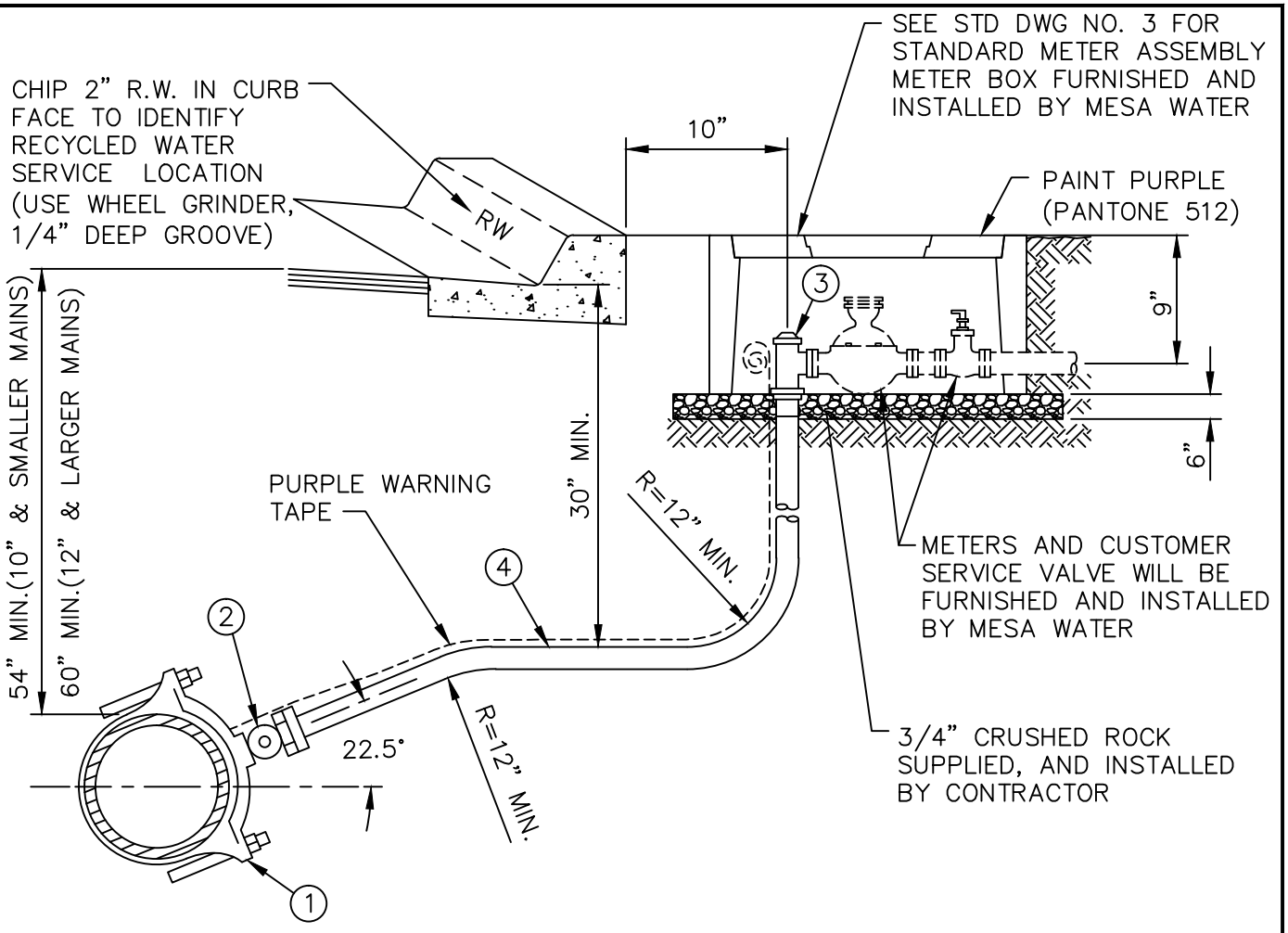
1. SERVICE SADDLE REQUIRED FOR ALL MAINS, EXCEPT STEEL. FOR STEEL MAIN, SEE STD. DWG. NO. 13.
2. INSTALL CORPORATION STOP WITH KEY SIDEWAYS, IN OPEN POSITION.
3. THE CORPORATION STOP TAP SHALL BE MADE AS RECOMMENDED BY THE PIPE MANUFACTURER. ALL DRY TAPS WILL BE MADE WITH MACHINE WITH GUIDE OR PILOT TAP. PVC TAPS SHALL BE PER MANUFACTURE GUIDE APPROVED TAPPING BIT FOR C900.
4. THE WATER SERVICE SHALL EXTEND PERPENDICULAR TO THE CENTERLINE OF THE STREET FROM THE WATER MAIN TO THE METER STOP EXCEPT IN CUL-DE-SAC ENDS.
5. STANDARD 1" SERVICE CONNECTION USED WITH THE FOLLOWING METER SIZES: 5/8" METER, 3/4" METER, & 1" METER.
6. HOT TAP TO MAIN SHALL NOT BE WITHIN 18" OF A COUPLING, JOINT, FITTING OR WITHIN 18" OF ANOTHER TAP.

LEGEND OF MATERIAL:

ITEM NO.	SIZE & DESCRIPTION	MANUFACTURER	SPEC. NO.(PVC)	
①	BRASS SERVICE SADDLE WITH STAINLESS STEEL BAND – CS THREAD	SMITH-BLAIR	325	
		FORD	202BS	
		McDONALD	3845	
			CS x COMPRESSION	CS x FLARE
②	1" BRASS "BALL STYLE" CORPORATION STOP (CS THREAD X FLARE CONNECTION)	JAMES JONES	J-1937	J-1930
		MUELLER	B-25008	B-25000
		FORD	FB1000-4	FB600-4
		McDONALD	4701B-22	4701B
			COMPRESSION	FLARE
③	1" BRASS "BALL STYLE" ANGLE METER STOP WITH LOCKWING (FLARE X METER FLANGE OR METER COUPLING)	JAMES JONES	-----	J1964W
		MUELLER	-----	B24255
		FORD	-----	BA23-444W
		McDONALD	-----	4602B
④	1" COPPER TUBING	------	TYPE "K" SOFT	

MESA WATER DISTRICT	STANDARD 1" COPPER SERVICE ASSEMBLY	DRAWN BY: RJW DATE: APR 2018	STANDARD DRAWING 1

mcwd#1.dwg 04/02/2018



GENERAL NOTES:

1. SERVICE SADDLE REQUIRED FOR ALL MAINS, EXCEPT STEEL. FOR STEEL MAIN, SEE STD. DWG. NO. 13.
2. INSTALL CORPORATION STOP WITH KEY SIDEWAYS, IN OPEN POSITION.
3. THE CORPORATION STOP TAP SHALL BE MADE AS RECOMMENDED BY THE PIPE MANUFACTURER. ALL DRY TAPS WILL BE MADE WITH MACHINE WITH GUIDE OR PILOT TAP. PVC TAPS SHALL BE PER MANUFACTURE GUIDE APPROVED TAPPING BIT FOR C900.
4. THE WATER SERVICE SHALL EXTEND PERPENDICULAR TO THE CENTERLINE OF THE STREET FROM THE WATER MAIN TO THE METER STOP EXCEPT IN CUL-DE-SAC ENDS.
5. STANDARD 1" SERVICE CONNECTION USED WITH THE FOLLOWING METER SIZES: 5/8" METER, 3/4" METER, & 1" METER.
6. HOT TAP TO MAIN SHALL NOT BE WITHIN 18" OF A COUPLING, JOINT, FITTING OR WITHIN 18" OF ANOTHER TAP.
7. FOR RECYCLED WATER, THE INSTALLATION DOWNSTREAM OF THE ANGLE METER STOP SHALL BE PER STD. DWG. NO. 27.
8. FOR RECYCLED WATER USE PURPLE TAPE ON COPPER TUBING BANDED EVERY 3 FEET. SEE TECHNICAL SPECIFICATION SECTION 15151.

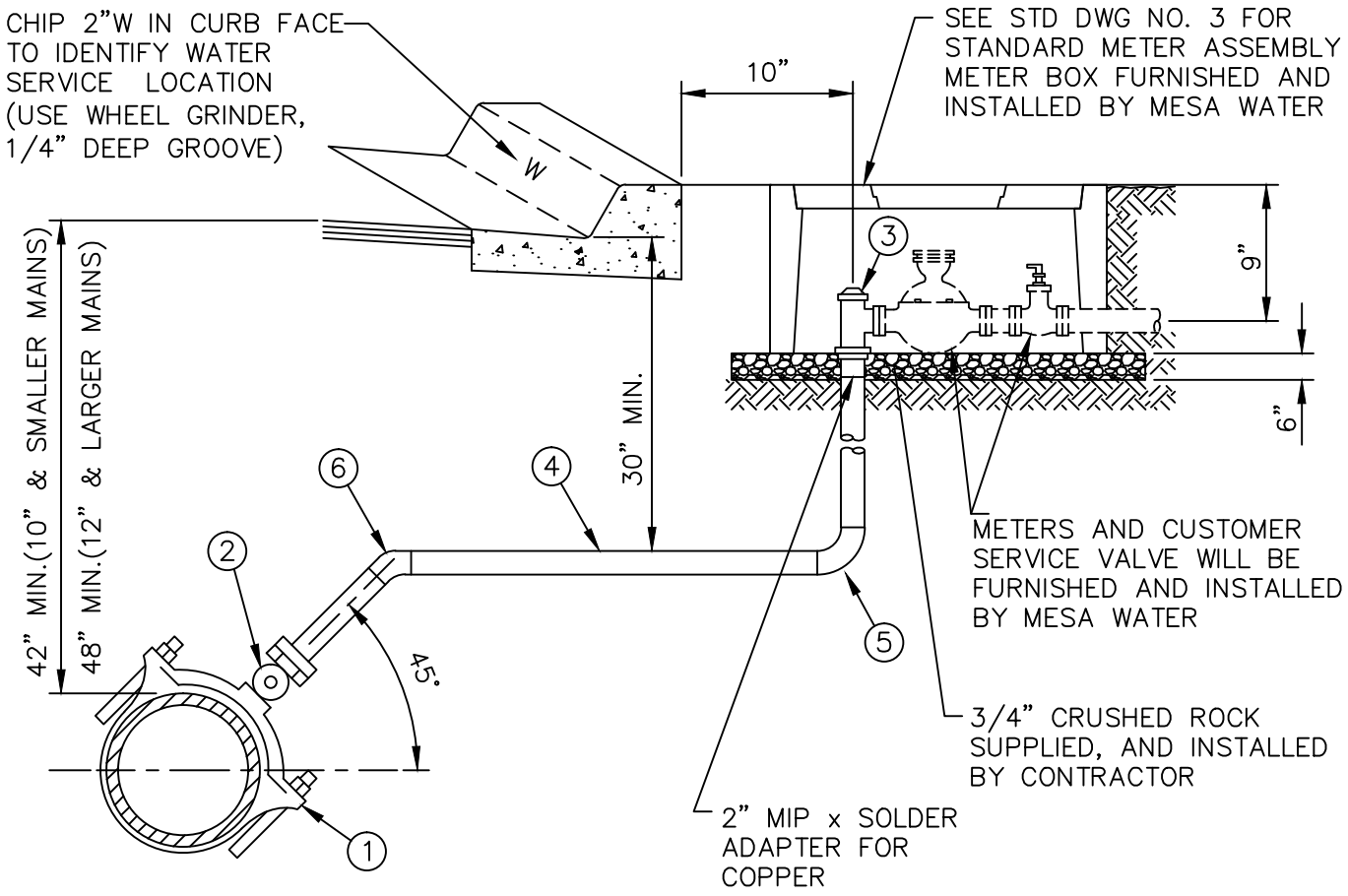
LEGEND OF MATERIAL:

ITEM NO.	SIZE & DESCRIPTION
①	BRASS SERVICE SADDLE WITH STAINLESS STEEL BAND – CS THREAD
②	1" BRASS "BALL STYLE" CORPORATION STOP (CS THREAD X FLARE CONNECTION)
③	1" BRASS "BALL STYLE" ANGLE METER STOP WITH LOCKWING (FLARE X METER FLANGE OR METER COUPLING)
④	1" COPPER TUBING

MANUFACTURER	SPEC. NO.(PVC)	
	CS x COMPRESSION	CS x FLARE
SMITH-BLAIR	325	
FORD	202BS	
McDONALD	3845	
JAMES JONES	J-1937	J-1930
MUELLER	B-25008	B-25000
FORD	FB1000-4	FB600-4
McDONALD	4701B-22	4701B
	COMPRESSION	FLARE
JAMES JONES	-----	J1964W
MUELLER	-----	B24255
FORD	-----	BA23-444W
McDONALD	-----	4602B
------	TYPE "K" SOFT	

mcwd#1a.dwg 04/02/2018

MESA WATER DISTRICT	STANDARD 1" COPPER RECYCLED WATER SERVICE ASSEMBLY	DRAWN BY: RJW DATE: APR 2018	STANDARD DRAWING 1A



GENERAL NOTES:

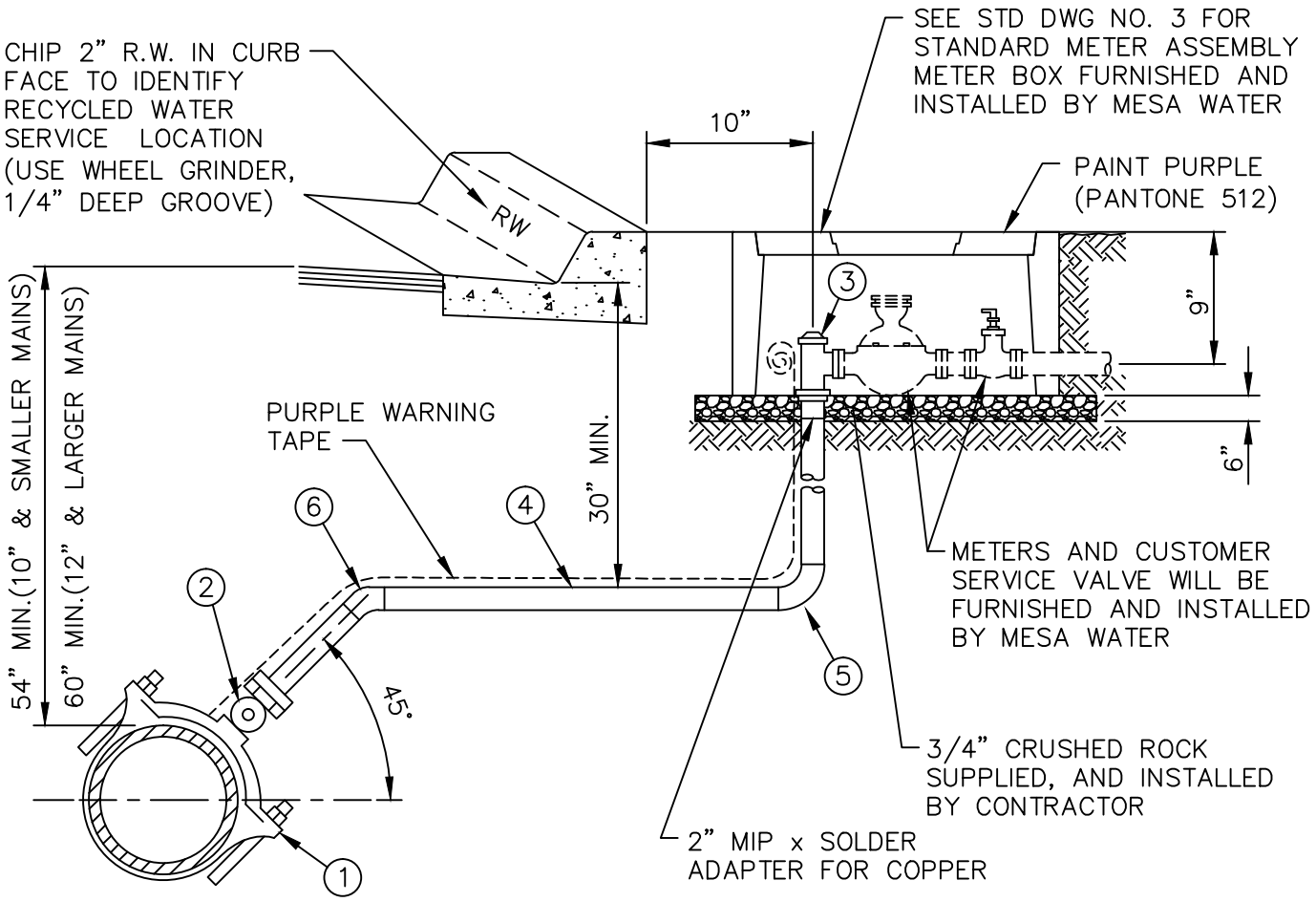
1. SERVICE SADDLE REQUIRED FOR ALL MAINS, EXCEPT STEEL. FOR STEEL MAIN, SEE STD. DWG. NO. 13.
2. INSTALL CORPORATION STOP WITH KEY SIDEWAYS, IN OPEN POSITION.
3. THE CORPORATION STOP TAP SHALL BE MADE AS RECOMMENDED BY THE PIPE MANUFACTURER. ALL DRY TAPS WILL BE MADE WITH MACHINE WITH GUIDE OR PILOT TAP. PVC TAPS SHALL BE PER MANUFACTURE GUIDE APPROVED TAPPING BIT FOR C900.
4. THE WATER SERVICE SHALL EXTEND PERPENDICULAR TO THE CENTERLINE OF THE STREET FROM THE WATER MAIN TO THE METER STOP EXCEPT IN CUL-DE-SAC ENDS.
5. STANDARD 2" SERVICE CONNECTION USED WITH THE FOLLOWING METER SIZES: 1 1/2" METER & 2" METER.
6. HOT TAP TO MAIN SHALL NOT BE WITHIN 18" OF A COUPLING, JOINT, FITTING OR WITHIN 18" OF ANOTHER TAP.

LEGEND OF MATERIAL:

ITEM NO.	SIZE & DESCRIPTION	MANUFACTURER	SPEC. NO.(PVC)
①	BRASS SERVICE SADDLE WITH STAINLESS STEEL BAND – CS THREAD	SMITH-BLAIR FORD McDONALD	325 202BS 3845
②	2" BRASS "BALL STYLE" CORPORATION STOP (CS THREAD x COMPRESSION CONNECTION)	JAMES JONES MUELLER FORD McDONALD	J-1937 B25008 FB 1000-7 4701B-22
③	2" BRASS "BALL STYLE" ANGLE METER STOP WITH LOCKWING (INLET: FIP; OUTLET: "SLOTTED" ELONGATED HOLES)	JAMES JONES MUELLER FORD McDONALD	J-1974W B24286 BFA13-777W 4604B
④	2" COPPER TUBING	-------	TYPE "K" SOFT
⑤	90° COPPER BEND (SILVER COPPER SOLDER ONLY)	-------	-------
⑥	45° COPPER BEND (SILVER COPPER SOLDER ONLY)	-------	-------

MESA WATER DISTRICT	STANDARD 2" COPPER SERVICE ASSEMBLY	DRAWN BY: RJW DATE: APR 2018	STANDARD DRAWING 2

mcwd#2.dwg 04/02/2018



GENERAL NOTES:

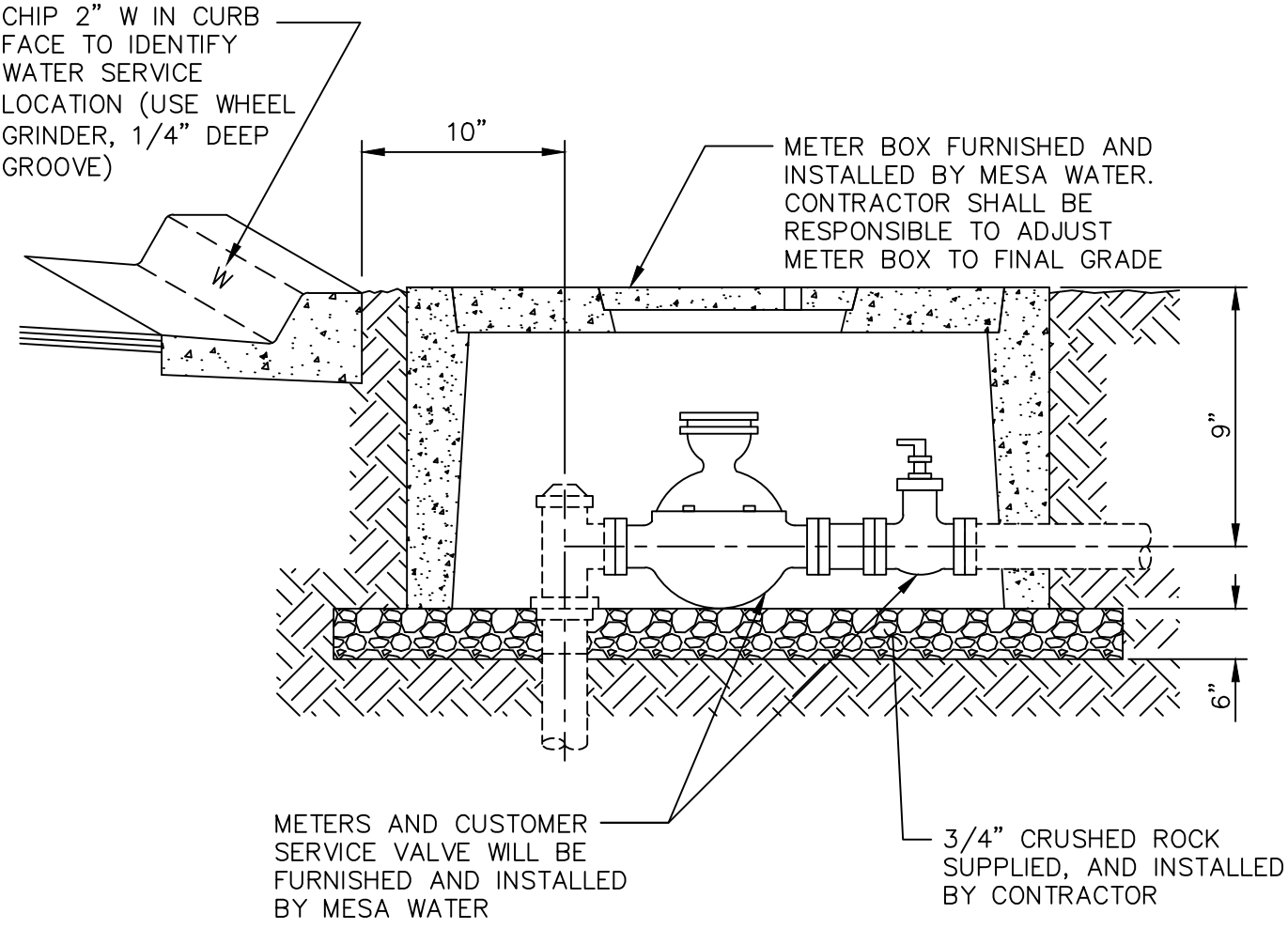
1. SERVICE SADDLE REQUIRED FOR ALL MAINS, EXCEPT STEEL. FOR STEEL MAIN, SEE STD. DWG. NO. 13.
2. INSTALL CORPORATION STOP WITH KEY SIDEWAYS, IN OPEN POSITION.
3. THE CORPORATION STOP TAP SHALL BE MADE AS RECOMMENDED BY THE PIPE MANUFACTURER. ALL DRY TAPS WILL BE MADE WITH MACHINE WITH GUIDE OR PILOT TAP. PVC TAPS SHALL BE PER MANUFACTURE GUIDE APPROVED TAPPING BIT FOR C900.
4. THE WATER SERVICE SHALL EXTEND PERPENDICULAR TO THE CENTERLINE OF THE STREET FROM THE WATER MAIN TO THE METER STOP EXCEPT IN CUL-DE-SAC ENDS.
5. STANDARD 2" SERVICE CONNECTION USED WITH THE FOLLOWING METER SIZES: 1 1/2" METER & 2" METER.
6. HOT TAP TO MAIN SHALL NOT BE WITHIN 18" OF A COUPLING, JOINT, FITTING OR WITHIN 18" OF ANOTHER TAP.
7. FOR RECYCLED WATER, THE INSTALLATION DOWNSTREAM OF THE ANGLE METER STOP SHALL BE PER STD DWG NO. 27
8. FOR RECYCLED WATER USE PURPLE TAPE ON COPPER TUBING BANDED EVERY 3 FEET. SEE TECHNICAL SPECIFICATION SECTION 15151.

LEGEND OF MATERIAL:

ITEM NO.	SIZE & DESCRIPTION	MANUFACTURER	SPEC. NO.(PVC)
①	BRASS SERVICE SADDLE WITH STAINLESS STEEL BAND – CS THREAD	SMITH-BLAIR FORD McDONALD	325 202BS 3845
②	2" BRASS "BALL STYLE" CORPORATION STOP (CS THREAD x COMPRESSION CONNECTION)	JAMES JONES MUELLER FORD McDONALD	J-1937 B25008 FB 1000-7 4701B-22
③	2" BRASS "BALL STYLE" ANGLE METER STOP WITH LOCKWING (INLET: FIP; OUTLET: "SLOTTED" ELONGATED HOLES)	JAMES JONES MUELLER FORD McDONALD	J-1974W B24286 BFA13-777W 4604B
④	2" COPPER TUBING	------	TYPE "K" SOFT
⑤	90° COPPER BEND (SILVER COPPER SOLDER ONLY)	------	------
⑥	45° COPPER BEND (SILVER COPPER SOLDER ONLY)	------	------

MESA WATER DISTRICT	STANDARD 2" COPPER RECYCLED WATER SERVICE ASSEMBLY	DRAWN BY: RJW DATE: APR 2018	STANDARD DRAWING 2A

mcwd#2a.dwg 04/02/2018



GENERAL NOTES:

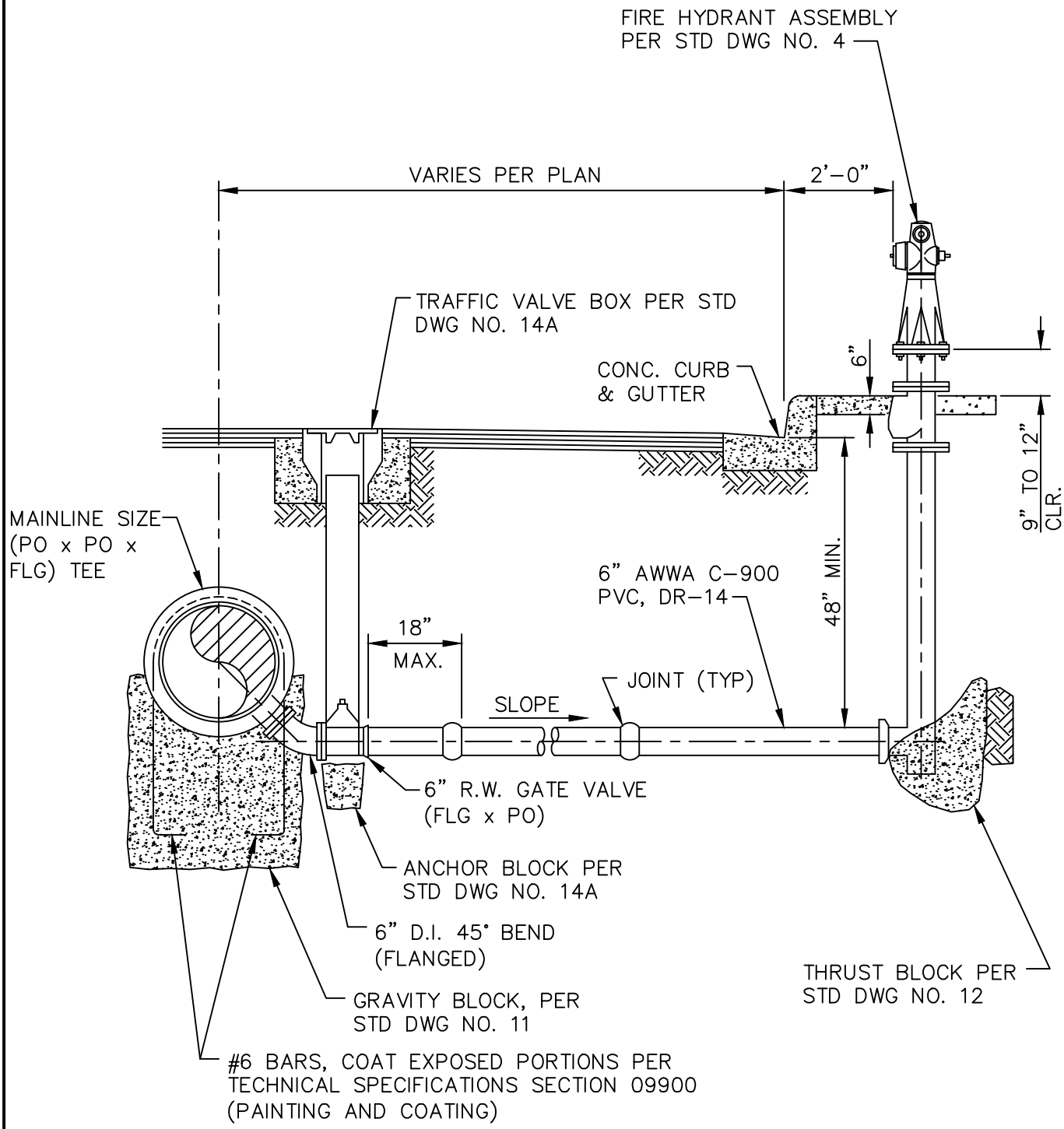
1. METER BOXES AND COVERS SHALL BE MANUFACTURED OF REINFORCED POLYMER PLASTIC MORTAR.

2. METER BOX SIZE
   5/8" & 3/4" METERS: 12"W X 20"L X 12"D
   1" METERS: 13"W X 24"L X 12"D
   1 1/2" & 2" METERS: 17"W X 30"L X 12"D

3. METER BOX MANUFACTURERS:
   J&R INC.: J&R P–W4$\frac{1}{2}$ OR P–W5$\frac{1}{2}$
   ARMORCAST PRODUCTS COMPANY: A6000485 /A6000484R OR A6001946PCX12/A6001866R

MESA WATER DISTRICT	STANDARD METER ASSEMBLY	DRAWN BY: RJW DATE: APR 2018	STANDARD DRAWING 3

mcwd#3.dwg 04/02/2018

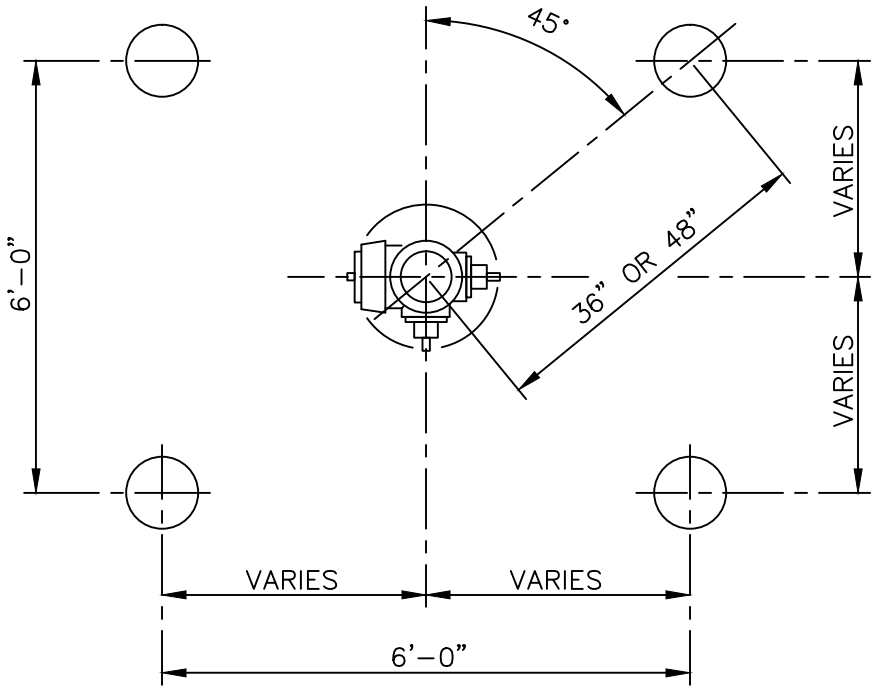


GENERAL NOTES:

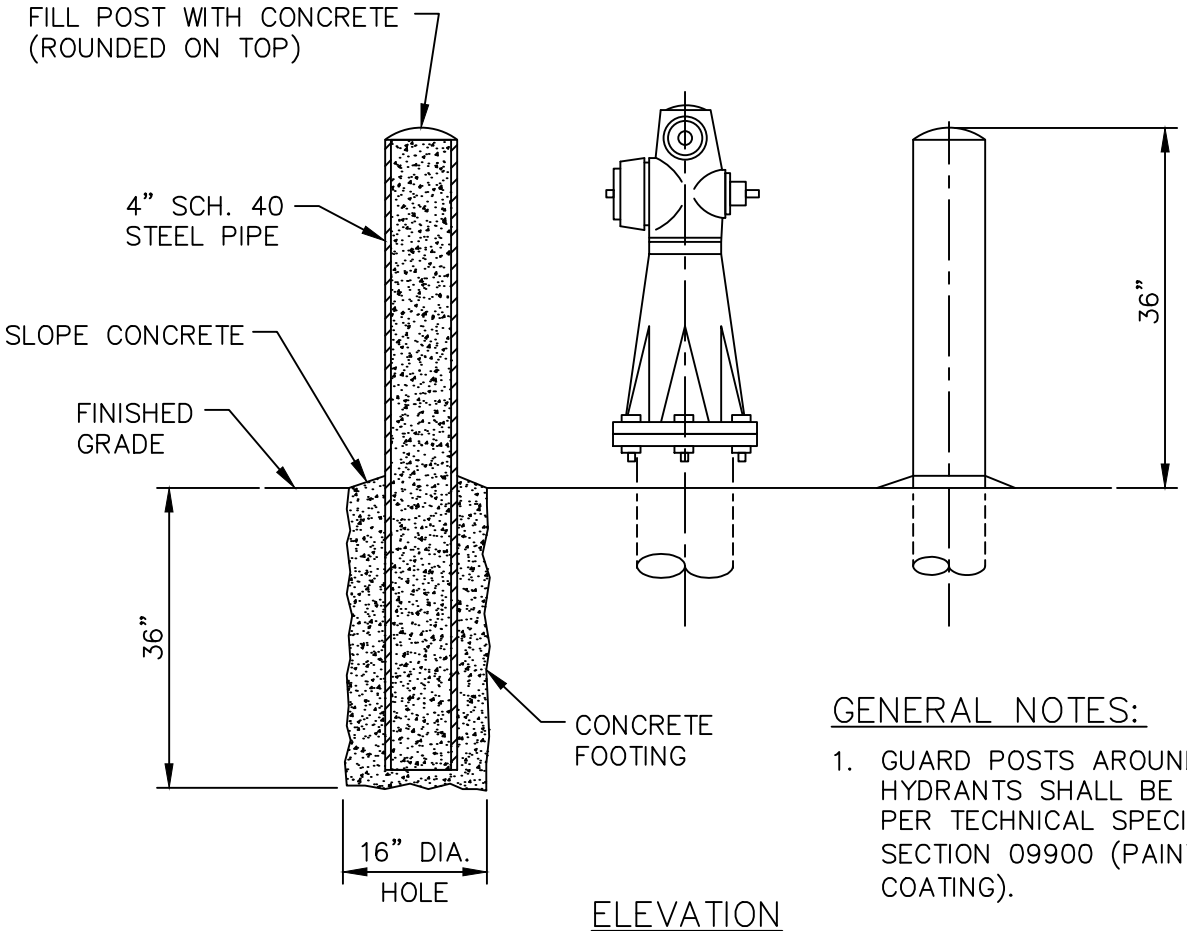
1. SEE STD. DWG. NO. 4 FOR PLAN VIEW DETAIL.
2. FH SHALL BE PAINTED PER TECHNICAL SPECIFICATION SECTION 09900 (PAINTING AND COATING).

MESA WATER DISTRICT	STANDARD BLOW-OFF HYDRANT DETAIL	DRAWN BY: RJW DATE: APR 2018	STANDARD DRAWING 4A

mcwd#4a.dwg 04/02/2018



PLAN



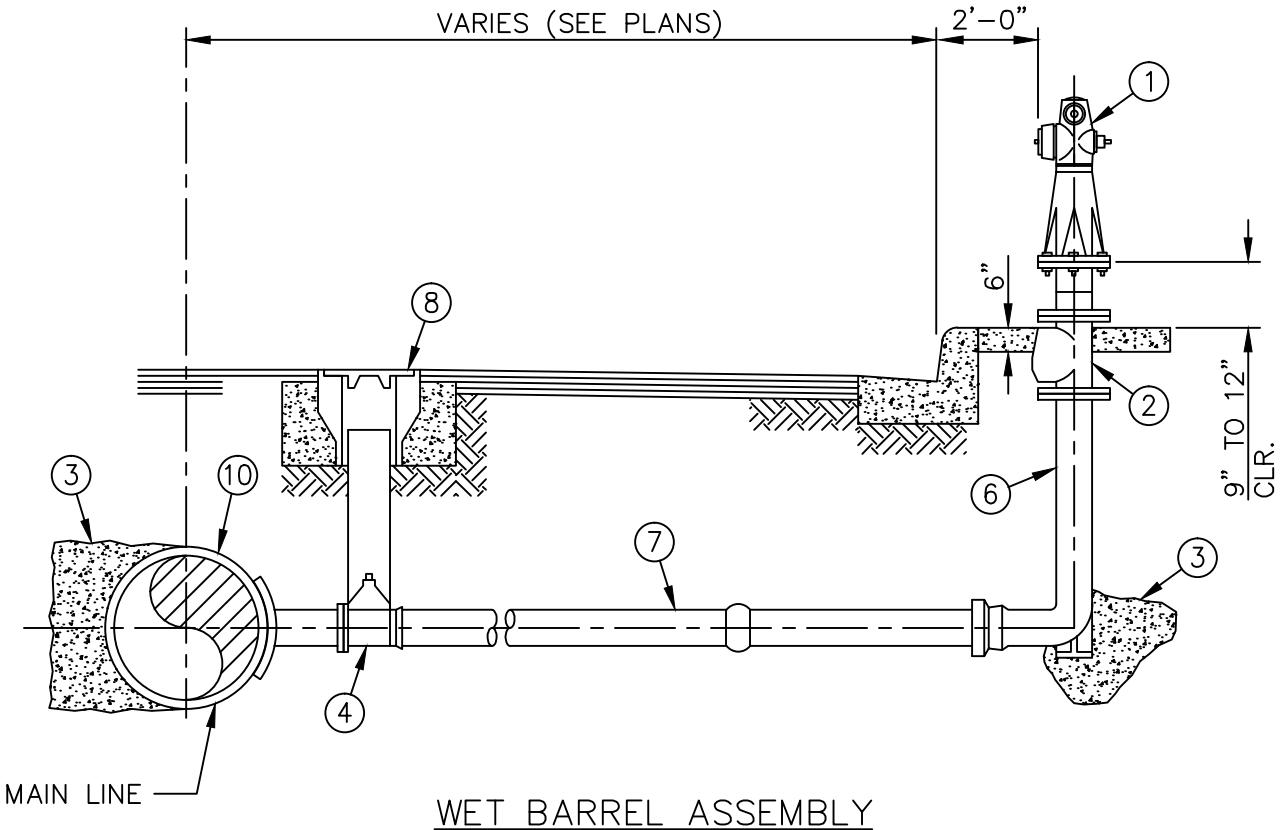
ELEVATION

GENERAL NOTES:

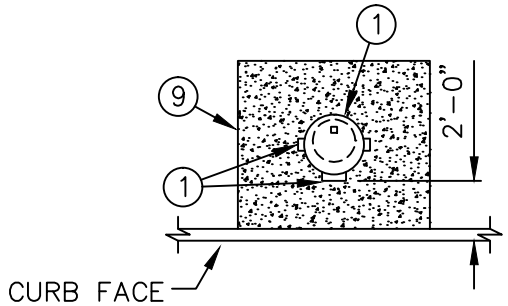
1. GUARD POSTS AROUND FIRE HYDRANTS SHALL BE PAINTED PER TECHNICAL SPECIFICATION SECTION 09900 (PAINTING AND COATING).

MESA WATER DISTRICT	STANDARD POST DETAIL	DRAWN BY: RJW DATE: APR 2018	STANDARD DRAWING 4B

mcwd#4b.dwg 04/02/2018



WET BARREL ASSEMBLY



PLAN

GENERAL NOTES:

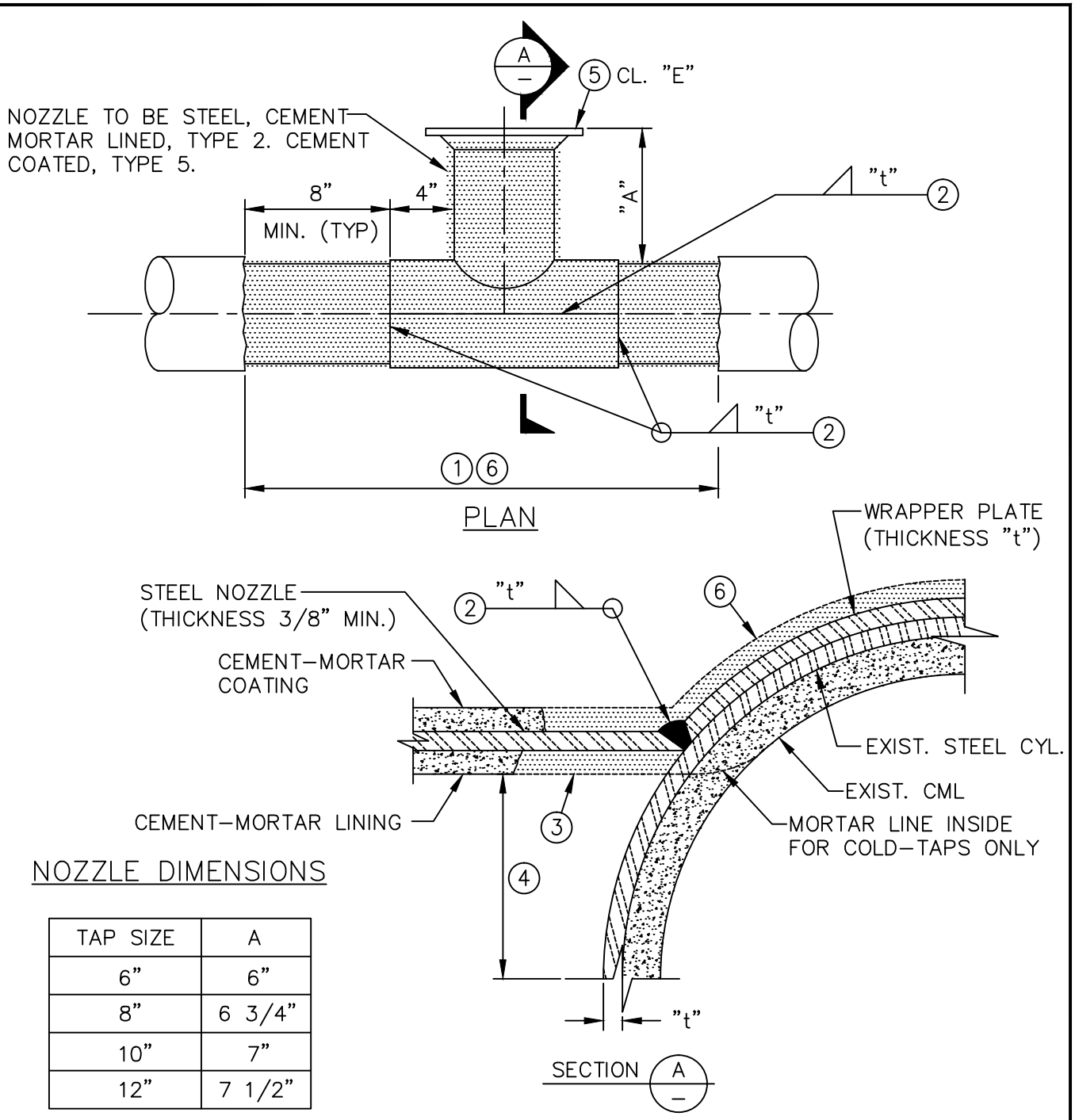
1. F.H. SHALL BE PAINTED PER TECHNICAL SPECIFICATION 09900 (PAINTING AND COATING)
2. PROVIDE A MINIMUM OF FOUR (4) FEET OF HORIZONTAL CLEARANCE BETWEEN FIRE HYDRANT AND ALL OTHER ADJACENT ABOVE GROUND FEATURES.
3. LOCATE 4" OUTLET PERPENDICULAR TO THE CURB LINE.

LEGEND OF MATERIAL:

ITEM NO.	SIZE & DESCRIPTION
①	WET BARREL FIRE HYDRANT ASSEMBLY BURY W/ONE 4" OUTLET AND TWO 2-1/2" OUTLETS OR ONE 4" OUTLET & ONE 2 1/2" OUTLET (RESIDENTIAL AREAS).
②	BREAK-OFF CHECK VALVE.
③	THRUST BLOCK PER STD DWG NO. 12.
④	6" R.W. GATE VALVE (FLG X PO)
⑤	NOT USED
⑥	6" D.I. FLG. x P.O. WET BARREL BURY.
⑦	6" AWWA C-900 PVC, DR-14
⑧	TRAFFIC VALVE BOX PER STD DWG NO. 14A
⑨	4'x 4'x 4" CONCRETE PAD OR SIDEWALK.
⑩	MAIN LINE SIZE X 6" D.I. TEE (PO X FLG) FOR EXISTING WATER MAIN, SEE STD DWG NO. 6

mcwd#4.dwg 04/02/2018

MESA WATER DISTRICT	STANDARD FIRE HYDRANT INSTALLATION	DRAWN BY: RJW DATE: APR 2018	STANDARD DRAWING 4



NOZZLE DIMENSIONS

TAP SIZE	A
6"	6"
8"	6 3/4"
10"	7"
12"	7 1/2"

ORDER OF CONSTRUCTION

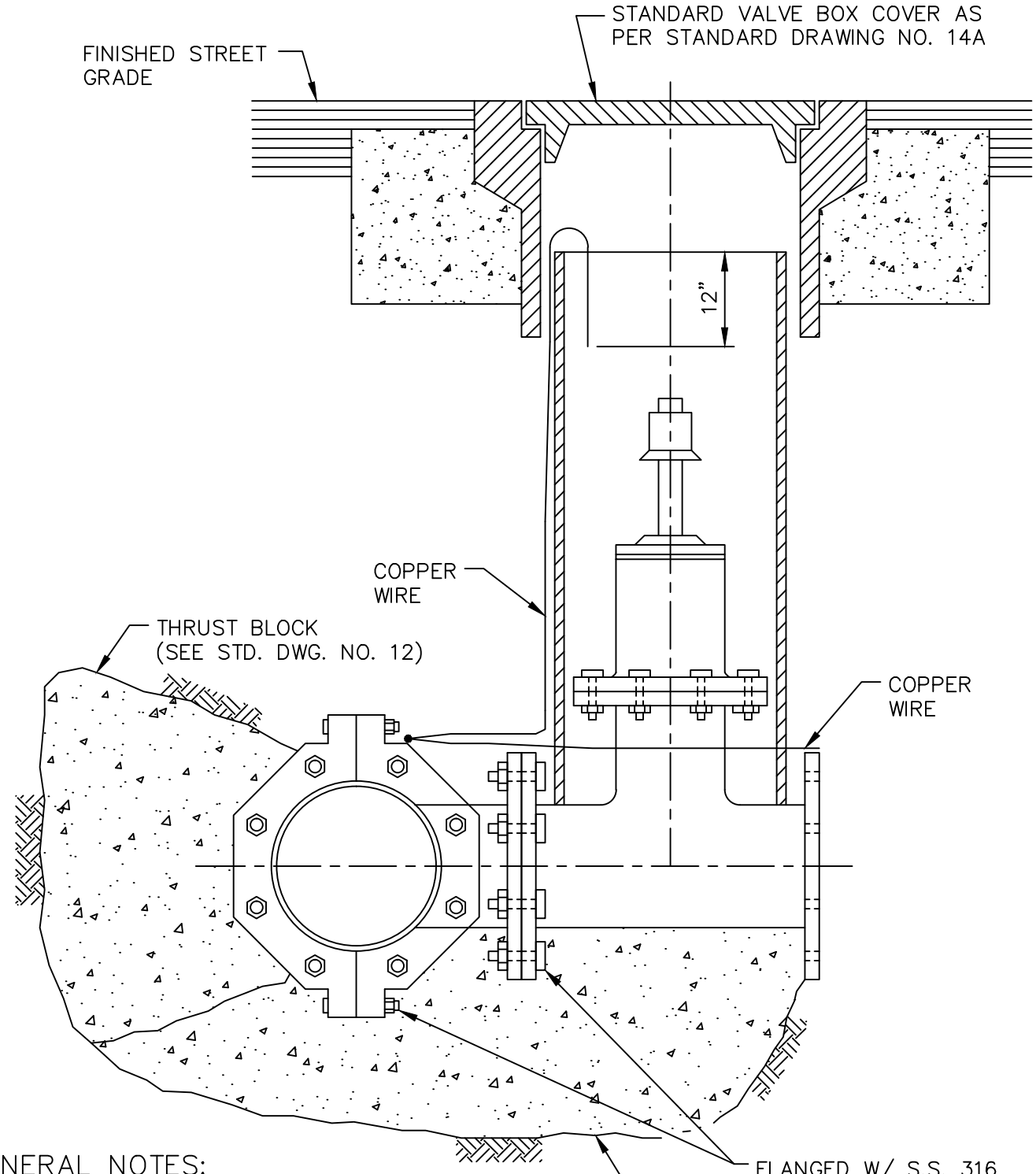
1. REMOVE CEMENT MORTAR COATING ON EXISTING STEEL MAIN
2. WELD WRAPPER PLATE AND NOZZLE TO EXISTING STEEL CYLINDER
3. FILL VOID INSIDE NOZZLE WITH CEMENT-MORTAR
4. HOT TAP PIPE – REMOVE COUPON
5. 2-HOLE FLANGE TO LEVEL VALVE
6. CEMENT-MORTAR COATING OF PIPE EXTERIOR

GENERAL NOTES:

1. HOT-TAP EXISTING MAINS UNLESS MESA WATER REQUIRES A COLD-TAP.
2. ALL CEMENT MORTAR LINING AND COATING SHALL BE PER TECHNICAL SPECIFICATION 10576.

MESA WATER DISTRICT	STANDARD TAPS ON STEEL MAINS	DRAWN BY: RJW DATE: APR 2018	STANDARD DRAWING 5

mcwd#5.dwg 04/02/2018



GENERAL NOTES:

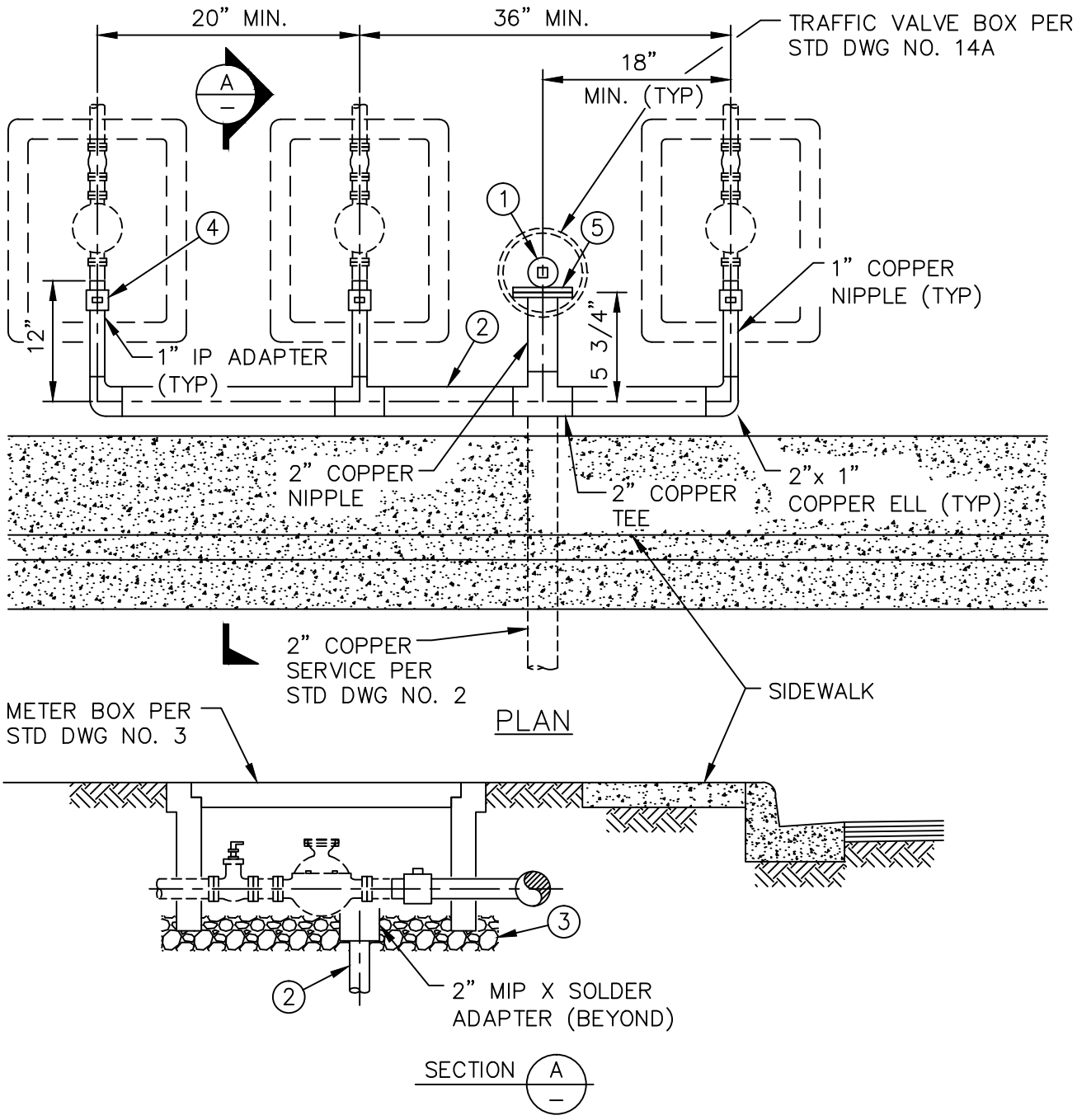
1. TAPPING SLEEVES SHALL BE PER TECHNICAL SPECIFICATION SECTION 15100. FOR SIZES 6" TO 12", MECHANICAL JOINT OR STAINLESS STEEL FULL–CIRCLE TAPPING SLEEVES. FOR SIZES LARGER THAN 12", STAINLESS STEEL FULL–CIRCLE TAPPING SLEEVE ONLY.

2. TAPPING VALVE SHALL BE PER TECHNICAL SPECIFICATION SECTION 15100. VALVE ENDS SHALL BE FLG X FLG OR FLG X PO

3. A 4" TAP IS NOT ALLOWED, MINIMUM SIZE IS 6".

MESA WATER DISTRICT	STANDARD TAPPING SLEEVE AND VALVE FOR CAST IRON, ASBESTOS CEMENT AND POLYVINYL CHLORIDE PIPE	DRAWN BY: RJW DATE: APR 2018	STANDARD DRAWING 6

mcwd#6.dwg 04/02/2018



LEGEND OF MATERIAL:

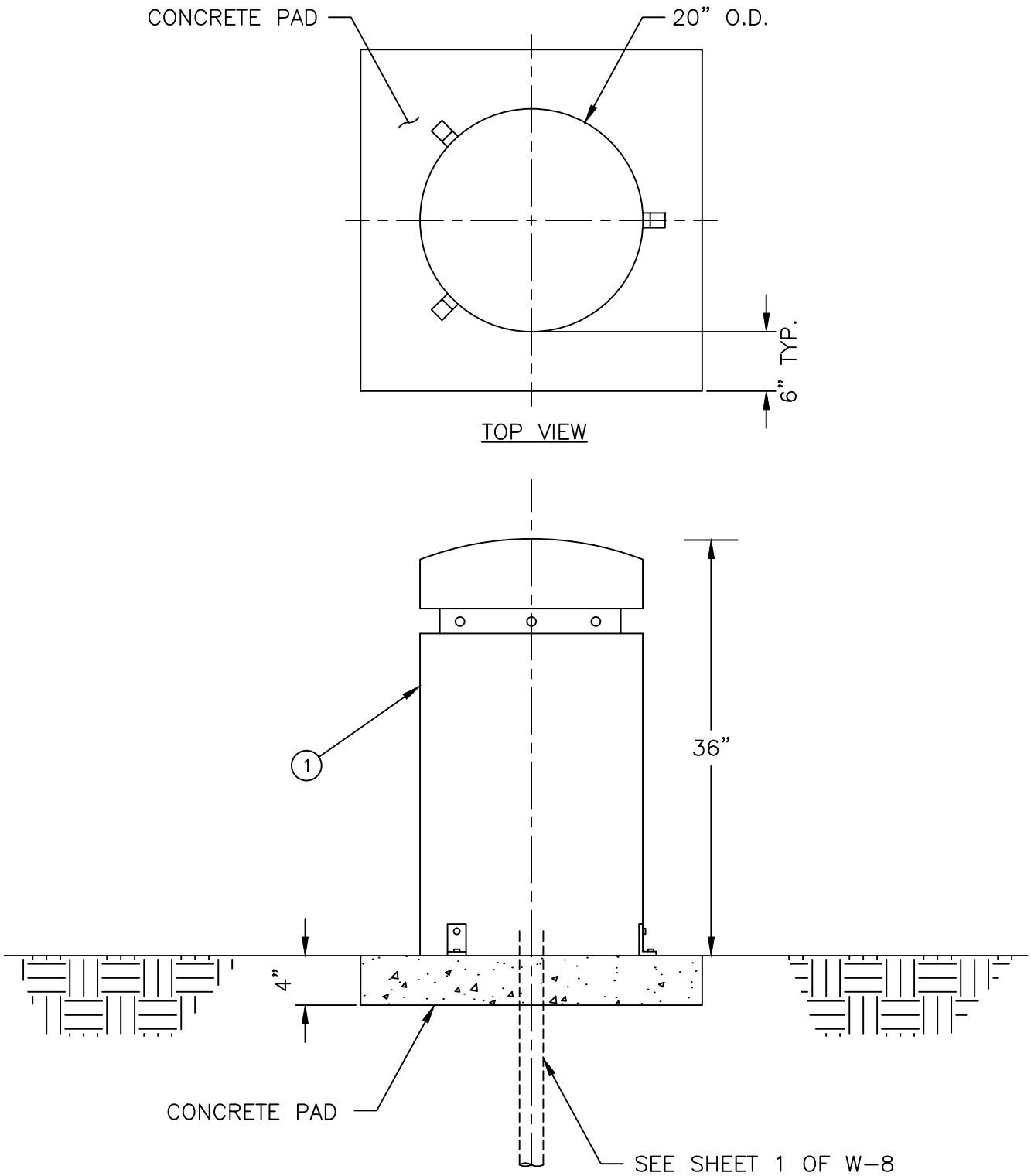
ITEM NO.	SIZE & DESCRIPTION	MANUFACTURER	SPEC. NO
①	2" BRASS "BALL STYLE" ANGLE METER STOP W/ LOCKWING (INLET: FIP; OUTLET: "SLOTTED" ELONGATED HOLES)	JAMES JONES MUELLER FORD McDONALD	J1974W B24265 BFA13-777W 4604B
②	2" COPPER TUBING	–	TYPE "K" SOFT
③	3/4" CHRUSHED ROCK	–	PER STD DWG NO. 3
④	1" BRASS BALL VALVE (LOCKWING)	JAMES JONES MUELLER FORD McDONALD	J1908W B24351 B13-444W 6101MW
⑤	METER FLANGE	JAMES JONES MUELLER FORD McDONALD	J129 CF31-77 610F

GENERAL NOTES:

1. NUMBER OF METERS AND SIZE SHALL BE DETERMINED BY MESA WATER, IRRIGATION SHALL BE SEPARATE.
2. METER AND CUSTOMER SERVICE VALVE WILL BE FURNISHED AND INSTALLED BY MESA WATER.
3. ALL FITTINGS SHALL BE SILVER COPPER SOLDER ONLY.

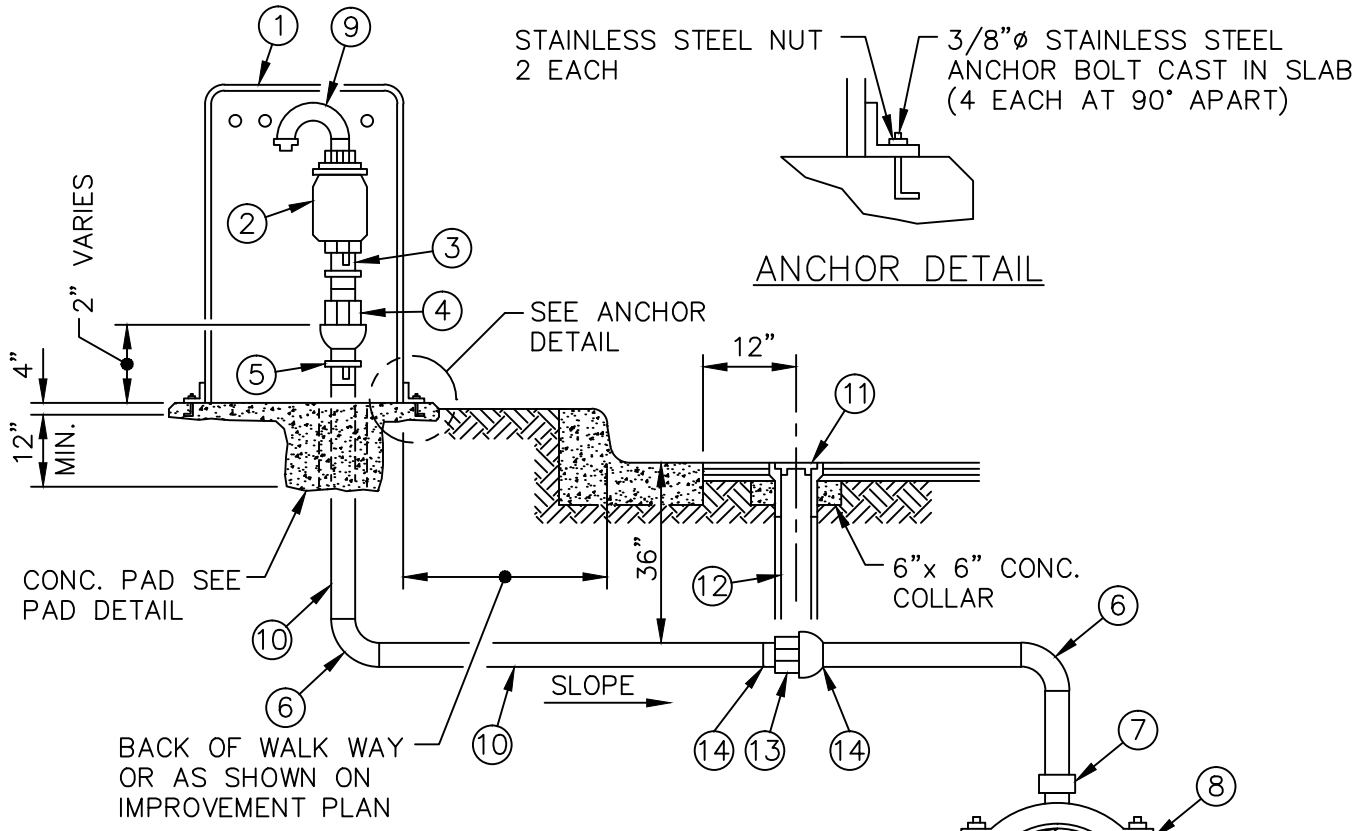
MESA WATER DISTRICT	2" SERVICE STANDARD MANIFOLD INSTALLATION	DRAWN BY: RJW DATE: APR 2018	STANDARD DRAWING 7

mcwd#7.dwg 04/02/2018



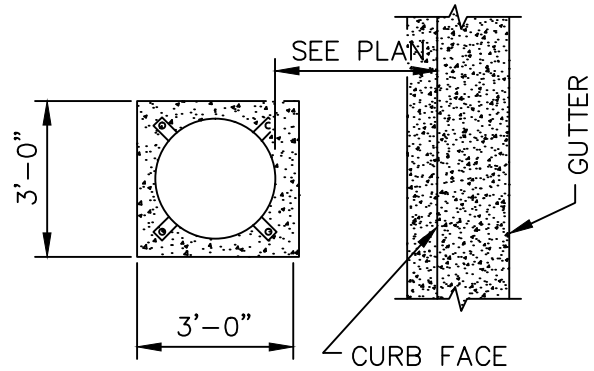
MESA WATER DISTRICT	STANDARD 1" OR 2" AIR AND VACUUM VALVE ASSEMBLY	DRAWN BY: RJW DATE: APR 2018	STANDARD DRAWING 8A

mcwd#8a.dwg 04/02/2018



MATERIALS

1. VENTED COVER (20" DIA. BY 30" HIGH) (LINEAR–LOW DENSITY POLYETHYLENE) COLOR TO BE SELECTED BY MESA WATER.
2. COMBINATION AIR RELEASE & VACUUM RELIEF VALVES.
3. BRASS CLOSE NIPPLE
4. BRASS BALL VALVE (MIP X FIP) JAMES JONES J–1931; FORD FB1700; MUELLER B–20046; MCDONALD 6107
5. BRASS ADAPTER W/I.P. THREAD x SWEAT ADAPTER
6. 90° COPPER BEND W/SILVER SOLDER
7. BRASS "BALL STYLE" CORPORATION STOP. SEE STD DWG NO. 1 FOR 1" AND STD DWG NO. 2 FOR 2"
8. BRASS SERVICE SADDLE WITH STAINLESS STEEL BAND – CS THREAD SMITH–BLAIR 325; FORD 202BS; MCDONALD 3845
9. SCH 80 PVC SHORT NIPPLES, 90° BENDS, DOWNWARD FACING PRE–FAB PVC SCREEN OUTLET WITH RIGID STAINLESS STEEL SCREEN.
10. COPPER TUBING TYPE "K" SOFT
11. TRAFFIC VALVE BOX PER STD DWG NO. 14A
12. PLASTIC SLEEVE WITHIN 8" PVC PIPE
13. BRASS BALL VALVE W/ 2" SQUARE OPERATING NUT ADAPTER ATTACHED WITH STAINLESS STEEL NUTS AND BOLTS (2" INLET: MIP; OUTLET: FIP) (1" INLET: FIP; OUTLET:FLARE). JAMES JONES J–1961 FOR 2" AND J–1901 FOR 1"; FORD B81–777 FOR 2" AND B21–444 FOR 1"; MUELLER B–20285 FOR 2" AND B–25174 FOR 1".
14. BRASS ADAPTER W/ I.P. THREAD X SWEAT ADAPTERS.



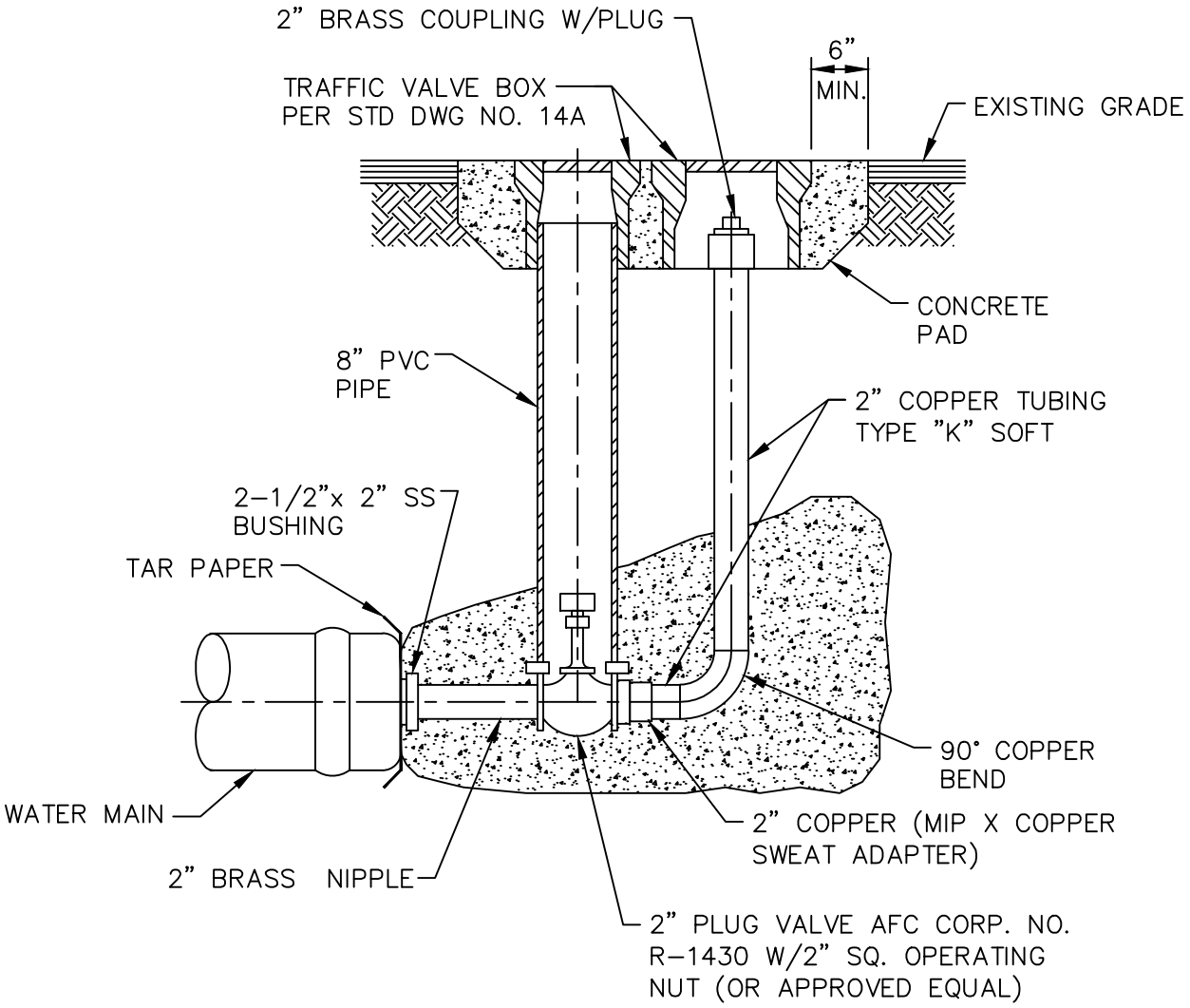
PAD DETAIL

GENERAL NOTES:

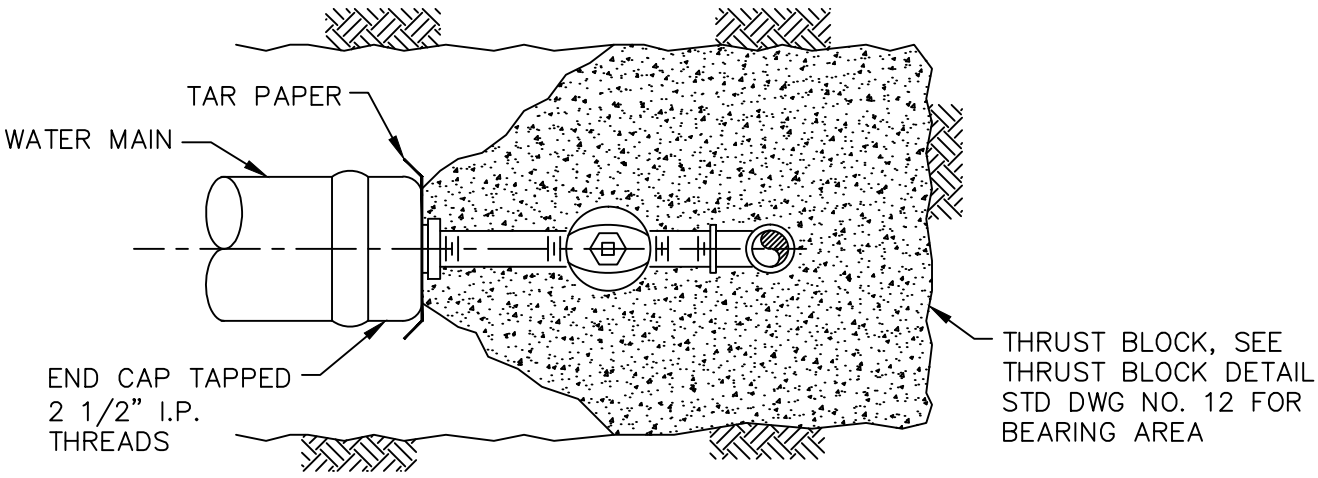
1. ALL COMPONENTS SHALL BE 1" OR 2", AS SPECIFIED ON CONSTRUCTION PLANS.
2. REFER TO TECHNICAL SPECIFICATION SECTION 15089 FOR APPROVED MATERIALS
3. LOCATION OF VALVE COVER SHALL BE COORDINATED IN THE FIELD WITH MESA WATER AND APPROPRIATE CITY (JUSIRDICTIONAL AGENCY) REPRESENTATIVE.

MESA WATER DISTRICT	STANDARD 1" OR 2" AIR AND VACUUM VALVE ASSEMBLY	DRAWN BY: RJW DATE: APR 2018	STANDARD DRAWING 8

mcwd#8.dwg 04/02/2018



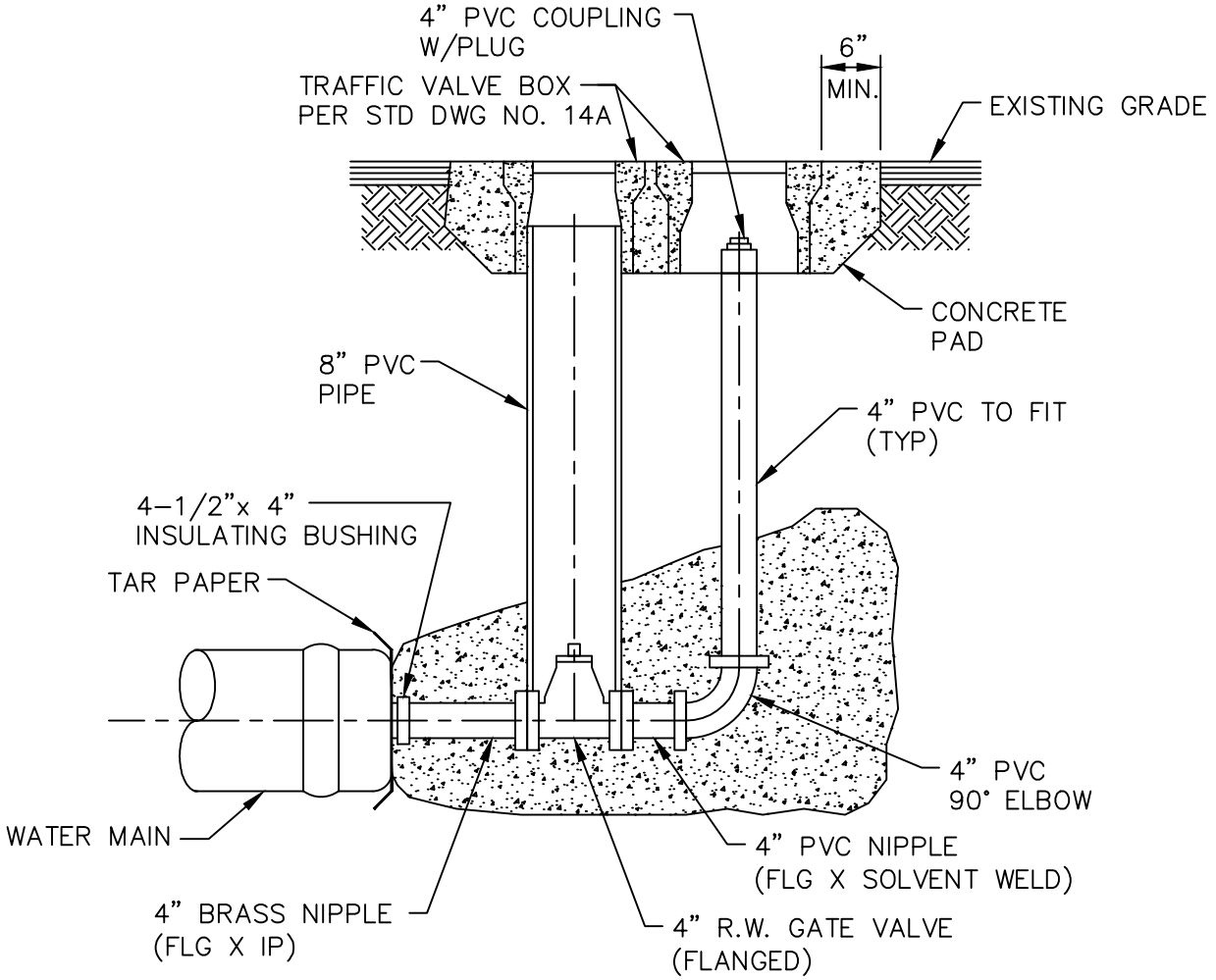
ELEVATION



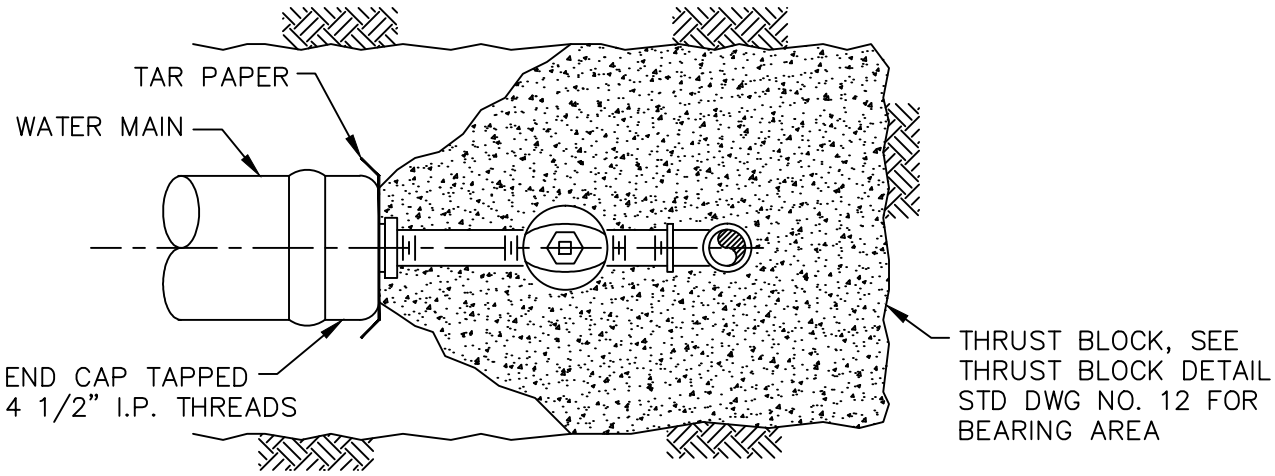
PLAN

mcwd#9.dwg 04/02/2018

MESA WATER DISTRICT	2" STANDARD BLOW-OFF AND CHLORINATION ASSEMBLY	DRAWN BY: RJW DATE: APR 2018	STANDARD DRAWING 9



ELEVATION



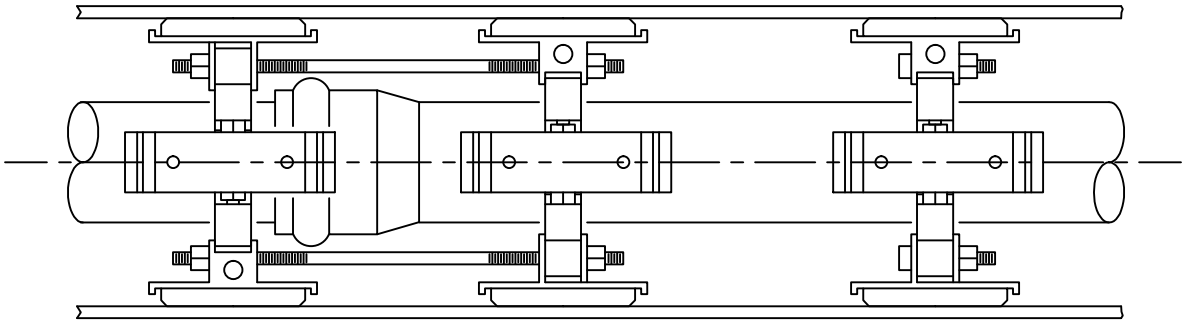
PLAN

GENERAL NOTES:

1. ALL PVC TO BE SCH. 80 (SOLVENT WELD)

MESA WATER DISTRICT	4" STANDARD BLOW-OFF AND CHLORINATION ASSEMBLY	DRAWN BY: RJW DATE: APR 2018	STANDARD DRAWING 9A

mcwd#9a.dwg 04/02/2018



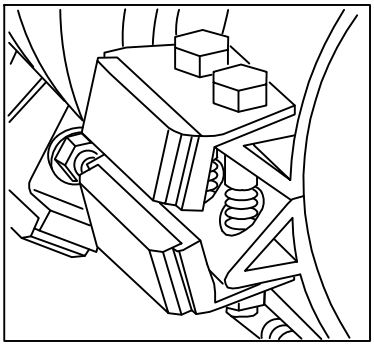
INSTALLATION RECOMMENDATIONS

EACH PIPE BELL JOINT WITHIN THE CASING SHOULD BE RESTRAINED AND SUPPORTED WITH A FORD METER BOX COMPANY UFRCS 1390 RESTRAINING CASING SPACER. ADDITIONALLY, MANUFACTURER RECOMMENDS A UFRCS 1300 BE INSTALLED EVERY TEN FEET OF THE PIPELINE. THE UFRCS 1300 CASING SPACER SUPPORTS THE WEIGHT OF THE PIPE BARREL AND THE WATER IT IS CARRYING.

CARRIER PIPE SIZE	RUNNER LOCATION AND QUANTITY
4"–8"	RUNNERS INSTALLED ON TIE ROD EARS AND CLAMPING BOLT PADS. TOTAL (4) ON THE UFRCS 1300 AND (8) ON THE UFRCS 1390.
10"–24"	RUNNERS INSTALLED ON TIE ROD EARS. TOTAL (4) FOR UFRCS 1300 AND (8) FOR UFRCS 1390.
10"–24"	RUNNERS FOR CLAMPING BOLT PADS ARE OPTIONAL WHEN THE MINIMUM SIZE CASING IS USED. THEY ARE MANDATORY FOR LARGER CASINGS. SEE TABLE BELOW BELOW FOR MIN. CASING SIZE.

NOM. PIPE SIZE	ACTUAL PIPE OD	MIN. CASING SIZE (ID)	RATED(PSI) PRESSURE PVC PIPE*	RATED(PSI) PRESSURE DUCTILE IRON*
4	4.80	12.4"	200	250
6	6.90	14"	200	250
8	9.05	17.9"	200	250
10	11.10	21.5"	200	200
12	13.20	23"	200	200

14" & LARGER SEE CONSTRUCTION PLANS



OPTIONAL RUNNERS FOR CLAMPING BOLTS 10" THRU 24" SIZE

SCHEDULE STEEL CASING MIN. WALL THICKNESS FOR C–900 PVC CARRIER PIPE SIZE	
6"	1/4"
8"	1/4"
10"	5/16"
12"	5/16"

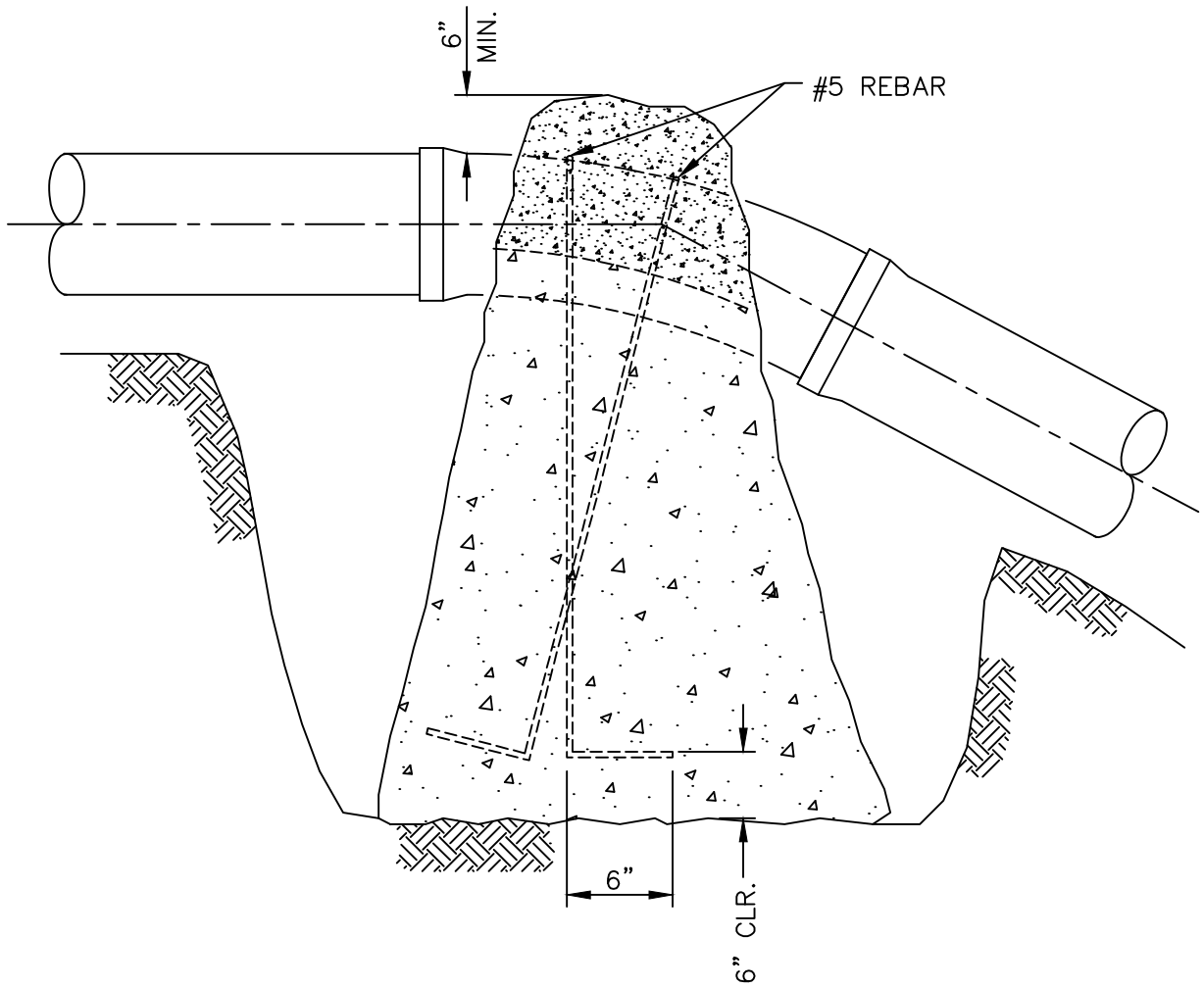
14" & LARGER SEE CONSTRUCTION PLANS

GENERAL NOTES:

1. CASING SHALL BE INSTALLED BY BORE, JACK OR TUNNEL METHOD.
2. SKIDS SHALL BE INSTALLED AS PER DETAILS ABOVE.
3. ALL CASING SECTIONS SHALL BE JOINED BY CONTINUOUS FULL–CIRCUMFERENCE WELD.
4. CARRIER PIPE SHALL BE PRESSURE TESTED PRIOR TO SEALING ENDS OF CASING.
5. EACH END OF CASING SHALL BE SEALED WITH RUBBER CASING END SEALS.

MESA WATER DISTRICT	STANDARD INSTALLATION OF CARRIER PIPE IN CASING	DRAWN BY: RJW DATE: APR 2018	STANDARD DRAWING 10

mcwd#10.dwg 04/02/2018



ELEVATION

GRAVITY BLOCK

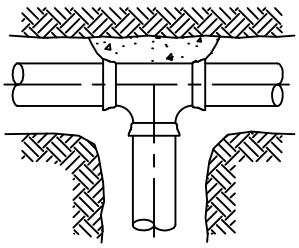
SIZE IN CUBIC FEET				
MAIN SIZE	11 1/4°	22 1/2°	45°	90°
6"	11	22	43	80
8"	20	40	77	142
10"	31	62	120	222
12"	44	88	173	320
OVER 12" SHOWN ON PLANS				

GENERAL NOTES:

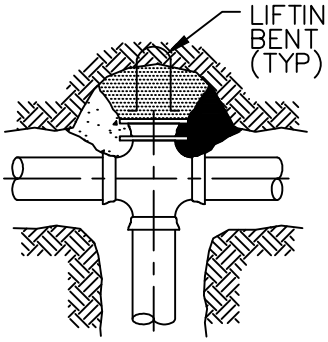
1. THRUST BLOCK SIZES BASED ON 200 PSI PRESSURE AND A 1.5 SAFETY FACTOR
2. THRUST BLOCKS SHALL BE CLASS 560-C-3250 (STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION, LATEST EDITION)
3. ALL PIPE & FITTINGS SHALL BE WRAPPED WITH TAR PAPER PRIOR TO PLACING BLOCKS.
4. ALL REBARS SHALL BE CLEAN.

MESA WATER DISTRICT	STANDARD DETAIL OF CONCRETE GRAVITY BLOCK	DRAWN BY: RJW DATE: APR 2018	STANDARD DRAWING 11

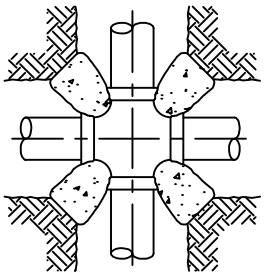
mcwd#11.dwg 04/02/2018



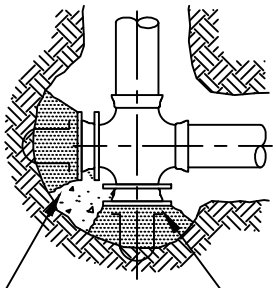
DETAIL 1



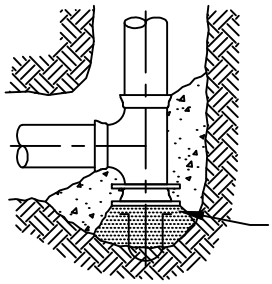
DETAIL 2



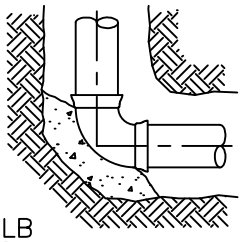
DETAIL 3



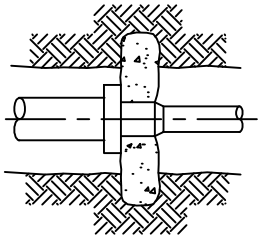
DETAIL 4



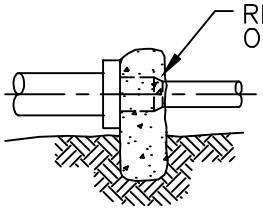
DETAIL 5



DETAIL 6

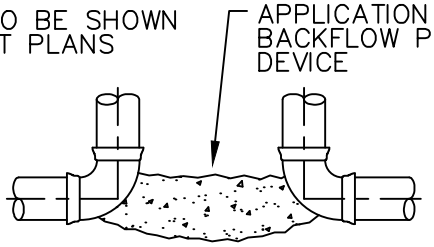


PLAN



ELEVATION

DETAIL 7



ELEVATION

DETAIL 8

THRUST BLOCK

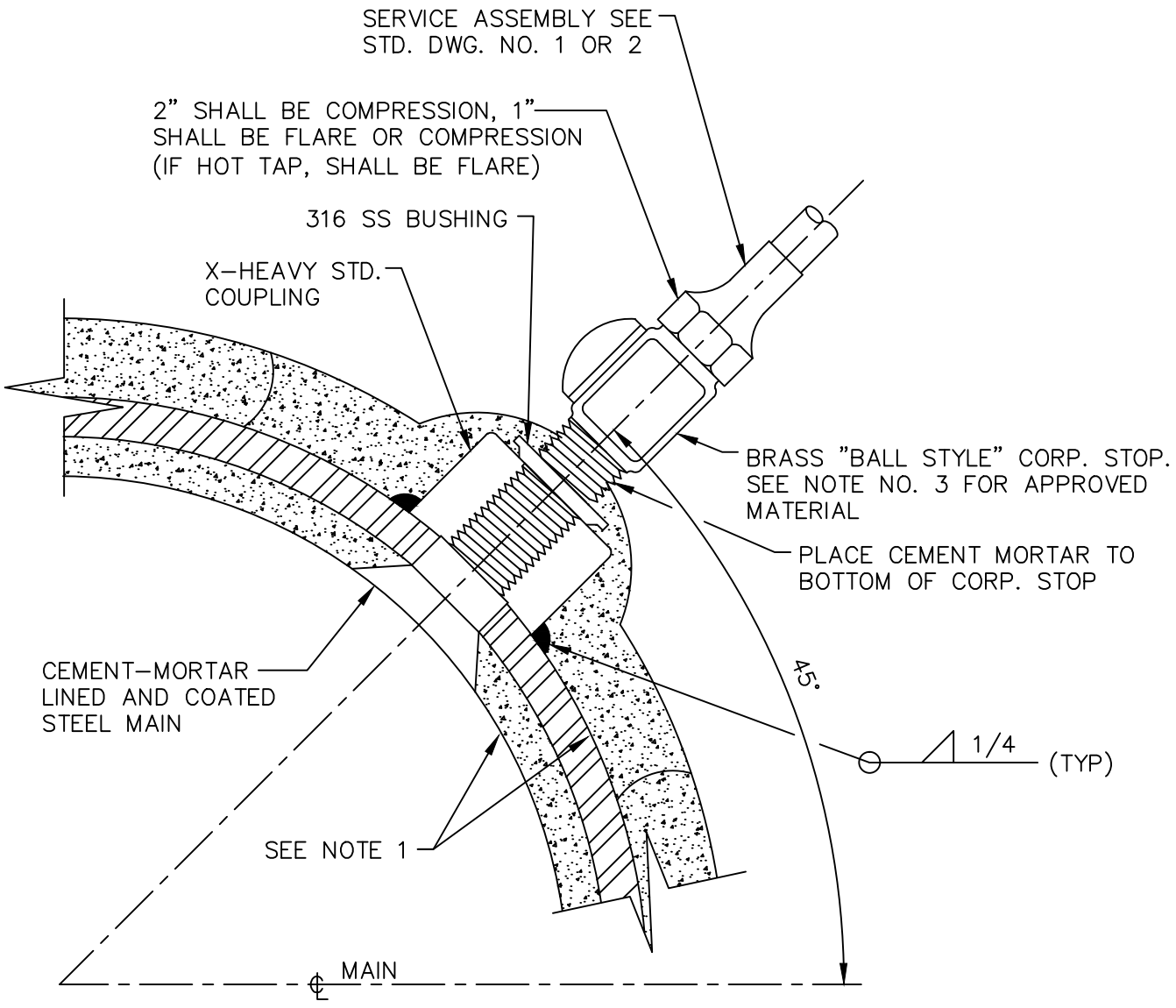
SOIL BEARING AREA IN SQUARE FEET				
MAIN SIZE	11 1/4°	22 1/2°	45°	90°
6"	1.7	3.3	6.5	12
8"	3.0	5.9	12	22
10"	4.6	9.2	18	33
12"	6.7	13	26	48
OVER 12" SHOWN ON PLANS				

GENERAL NOTES:

1. THRUST BLOCK SIZES BASED ON A SOIL BEARING VALUE OF 1000 PSF AND 200 PSI WATER PRESSURE AND A 1.5 SAFETY FACTOR.
2. THRUST BLOCKS SHALL BE CLASS 560-C-3250 (STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION, LATEST EDITION)
3. ALL PIPE & FITTINGS SHALL BE WRAPPED WITH TAR PAPER PRIOR TO PLACING BLOCKS.
4. LIFTING HOOKS SHALL BE CLEANED AND COATED PER TECHNICAL SPECIFICATION SECTION 09900.
5. THRUST BLOCK SOIL BEARING AREAS FOR DEAD ENDS AND TEES ARE THE SAME AS FOR 90° BENDS.

MESA WATER DISTRICT	STANDARD DETAIL OF CONCRETE THRUST BLOCK	DRAWN BY: RJW DATE: APR 2018	STANDARD DRAWING 12

mcwd#12.dwg 04/02/2018



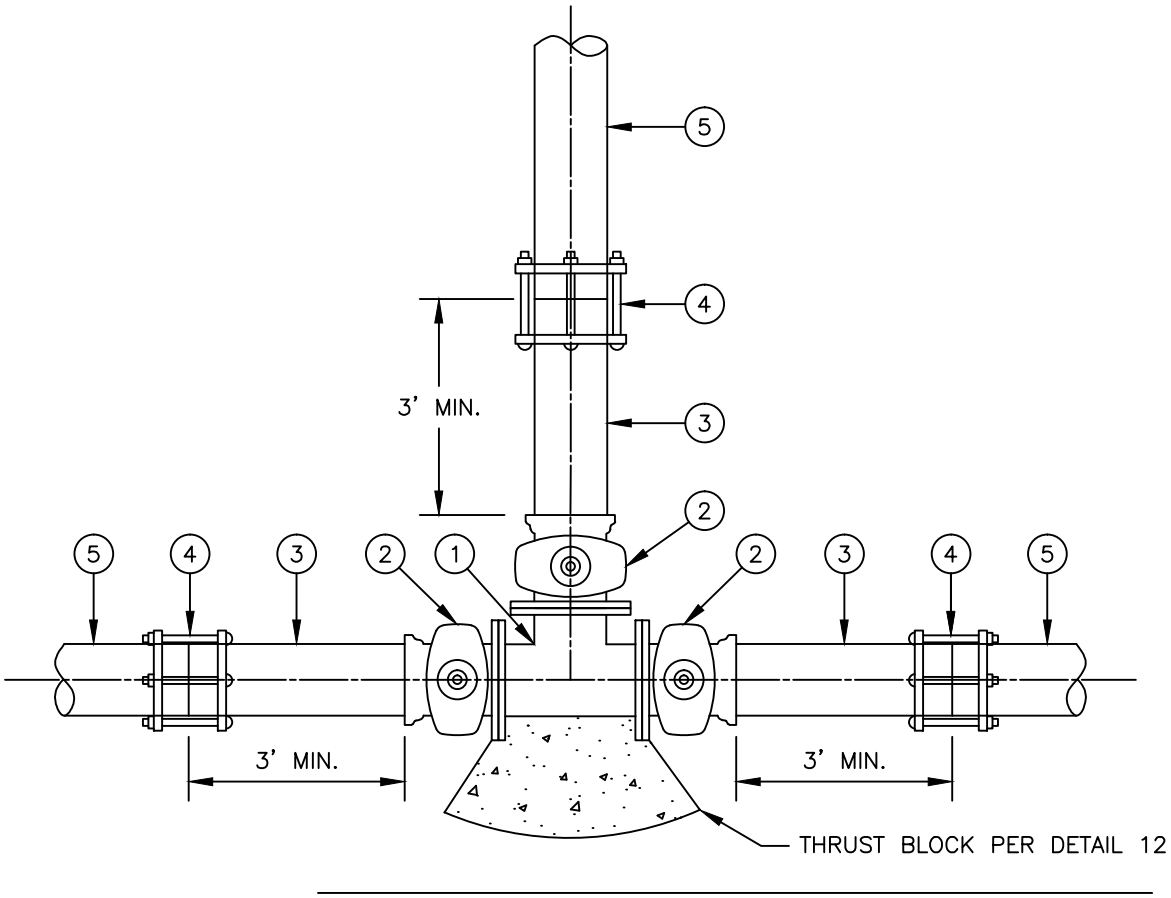
GENERAL NOTES:

1. ALL COATING DAMAGED OR REMOVED FOR INSTALLATION OF THE SERVICE TAP SHALL BE REPLACED TO THEIR ORIGINAL CONDITION UPON COMPLETION PER TECHNICAL SPECIFICATION SECTION 15076.
2. OUTLET SIZE OF COUPLING SHALL BE INCREASED BY 1/2-INCH TO ACCOMMODATE THE BUSHING FOR TAPS SMALLER THAN 2-INCHES.
3. BRASS "BALL STYLE" CORP. STOP

	COMPRESSION	FLARE
JAMES JONES	J-1935	J-1929
MUELLER	B-25028	B-25025
FORD	FB1100	FB700
MCDONALD	4704B-22	4704B

MESA WATER DISTRICT	STANDARD TAP TO CEMENT MORTAR LINED AND COATED STEEL MAIN	DRAWN BY: RJW DATE: APR 2018	STANDARD DRAWING 13

mcwd#13.dwg 04/02/2018



ITEMS:

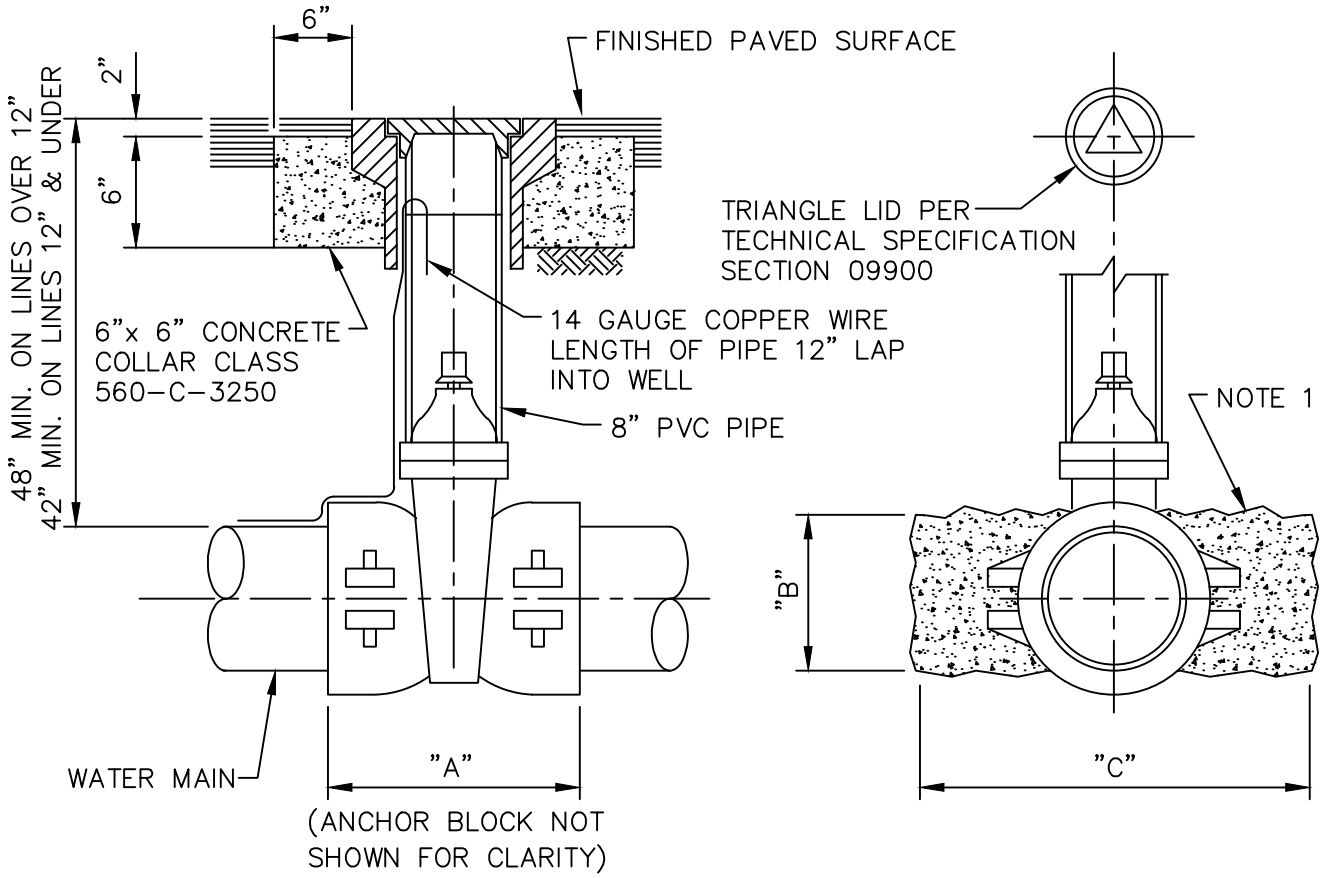
1. FLG x FLG x FLG D.I.P. TEE
2. FLG x PO RW GATE VALVE PER MESA WATER STANDARD SPECIFICATION 15100
3. BEVELED END JOINING VALVE x PE DR-14 PVC (C900) PIPE
4. CAST BOLTED SLEEVE-TYPE COUPLING FOR IDENTICAL OR DIFFERENT PIPE MATERIALS ON EACH SIDE
5. EXISTING PIPE

NOTES:

1. NUTS AND BOLTS SHALL BE 316 STAINLESS STEEL.
2. DOUBLE WRAP TEES, VALVES AND ALL FITTINGS IN 8-MIL POLYETHYLENE.
3. WARNING TAPE SHALL BE INSTALLED.
4. SEE MESA WATER STANDARD DRAWING 18 FOR TRENCH DETAILS.
5. SEE MESA WATER STANDARD DRAWING 12 FOR FURTHER THRUST BLOCK DETAILS.
6. SEE MESA WATER STANDARD DRAWING 14A AND 15 FOR VALVE BOX ASSEMBLY AND VALVE EXTENSION.

MESA WATER DISTRICT	CUT-IN TEE AND VALVE INSTALLATION	DRAWN BY: RJW DATE: APR 2018	STANDARD DRAWING 14

mcwd#14_REVISED.dwg 04/02/2018

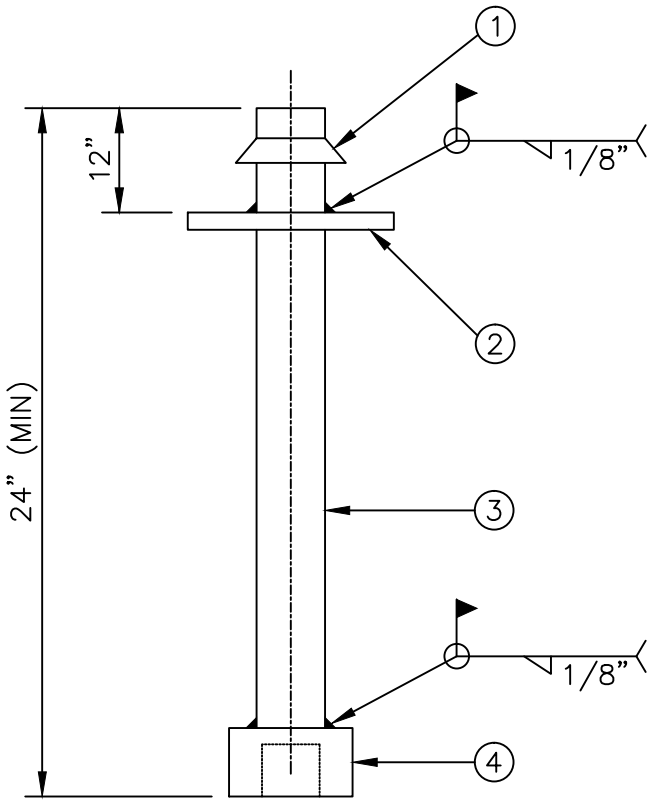


GENERAL NOTES:

1. ANCHOR BLOCK ONLY REQUIRED WHEN VALVE IS NOT FLANGED TO TEE OR CROSS.
2. VALVE BODY TO BE WRAPPED WITH PLASTIC (4 MIL) WHEN ANCHOR IS REQUIRED.
3. PROVIDE VALVE STEM EXTENSION IF DEPTH TO VALVE EXCEEDS 4 FT PER STD DWG NO. 15
4. ANCHOR BLOCK DIMENSIONS: DIMENSION "A" EQUALS LENGH OF VALVE BODY DIMENSION "B" EQUALS WIDTH OF VALVE BODY DIMENSION "C" EQUALS TRENCH WIDTH PLUS 2X PIPE DIAMETER.

mcwd#14A.dwg 04/02/2018

MESA WATER DISTRICT	STANDARD R.W. GATE VALVE INSTALLATION	DRAWN BY: RJW DATE: APR 2018	STANDARD DRAWING 14A



VALVE STEM EXTENSION

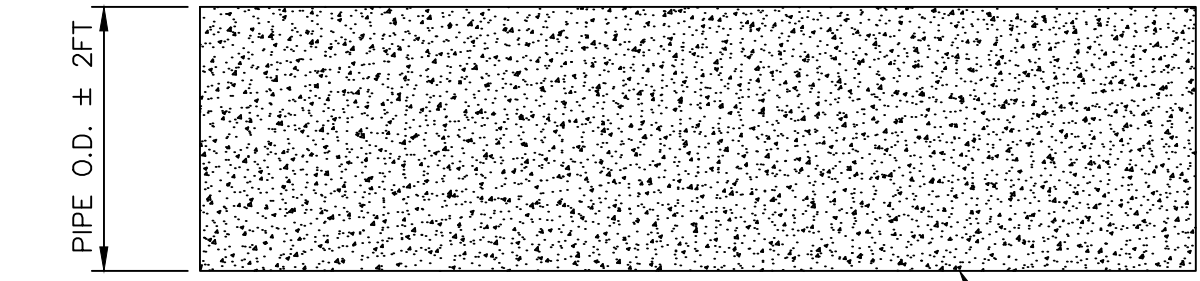
1. A.W.W.A. 2" SQUARE OPERATING NUT
2. 5" DIA. x 3/16" SPACER PLATE 12" BELOW TOP OF OPERATING NUT
3. 1 1/4" ROUND OR SQUARE STOCK (PINNED COUPLERS ARE NOT ALLOWED)
4. SOCKET FOR 2" SQUARE OPERATING NUT

NOTES

1. PROVIDE VALVE STEM EXTENSION WHEN DEPTH TO TO VALVE NUT EXCEEDS 48" INCHES (FABRICATE EXTENSION TO FIELD MEASUREMENT – SEE NOTE 2)
2. NO VALVE STEM EXTENSION SHALL BE LESS THAN 24" IN LENGTH. TERMINATE EXTENSION 24" TO 30" FROM FINISHED GRADE.
3. PROVIDE ADDITIONAL SPACER PLATE WHEN DISTANCE TO BOTTOM SOCKET EXCEEDS 5 FEET.

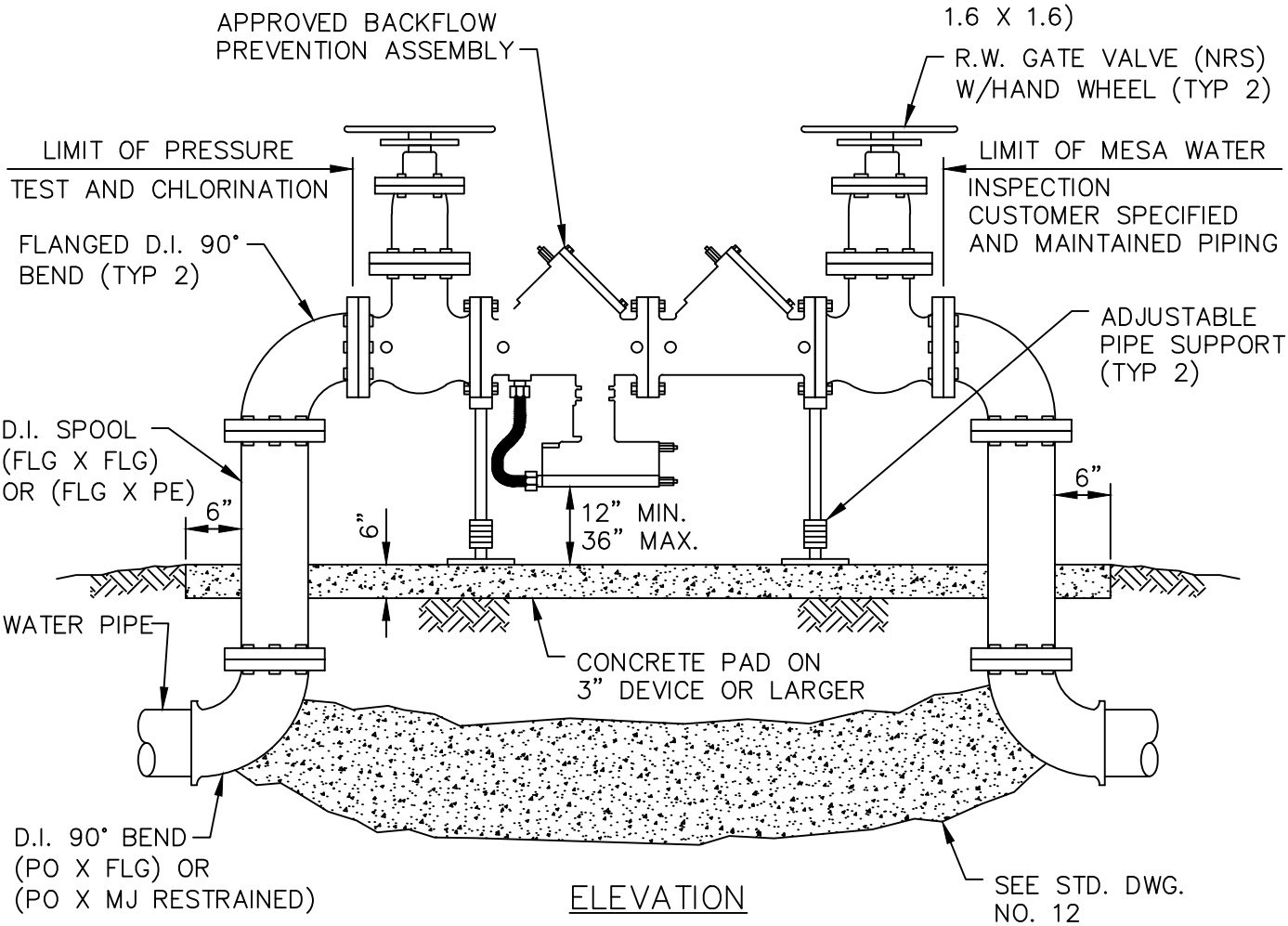
MESA WATER DISTRICT	VALVE EXTENSION	DRAWN BY: RJW DATE: APR 2018	STANDARD DRAWING 15

mcwd#15.dwg 04/02/2018



PLAN
(PAD ONLY)

CONCRETE PAD
(REINFORCED WITH W.W.F.
1.6 X 1.6)



ELEVATION

GENERAL NOTES:

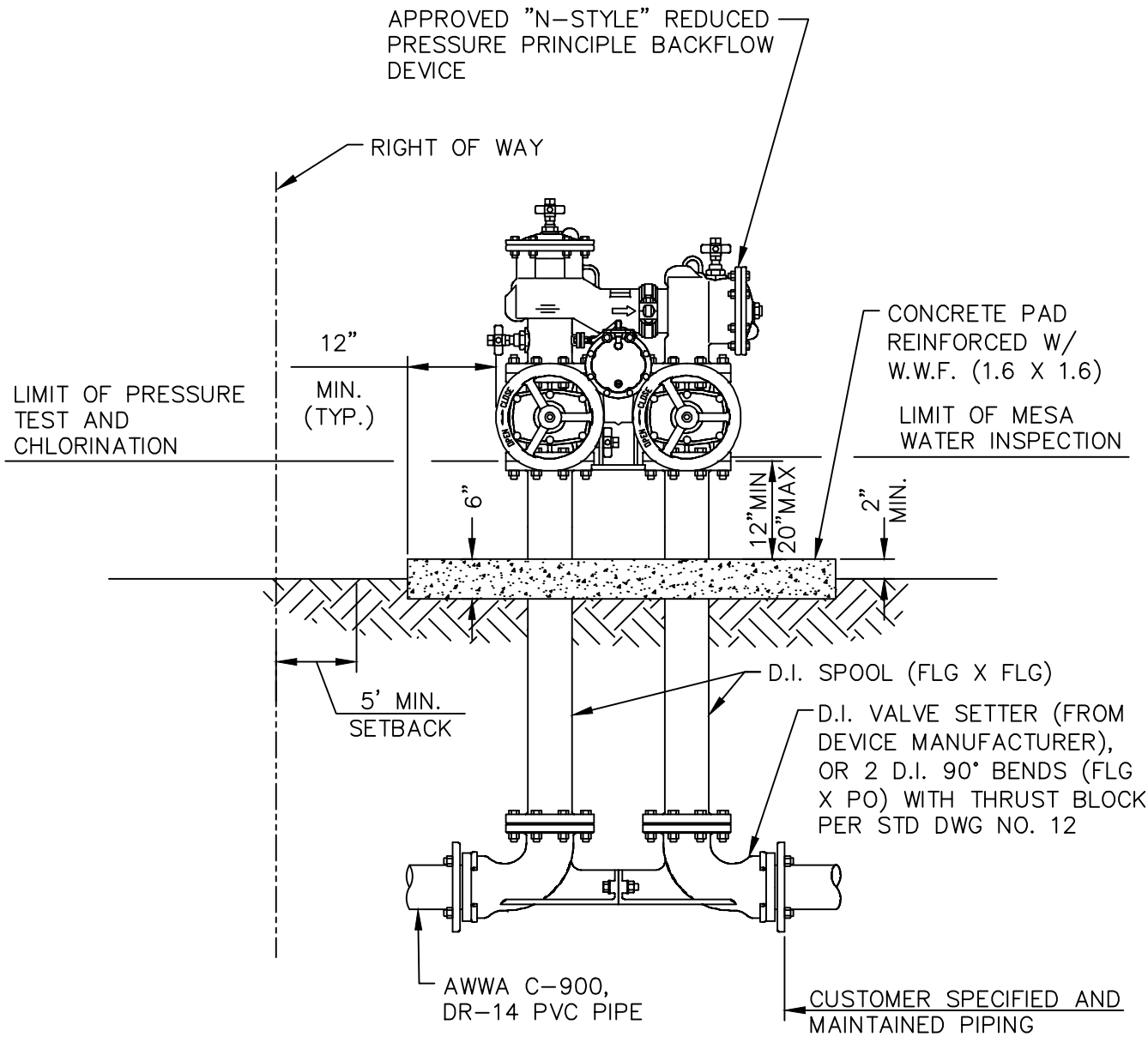
1. PRESSURE TEST AND CHLORINATE TO LIMITS SHOWN ABOVE
2. CONTACT MESA WATER FOR LATEST LIST OF APPROVED BACKFLOW PREVENTION ASSEMBLIES.
3. BACKFLOW ASSEMBLY SHALL BE A MINIMUM OF 36" FROM ANY STRUCTURE, CURB OR SIDEWALK.
4. BACKFLOW ASSEMBLY MUST BE EASILY ACCESSIBLE TO FACILITATE TESTING AND SERVICING.

"FOR DOMESTIC USE ONLY"

HEALTH HAZARD (CONTAMINANT) BACKFLOW PREVENTION DEVICE

MESA WATER DISTRICT	REDUCED PRESSURE PRINCIPLE ASSEMBLY (3" OR LARGER)	DRAWN BY: RJW DATE: APR 2018	STANDARD DRAWING 16

mcwd#16.dwg 04/02/2018



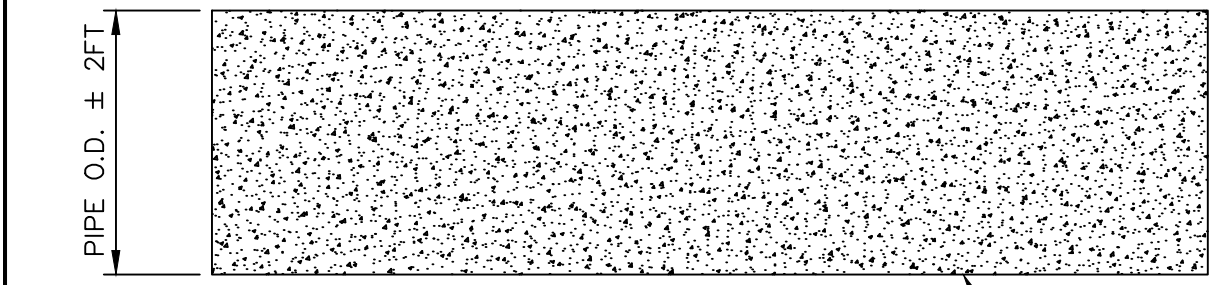
FRONT ELEVATION VIEW

GENERAL NOTES:

1. PRESSURE TEST AND CHLORINATE TO LIMITS SHOWN ABOVE.
2. CONTACT MESA WATER FOR LATEST LIST OF APPROVED BACKFLOW PREVENTION ASSEMBLIES.
3. BACKFLOW ASSEMBLY SHALL BE A MINIMUM OF 36" FROM ANY STRUCTURE, CURB OR SIDEWALK.
4. BACKFLOW ASSEMBLY MUST BE EASILY ACCESSIBLE TO FACILITATE TESTING AND SERVICING.

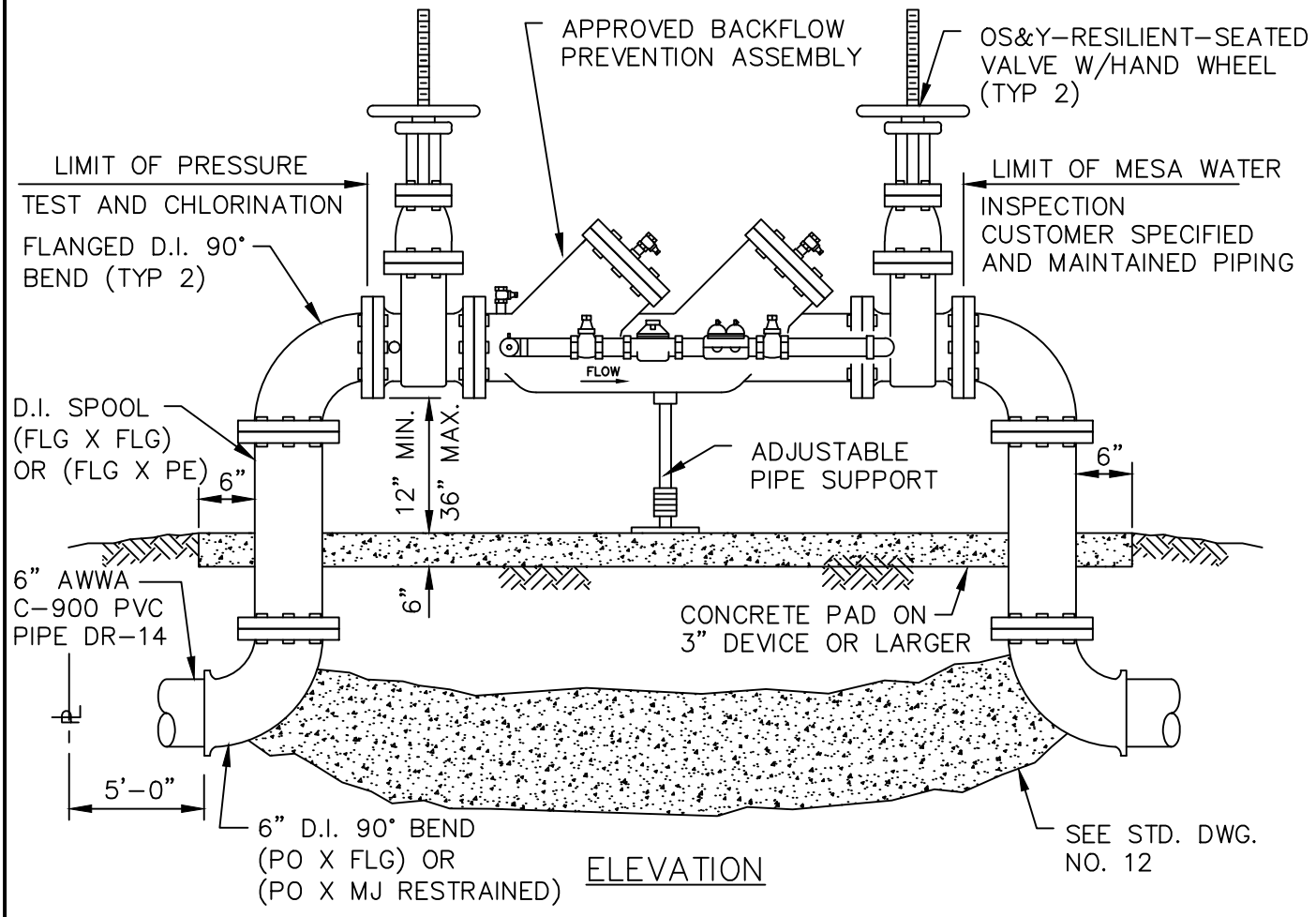
MESA WATER DISTRICT	COMPACT REDUCED PRESSURE PRINCIPLE ASSEMBLY FOR LARGE SERVICES	DRAWN BY: RJW DATE: APR 2018	STANDARD DRAWING 16N

mcwd#16n.dwg 04/02/2018



PLAN
(PAD ONLY)

CONCRETE PAD
(REINFORCED WITH W.W.F.
1.6 X 1.6)



ELEVATION

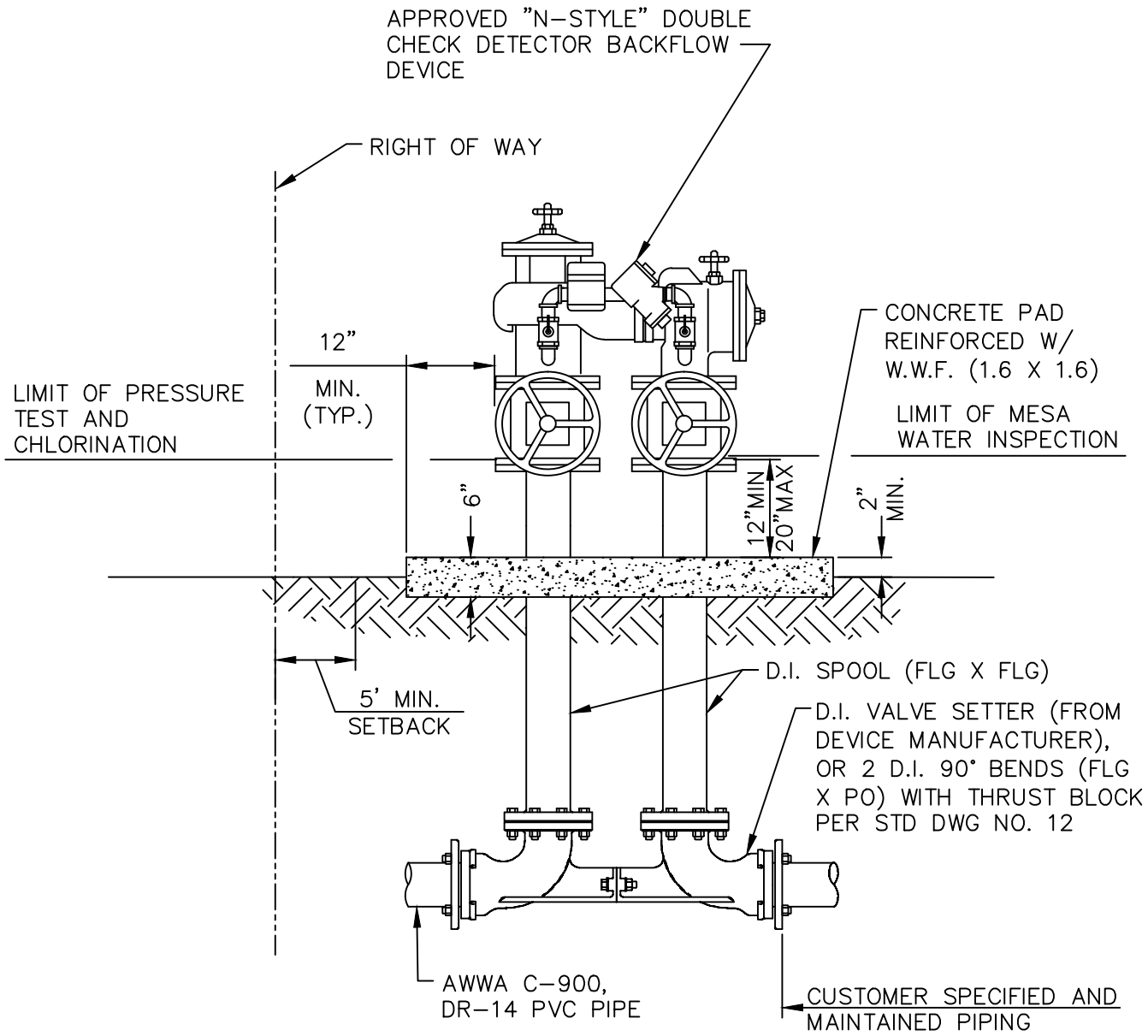
GENERAL NOTES:

1. PRESSURE TEST AND CHLORINATE TO LIMITS SHOWN ABOVE
2. CONTACT MESA WATER FOR LATEST LIST OF APPROVED BACKFLOW PREVENTION ASSEMBLIES.
3. BY–PASS DETECTOR METER IN CUBIC FEET
4. BACKFLOW ASSEMBLY SHALL BE A MINIMUM OF 36" FROM ANY STRUCTURE, CURB OR SIDEWALK.
5. BACKFLOW ASSEMBLY MUST BE EASILY ACCESSIBLE TO FACILITATE TESTING AND SERVICING.

"FOR FIRE USE ONLY"
NON–HEALTH HAZARD (POLLUTANT) BACKFLOW PREVENTION DEVICE

MESA WATER DISTRICT	DOUBLE CHECK DETECTOR ASSEMBLY	DRAWN BY: RJW DATE: APR 2018	STANDARD DRAWING 17

mcwd#17.dwg 04/02/2018



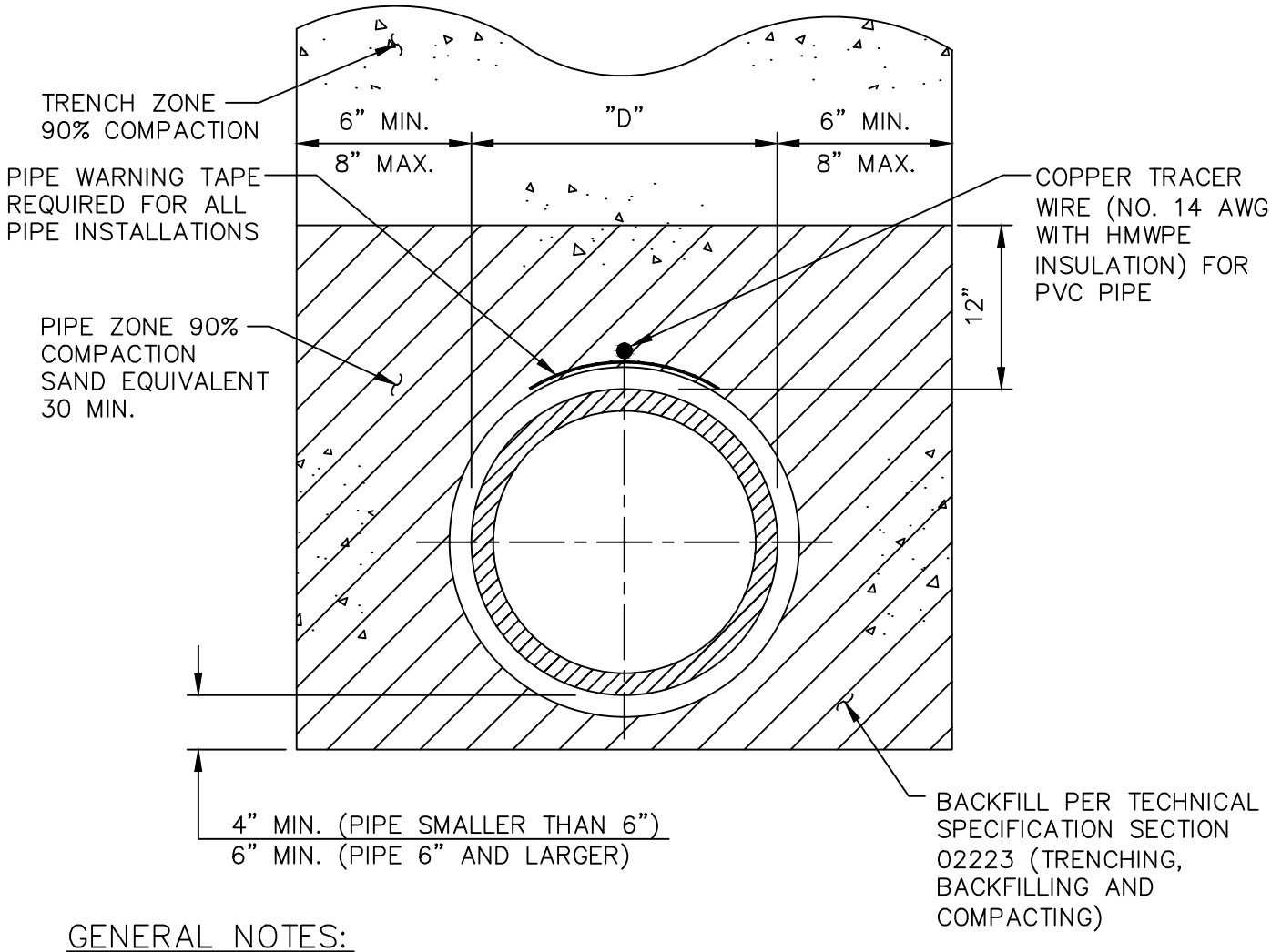
FRONT ELEVATION VIEW

GENERAL NOTES:

1. PRESSURE TEST AND CHLORINATE TO LIMITS SHOWN ABOVE.
2. CONTACT MESA WATER FOR LATEST LIST OF APPROVED BACKFLOW PREVENTION ASSEMBLIES.
3. BACKFLOW ASSEMBLY SHALL BE A MINIMUM OF 36" FROM ANY STRUCTURE, CURB OR SIDEWALK.
4. BACKFLOW ASSEMBLY MUST BE EASILY ACCESSIBLE TO FACILITATE TESTING AND SERVICING.

MESA WATER DISTRICT	COMPACT DOUBLE CHECK DETECTOR ASSEMBLY	DRAWN BY: RJW DATE: APR 2018	STANDARD DRAWING 17N

mcwd#17n.dwg 04/02/2018

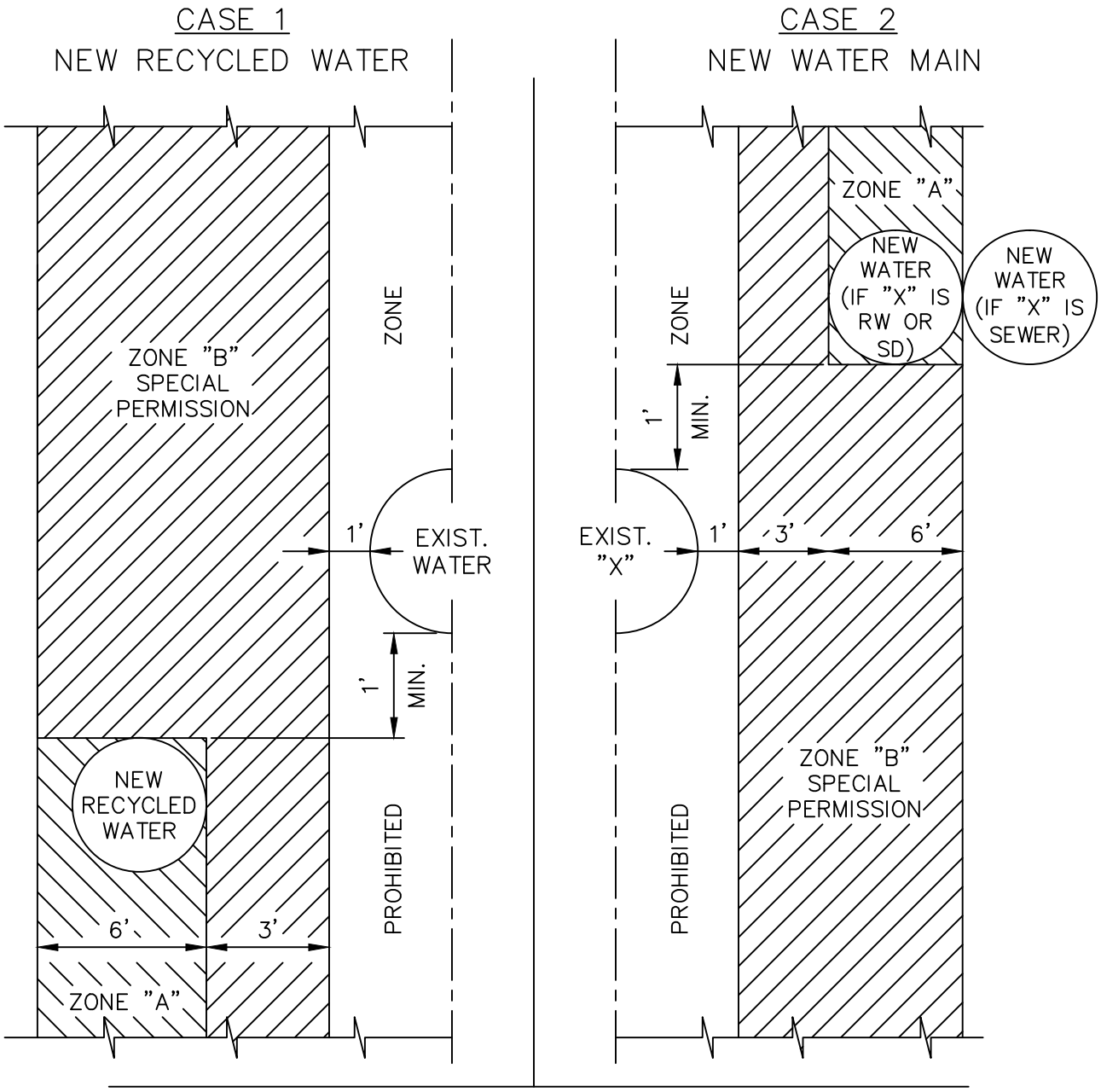


GENERAL NOTES:

1. BACKFILL MATERIAL FOR ALL TRENCHES SHALL HAVE A CERTIFIED SAND EQUIVALENT OF NOT LESS THAN 30. SEE SECTION 02223 OF THE TECHNICAL SPECIFICATION FOR GRADATION.
2. COMPACTION METHODS SHALL CONFORM TO TECHNICAL SPECIFICATION SECTION 02223.
3. ALL TRENCHING & CONSTRUCTION OPERATIONS SHALL COMPLY WITH THE REQUIREMENTS OF THE STATE DIVISION OF INDUSTRIAL SAFETY.
4. CONSTRUCTION PROCEDURES AND MATERIAL ABOVE THE PIPE ZONES SHALL BE IN ACCORDANCE WITH CITY OF COSTA MESA, CITY OF NEWPORT BEACH OR COUNTY OF ORANGE STANDARD DETAILS.
5. IF UNSTABLE SOIL IS ENCOUNTERED, THE MESA WATER REPRESENTATIVE SHALL DETERMINE THE OVEREXCAVATION DEPTH AND FOUNDATION RE-FILL MATERIAL PER TECHNICAL SPECIFICATION SECTION 02223

MESA WATER DISTRICT	STANDARD TRENCHING & PIPE ZONE DETAIL	DRAWN BY: RJW DATE: APR 2018	STANDARD DRAWING 18

mcwd#18.dwg 04/02/2018



GENERAL NOTES:

1. ZONES IDENTICAL ON EITHER SIDE OF CENTER LINES.

2. ZONE "A" CONSTRUCTION IS ALLOWED ONLY FOR THE INDICATED CONVEYANCE; OTHERWISE SPECIAL PERMISSION. NO PIPES SHALL BE INSTALLED WITHIN THE PROHIBITED ZONE.

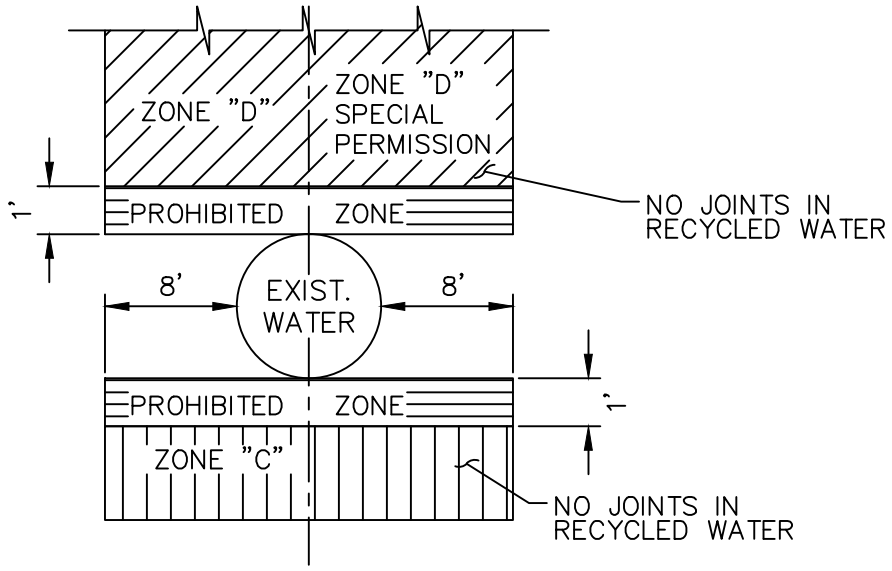
3. SPECIAL PERMISSION WILL BE REQUIRED TO CONSTRUCT WITHIN THE ZONE "B". WITH STATE DEPARTMENT OF PUBLIC HEALTH APPROVAL, NEWLY INSTALLED MAINS MAY BE EXEMPTED FROM THE SEPARATION DISTANCES IF THE WATER MAIN CAN BE ADEQUATELY PROTECTED AS SET FORTH IN CALIFORNIA ADMINISTRATIVE CODE (CAC), TITLE 22, SECTION 64572, SUB-SECTION (H). PROPOSED PROTECTIVE MEASURE(S) SHALL BE SUBMITTED TO DISTRICT FOR CONSIDERATION BEFORE REQUESTING APPROVAL FROM THE STATE HEALTH DEPARTMENT.

FIGURE 1 – PARALLEL CONSTRUCTION

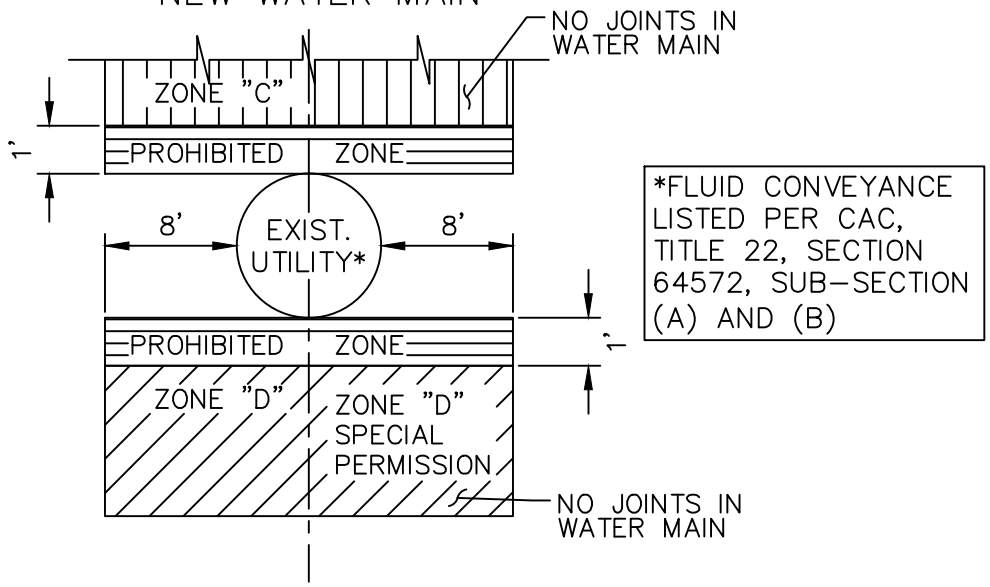
MESA WATER DISTRICT	SEPARATION OF WATERMAINS AND SANITARY SEWERS	DRAWN BY: RJW DATE: APR 2018	STANDARD DRAWING 19 1 OF 3

mcwd#19-1.dwg 04/02/2018

CASE 1
NEW RECYCLED WATER



CASE 2
NEW WATER MAIN



GENERAL NOTES:

1. ZONE "C" CONSTRUCTION SHALL HAVE NO JOINTS. CROSSINGS SHALL BE MADE AT AN ANGLE NO LESS THAN 45° TO EXISTING PIPELINE. NO PIPES SHALL BE INSTALLED WITHIN THE PROHIBITED ZONE.

3. SPECIAL PERMISSION WILL BE REQUIRED TO CONSTRUCT WITHIN THE ZONE "D". WITH STATE DEPARTMENT OF PUBLIC HEALTH APPROVAL, NEWLY INSTALLED MAINS MAY BE EXEMPTED FROM THE SEPARATION DISTANCES IF THE WATER MAIN CAN BE ADEQUATELY PROTECTED AS SET FORTH IN CALIFORNIA ADMINISTRATIVE CODE (CAC), TITLE 22, SECTION 64572, SUB-SECTION (H). PROPOSED PROTECTIVE MEASURE(S) SHALL BE SUBMITTED TO DISTRICT FOR CONSIDERATION BEFORE REQUESTING APPROVAL FROM THE STATE HEALTH DEPARTMENT.

FIGURE 2 – CROSSINGS

MESA WATER DISTRICT	SEPARATION OF WATERMAINS AND SANITARY SEWERS	DRAWN BY: RJW DATE: APR 2018	STANDARD DRAWING 19 2 OF 3

mcwd#19-2.dwg 04/02/2018

NOTES:

1. ALL NEW WATER MAINS (DOMESTIC AND RECYCLED) SHALL BE INSTALLED PER THE LATEST CALIFORNIA PUBLIC HEALTH LAWS FOR DRINKING WATER SAFETY.

2. CALIFORNIA ADMINISTRATIVE CODE, TITLE 22, SECTION 64572 (UPDATED FEBRUARY 2008) STATES:

(A) NEW WATER MAINS AND NEW SUPPLY LINES SHALL NOT BE INSTALLED IN THE SAME TRENCH AS, AND SHALL BE AT LEAST 10 FEET HORIZONTALLY FROM AND ONE FOOT VERTICALLY ABOVE, ANY PARALLEL PIPELINE CONVEYING:

1) UNTREATED SEWAGE,
2) PRIMARY OR SECONDARY TREATED SEWAGE,
3) DISINFECTED SECONDARY–2.2 RECYCLED WATER (DEFINED IN SECTION 60301.220),
4) DISINFECTED SECONDARY–23 RECYCLED WATER (DEFINED IN SECTION 60301.225), AND
5) HAZARDOUS FLUIDS SUCH AS FUELS, INDUSTRIAL WASTES, AND WASTEWATER SLUDGE.

(B) NEW WATER MAINS AND NEW SUPPLY LINES SHALL BE INSTALLED AT LEAST 4 FEET HORIZONTALLY FROM, AND ONE FOOT VERTICALLY ABOVE, ANY PARALLEL PIPELINE CONVEYING:

1) DISINFECTED TERTIARY RECYCLED WATER (DEFINED IN SECTION 60301.230), AND
2) STORM DRAINAGE.

(C) NEW SUPPLY LINES CONVEYING RAW WATER TO BE TREATED FOR DRINKING PURPOSES SHALL BE INSTALLED AT LEAST 4 FEET HORIZONTALLY FROM, AND ONE FOOT VERTICALLY BELOW, ANY WATER MAIN.

(D) IF CROSSING A PIPELINE CONVEYING A FLUID LISTED IN SUBSECTION (A) OR (B), A NEW WATER MAIN SHALL BE CONSTRUCTED NO LESS THAN 45–DEGREES TO AND AT LEAST ONE FOOT ABOVE THAT PIPELINE. NO CONNECTION JOINTS SHALL BE MADE IN THE WATER MAIN WITHIN EIGHT HORIZONTAL FEET OF THE FLUID PIPELINE.

(E) THE VERTICAL SEPARATION SPECIFIED IN SUBSECTIONS (A), (B), AND (C) IS REQUIRED ONLY WHEN THE HORIZONTAL DISTANCE BETWEEN A WATER MAIN AND PIPELINE IS LESS THAN TEN FEET.

(F) NEW WATER MAINS SHALL NOT BE INSTALLED WITHIN 100 HORIZONTAL FEET OF THE NEAREST EDGE OF ANY SANITARY LANDFILL, WASTEWATER DISPOSAL POND, OR HAZARDOUS WASTE DISPOSAL SITE, OR WITHIN 25 HORIZONTAL FEET OF THE NEAREST EDGE OF ANY CESSPOOL, SEPTIC TANK, SEWAGE LEACH FIELD, SEEPAGE PIT, UNDERGROUND HAZARDOUS MATERIAL STORAGE TANK, OR GROUNDWATER RECHARGE PROJECT SITE.

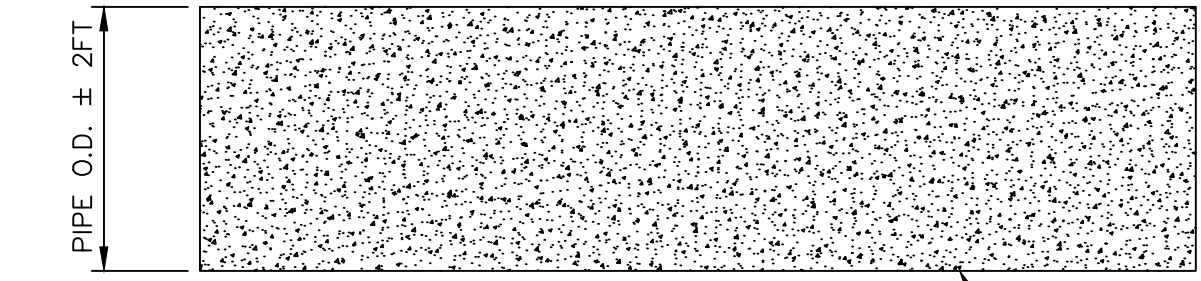
(G) THE MINIMUM SEPARATION DISTANCES SET FORTH IN THIS SECTION SHALL BE MEASURED FROM THE NEAREST OUTSIDE EDGE OF EACH PIPE BARREL.

(H) WITH DEPARTMENT APPROVAL, NEWLY INSTALLED WATER MAINS MAY BE EXEMPT FROM THE SEPARATION DISTANCES IN THIS SECTION, EXCEPT SUBSECTION (F), IF THE NEWLY INSTALLED MAIN IS:

1) LESS THAN 1320 LINEAR FEET,
2) REPLACING AN EXISTING MAIN, INSTALLED IN THE SAME LOCATION, AND HAS A DIAMETER NO GREATER THAN SIX INCHES MORE THAN THE DIAMETER OF THE MAIN IT IS REPLACING, AND
3) INSTALLED IN A MANNER THAT MINIMIZES THE POTENTIAL FOR CONTAMINATION, INCLUDING, BUT NOT LIMITED TO:
   A. SLEEVING THE NEWLY INSTALLED MAIN, OR
   B. UTILIZING UPGRADED PIPING MATERIAL

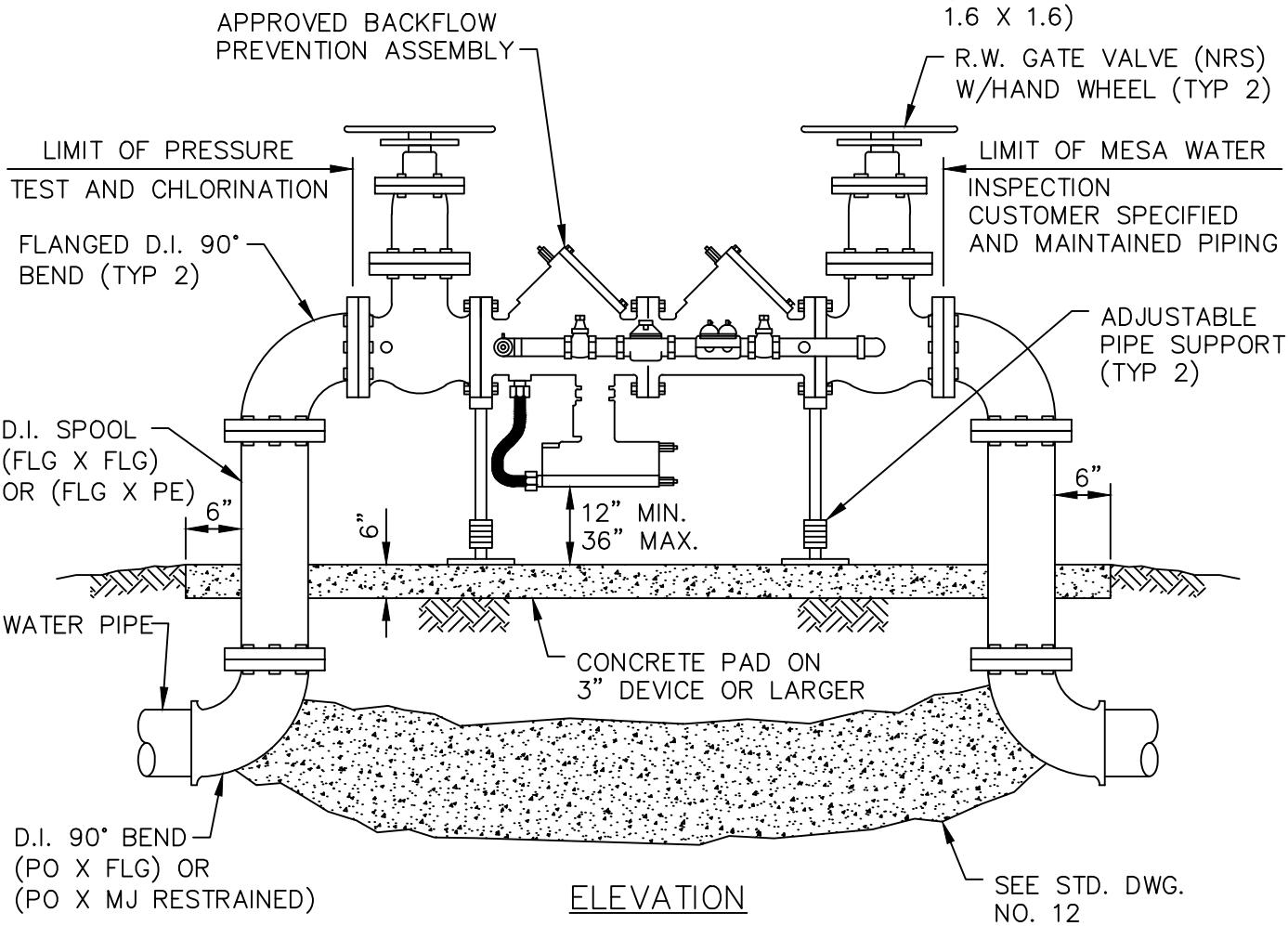
MESA WATER DISTRICT	SEPARATION OF WATERMAINS AND SANITARY SEWERS	DRAWN BY: RJW DATE: APR 2018	STANDARD DRAWING 19 3 OF 3

mcwd#19-3.dwg 04/02/2018



PLAN
(PAD ONLY)

CONCRETE PAD
(REINFORCED WITH W.W.F.
1.6 X 1.6)



ELEVATION

GENERAL NOTES:

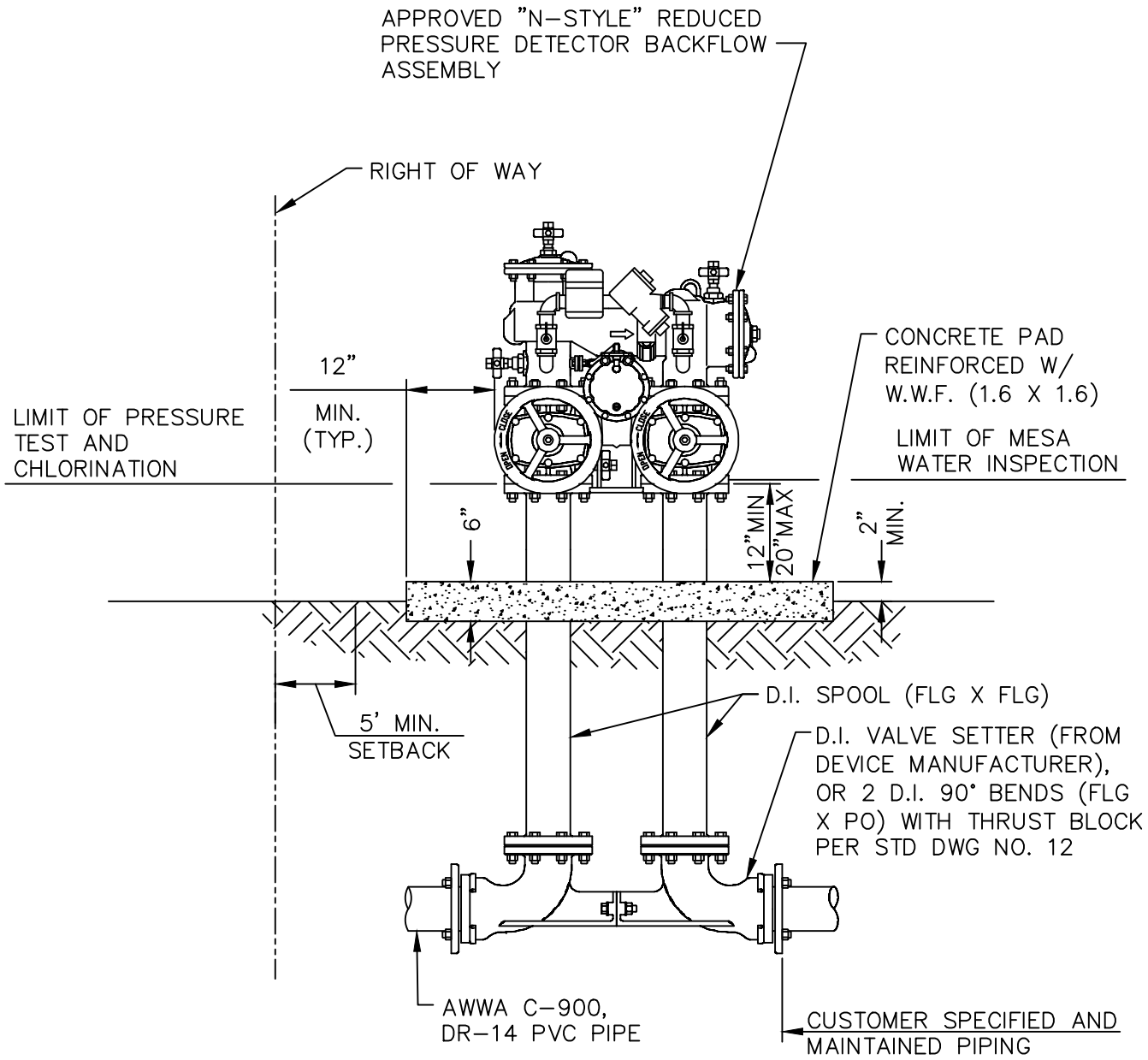
1. PRESSURE TEST AND CHLORINATE TO LIMITS SHOWN ABOVE
2. CONTACT MESA WATER FOR LATEST LIST OF APPROVED BACKFLOW PREVENTION ASSEMBLIES.
3. BACKFLOW ASSEMBLY SHALL BE A MINIMUM OF 36" FROM ANY STRUCTURE, CURB OR SIDEWALK.
4. BACKFLOW ASSEMBLY MUST BE EASILY ACCESSIBLE TO FACILITATE TESTING AND SERVICING.

"FOR DOMESTIC USE ONLY"

HEALTH HAZARD (CONTAMINANT) BACKFLOW PREVENTION DEVICE

MESA WATER DISTRICT	REDUCED PRESSURE DETECTOR ASSEMBLY (3" OR LARGER)	DRAWN BY: RJW DATE: APR 2018	STANDARD DRAWING 21

mcwd#21.dwg 04/02/2018



FRONT ELEVATION VIEW

GENERAL NOTES:

1. PRESSURE TEST AND CHLORINATE TO LIMITS SHOWN ABOVE.
2. CONTACT MESA WATER FOR LATEST LIST OF APPROVED BACKFLOW PREVENTION ASSEMBLIES.
3. BACKFLOW ASSEMBLY SHALL BE A MINIMUM OF 36" FROM ANY STRUCTURE, CURB OR SIDEWALK.
4. BACKFLOW ASSEMBLY MUST BE EASILY ACCESSIBLE TO FACILITATE TESTING AND SERVICING.

MESA WATER DISTRICT	COMPACT REDUCED PRESSURE DETECTOR ASSEMBLY FOR LARGE SERVICES	DRAWN BY: RJW DATE: APR 2018	STANDARD DRAWING 21N

mcwd#21n.dwg 04/02/2018

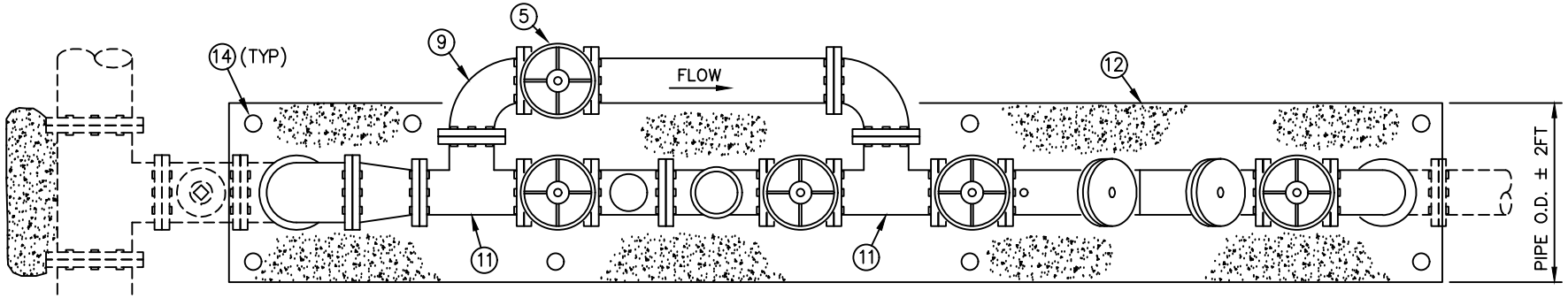
MESA WATER DISTRICT

RPP OR DCV APPROVED BACKFLOW ASSEMBLY (3",4",6" & 8" METER INST.)

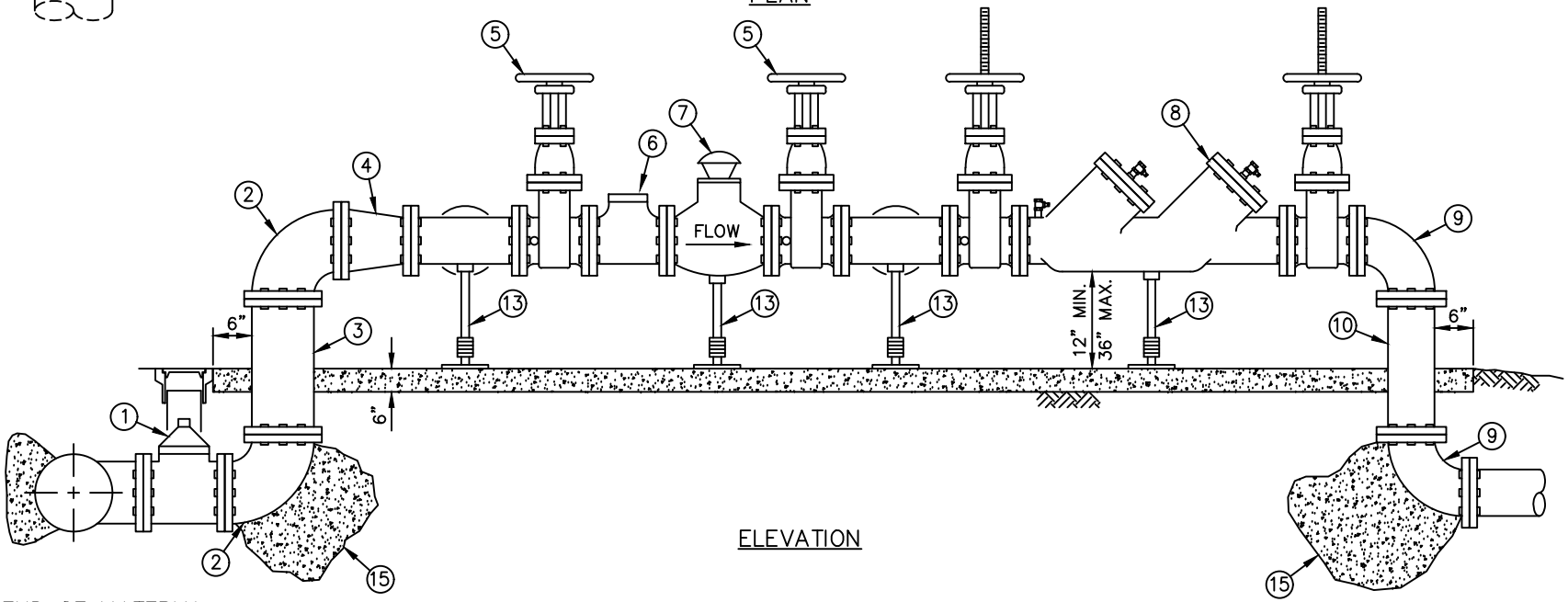
DRAWN BY: RJW

DATE: APR 2018

STANDARD DRAWING 22



PLAN



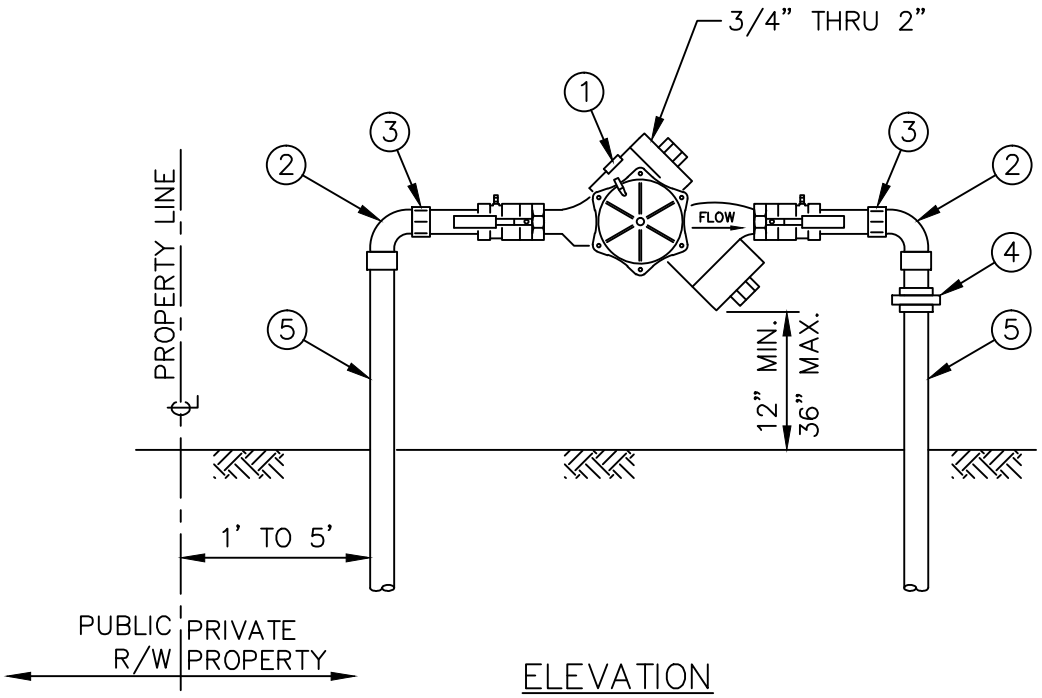
ELEVATION

LEGEND OF MATERIAL:

ITEM NO.	SIZE & DESCRIPTION
①	6" R.W. GATE VALVE (FLG. x FLG.)
②	6"–90° D.I. BEND (FLG. x FLG.)
③	6" D.I. SPOOL (FLG. x FLG.)
④	6" D.I. REDUCER (FLG. x FLG.)
⑤	R.W. GATE VALVE WITH HANDWHEEL (NRS) (FLG. x FLG.)
⑥	D.I. STRAINER (FLG. x FLG.)
⑦	COMPOUND METER OR TURBO METER (FLG. x FLG.) PURCHASED FROM MESA WATER AND INSTALLED BY CONTRACTOR
⑧	APPROVED REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTION ASSEMBLY OR APPROVED DOUBLE CHECK VALVE ASSEMBLY (FLG. x FLG.)
⑨	90° ELL (FLG. x FLG.)
⑩	D.I. SPOOL (FLG. x FLG.)
⑪	D.I. TEE (FLG. x FLG.)
⑫	CONCRETE PAD REINFORCED W/ W.W.F. 1.6 X 1.6)
⑬	ADJUSTABLE PIPE SUPPORTS
⑭	STANDARD POST PER STD DWG NO. 4B.
⑮	CONCRETE THRUST BLOCK PER STD DWG NO. 12

GENERAL NOTES:

1. DIMENSIONS SHOWN ARE APPROXIMATE, AND ARE BASED ON AN ASSUMED METER LENGTH OF 20". CONTRACTOR SHALL SUBMIT SHOP DRAWINGS TO MESA FOR REVIEW PRIOR TO CONSTRUCTION.
2. R.W. VALVES IN METER ASSEMBLY TO BE LOCKED (BY CHAIN) IN TO OPEN POSITION R.W. VALVE IN BYPASS TO BE LOCKED (BY CHAIN) IN THE CLOSED POSITION.
3. ASSEMBLY MUST BE EASILY ACCESSIBLE TO FACILITATE TESTING AND SERVICING.



ELEVATION

LEGEND OF MATERIAL:

ITEM NO.	SIZE & DESCRIPTION
(1)	APPROVED BACKFLOW PREVENTION ASSEMBLY
(2)	SOLDER 90° ELL
(3)	MIP SOLDER ADAPTER
(4)	SOLDER UNION
(5)	TYPE "K" SOFT COPPER OR BRASS

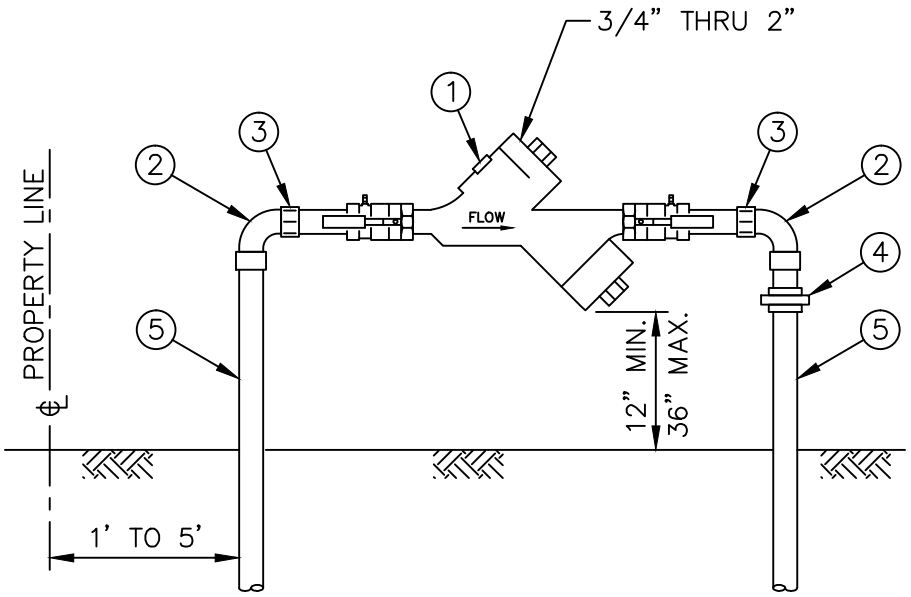
GENERAL NOTES:

1. USE MESA WATER CURRENT LIST OF DEVICES THAT HAVE BEEN EVALUATED AND APPROVED BY THE STATE OF CALIFORNIA OFFICE OF DRINKING WATER. THIS LIST HAS BEEN ADOPTED BY MESA WATER AS THE ONLY ASSEMBLIES APPROVED FOR USE ON THE WATER LINES UNDER OUR JURISDICTION.
2. TO ENSURE APPROPRIATE FLOW PLEASE CHECK WITH THE CITY PLUMBING INSPECTOR FOR SIZING.
3. ALL BACKFLOW PREVENTION DEVICES SHALL BE TESTED BY A CERTIFIED TESTER AFTER INSTALLATION, RELOCATION OR REPAIR.
4. BACKFLOW MUST BE EASILY ACCESSIBLE TO FACILITATE TESTING AND SERVICING.

HEALTH HAZARD (CONTAMINANT) BACKFLOW PREVENTION DEVICE

MESA WATER DISTRICT	REDUCED PRESSURE PRINCIPLE BACKFLOW DEVICE (2" OR SMALLER)	DRAWN BY: RJW DATE: APR 2018	STANDARD DRAWING 23

mcwd#23.dwg 04/02/2018



ELEVATION

LEGEND OF MATERIAL:

ITEM NO.	SIZE & DESCRIPTION
(1)	APPROVED BACKFLOW PREVENTION ASSEMBLY
(2)	SOLDER 90° ELL
(3)	MIP SOLDER ADAPTER
(4)	SOLDER UNION
(5)	TYPE "K" SOFT COPPER OR BRASS

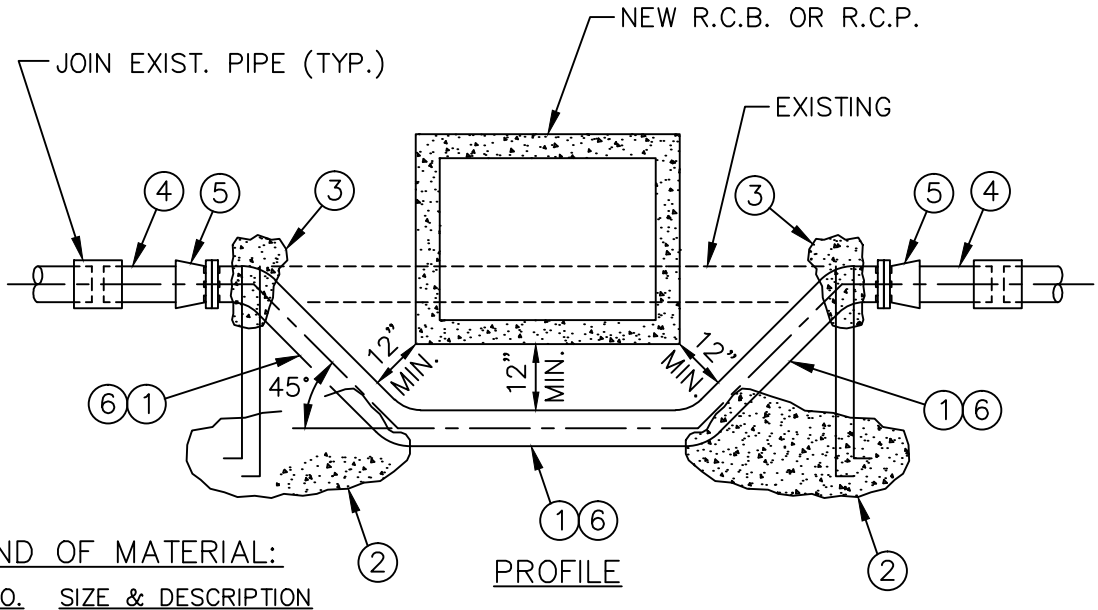
GENERAL NOTES:

1. USE MESA WATER CURRENT LIST OF DEVICES THAT HAVE BEEN EVALUATED AND APPROVED BY THE STATE OF CALIFORNIA OFFICE OF DRINKING WATER. THIS LIST HAS BEEN ADOPTED BY MESA WATER AS THE ONLY ASSEMBLIES APPROVED FOR USE ON THE WATER LINES UNDER OUR JURISDICTION.
2. TO ENSURE APPROPRIATE FLOW PLEASE CHECK WITH THE CITY PLUMBING INSPECTOR FOR SIZING.
3. ALL BACKFLOW PREVENTION DEVICES SHALL BE TESTED BY A CERTIFIED TESTER AFTER INSTALLATION, RELOCATION OR REPAIR.
4. BACKFLOW MUST BE EASILY ACCESSIBLE TO FACILITATE TESTING AND SERVICING.

HEALTH HAZARD (POLLUTANT) BACKFLOW PREVENTION DEVICE

MESA WATER DISTRICT	DOUBLE CHECK VALVE ASSEMBLY (2" AND SMALLER)	DRAWN BY: RJW DATE: APR 2018	STANDARD DRAWING 24

mcwd#24.dwg 04/02/2018



LEGEND OF MATERIAL:

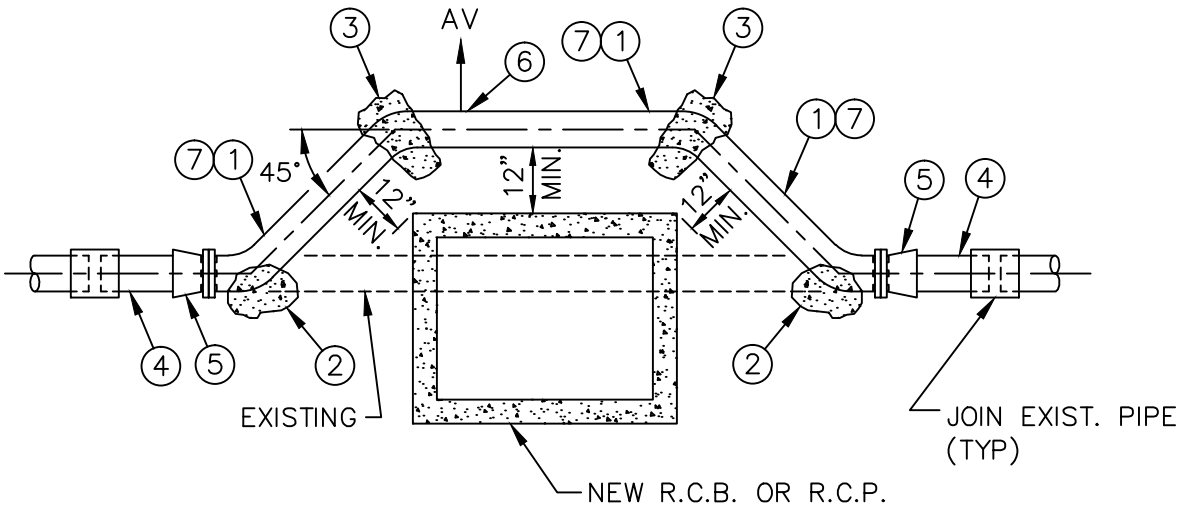
ITEM NO.	SIZE & DESCRIPTION
1	CEMENT MORTAR LINED AND COATED STEEL PIPE, WELD ALL JOINTS HAND HOLES AS REQUIRED
2	THRUST BLOCK PER STANDARD DRAWING NO. 12
3	GRAVITY BLOCK PER STANDARD DRAWING NO. 11
4	AWWA C-900 PVC PIPE (DR-14)
5	P.O. x FLG. ADAPTER
6	HAND HOLES AS NEEDED

GENERAL NOTES:

1. ALL CONSTRUCTION ON WATER LINES SHALL CONFORM TO MESA WATER STANDARD DRAWINGS AND SPECIFICATIONS.
2. CONTRACTOR SHALL NOTIFY MESA WATER AT LEAST 48 HOURS PRIOR TO ANY WORK ON WATER LINES. (949)631-1291 INSPECTION.
3. CONTRACTOR TO VERIFY LOCATION, DEPTH AND TYPE OF EXISTING WATER FACILITIES PRIOR TO CONSTRUCTION.
4. ALL EXISTING VALVES TO BE REUSED WHERE APPLICABLE OR SALVAGED AND RETURNED TO MESA WATER CORP. YARD.
5. TEST AND DISINFECT NEW LINES PER MESA WATER STANDARD SPECIFICATIONS BEFORE RETURNING TO SERVICE.
6. ALL STEEL PIPE (1/4" WALL THK.) SHALL CONFORM TO THE REQUIREMENTS OF ASTM A53, GR. B.
7. ALL CEMENT MORTAR LINING AND COATING SHALL CONFORM TO THE TECHNICAL SPECIFICATION 15076.
8. COMPLETED FAB. UNIT SHALL BE SHOP HYDRO TESTED TO 1.5 TIMES WATER LINE DESIGN PRESSURE.
9. AFTER HYDRO TEST & BEFORE PATCHING CEMENT MORTAR LINING & COATING, ALL WELDED JOINTS SHALL BE SUCCESSFULLY DYE CHECKED USING DYE PENETRANT METHODS.
10. ALL FLANGES SHALL CONFORM TO THE REQM'T OF AWWA C-207, CLASS "E", EXCEPT THAT FLGS. SHALL HAVE SPECIAL COUNTER BORES, STEEL SHALL MEET REQM'T OF ASTM A36.
11. FABRICATOR SHALL PROVIDE LETTER OF COMPLIANCE TO MESA WATER COVERING ALL FAB. STEEL ITEMS.

mcwd#25.dwg 04/02/2018

MESA WATER DISTRICT	TYPICAL SIPHON	DRAWN BY: RJW DATE: APR 2018	STANDARD DRAWING 25



PROFILE

LEGEND OF MATERIAL:

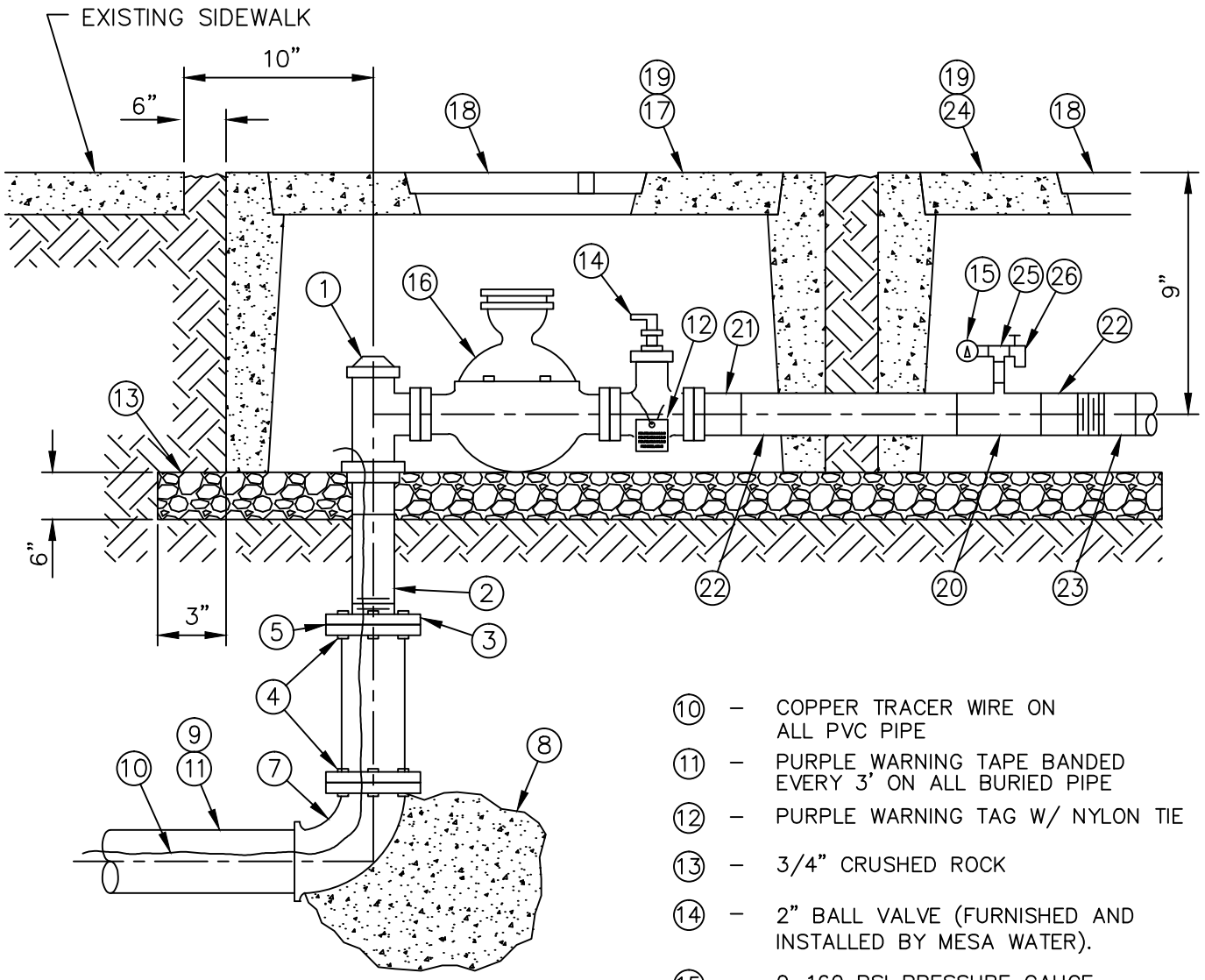
ITEM NO.	SIZE & DESCRIPTION
(1)	CEMENT MORTAR LINED AND COATED STEEL PIPE, WELD ALL JOINTS
(2)	THRUST BLOCK PER STANDARD DRAWING NO. 12
(3)	GRAVITY BLOCK PER STANDARD DRAWING NO. 11
(4)	AWWA C-900 PVC PIPE (DR-14)
(5)	P.O. x FLG. ADAPTER
(6)	AIR-VAC ASSEMBLY PER STANDARD DRAWING NO. 8
(7)	HAND HOLES AS NEEDED

GENERAL NOTES:

1. ALL CONSTRUCTION ON WATER LINES SHALL CONFORM TO MESA WATER STANDARD DRAWINGS AND SPECIFICATIONS.
2. CONTRACTOR SHALL NOTIFY MESA WATER AT LEAST 48 HOURS PRIOR TO ANY WORK ON WATER LINES. (949)631-1291 INSPECTION.
3. CONTRACTOR TO VERIFY LOCATION, DEPTH AND TYPE OF EXISTING WATER FACILITIES PRIOR TO CONSTRUCTION.
4. ALL EXISTING VALVES TO BE REUSED WHERE APPLICABLE OR SALVAGED AND RETURNED TO MESA WATER CORP. YARD.
5. TEST AND DISINFECT NEW LINES PER MESA WATER STANDARD SPECIFICATIONS BEFORE RETURNING TO SERVICE.
6. ALL STEEL PIPE (1/4" WALL THK.) SHALL CONFORM TO THE REQUIREMENTS OF ASTM A53, GR. B.
7. ALL CEMENT MORTAR LINING AND COATING SHALL CONFORM TO THE TECHNICAL SPECIFICATION 15076.
8. COMPLETED FAB. UNIT SHALL BE SHOP HYDRO TESTED TO 1.5 TIMES WATER LINE DESIGN PRESSURE.
9. AFTER HYDRO TEST & BEFORE PATCHING CEMENT MORTAR LINING & COATING, ALL WELDED JOINTS SHALL BE SUCCESSFULLY DYE CHECKED USING DYE PENETRANT METHODS.
10. ALL FLANGES SHALL CONFORM TO THE REQM'T OF AWWA C-207, CLASS "E", EXCEPT THAT FLGS. SHALL HAVE SPECIAL COUNTER BORES, STEEL SHALL MEET REQM'T OF ASTM A36.
11. FABRICATOR SHALL PROVIDE LETTER OF COMPLIANCE TO MESA WATER COVERING ALL FAB. STEEL ITEMS.

MESA WATER DISTRICT	TYPICAL INVERTED SIPHON	DRAWN BY: RJW DATE: APR 2018	STANDARD DRAWING 26

mcwd#26.dwg 04/02/2018

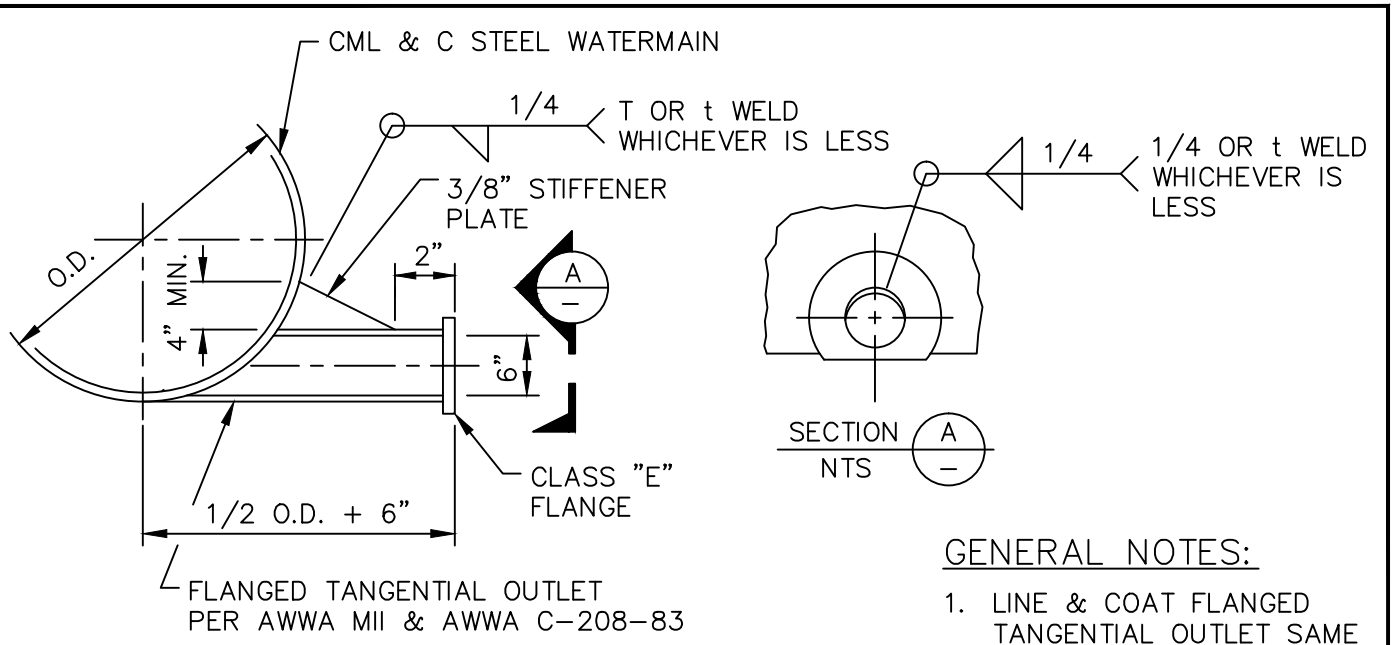


LEGEND OF MATERIAL:

ITEM NO.	SIZE & DESCRIPTION
①	2" BRASS "BALL STYLE" ANGLE METER STOP WITH LOCKWINGS (INLET: FIP; OUTLET: "SLOTTED" ELONGATED HOLES)
②	2"x 4" LONG BRASS NIPPLE
③	4" BRASS FLG. W/2" TAP
④	316 S.S. BOLTS & NUTS
⑤	FLG. INSULATING KIT
⑥	6" OR 4" FLG. D.I. SPOOL
⑦	6" OR 4" P.O.. x FLG. D.I. 90° BEND
⑧	THRUST BLOCK PER STD. DWG. NO. 12
⑨	EX. 4" OR 6" AWWA C-900 PVC PIPE (DR-14) (PURPLE)
⑩	COPPER TRACER WIRE ON ALL PVC PIPE
⑪	PURPLE WARNING TAPE BANDED EVERY 3' ON ALL BURIED PIPE
⑫	PURPLE WARNING TAG W/ NYLON TIE
⑬	3/4" CRUSHED ROCK
⑭	2" BALL VALVE (FURNISHED AND INSTALLED BY MESA WATER).
⑮	0-160 PSI PRESSURE GAUGE
⑯	2" METER (FURNISHED AND INSTALLED BY MESA WATER).
⑰	METER BOX SEE STD DWG NO. 3
⑱	PURPLE LID (PANTONE 512)
⑲	PAINT METER BOX & EXPOSED PIPING IN METER BOX PURPLE (PANTONE 512)
⑳	2"x 1/2" SOLDER TEE
㉑	2" MIP x SLIP ADAPTER
㉒	2" TYPE "K" COPPER - SOFT
㉓	2" FLP x SLIP ADAPTER
㉔	METER BOX - SIMILAR TO 1" METER. SEE STD DWG NO. 3
㉕	1/2" BRASS TEE
㉖	1/2" SAMPLE COCK

MESA WATER DISTRICT	4" OR 6" X 2" RECYCLED WATER CONNECTION	DRAWN BY: RJW DATE: APR 2018	STANDARD DRAWING 27

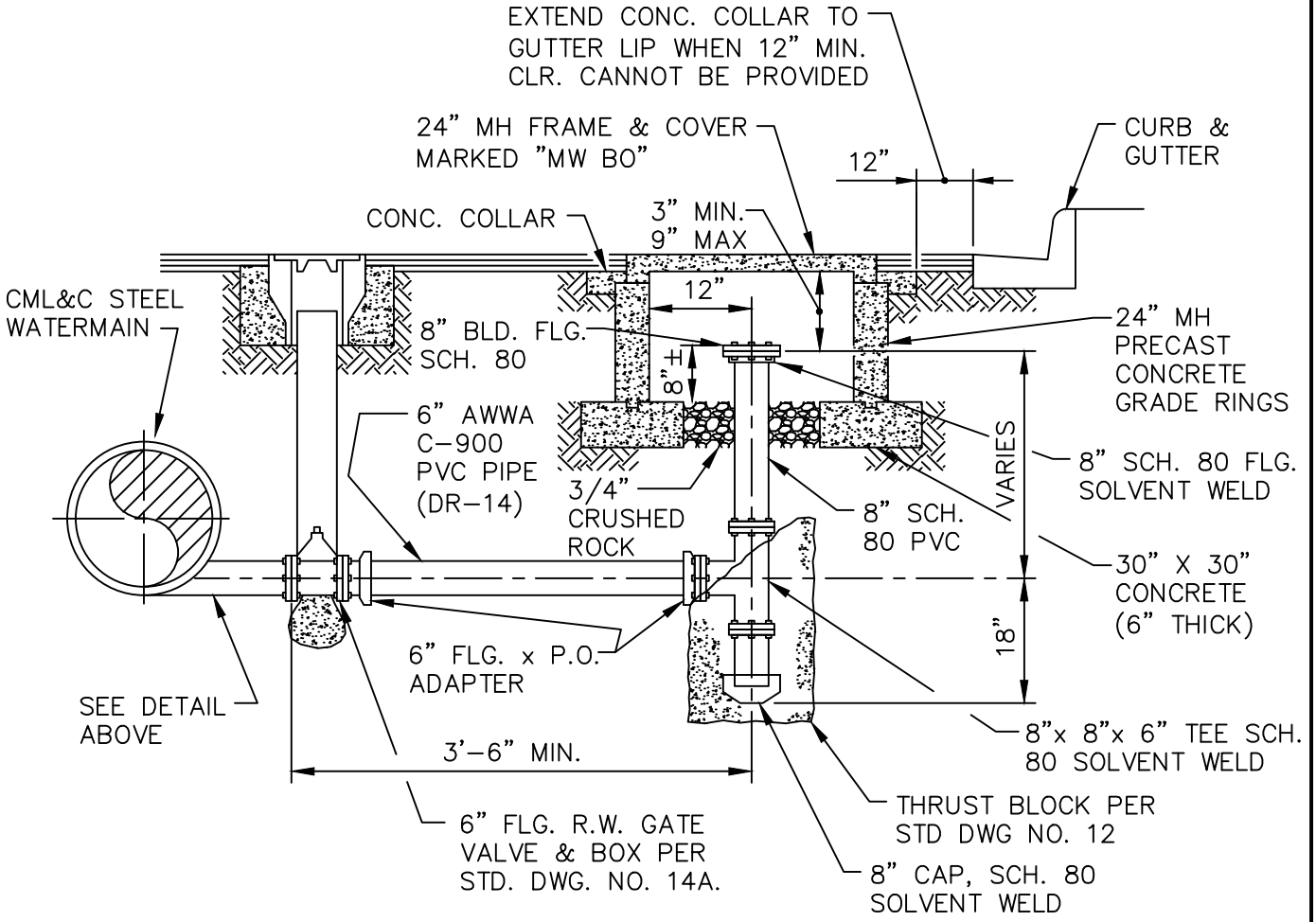
mcwd#27.dwg 04/02/2018



GENERAL NOTES:

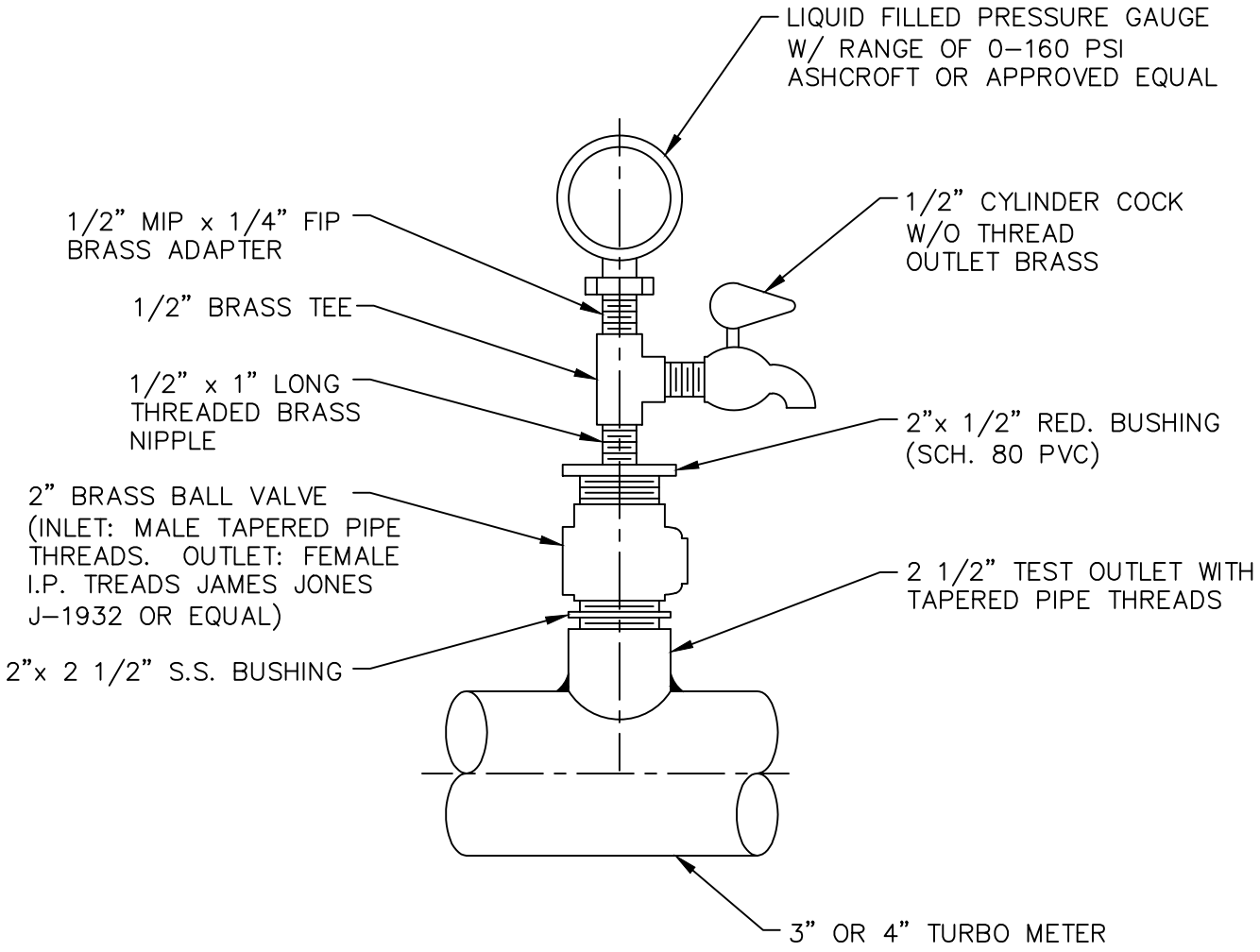
1. LINE & COAT FLANGED TANGENTIAL OUTLET SAME AS MAIN.

FLANGED TANGENTIAL OUTLET DETAIL



MESA WATER DISTRICT	6" BLOWOFF ASSEMBLY (STEEL WATER MAIN)	DRAWN BY: RJW DATE: APR 2018	STANDARD DRAWING 28

mcwd#28.dwg 04/02/2018

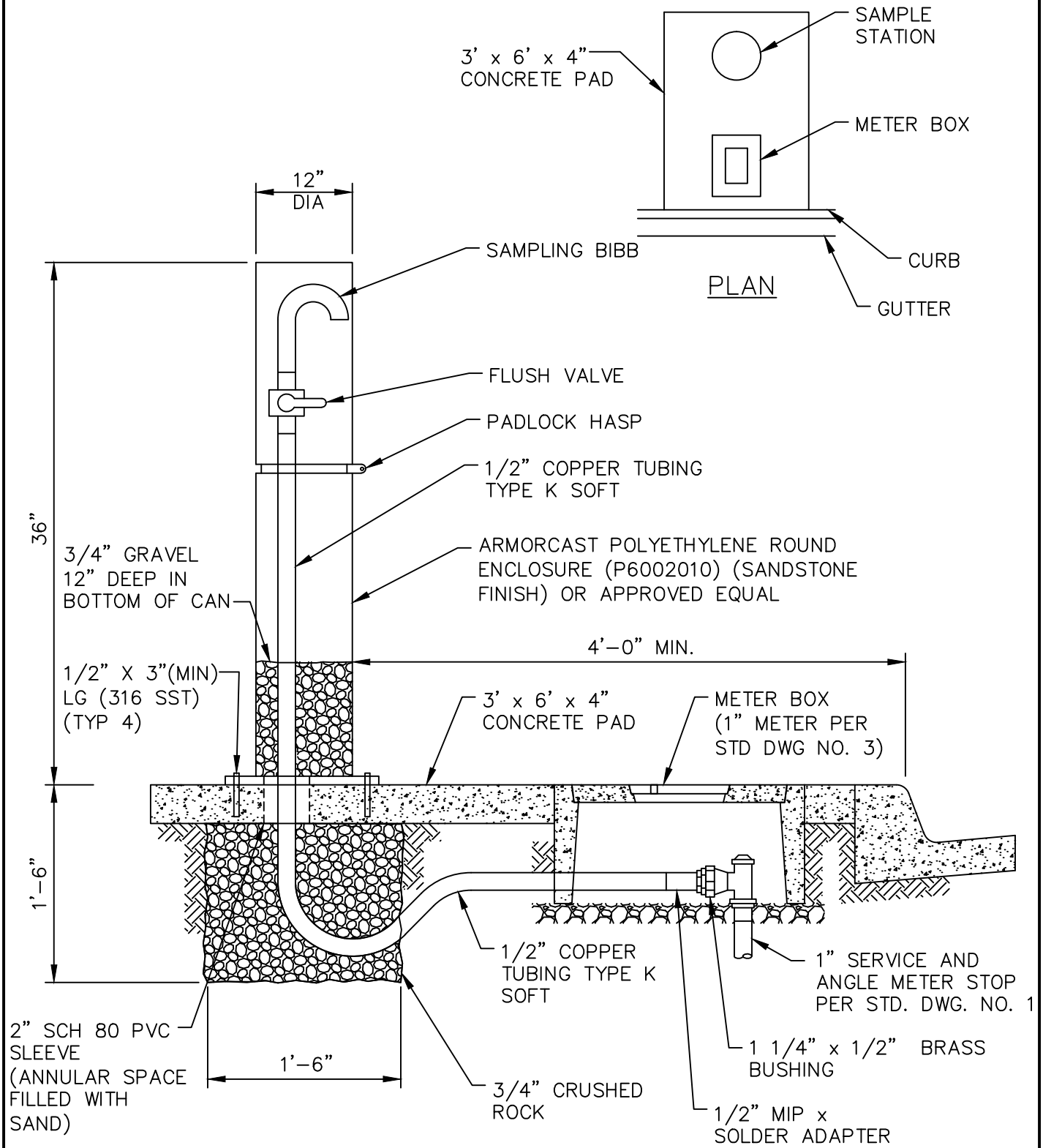


GENERAL NOTES:

1. TO BE INSTALLED AT METER & STRAINER OR DOWNSTREAM OF METER & STRAINER.
2. IF REQUIRED BY MESA WATER, SEE MESA WATER STD DWG #22 FOR TYPICAL METER INSTALLATION DETAIL.

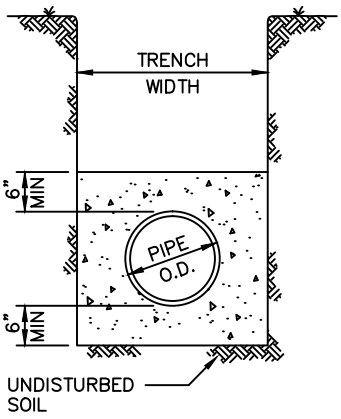
MESA WATER DISTRICT	PRESSURE GAUGE & SAMPLE COCK	DRAWN BY: RJW DATE: APR 2018	STANDARD DRAWING 29

mcwd#29.dwg 04/02/2018

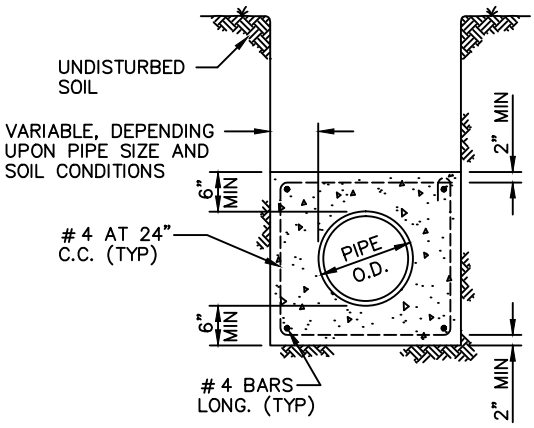


MESA WATER DISTRICT	STANDARD SAMPLING STATION DETAIL	DRAWN BY: RJW DATE: APR 2018	STANDARD DRAWING 30

mcwd#30.dwg 04/02/2018



TYPE "A"

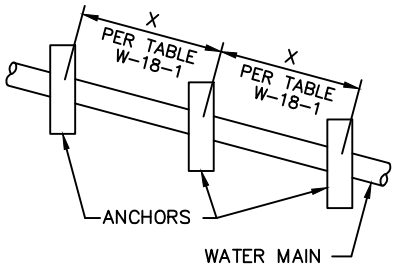


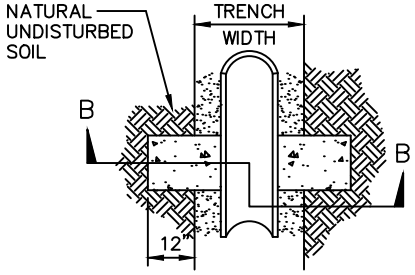
TYPE "B"

NOTES:

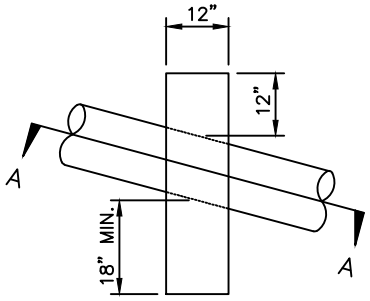
1. ENCASEMENT TO BE PLACED AGAINST UNDISTURBED NATURAL GROUND OR FILL COMPACTED TO 90% RELATIVE COMPACTION.
2. NO. 4 STEEL REINFORCING BARS SHALL BE USED AS SPECIFIED.
3. TYPE OF CONCRETE ENCASEMENT TO BE USED WILL BE SHOWN ON PLANS OR AS SPECIFIED BY INSPECTOR TO MEET UNFORSEEN FIELD CONDITIONS.
4. WHERE SLOPE TRENCHES ARE USED, WALLS WILL NOT BEGIN TO SLOPE CLOSER THAN 12" FROM THE TOP OF THE PIPE.
5. ENCASEMENT CONCRETE TO BE CLASS 560-C-3250.

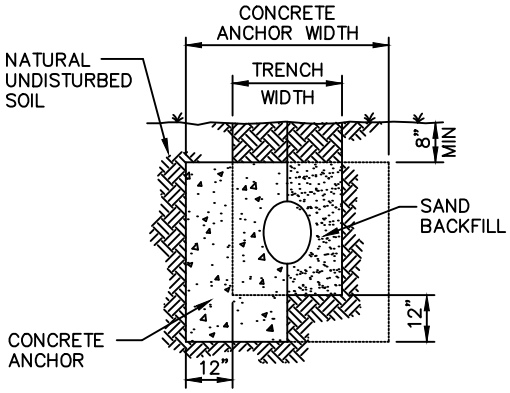
CONCRETE ENCASEMENT





SECTION A-A

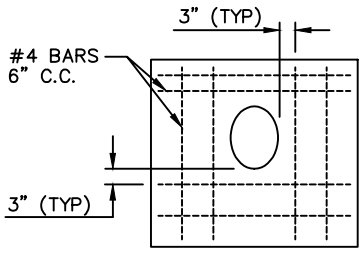




SECTION B-B

NOTES:

1. PIPE ANCHORS REQUIRED ON ALL SLOPES OF 20% OR GREATER.
2. ANCHOR SHALL EXTEND 12" INTO NATURAL UNDISTURBED SOIL.
3. CONCRETE SHALL BE CLASS 560-C-3250
4. ANCHORS FOR TRAPEZOIDAL TRENCH SECTIONS WILL CONFORM TO TRENCH CROSS SECTION AND EXTEND 12" INTO UNDISTURBED SOIL.



REINFORCING STEEL PATTERN

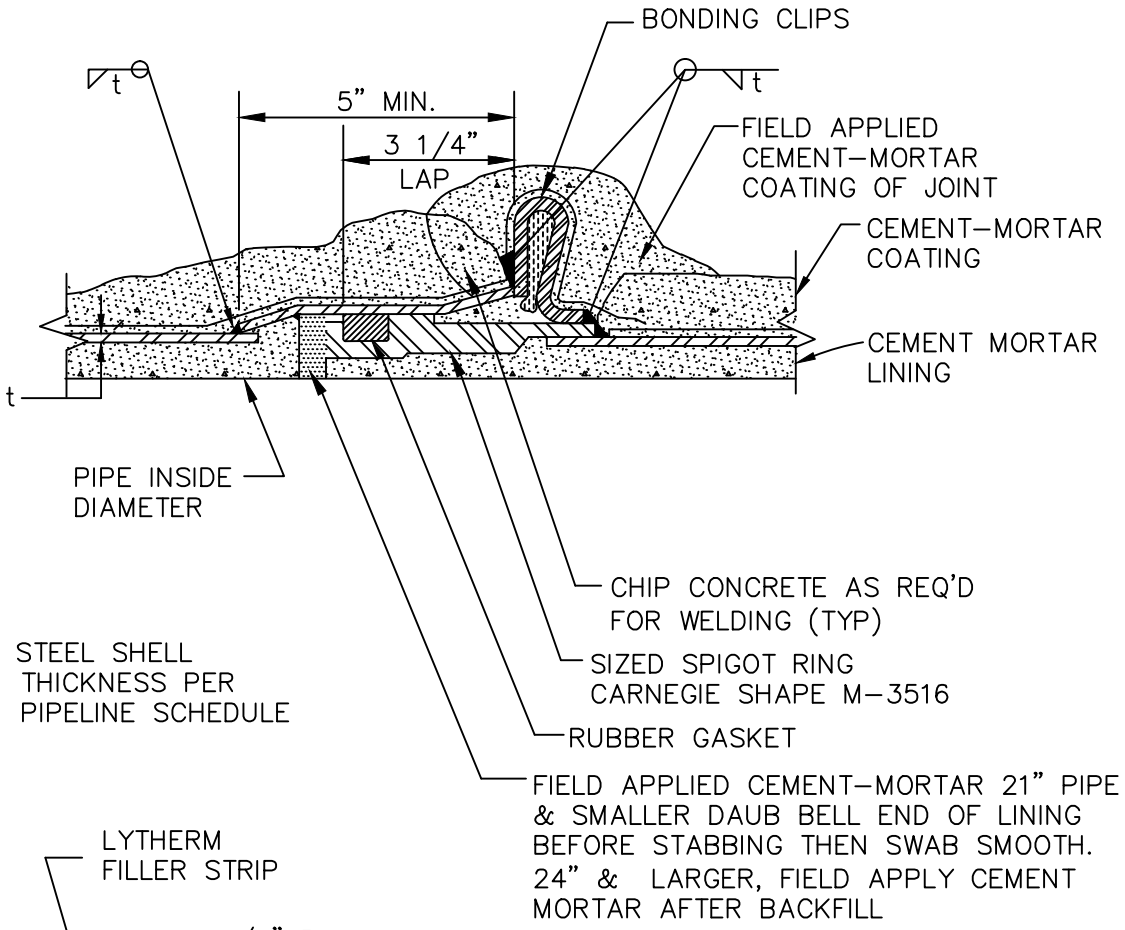
TABLE

PIPE SLOPE	X DISTANCE
20% TO 35%	36'
35% TO 50%	24'
> 50%	16'

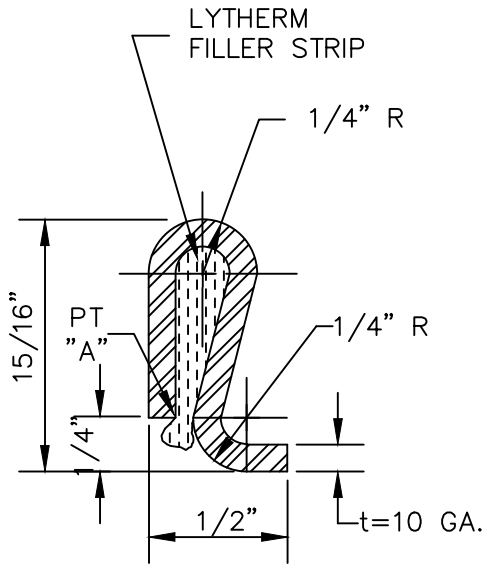
SLOPE ANCHORS

MESA WATER DISTRICT	CONCRETE ENCASEMENT AND SLOPE ANCHORS	DRAWN BY: RJW DATE: APR 2018	STANDARD DRAWING 31

mcwd#31.dwg 04/02/2018



t = STEEL SHELL THICKNESS PER PIPELINE SCHEDULE



BONDING CLIP NOTES

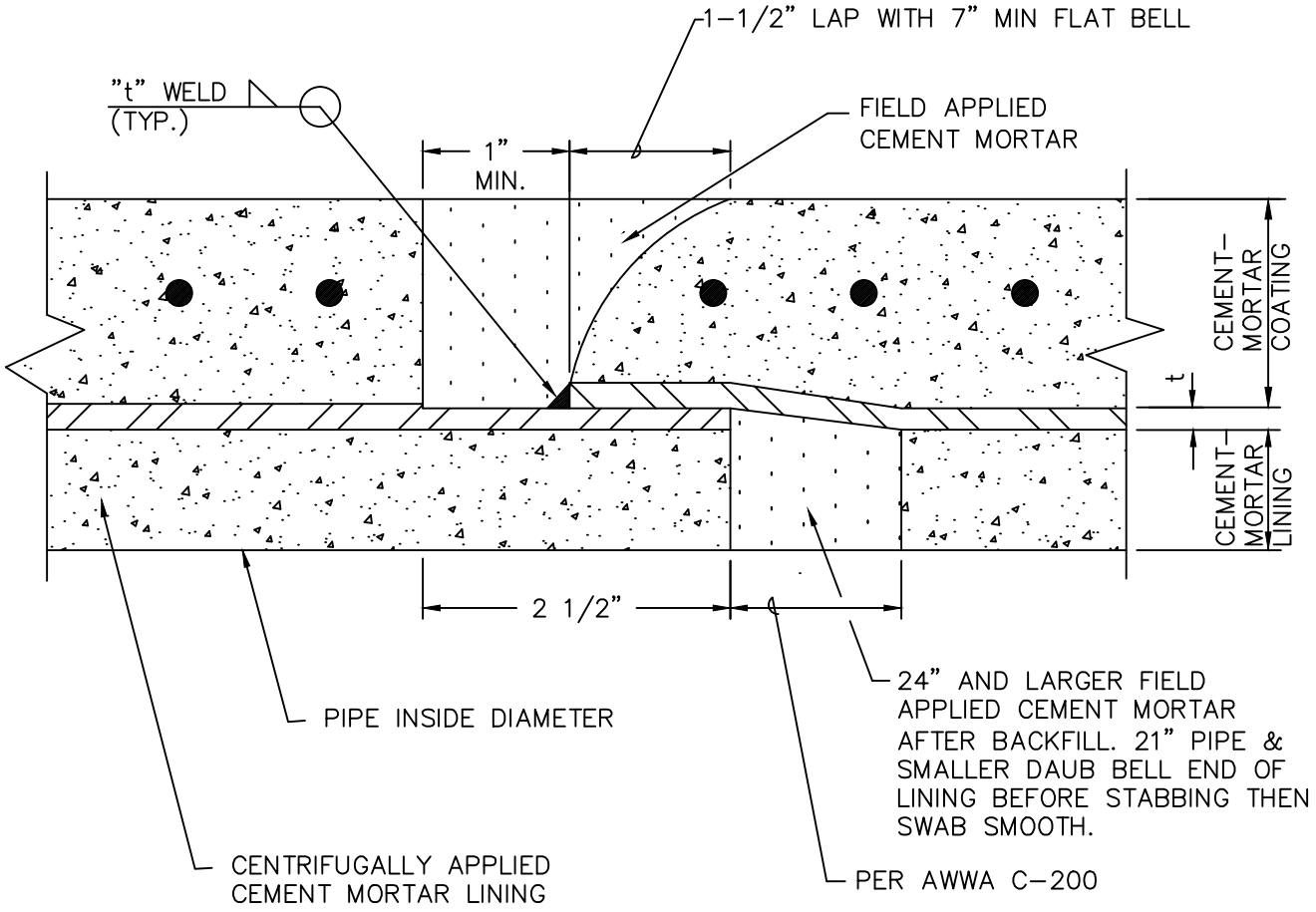
1. BONDING CLIPS SHALL BE LOCATED AT THE SPRING LINE OF THE PIPE.
2. BONDING CLIPS SHALL BE MADE OF ASTM A366 STEEL WITH A CUT LENGTH OF 2–1/2–INCHES AND WIDTH OF 1–1/4–INCH.
3. LYTHERM FILLER STRIP SHALL BE 1–INCH X 1–1/2–INCH WIDE TO OVERLAP SIDES OF CLIP. CONTRACTOR SHALL CRIMP BONDING CLIP OVER FILLER AT PT. "A" TO COMPRESS FILLER.
4. 2 BONDING CLIPS PER JOINT FOR 20" AND SMALLER PIPE. 4 BONDING CLIPS PER JOINT FOR PIPES LARGER THAN 20".

NOTE:

1. CEMENT–MORTAR LINING AND COATING PER TECHNICAL SPECIFICATION SECTION 15076

mcwd#32–1.dwg 04/02/2018

MESA WATER DISTRICT	STEEL PIPE DETAILS, BELL AND SPIGOT RUBBER BASKET JOINT WITH BONDING CLIP	DRAWN BY: RJW DATE: APR 2018	STANDARD DRAWING 32 1 OF 5

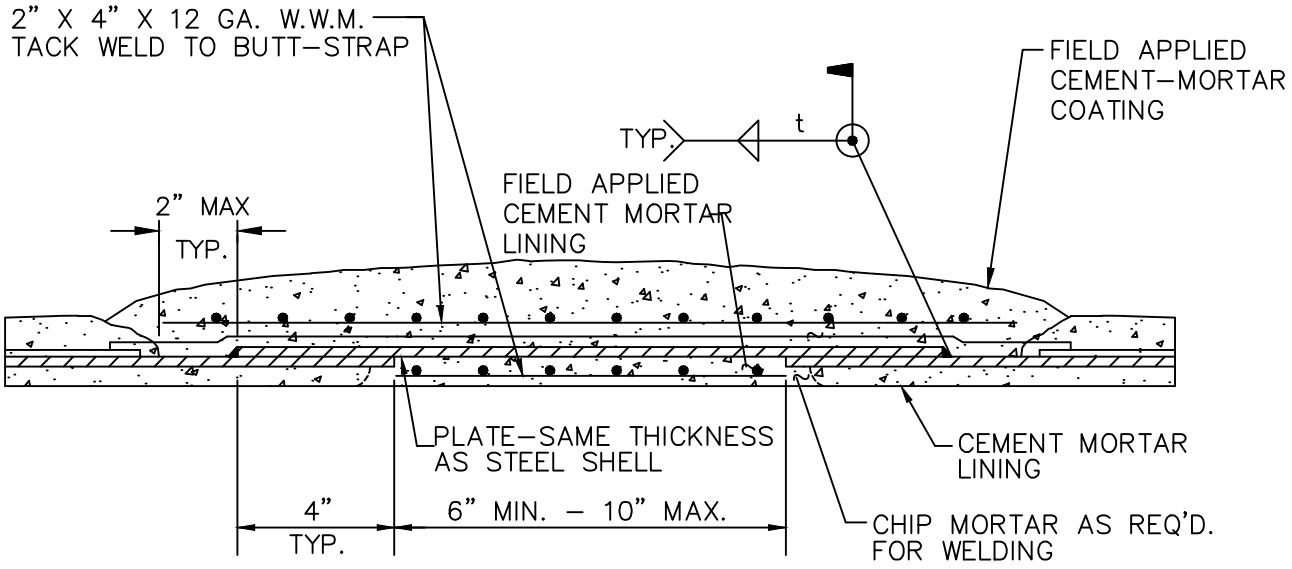


NOTE:

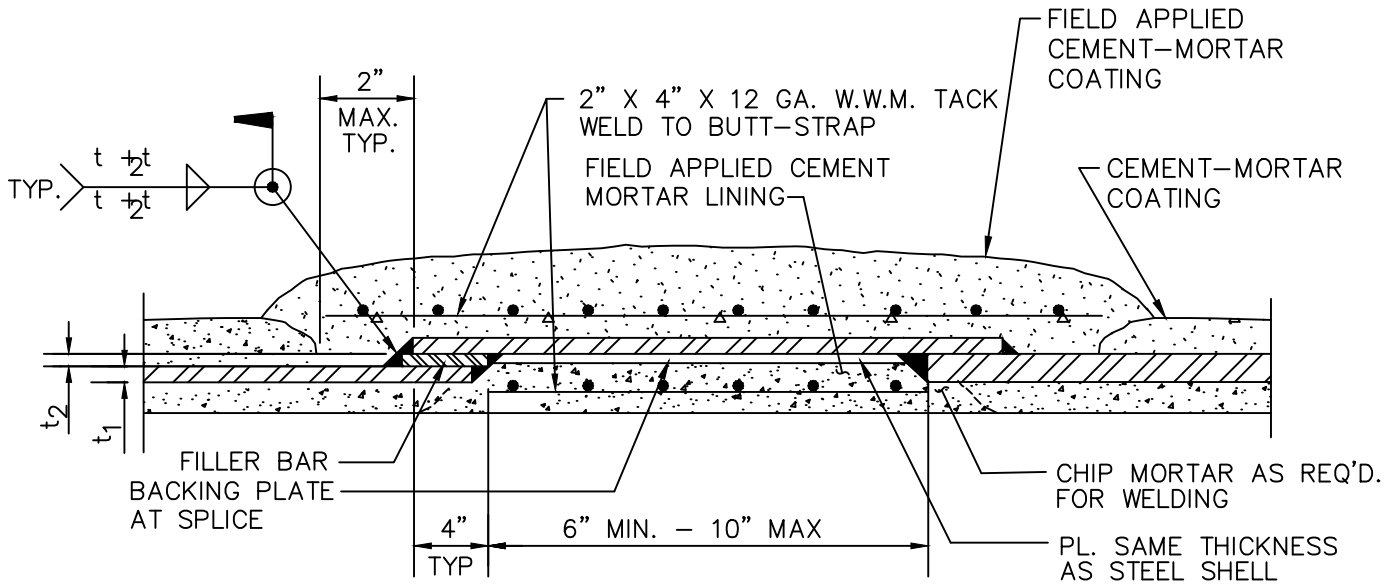
1. CEMENT-MORTAR LINING AND COATING PER TECHNICAL SPECIFICATION SECTION 15076

mcwd#32-2.dwg 04/02/2018

MESA WATER DISTRICT	STEEL PIPE DETAILS LAP WELD JOINT	DRAWN BY: RJW DATE: APR 2018	STANDARD DRAWING 32 2 OF 5



TYPE I



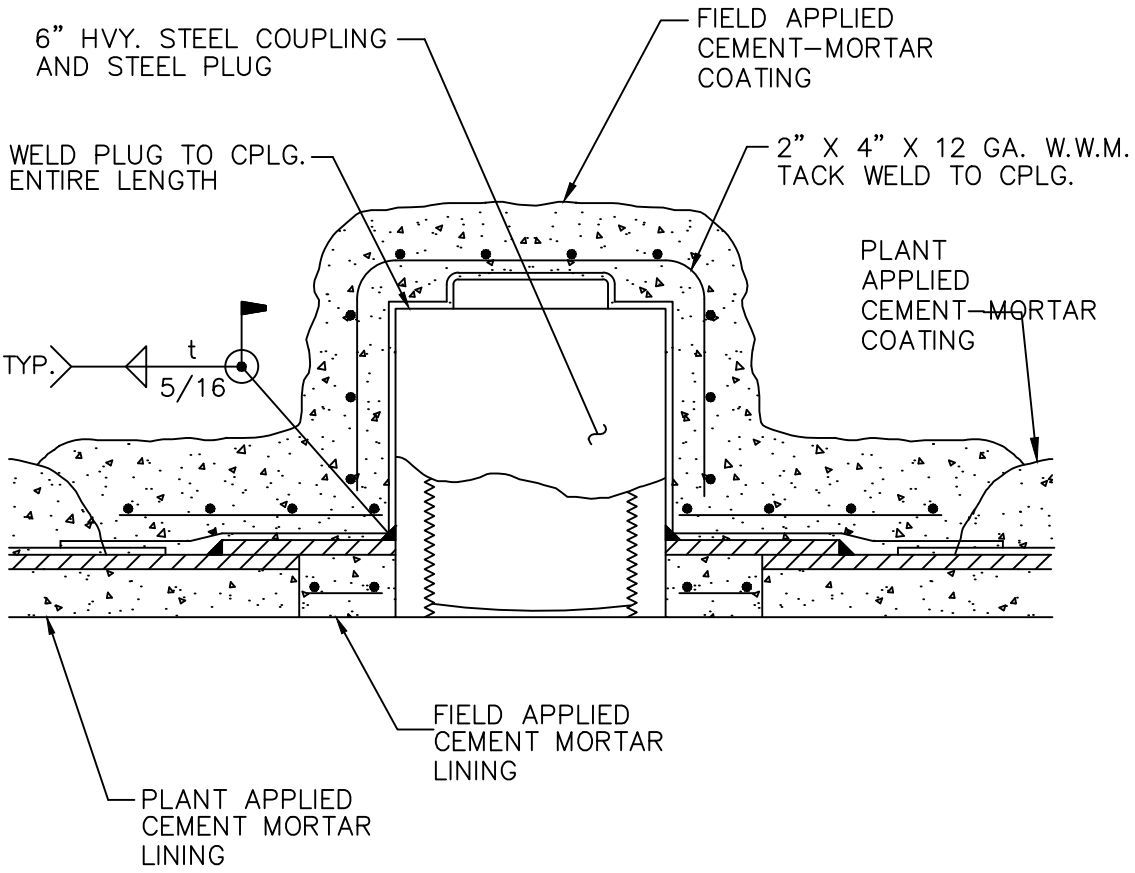
TYPE II

NOTE:

1. CEMENT-MORTAR LINING AND COATING PER TECHNICAL SPECIFICATION SECTION 15076

mcwd#32-3.dwg 04/02/2018

MESA WATER DISTRICT	STEEL PIPE DETAILS BUTT STRAP CONNECTION	DRAWN BY: RJW DATE: APR 2018	STANDARD DRAWING 32 3 OF 5

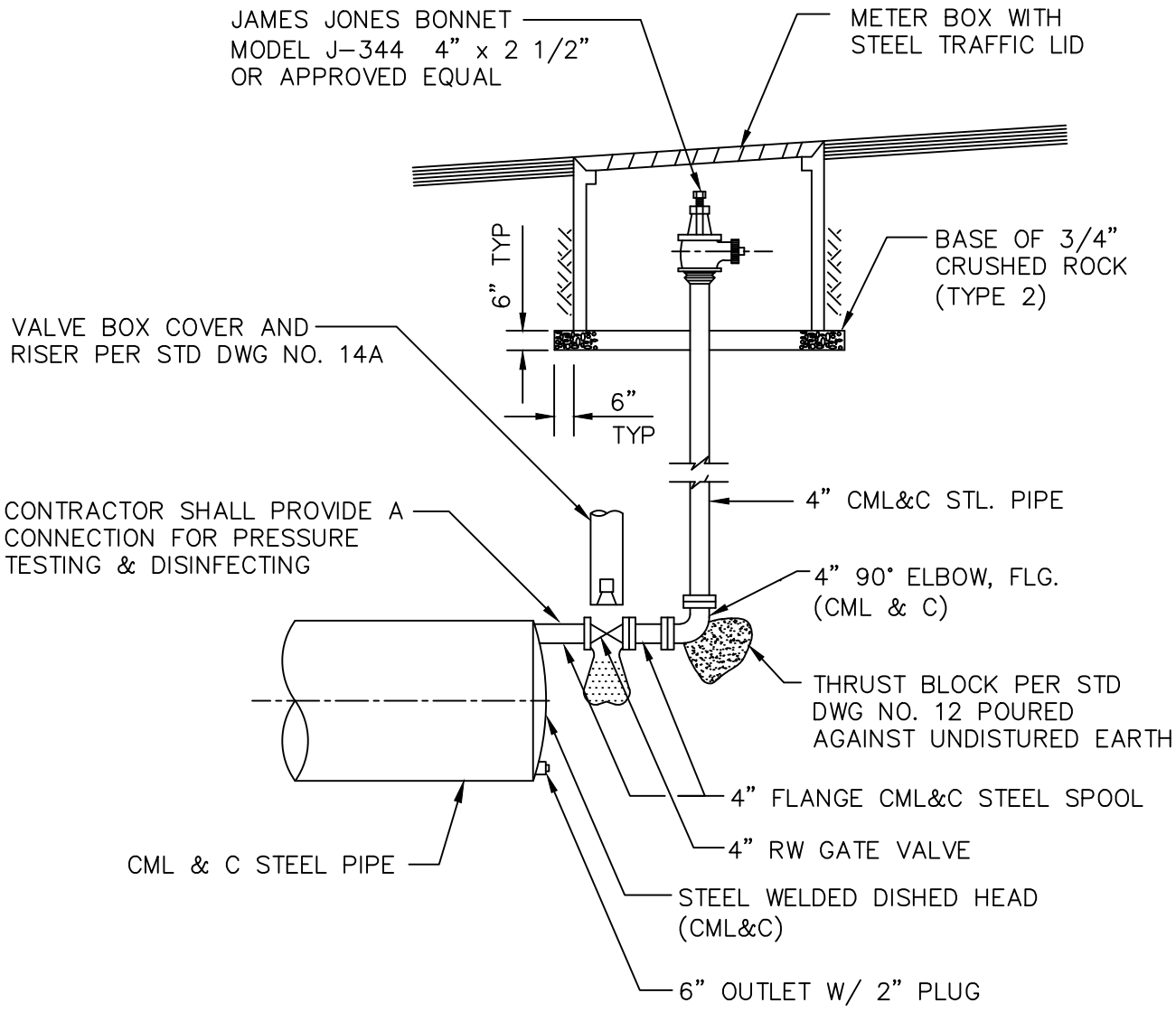


NOTES:

1. TYPICAL HANDHOLES REQUIRED ON PIPE SMALLER THAN 24" DIAMETER
2. MINIMUM OF TWO HANDHOLES REQUIRED FOR EACH BUTT STRAP 1.
3. CEMENT–MORTAR LINING AND COATING PER TECHNICAL SPECIFICATION SECTION 15076

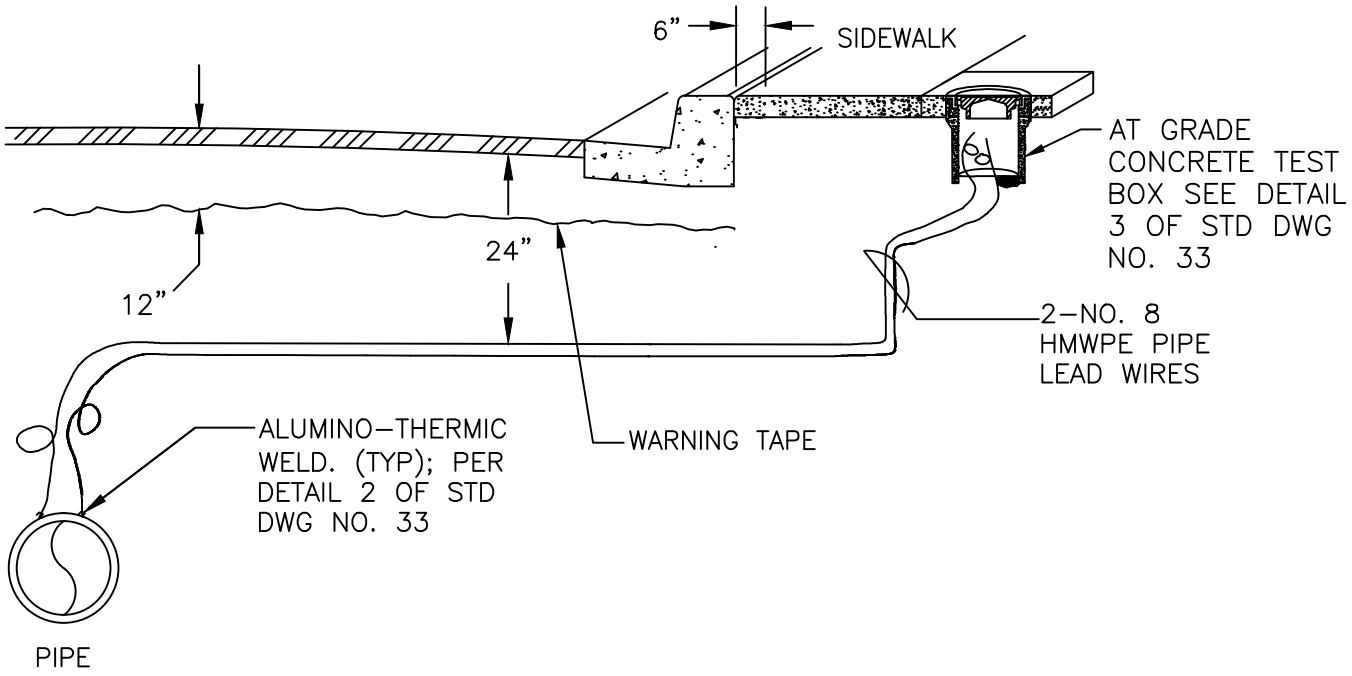
mcwd#32-4.dwg 04/02/2018

MESA WATER DISTRICT	STEEL PIPE DETAILS TYPICAL HANDHOLE	DRAWN BY: RJW DATE: APR 2018	STANDARD DRAWING 32 4 OF 5



mcwd#32-5.dwg 04/02/2018

MESA WATER DISTRICT	STEEL PIPE AND DETAILS TEMPORARY BULKHEAD AND BLOW-OFF	DRAWN BY: RJW DATE: APR 2018	STANDARD DRAWING 32 5 OF 5



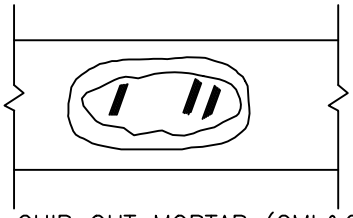
NOTES:

1. PROVIDE 18" SLACK WIRE AT WELD AND COILED IN TEST BOX.
2. IDENTIFY BRASS TAGS PER DETAIL 3 OF STD DWG NO. 33
3. WIRE TRENCH SHALL BE 24–INCHES DEEP (MIN). PLACE 3–INCHES OF SAND OR DG BEDDING IN TRENCH BEFORE PLACING WIRES. COVER WIRES WITH 6–INCHES OF SAND OR DG.
4. USE 6" WIDE, 4 MIL THICK INERT PLASTIC WARNING TAPE PRINTED WITH "CAUTION: CATHODIC PROTECTION CABLE BELOW".

MESA WATER DISTRICT	STEEL PIPE CORROSION DETAILS 2-WIRE TEST STATION	DRAWN BY: RJW DATE: APR 2018	STANDARD DRAWING 33 1 OF 6

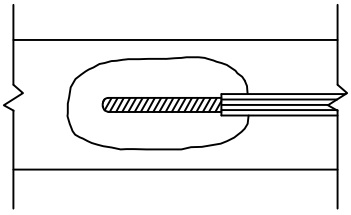
mcwd#33–1.dwg 04/02/2018

STEP 1



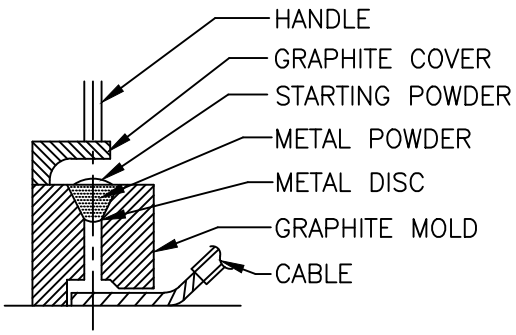
CHIP OUT MORTAR (CML&C) AND/OR FILE SURFACE TO BRIGHT METAL AND CLEAN

STEP 2



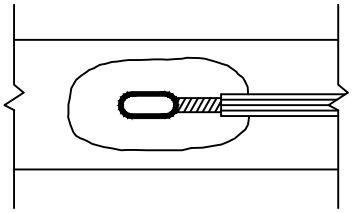
STRIP INSULATION FROM WIRE

STEP 3



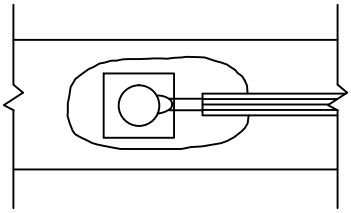
HOLD WELDER FIRMLY WITH OPENING AWAY FROM OPERATION AND IGNITE STARTING POWDER

STEP 4



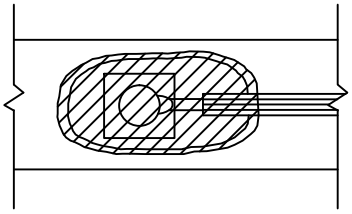
REMOVE SLAG FROM CONNECTION

STEP 5



APPLY 2 COATS OF PRIMER AND COVER CONNECTION WITH A PREFORMED WELD CAP

STEP 6



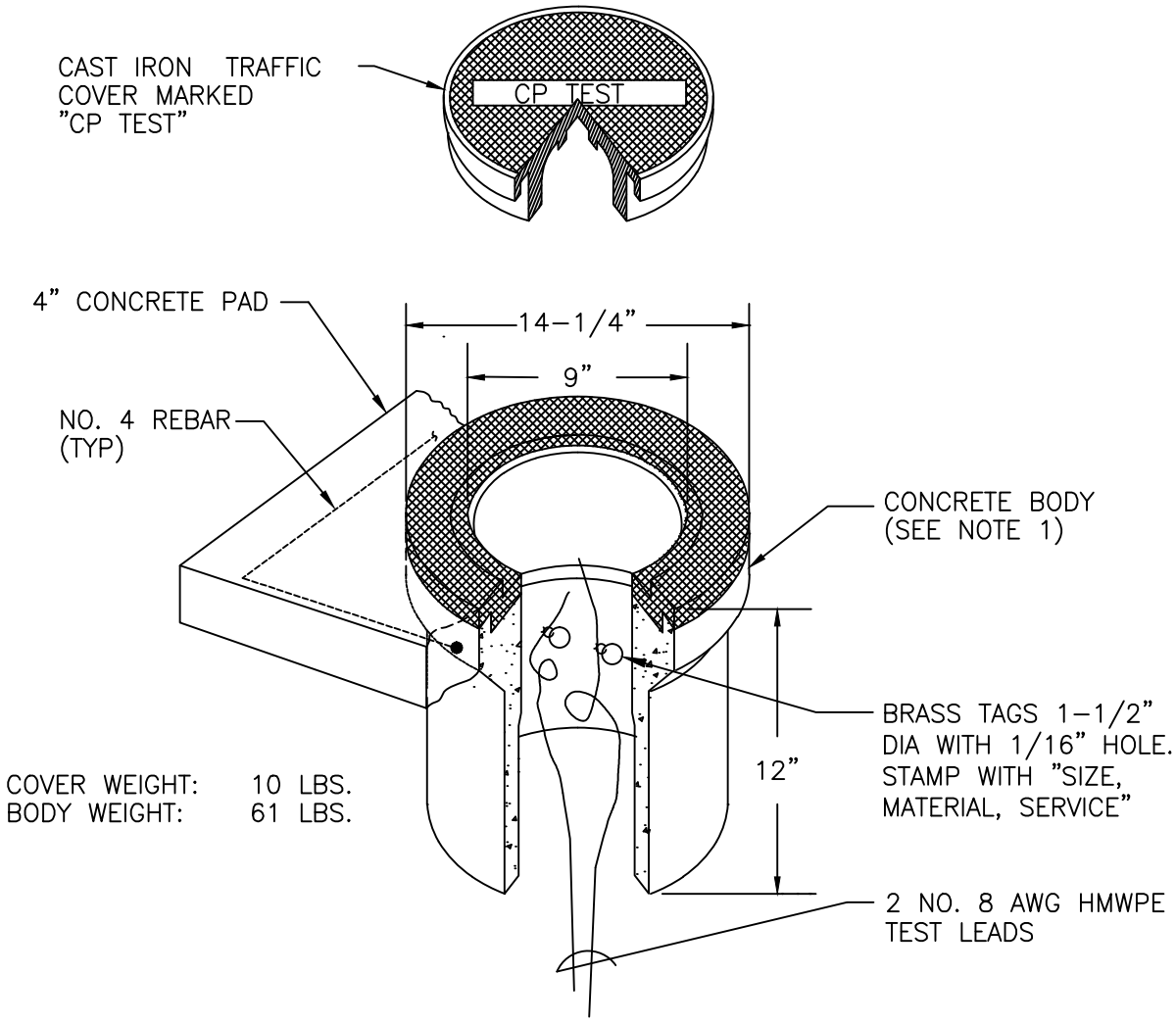
COAT AREA WITH BITUMEN. PATCH MORTAR. SEE NOTE 5.

NOTES:

1. WELDER SHOWN IS FOR HORIZONTAL SURFACES. FOR VERTICAL SURFACES SIDE WELDER IS REQUIRED.
2. ALL WIRE WELDS SHALL BE 3 INCHES APART, MINIMUM.
3. STANDARD WELD CARTRIDGES SHALL BE USED FOR DUCTILE IRON AND STEEL SURFACE.
4. ALL EXPOSED METAL (STRUCTURE, WIRE, & WELD) SHALL BE COVERED WITH 2 COATS OF PRIMER AND AN ELASTOMERIC WELD CAP.
5. APPLY GENEROUS COAT OF BITUMEN OVER WELD CAP AND EXPOSED METAL AREA UP TO EDGE OF MORTAR (CML&C) OR 3" BEYOND WELD CAP (DIP). USE CARBOLINE 300M OR EQUAL.
6. PATCH MORTAR COATING WITH QUICK SETTING MORTAR (CML&C).

mcwd#33-2.dwg 04/02/2018

MESA WATER DISTRICT	STEEL PIPE CORROSION DETAILS ALUMINO-THERMIC WELD	DRAWN BY: RJW DATE: APR 2018	STANDARD DRAWING 33 2 OF 6

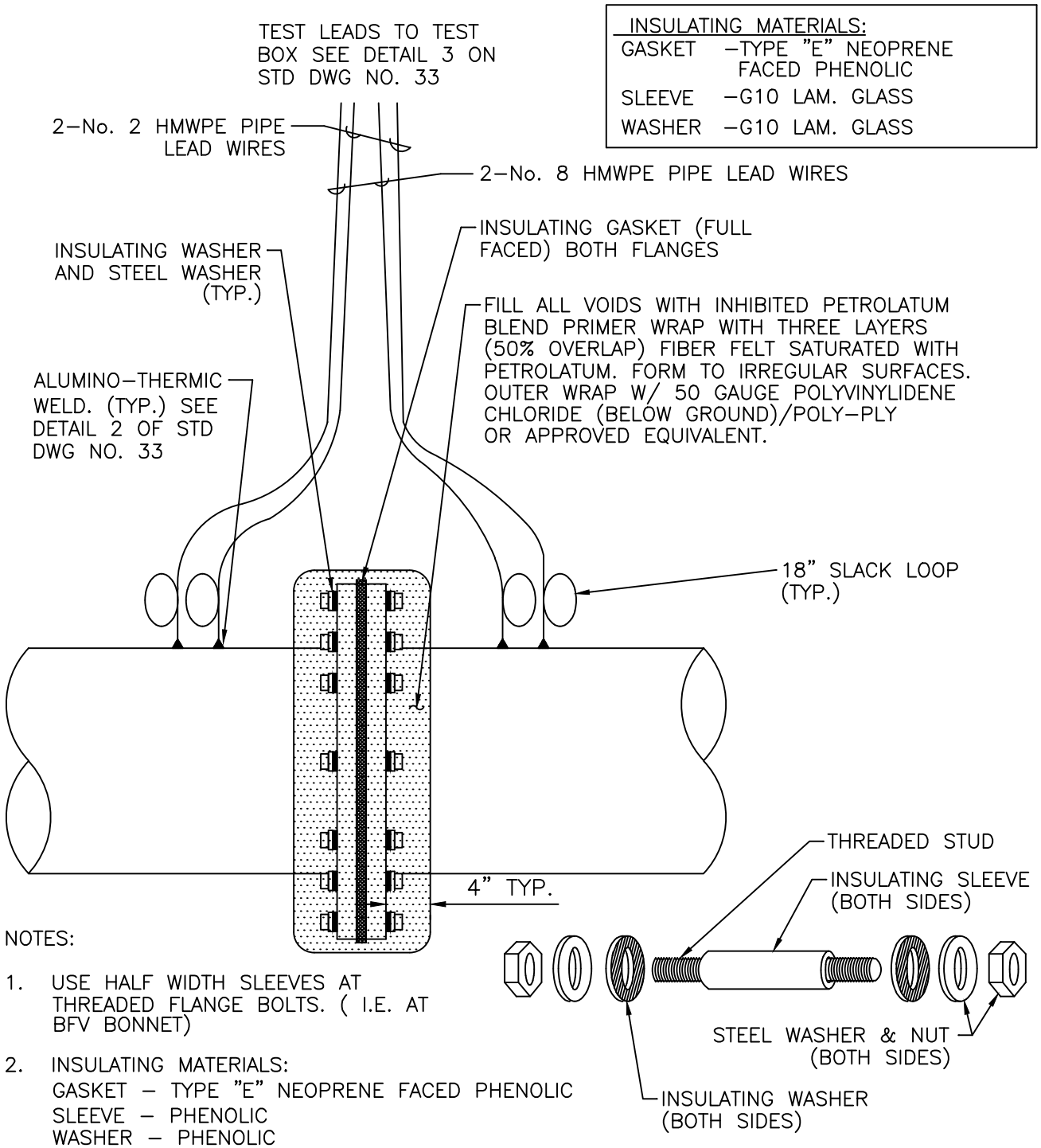


NOTES:

1. VALVE BOX VEHICLE TRAFFIC – SOUTH BAY FOUNDRY – SBF-1208N
2. ALL WIRES SHALL HAVE 18" MIN. SLACK IN BOX.
3. BOTTOM OF TEST BOX SHALL BE NATIVE SOIL. DO NOT PLACE ROCK, GRAVEL OR SAND IN TEST BOX.
4. FIRMLY STAMP BRASS TAGS (1-1/2" DIA WITH 1/16" DIA. HOLE) "SIZE, MATERIAL AND SERVICE" (EXAMPLE: 24", CMLCSP, DW). USE 1/4" HIGH CHARACTERS. SECURELY ATTACH BRASS TAGS TO TEST LEADS WITH BARE NO. 14 COPPER WIRE.
5. HORIZONTAL WIRE RUNS SHALL BE IN 24-INCH DEEP TRENCH. PLACE 3-INCHES OF SAND OR DG. BEDDING IN TRENCH BEFORE PLACING WIRES. COVER WIRES WITH 6-INCHES OF SAND OR DG.
6. USE 6" WIDE, 4 MIL THICK INERT PLASTIC TAPE PRINTED WITH "CAUTION: CATHODIC PROTECTION CABLE BELOW". PLACE 12-INCHES BELOW GRADE.

mcwd#33-3.dwg 04/02/2018

MESA WATER DISTRICT	STEEL PIPE CORROSION DETAILS AT-GRADE TEST BOX	DRAWN BY: RJW DATE: APR 2018	STANDARD DRAWING 33 3 OF 6

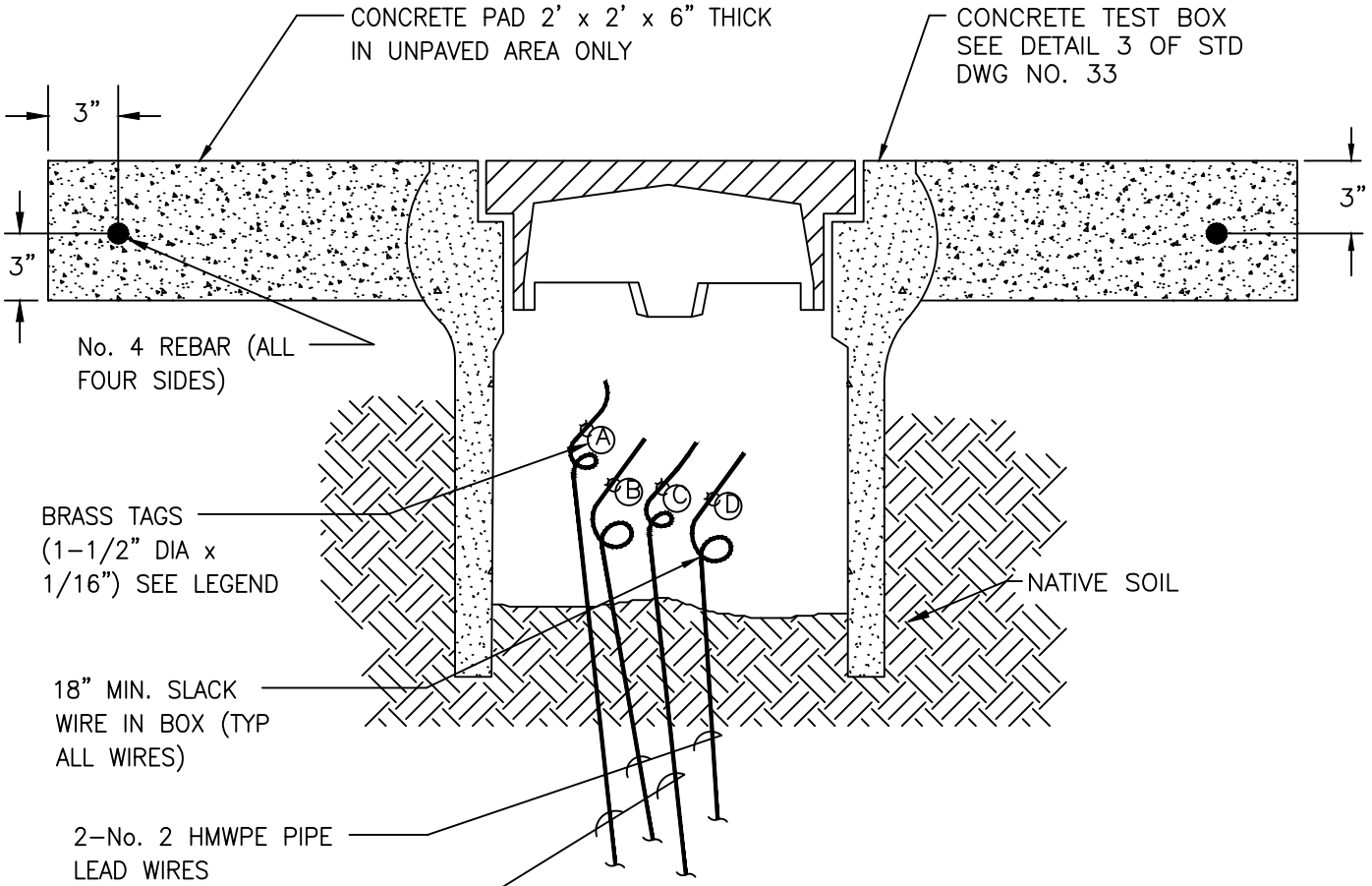


NOTES:

1. USE HALF WIDTH SLEEVES AT THREADED FLANGE BOLTS. (I.E. AT BFV BONNET)
2. INSULATING MATERIALS:
   GASKET – TYPE "E" NEOPRENE FACED PHENOLIC
   SLEEVE – PHENOLIC
   WASHER – PHENOLIC

mcwd#33–4.dwg 04/02/2018

MESA WATER DISTRICT	STEEL PIPE CORROSION DETAILS BURIED INSULATING FLANGE & TEST STATION	DRAWN BY: RJW DATE: APR 2018	STANDARD DRAWING 33 4 OF 6



TAG LEGEND

WIRE	SIZE	TAG ID (EXAMPLE)
A	No. 8 HMWPE	24" CMLC, DW
B	No. 2 HMWPE	24" CMLC, DW
C	No. 8 HMWPE	24" CMLC, DW
D	No. 2 HMWPE	24" CMLC, DW

CORROSION TEST STATION NOTES:

A. ALL TEST STATIONS SHALL BE THE AT-GRADE TYPE WITH A CONCRETE TEST BOX SUITABLE FOR VEHICULAR TRAFFIC.

B. PROVIDE 18" SLACK WIRE AT WELD TO PIPE AND COILED IN TEST BOX.

C. BOTTOM OF TEST BOX SHALL BE NATIVE SOIL. DO NOT PLACE ROCK, GRAVEL OR SAND IN TEST BOX.

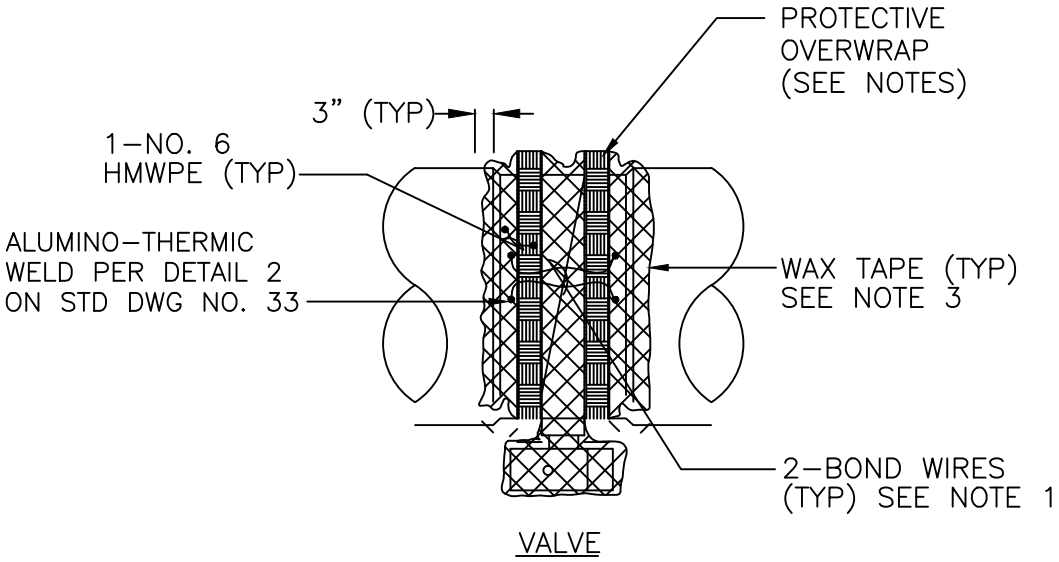
D. A CONCRETE PAD (24" SQUARE X 6" THICK) AROUND TEST BOXES ARE REQUIRED IN UNPAVED AREAS.

E. JACK AND BORE WIRES UNDER PAVEMENT WHERE REQUIRED.

F. FOR TWO-WIRE TEST STATION, WIRES "C" AND "D" CAN BE OMITTED.

mcwd#33-5.dwg 04/02/2018

MESA WATER DISTRICT	STEEL PIPE CORROSION DETAILS 4-WIRE TEST STATION	DRAWN BY: RJW DATE: APR 2018	STANDARD DRAWING 33 5 OF 6



VALVE

NOTES:

1. BOND WIRE SIZE:

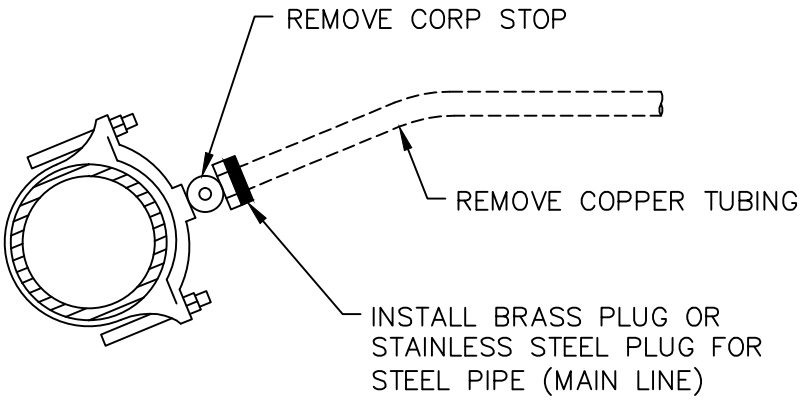
PIPE DIA	SIZE
<14"	NO. 6 AWG HMWPE
<20"	NO. 4 AWG HMWPE
⩾20"	NO. 2 AWG HMWPE

2. WIRES CAN BE WELDED DIRECTLY TO PIPE OR FLANGE. JUMPER FROM PIPE TO VALVE OR FOLLOWER IS NO 6 HMWPE.
3. ALL NON–MORTAR COATED SURFACES SHALL BE WRAPPED WITH WAX TAPE. INDIVIDUALLY WRAP ALL RODS, BOLTS & IRREGULAR SURFACES. SEE TECHNICAL SPECIFICATION SECTION 16640.
4. INSTALL BOND WIRES BEFORE WAX TAPE.
5. CARE SHALL BE TAKEN WHEN BACKFILLING TRENCH TO PREVENT DAMAGE TO WAX TAPE SYSTEM.
6. FLANGES (ONLY) 18" AND LARGER SHALL BE OVERWRAPPED WITH 10 MIL PIPE TAPE (2 LAYERS 50% OVERLAP) TO PROTECT WAX TAPE DURING BACKFILLING.
7. FLANGES LESS THAN 18" REQUIRE NO PIPE TAPE PROTECTIVE OVERWRAP.

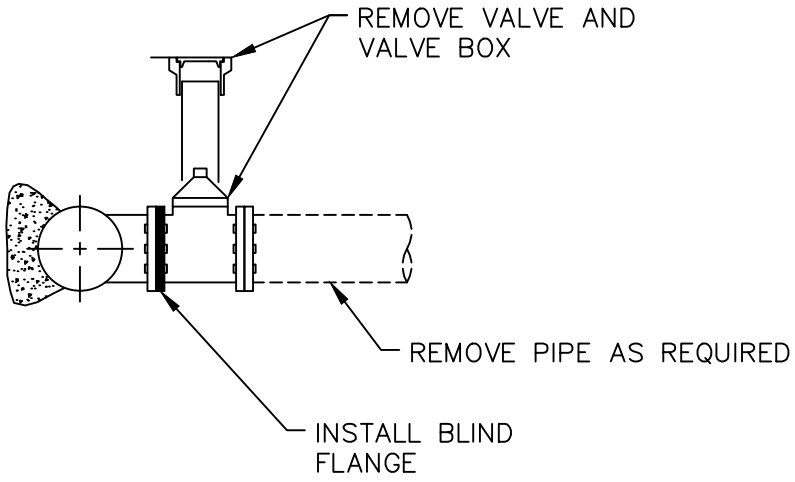
mcwd#33–6.dwg 04/02/2018

MESA WATER DISTRICT	STEEL PIPE CORROSION DETAILS MECHANICAL JOINT BOND	DRAWN BY: RJW DATE: APR 2018	STANDARD DRAWING 33 6 OF 6

2" AND SMALLER



4" AND LARGER

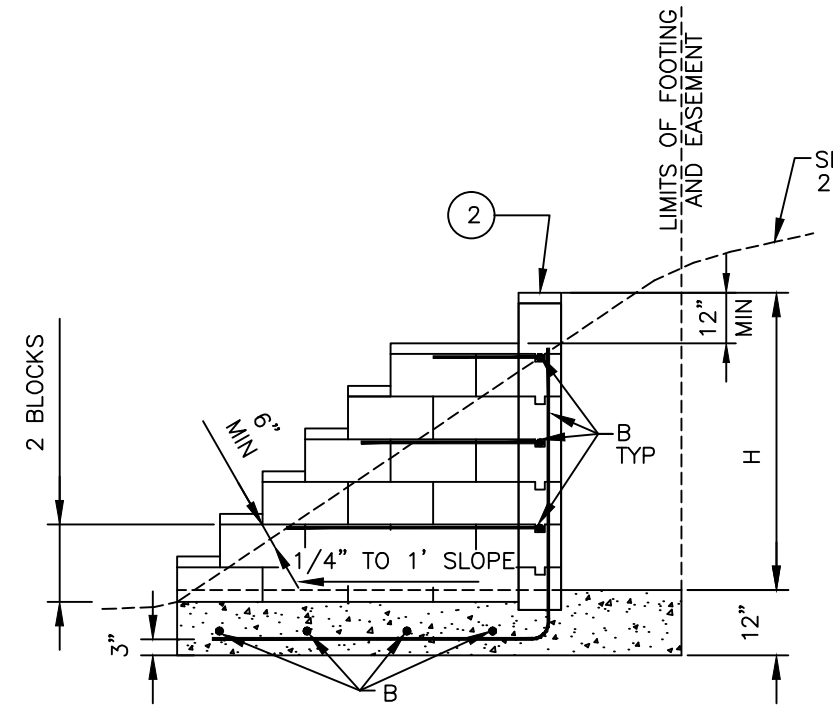


GENERAL NOTES:

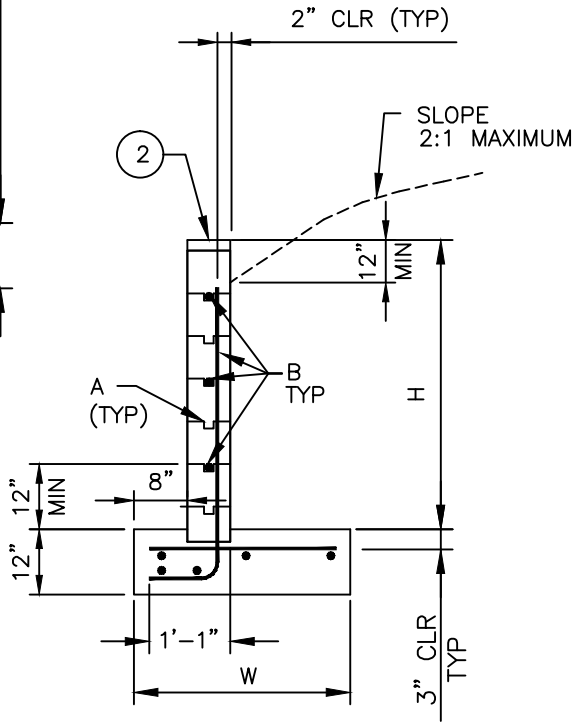
1. ALL EXISTING VALVES (4" AND LARGER) SHALL BE SALVAGED AND RETURNED TO MESA WATER CORP. YARD.

MESA WATER DISTRICT	ABANDONMENT DETAILS	DRAWN BY: RJW DATE: APR 2018	STANDARD DRAWING 34

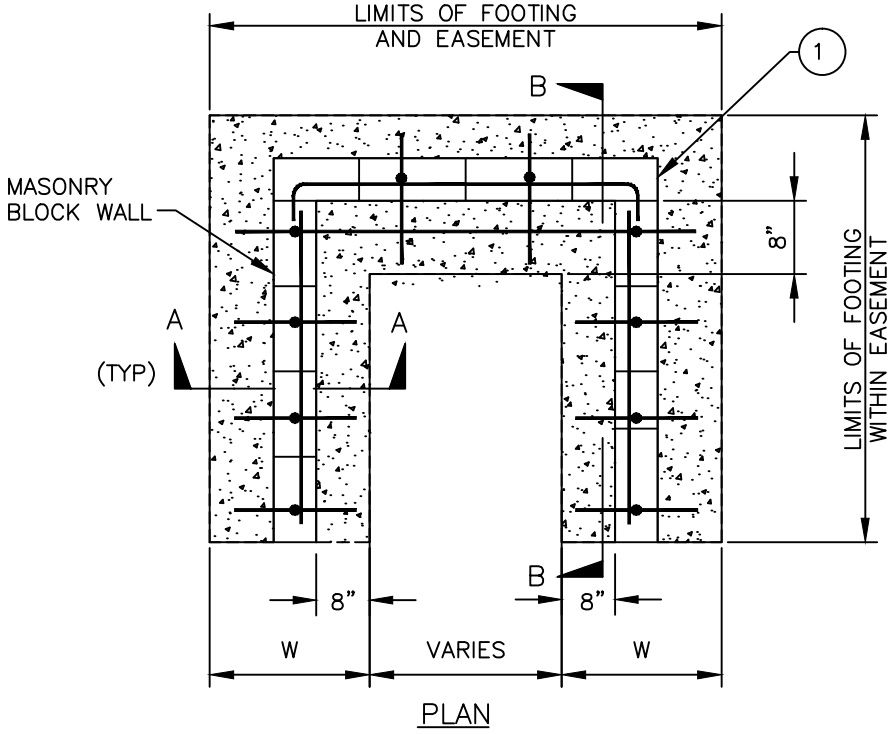
mcwd#34.dwg 04/02/2018



SECTION B–B



SECTION A–A



PLAN

MESA WATER DISTRICT	RETAINING WALL	DRAWN BY: RJW DATE: APR 2018	STANDARD DRAWING 35 1 OF 2

mcwd#35–1.dwg 04/02/2018

ITEM	MATERIALS
1	MASONRY BLOCK. SEE NOTE 2.
2	BLOCK CAP. MATCH BLOCK STYLE AND COLOR.

NOTES:

1. RETAINING WALL TO BE CONSTRUCTED WITH ALL APPURTENANCES WHEN A SLOPE EXISTS AT THE LOCATION OF THE APPURTENANCES. EXAMPLES INCLUDE BACKFLOW DEVICES, FIRE HYDRANTS, AIR/VACS, METERS, VAULTS, VALVES AND WHEREVER REQUIRED BY MESA WATER.
   A. CLEARANCE BETWEEN INSIDE WALL FACE AND APPURTENANCE SHALL BE 36-INCH MINIMUM.
   B. FOR POWERED APPURTENANCES, SUCH AS TRANSFORMERS, REFER TO THE SCE MINIMUM CLEARANCE REQUIREMENTS.
2. MASONRY BLOCK SHALL BE 8" X 8" X 16" UNITS CONFORMING TO ASTM C-90 CLASS "S" AND CONCRETE MASONRY ASSOCIATION STANDARDS. BLOCK SHALL BE "SPLIT FACE" BEIGE COLOR FINISH ON ALL EXPOSED FACES TO MATCH EXISTING. FILL ALL CELLS WITH GROUT.
3. MORTAR AND GROUT SHALL MATCH BLOCKWORK AND BE IN CONFORMANCE WITH SECTION 202-2 OF THE STD. SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION (GREEN BOOK).
4. OMIT MORTAR FROM THE FIRST VERTICAL JOINT OF THE BLOCK COURSE ABOVE FINISH GRADE TO PROVIDE WEEP HOLES FOR SUB-DRAINAGE PURPOSES.
5. CONCRETE SHALL BE CLASS 560-C-3250.
6. WALL CONSTRUCTION SHALL MEET "GREEN BOOK".
7. PROVIDE RAILING ON TOP OF WALL WHEN REQUIRED BY CODE.

REINFORCEMENT TABLE					
DESIGN H	3'-4"	4'-0"	4'-8"	5'-4"	6'-0"
DESIGN W	2'-8"	3'-0"	3'-4"	3'-8"	4'-0"
A VERT. REINF.	#4@16"	#4@16"	#5@16"	#6@16"	#6@16"
B VERT. REINF.	#4@16"	#4@16"	#5@16"	#6@16"	#6@16"
DESIGN CRITERIA 1. EQUIVALENT FLUID PRESSURE = 35 pcf (TOE AND HEEL) 2. ALLOWABLE BEARING CAPACITY = 1500 psf					

mcwd#35-2.dwg 04/02/2018

MESA WATER DISTRICT	RETAINING WALL	DRAWN BY: RJW DATE: APR 2018	STANDARD DRAWING 35 2 OF 2