

Highlands Mutual Water Company



WATER DISTRIBUTION SYSTEM DESIGN AND CONSTRUCTION STANDARDS AND SPECIFICATIONS

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WATER DISTRIBUTION SYSTEM DESIGN STANDARDS

1.01 PURPOSE

To provide guidelines for the design of water utilities projects and thereby reduce the time required for processing the plans. These guidelines do not include, but may reference, additional conditions which may be promulgated by all other pertinent ordinances, codes, and official policy set forth by Highlands Mutual Water Company or other government agencies. These guidelines establish minimum acceptable design criteria. More stringent requirements may be imposed by the Highlands Mutual Water Company based on specific project conditions.

Portions of these standards apply to fire systems, both HMWC and private, and are intended as general reference to aid in the design of the HMWC water distribution system. Final designs are subject to approval of the Fire Department.

Wherever the approval, discretion or opinion of Highlands Mutual Water Company is called for herein, the project applicant shall submit a written request for the same. Variance requests must clearly identify the unusual circumstance that would warrant an exemption or waiver from the standards or specifications. The project applicant shall be responsible for providing any calculations or studies needed to support the proposal and for resolving specific design problems with the appropriate agencies, departments, or divisions.

1.02 REQUIREMENTS FOR IMPROVEMENT PLANS

- A. Provide a detailed utility plan showing onsite and offsite water and fire protection systems, including mains, services, hydrants, and all other required appurtenances, and their connections to existing Highlands Mutual Water Company facilities. Show the location, type, and diameter of water mains. Reference any existing fire hydrants within 300' of the project boundaries. Show any wells, existing or to be abandoned. When a separate irrigation service is necessary, an irrigation plan is required per section X-O of these standards. (See section XI-B for submittal of plans for private fire systems.)
- B. Miscellaneous specific items required on improvement plans are indicated throughout these standards.
- C. Before combustible materials may be delivered, stored or constructed on site, fire flow and access must be provided and approved by the Lake County Fire Protection District. In addition, HMWC and/or private fire hydrants must be installed, flushed and operational unless an alternant supply of water is onsite that has been approved by the Lake County Fire Protection District for this purpose. This information must be included on all improvement plans. Provide any necessary calculations with the submittal of improvement plans or with the Tentative Map submittal to demonstrate adequate fire flows are available. Newly installed fire hydrants shall be flow tested per the methods described in NFPA 291, Chapter 4 and the results transmitted to Highlands Mutual Water Company for inclusion into the Geographic Information System (GIS).
- D. Any known areas of contamination shall be delineated on the improvement plans.

1.03 WATER MAINS - GENERAL

- A. Water mains may not be designed outside the street right-of-way without approval from Highlands Mutual Water Company.
- B. In general, water distributions systems shall be designed only where they serve multiple ownership lots and where appropriate access for maintenance can be provided.
- C. Water mains installed at a slope of 15% or greater shall be designed with restrained joints. The Design Engineer must provide adequate drainage measures to protect the trench from erosion.
- D. Water mains installed outside of any roadway, called "cross-country mains", shall be Ductile Iron Pipe (DIP) and shall have suitable access for maintenance by Highlands Mutual Water Company personnel and vehicles. Cross-country mains shall be designed and constructed with isolation valves installed in the public right-of-way and shall be identified with blue locating posts per Standard P-48 at approximate 500' intervals, at any angle point, and at the entrance to an easement. Stakes should have vandal proof metal bottoms.
- E. For system reliability, to minimize pipe size, and to minimize the number of people affected by a system shutdown, either for domestic or fire protection purposes, no more than 100 residential units may be served by a single-feed water system. A dual-feed (looping) HMWC water systems shall be designed to provide a secondary source of water to developments serving more than 100 units or in situations where a single feed does not have sufficient hydraulic and/or fire flow capacity Onsite private fire requirements. such as dual fire services and looping mains, will be determined by the Lake County Fire Protection District for residential and nonresidential developments.
- F. For purposes of leak detection and maintenance access, no reinforced concrete may be designed over HMWC maintained water facilities. Unreinforced concrete will be allowed under special circumstances such as crosswalks, sidewalks, and driveways.
- G. Extent of water main improvements will be as follows:
 - 1. Any offsite water main improvements needed to serve the project must be shown on the improvement plans, including upgrades to existing mains that may be required as a result of a flow analysis or modeling effort.
 - 2. In general, water mains must be designed at least across one-half of the property frontage or to the last service connection, whichever is greater, or where the project is required to provide new street improvements over the water main alignment and the water main will serve properties beyond the project limits, the water main must be designed to cross the full property frontage or to the limits of the street improvements, whichever is greater.

1.04 MATERIALS

- A. All materials used shall be lead free per California Health & Safety code, Section 1168 75.
- B. Service laterals shall be high density polyethylene (HDPE) or Ductile Iron Pipe (DIP) per applicable Highlands Mutual Water Company Standards.
- C. 8" and 12" HWMC water mains and 4"-12" private fire mains shall be; Polyvinyl Chloride

(PVC) Pressure Class (PC) 235, DR1 8 per AWWA Standard C900. minimum or Ductile Iron Pipe Pressure Class 350 per AWWA Standard C151 minimum. Where the normal mainline static pressure exceeds 100 psi, or when required per SWRCB separation criteria, Ductile Iron Pipe or PVC PC305, DR14 shall be used. Note: Lake County Fire Protection District may also require DIP or PVC PC305 DR14 pipe downstream of fire line backflow assemblies.

- D. 16" diameter water mains shall be; PVC PC165, DR25 per AWWA Standard C900 or Ductile Iron Pipe per AWWA Standard C151, or as shown on plans and specifications. Where the normal mainline static pressure exceeds 100 psi, PVC PC235, DR 18 per AWWA Standard C900 or Ductile Iron Pipe shall be used.
- E. 20" diameter and larger water mains shall be concrete cylinder pipe, wrapped steel pipe, or Ductile Iron Pipe unless otherwise approved by Highlands Mutual Water Company.
- F. Asbestos cement pipe shall not be allowed under any circumstances.

1.05 CONNECTION TO AN EXISTING HMWC WATER MAIN

- A. Indicate a "hot tap" for connection of service laterals 2" in diameter and smaller unless a mainline valve is also to be installed for isolation.
- B. Indicate connection of pipes 4" - 12" in diameter with a hot tap or a cut-in tee in conformance with the provisions of Highlands Mutual Water Company Water Distribution System Construction Specifications. Hot taps will be allowed only when no main line valves are required.
- C. Design a cut-in tee if additional valves are required on the existing main. If the new main/lateral is larger than the existing main, the tee and main/lateral valve shall be the size of the existing main unless it is hydraulically necessary to increase the tee and valve to the size of the new main/lateral.
- D. Tie-ins to the existing Highlands Mutual Water Company water distribution system shall be inspected by an authorized Highlands Mutual Water Company representative and the improvement plans shall be so annotated.
- E. Size-on-size taps are allowed up to 8" for cast iron, ductile iron and PVC mains in accordance with the approved standards. Size on size taps on asbestos cement mains are not recommended and shall only be allowed with prior authorization from Highlands Mutual Water Company. 12" size-on-size taps are allowed only under emergency situations and with the specific approval of Highlands Mutual Water Company.

1.06 ALIGNMENT

- A. Horizontal
 - 1. Alignment shall be in accordance with the provisions of Standard P-47 or as directed by the Engineer.
 - 2. New water systems shall be designed as "Restrained Joint Systems" wherever possible, minimizing the use of concrete thrust blocks and or harnesses except as otherwise specified herein, in the Water Distribution System Construction

Specifications or on the plans. The Design Engineer shall show system restraint lengths on the plans, and all restraint calculations shall be provided to HMWC.

3. Installations of 90-degree bends shall only be installed where site constraints do not allow the installation of two 45-degree bends. Where two 45-degree bends are required per these specifications there shall be as much separation between the bends as practical for the design.
4. In general, the water distribution system shall be designed in straight segments parallel to the sanitary sewer or storm drain system, or to the curb line when no other utilities are present, so that future locating and maintenance is simplified. When deflection of the system is required, the minimum allowable radius of curvature for an 8" water main is 250 feet and for a 12" water main is 350 feet. Any deflection in mains larger than 12" must first be approved by Highlands Mutual Water Company.
5. Conform to the latest revision of the State of California State Water Resources Control Board (SWRCB) (See Standard P-2A, P-2B & P2C) and any modifications herein or as approved by both the SWRCB Division of Drinking Water and the Highlands Mutual Water Company. 4" and larger service laterals shall have the same separation requirements as water mains.
6. The minimum horizontal separation from storm drains, monuments, gas, electrical, and telephone lines shall be 4 feet clear between facilities except at crossings.
7. The minimum clear horizontal separation from a metallic pipeline with an induced current or from an anode field shall be 5 feet. Where the new water main will be in proximity to an anode field, special design shall be required for approval by Highlands Mutual Water Company.
8. All HMWC water mains shall be designed a minimum of 5 feet from all structures, such as manholes or drop inlets. Provide a minimum of 3 feet separation from the lip of gutter to edge of pipe for future maintenance. The edge of water main pipes shall be designed a minimum of 5 feet from the edge of easements.
9. All water main trenches that are parallel to and deeper than the footing of any adjacent structure must be designed at least 45-degrees from the footing as required in the Uniform Plumbing Code. Any exceptions must first be approved in writing by Highlands Mutual Water Company and the City Building Official, and shall comply with all applicable Codes and Regulations.
10. Where dual water mains are designed, a minimum of 5 feet clear horizontal separation shall be maintained unless otherwise approved by Highlands Mutual Water Company.
11. In general, water main crossings over or under other underground facilities shall be designed as close as 90 degrees to that facility as possible. Crossings of less than 45 degrees shall only be approved when no other design is possible.

B. Vertical

1. Generally, provide a minimum of 6" of vertical separation from water mains and telephone (non-fiber optic) and cable TV, and 12" vertical separation from water mains

and; gas, electric, and fiber optic lines. When the minimum cannot be maintained, plans shall indicate installation of felt expansion material, Styrofoam, or an approved equivalent between facilities. Other measures, such as the use of control density backfill, or ductile iron pipe may be submitted for review by Highlands Mutual Water Company. The absolute minimum separation between water lines and other underground facilities, except sewer shall be 0.1'.

2. Conform to the latest revision of the State of California Water Resources Control Board (SWRCB), (See Standard P-2A, P-2B & P2C), and any modifications herein or as approved by both the SWRCB Division of Drinking Water and the Highlands Mutual Water Company.
3. Comply with section 1.06-A-2 above.
4. Where dual water mains are designed, a minimum 1' clear vertical separation shall be maintained.
5. Where the new water main will be in proximity to an anode field, special design will be required for approval by Highlands Mutual Water Company.

1.07 MAIN SIZING CRITERIA

- A. Allowable nominal sizes for HMWC water mains are 8", 12", and 16" Any main size other than those specified must first be approved by Highlands Mutual Water Company.
- B. HMWC water mains shall be sized to meet minimum Fire Code requirements in addition to domestic and irrigation demands. Private fire protection mains shall be sized to meet minimum Fire Code requirements (see Section 1.12-J for fire flow requirements).
- C. The minimum new HMWC main size shall be 8 inches. New HMWC mains serving commercial, industrial and/or multi-family residential developments greater than two units shall be a minimum of 12 inches. Existing mains that will serve such proposed uses must be upgraded as required to meet the current Fire Code.
- D. Maximum flow velocity for new water mains shall be 10 feet per second, to be calculated by applying the demands from Section 1.07-B above.

1.08 MAIN / LATERAL COVER

- A. Cover is the distance from the top of the pipe to final finished grade measured directly over the pipe.
- B. Typically, the minimum standard depths of cover for HMWC water mains and private fire protection mains are:

Pipe Size	4" through 8"	10"	12"	16" or Larger
Cover (in.)	36"	40"	44"	48"

- C. Where minimum cover is less than standard or greater than 8', special permission from Highlands Mutual Water Company is required. All new water mains shall be shown in a profile on the Improvement Plans. Where cover is less than the standard, Pressure Class 350 Ductile Iron Pipe is required, but in no cases shall a cover of less than 24" be approved.
- D. Where standard cover cannot be maintained, such as at the crossing of a water main with a sewer line or any other utility line, the Design Engineer shall propose lowering or raising the water main utilizing either a gradual deflection of the water main pipe itself, without installed elbow fittings, and that does not exceed the manufacturer's recommended instructions for this type of installation, or by utilizing ductile iron pipe with restrained mechanical joint type elbows. Where restrained joints are used to lower or raise the water main, all connected piping and appurtenances shall also be restrained, as needed, to safeguard all system components, new and existing, that may be affected. Evaluation by the Design Engineer should include, at a minimum, the need for higher class pipe, use of control density backfill, pipe encasement, ability to meet State Water Resources Control Board (SWRCB) Criteria for the Separation of Water Mains and Non-Potable Pipeline, need for additional joint restraint beyond the structure, and the resulting need for combination air and vacuum release valves (ARV). This evaluation shall be submitted to both the SWRCB and Highlands Mutual Water Company for review with any proposal.

Where the raising or lowering does not satisfy the current SWRCB Waterworks Standards criteria for the separation of Water Mains and Non-Potable Pipelines and Highlands Mutual Water Company Standards, the proposed installation shall be submitted to the SWRCB "Drinking Water Division" for review. Once approved by the SWRCB, the proposal along with all documentation shall be submitted to Highlands Mutual Water Company for review. Approval by the SWRCB does not guarantee an approval by Highlands Mutual Water Company.

- E. The minimum cover for service laterals shall be as shown on the appropriate Highlands Mutual Water Company Standard Plan. Where service laterals have conflicts with other facilities, a detail or profile shall be shown on the plans, or the plans shall be sufficiently annotated to give clear direction for the installation.
- F. When designing a cut-in tee or cross for a service or main connection that is larger than the existing main, the new assembly shall be shown at the minimum depth for the size of tee or cross per section VIII above. The depth shall also be sufficient to allow the valves to remain below the street subgrade, which may necessitate lowering the existing main.

1.09 VALVING

- A. Valve installations at intersections shall be in accordance with the provisions of Standard P-47. A minimum of three mainline valves are required at three-way intersections and four valves are required at four-way intersections. A valve may not be required on any leg of a tee or cross intersection if another valve is within 250 feet, except as needed to isolate fire hydrants, fire lines, commercial or multi-unit services, or dialysis centers.
- B. All hydrants shall be on separately valved sections of the HMWC main, including fire lines serving private hydrants.
- C. Any water main which does not have a fire hydrant, fire line, commercial or multi-unit service, or dialysis center lateral connection shall have valves designed at approximately

1,000-foot intervals or as required by Highlands Mutual Water Company.

- D. Water main valves shall be designed outside of concrete areas wherever possible to facilitate repairs.
- E. Cross-country water mains must be isolated with valves in the public right-of-way and shall be identified with locating posts at 500-foot intervals, at any angle point and at entrances to easements.
- F. Gate Valves
 - 1. Water gate valves shall comply with Highlands Mutual Water Company Standard P-32.
 - 2. Water gate valves shall be ductile iron conforming to either AWWA Standard C509 or C515 of the latest revision and shall be resilient seat type with non-rising stem opening counter clockwise, with O-ring stem seal and suitable ends for connecting to the type of pipe or fitting used.
 - 3. The working pressure rating of the water gate valve shall meet or exceed the pressure rating of the pipe.
 - 4. External bolts and nuts shall be stainless steel grade 304 or better.
 - 5. For shallow installations where the operating nut of the valve will be 6 inches or less below finished grade, the design shall call for installation of a horizontal gate valve unless otherwise directed by the Engineer.

1.10 SERVICE LATERALS AND METERS FOR DOMESTIC AND IRRIGATION SERVICE

- A. Developments will be provided with domestic and/or Irrigation water service via water meters located at the frontage of a public street.
- B. Highlands Mutual Water Company may allow meters to be located on private street frontages and/ or within public utility/water easements if a Highlands Mutual Water Company evaluation concludes that it is reasonable under the circumstances. However, meters must be readily accessible for reading and maintenance.
- C. Design meter boxes out of traveled ways and a minimum of 10' from street trees whenever possible.
- D. Base any required hydraulic calculations for the water meter and service lateral sizes on criteria from the latest edition of AWWA Manual M22 and any additional requirements from the Lake County Fire Protection District, and submit to Highlands Mutual Water Company for approval.
- E. The maximum velocity in domestic, irrigation, fire line, or combination water service laterals from the main to the meter shall be 15 feet per second.
- F. Maintain a minimum 5' horizontal separation between water and sewer laterals.

- G. Meter manifolds other than those shown in various Highlands Mutual Water Company Standards shall be detailed on the plans and must be approved by the Engineer.
- H. Residential (single units)
1. Each lot shall be separately metered.
 2. Provide a 1 -1/2" HDPE water service lateral with a 1" meter for any lot greater than 2 acres.
 3. Water service laterals shall not cross lots they do not serve.
- I. Residential with second unit, two SFD=s on one lot, and Duplexes.
1. Each unit shall be served by separate meters.
 2. If a new second unit is constructed and the total water flow for both units exceeds the capacity and allowable velocity of the existing water service lateral, based on the criteria established in the latest edition of AWWA Manual M22, the service lateral shall be upsized to accommodate the additional flows as directed by Highlands Mutual Water Company staff. If first approved by Highlands Mutual Water Company, the existing lateral may be utilized and an additional water service lateral installed to serve the second unit.
 3. The appropriate service lateral shall be shown on the Improvement Plans for approval.
- J. Multi-Family Residential (3 or more units)
1. For triplexes or lots with three PUDs, condominiums, or townhomes, individual meters shall be required for each unit.
 2. For multi-family developments of 4-99 units, whether rental units or separate ownership units, design for an appropriately sized single master meter, a master meter for each building cluster, or individual meters for each unit.
 3. For comp1exes of 100 units or more, metering shall be designed as in (2) above, except that at least two metered connections shall be required if the project is to be master-metered.
 4. See Section 1.10-N for irrigation meter requirements to any landscaped or common areas.
 5. All meters shall be within public right-of-way or easements and easily accessible, and multiple meters shall be clustered where possible.
- K. Mobile Home Parks
1. Mobile home parks that have rental spaces may have a master meter (two master meters it more than 100 spaces) or each unit may have an individual meter. Parks with individually-owned lots shall have individual meters. When master meters are used, the mobile home park owner may sub-meter to the tenants at their own expense,

providing they comply with P.U.C. Requirements.

2. Individual meters shall be clustered and located within the public right-of-way or easement and located for ease of access.
3. See Section 1.10-N for common area irrigation meter requirements.

L. Mixed residential and commercial uses shall have separate meters.

M. Commercial

1. See Section 1.10-N below for irrigation requirements.
2. A minimum 2" HDPE domestic service lateral is required for commercial use.
3. Critical use facilities such as hospitals, jails, elderly care facilities, and others as determined by Highlands Mutual Water Company, shall require at least two separate water services for domestic use that must be connected to separately valved sections of the HMWC water distribution system.

N. Irrigation

1. Provide Separate irrigation meters for landscaped areas of all commercial uses.
2. Provide separate irrigation meters for common areas of all condominium, townhome, PUD, apartment complexes, and mobile home parks.
3. Provide reduced pressure (RP) backflow devices for all irrigation services. Backflow device types shall be specified on the irrigation plan and shall conform to Highlands Mutual Water Company Standard P-35A and the most current USC Approved List of Devices at time of installation.
4. Irrigation meter size shall be determined by the maximum flow required at the meter and shall be based on the latest edition of AWWA manual M22's criteria for meter sizing. Water demand purchased shall be based on the estimated gallons required to maintain the planned landscape in a healthy condition for our climate. Along with landscape and irrigation plans, the applicant shall submit the planned square footage of planted areas and categories of plants to be used as selected from the following:
 - a. High water use plants: turf, annuals, and container plants;
 - b. Moderate water use plants: ornamental trees, shrubs ground covers, and perennials primarily irrigated by sprinklers. (Note that there may be some use of drip or bubblers in this category but not a predominance.)
 - c. Low water use plants: drought tolerant plants recognized as having a plant factor of 0.3 or less and irrigated primarily through drip emitters.

1.11 IMPROVEMENTS FOR PRIVATE FIRE SYSTEMS

- A. Design plans showing private fire systems shall also be submitted to the appropriate Fire and/or Building jurisdiction for approval. Provide copies of approved plans to HMWC for

review prior to HMWC approval.

- B. Generally, the lateral size shall be designed to be the same size or larger than the size required for the fire sprinkler system and or the private hydrant system. Caution - onsite fire system design may necessitate changes to preapproved improvements. The hydraulic calculations for laterals serving private fire systems shall be based on the required fire flow or the fire sprinkler demand, whichever is greater.
- C. Reduced-pressure detectors are required for:
 - 1. Any fire line utilizing chemical additives such as antifreeze or fire suppressants; or
 - 2. Any building where an extreme hazard exists.
- D. For one- and two-family residential fire sprinkler systems:
 - 1. Where the multipurpose water system circulates for fire sprinklers and domestic supply no backflow device is required.
 - 2. Where the fire system does not circulate water with the domestic supply, double-check backflow assemblies must be designed where the fire systems connect to the domestic system. Design the backflow assembly as close as possible to the water meter.
 - 3. Where a fire sprinkler system is to be installed in a one- or two-unit family dwelling, design the service lateral from the street main to the water meter and the water meter to be 1" minimum. Larger size laterals and meters may be required where hydraulic calculations indicate the need.
- E. The location of any Fire Department Connection shall be approved by the Lake County Fire Protection District.
- F. Critical use facilities such as hospitals, jails, elderly care facilities, and others as determined by the Highlands Mutual Water Company and/or the Fire Marshal, require at least two fire line service connections to separately valved sections of the HMWC water main, so that service can be maintained in the event of a main line shutdown.

1.12 FIRE HYDRANTS

- A. Generally, fire hydrants required onsite to serve one lot shall be private.
- B. Generally, fire hydrants required onsite to serve two or more lots shall be HMWC.
- C. Design of onsite and offsite hydrant locations shall meet the Fire Code requirements and must be approved by the Lake County Fire Protection District for logistics. Design of offsite hydrant locations must be approved by Highlands Mutual Water Company for maintainability.
- D. Each hydrant shall be connected to a water distribution system main with a 6" diameter or larger lateral controlled by an independent valve.
- E. Whenever possible, locate hydrants near street intersections.

- F. If it is not possible to locate near an intersection, locate the hydrant near a property line or where it will minimize interference with property use.
- G. Locate hydrants a minimum of 10' from roll down of driveways for commercial or multi-family sites and 5' from residential driveways.
- H. Residential property with one or two dwelling units - Typical locations
 - 1. Design hydrants with a maximum spacing of 500', or as approved by the Lake County Fire Protection District. Design hydrants at a maximum spacing of 300' in Wildland—Urban Interface Fire Areas as designated by the Lake County Fire Protection District.
 - 2. Generally, design hydrants at intersections and then evenly distribute hydrants throughout the project.
 - 3. Specify "residential" hydrants per Standard P-8 or P-9 on the plans.
- I. Commercial, Industrial, and Multi-family (3 or more units) - Typical locations
 - 1. Generally, design hydrants at inter sections or near driveway entrances and then evenly distribute hydrants throughout the project.
 - 2. No portion of the exterior wall of the facility or building shall be more than 150' from the nearest hydrant as measured by an approved route around the building per the Lake County Fire Protection District. Onsite fire hydrants and mains shall be provided where required by the Lake County Fire Protection District.
 - 3. Specify "commercial" hydrants per Standard P-8 or P-9 on the plans.
- J. Minimum fire flow required at all hydrants
 - 1. Fire Flow is the flow rate of a water supply, measured at 20 pounds per square inch (psi) (138 kPa) residual pressure, measured in the water main in the vicinity of the flowing hydrant, that is available for firefighting.
 - 2. Single and two-family residential uses require 1,500 gallons per minute flow.
 - 3. The required fire flows for schools, commercial, industrial, and multi- family residential (3 or more units) uses shall be based on the Fire Code. The water system shall be designed so that 1,500 gpm is available from the hydraulically most demanding hydrant and the remaining flow required is available at the next most demanding hydrant(s), up to a maximum of 1,500 gpm per hydrant.
 - 4. Fire flow requirements are under the jurisdiction of the Lake County Fire Protection District. The guidelines given above are general. Actual flow requirements shall be verified with the Lake County Fire Protection District prior to submittal of plans. Calculations may be required by the Lake County Fire Protection District to verify the adequacy of the proposed design.

1.13 BACKFLOW DEVICES (EXCEPT FOR FIRE LINES)

- A. Backflow device installations shall be in accordance with State of California Title 17.

- B. All backflow devices shall be listed on the latest revision of the approved USC Foundation for Cross-Connection Control and Hydraulic Research list.
- C. Design the installation of backflow assemblies as near as possible to the water meter as shown on Standard P-35A.
- D. Backflow preventer type shall be designed in accordance with Appendix "A ". For uses not listed contact Highlands Mutual Water Company.

1.14 PRESSURE

- A. To obtain water distribution system data for these calculations. contact the Highlands Mutual Water Company. A fee shall be imposed if flow testing is required.
- B. Mainline
 - 1. The minimum allowable static pressure in the system is 20 psi.
 - 2. The maximum allowable static pressure in the system is 120 psi.
 - 3. The maximum allowable pressure in a high-level zone is calculated by assuming the reservoir full.
 - 4. The minimum allowable pressure in a high-level zone is calculated by assuming the reservoir drawn down 10' from the high-water level.
- C. Domestic Service
 - 1. The minimum allowable static pressure is 20 psi measured at the meter. If pressure measured at any faucet is less than 35 psi, a pressure booster system shall be required.
 - 2. The maximum allowable static pressure at a meter is 120 psi. If service pressure measured at any faucet exceeds 80 psi, a private pressure regulating device shall be required.

1.15 SPECIALTY VALVES

- A. Specific locations shall be reviewed for each project by Highlands Mutual Water Company.
- B. A combination air and vacuum valve shall be required at substantial high points in the system such as over a hilltop or at the upper end of a dead end main.
- C. Design pressure reducing valves to maintain overall system balance and to maintain service pressure levels within the parameters established within these system design standards.
- D. Typically surge or pressure relief valves are to be designed near the low points of any high-level pressure zone where discharge may be directed to an approved disposal system.

1.16 EASEMENTS

- A. An easement shall be provided over any HMWC water system when it is installed outside a public right-of-way.
- B. The easement shall be a minimum of 15' wide. The easement will be dedicated as a "water easement" if it contains water only. It will be dedicated as a "public utilities easement" if it contains other facilities as well.
- C. Easements shall be configured to encompass all HMWC maintained appurtenances, such as water service laterals, meters and fire hydrants and shall be generally centered over the facility. Separate access easements may be required depending on site conditions. When water mains are to be installed along a property line the easement shall be wholly contained on one parcel.
- D. All property restrictions placed as a result of dedication of easements shall be noted on the Easement Deed. Required notes are:
 - 1. No structures may encroach on, above or below the surface of the ground in any water easement. This includes footing of foundations or eaves from the roof of any adjacent structure, pools, ponds or outbuildings on slabs or foundations. Decks, sheds, or other structures which may be easily removed for maintenance of the water system may be allowed at the discretion of the Highlands Mutual Water Company.
 - 2. No trees shall be planted in a water easement without first obtaining approval of Highlands Mutual Water Company. Trees may be allowed to the extent that damage to the water system does not occur from root intrusion and adequate access can be provided for maintenance and repair vehicles.

1.17 ABANDONMENT OF WATER DISTRIBUTION SYSTEM COMPONENTS

- A. Any existing water mains and service laterals larger than 2" that will not be used shall be abandoned per Standard P-6 and shall be shown on the Improvement Plans with appropriate notation.
- B. For all abandoned water services up to and including 2", on water mains that are to remain active, annotate to remove the valve and saddle and install a full circle stainless steel clamp on the main under Highlands Mutual Water Company inspection.
- C. For tees or crosses on water mains that are to remain active, annotate the Improvement Plans to show removal of the tee or cross, any associated valve(s) and thrust blocks, and install a section of ductile iron pipe with approved couplers under Highlands Mutual Water Company inspection.
- D. Valve boxes and riser pipes for abandoned valves shall be removed and so noted on the Improvement Plans.
- E. Abandoned mains, valves and riser pipes located within any street structural section or within any new trench shall be shown on the Improvement Plans to be removed.
- F. Show all 12" diameter and larger water mains to be abandoned as removed or broken into every 50' and filled with an approved flowable fill per Standard P-6.

- G. Where a fire hydrant is to be abandoned, note that the hydrant barrel, break off riser, and check valve are to be removed, and the bury is to be capped or plugged in an approved manner, and the lateral abandoned at main per Standard P-6. Abandonments of fire hydrants must first be approved by the Lake County Fire Protection District.

APPENDIX "A"

BACKFLOW DEVICE REQUIREMENTS FOR SPECIFIC TYPES OF USE

DC = Double Check
 RP = Reduced
 Pressure AG = Air Gap
 DC w/Det. Ck. = Double Check
 with Detected Check

APPLICATION	TYPE OF DEVICE
Auto Sales, Painting, Repair & Radiator work	RP
Auxiliary Water Supply (Contaminated Wells, etc.)	RP
Auxiliary Water Supply	DC
Auxiliary Water Supply (with 2 or more City Water Connections to Site)	DC/RP
Barber Shops	RP
Blood Banks	RP
Boiler Systems (any)	RP
Buildings with Booster Systems	DC
Buildings with 3 or more Stories or with fixtures 30 feet above the service	DC
Buildings with Sewage Ejectors	AG / RP
Buildings with Storage Tanks	DC/RP
Homes with Sewage Lift Stations	RP
Car Wash	AG/RP
Cement, Concrete, Sand & Gravel Plants	RP
Chemical Storage or Processing Facilities	AG / RP
Dairy or Cold Storage	RP
Film Processing	RP
Fire Systems - Business/Residential (sprinklers with or without hydrants)	DC w/Det.Ck.
Fire Systems - w/Sprinkler in Hazardous Locations	AG/RP
Gas Stations	RP
Gray Water System	RP
Heating & Air Conditioning (Using Water)	RP
Hospital or Medical Facility (any) Convalescent or Long Term Care	RP

**BACKFLOW DEVICE REQUIREMENTS
FOR SPECIFIC TYPES OF USE
(Continued)**

DC = Double Check RP = Reduced Pressure AG = Air Gap DC w/Det. Ck. = Double Check with Detected Check

APPLICATION	TYPE OF DEVICE
Irrigation Systems	RP
Irrigation System w/Chemical Feed	RP
Laboratories (Commercial or Research)	AP/RP
Laundry or Dip Cleaner	RP
Manufacturing or Processing (with Toxic Chemicals)	AG/RP
Medical or Dental Facility (any)	RP
Mobile Home Park	DC
Ornamental Pools, Ponds or Fountains	RP
Painting Auto Shops	RP
Printing Shops	RP
Radiator Shops (all)	RP
Radioactive Materials	AG / RP
Restaurant	RP
Restricted or Classified Facilities	AG / RP
Schools	RP
Sewage or Storm Drain Facilities	AG / RP
Spray Rigs (all types)	AG
Steam Cleaning Equipment (any type)	RP
Steam Generation	AG/RP
Swimming Pools (Public and Commercial)	RP
Tank Trucks or Chemical Spray Rigs	AG
Veterinary Clinics	RP
Warehousing & Storage	DC / RP

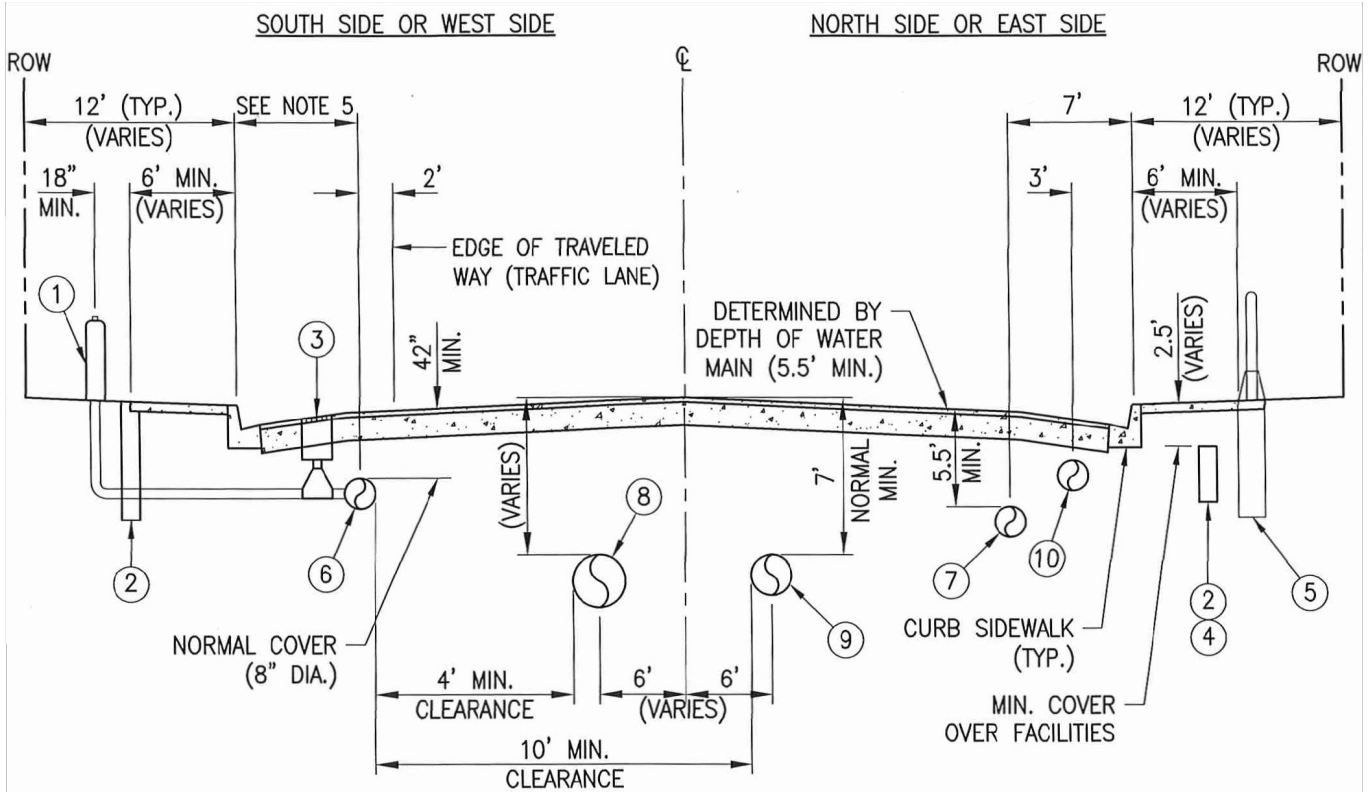
SECTION 2
WATER DISTRIBUTION SYSTEM STANDARD
PLANS

Standard Plans Table of Content

No.	Title
P-1	Typical Utility Location for New Construction
P-2	Pipeline Separation Requirements
P-3	Water Pipe Bedding and Trench Backfill
P-4	Trench Repaving
P-5	Not Used
P-6	Cutting and Plugging Water Mains
P-7	Trench Plates
P-8	6-Inch Standard Wet Barrel Fire Hydrant
P-9	6-Inch Standard Dry Barrel Fire Hydrant
P-11	4-Inch Blow-off Assembly
P-12	6-Inch Blow-off Assembly
P-13	Not Used
P-14	1-Inch Combination Air Release and Vacuum Relief Valve
P-15	Not Used
P-16	Not Used
P-17	Not Used
P-18	Standard Thrust Block
P-19	Restraint of Joints for Ductile Iron & PVC Pipe at Tee Connection
P-20	Restraint of Joints for Ductile Iron & PVC Pipe at 90-degree Vertical or Horizontal Bend
P-21	Restraint of Joints for Ductile Iron & PVC Pipe at a Dead End or Each Side of Valve
P-22	Casing for Water Mains
P-23	Tapping Sleeve and Valve
P-24	Cut-in Tee
P-25	Water Service Construction Notes
P-26	1-Inch Water Service Connection For 5/8", 3/4", or 1" Meter
P-26A	1-Inch Water Service Connection W/ Twin 5/8" Meter Setting
P-27	2-Inch Water Service Connection For 1-1/2" or 2" Meter
P-28	Typical Meter Box Location
P-29	Not Used
P-30	Large Meter with Bypass (3-inch to 10-inch Meter)
P-31	Valve Box – Type 1
P-32	Valve Box – Type 3
P-33	Normally Closed Valve Box
P-34	Not Used
P-35A	Backflow Prevention Assembly- Overflow for Above Ground Installation
P-35B	Backflow Assembly for Fire Service
P-36	Utility Vault Installation
P-37	Sealing Pipeline -Thru Vault
P-38	Not Used
P-39	90-Degree Welded Steel Utility Invert
P-40	90-Degree Mechanical Joint D.I.P. Utility Invert

No. Title

- P-41 45-Degree Welded Steel Utility Invert
- P-42 45- degree Mechanical Joint D.I.P. Utility Invert
- P-43 Valve Anchor
- P-44 Typical Fire Hydrant Layout
- P-45 Adjustable Pipe Support
- P-46 Paving Around Valves (Not in the Pavement)
- P-47 Alignment of Water Mains and Placement of Mainline Valves
- P-48 Waterline Marker Post Installation
- P-49 Temporary Blowoff and/or Metered Connection for Mains Under Construction
- P-50 Construction General Notes



ITEM	DESCRIPTION
①	Fire hydrant, locate in accordance with HMWC Std. Dwg. No. P-44.
②	Joint utilities trench
③	Valve box
④	Street lighting conduit in trench
⑤	Street light base
⑥	Domestic water main
⑦	Reclaimed water main (where required)
⑧	Storm drain
⑨	Sewer main
⑩	Gas main

NOTES:

1. Location and depth of existing and proposed utilities must be provided by the developer and shown on any plans submitted to HMWC and City of Clearlake for approval.
2. Changes may be permitted by HMWC in cases of conflicting facilities.
3. For commercial sidewalks, the fire hydrant shall be placed 18" behind sidewalk. Hydrants shall not be located in sidewalks.
4. Materials shall be selected from the accepted materials guideline.
5. Distance from curb face to water main is 4' min for 8" pipe and 5' min for 12" or larger pipe in residential/commercial developments in streets up to 40' curb to curb. Distance can be 7' in major streets greater than 40' wide.

APPROVED BY:
JEFF DAVIS

GENERAL MANAGER

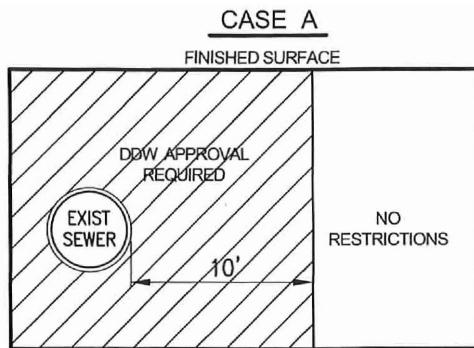
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**HIGHLANDS
MUTUAL WATER
COMPANY**

TITLE:
**TYPICAL UTILITY LOCATION
FOR NEW CONSTRUCTION**

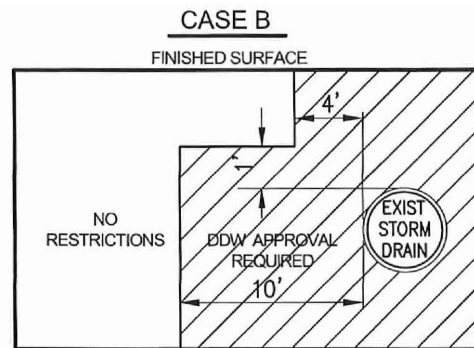
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PARALLEL CONSTRUCTION REQUIREMENTS
NEAR SEWERS

NOTES:

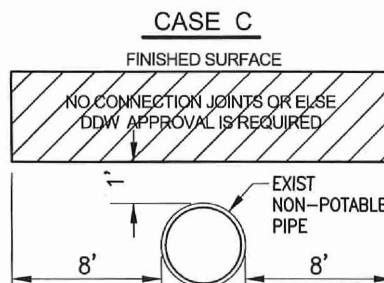
1. New water mains shall not be installed in the same trench and shall be at least 10 feet horizontally from and 1 foot vertically above any parallel pipeline conveying:
 - a. untreated sewage
 - b. primary or secondary treated sewage
 - c. disinfected secondary recycled water
 - d. hazardous fluids such as fuels, industrial wastes and wastewater sludge
2. Use professional judgement to propose construction that is protective of public health.



PARALLEL CONSTRUCTION REQUIREMENTS
NEAR STORM DRAINS

NOTES:

1. New water mains shall not be installed in the same trench and shall be at least 4 feet horizontally from and 1 foot vertically above any parallel pipeline conveying:
 - a. storm drainage
 - b. disinfected tertiary recycled water
2. Use professional judgement to propose construction that is protective of public health.
3. The vertical separation in Case B is required when the horizontal separation is less than 10 feet.



CROSSING CONSTRUCTION REQUIREMENTS
NEAR NON-POTABLE PIPELINES

NOTES:

1. New water mains crossing an existing pipeline carrying non-potable water fluids (as listed in Case A or Case B) shall be constructed no less than 45-degrees to and at least 1 foot above the existing pipeline. A DDW waiver is not required if the angle of the crossing is greater than 45 degrees and the water main is at least 1 foot above the pipe being crossed.
2. No connection joints shall be made in the waterline within 8 feet horizontal measured on either side of the non-potable fluid pipeline (wall to wall measurement).
3. Use professional judgement to propose construction that is protective of public health.

APPROVED BY:
JEFF DAVIS

GENERAL MANAGER

DATE



**HIGHLANDS
MUTUAL WATER
COMPANY**

TITLE:

**PIPELINE SEPARATION
REQUIREMENTS**

SCALE: NONE	DATE: 6/23	REV: -	STANDARD DWG. NO. P-2A
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GENERAL NOTES:

- 1) Application of this standard drawing must comply with Section 64572, Title 22, California Code of Regulations, latest revision.
- 2) If the condition of the existing sewer cannot be readily determined, the alternative construction requirements for water mains described below shall apply depending on if the crossing is perpendicular or parallel.
- 3) A "sewer line" is defined as a pipeline conveying non-potable water or hazardous liquids including but not limited to storm drainage, recycled water, sewage and fuels.
- 4) All exceptions to these minimum separation standards must be reviewed by the Division of Drinking Water (DDW) and a written waiver obtained prior to construction of the crossing.

I. Separation Standards per Division of Drinking Water Requirements (DDW)

a. The Minimum Separation Requirements Between Water Mains And Non-Potable Pipelines As Contained In Section 64572, Title 22, California Code Of Regulations

i. Parallel Construction Requirements:

- 1. Sewer Lines: Water mains shall be at least 10 feet clear horizontal distance from sewer lines and 1 foot clear vertical distance above sewer lines.
- 2. Storm Drain Or Recycled Water Pipelines: Water mains shall be at least 4 feet clear horizontal and 1 foot clear vertical distance above storm drain or recycled water pipelines.

ii. Crossing Construction Requirements: When pipelines must cross, potable water mains shall be at least 1 foot clear above non-potable pipelines and at no less than 45-degrees crossing angle.

iii. Separation distances as specified shall be measured from the nearest outside edge of each pipeline; i.e. the clear distance.

iv. Water mains and sewer lines must not be installed in the same common trench.

v. 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 without written approval of the Department of Drinking Water.

b. Exceptions to Basic Separation Standards

- i. Local conditions may create a situation where there is no alternative but to install water mains at a distance less than that required by the Basic Separation Standards above. In such cases alternative construction criteria as shown below should be followed.
- ii. Sewer mains of 24 inches in diameter or larger may create special hazards because of the large volumes of flow from a pipeline break. Therefore installations of water mains in the vicinity of sewer mains 24 inches in diameter or larger must be reviewed on a case-by-case basis by DDW to determine if the separation and protection measures are adequate.

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JEFF DAVIS

GENERAL MANAGER

DATE



**HIGHLANDS
MUTUAL WATER
COMPANY**

TITLE:

**PIPELINE SEPARATION
REQUIREMENTS**

SCALE:	DATE:	REV	STANDARD DWG. NO.
NONE	6/23	-	P-2B

GENERAL NOTES CONTINUED:

II. Construction of Water Lines Parallel to Sewer and Storm Drain Lines

- a. See Case A and Case B
- b. New water mains in this zone shall be constructed of Special Pipe Materials (see Section VI). Joints shall be restrained.

III. Construction of Water Lines Crossing Sewer and Storm Drain Lines

- a. See Case C
- b. The new water main in this zone shall have no joints in the area over the existing non-potable pipe unless they are restrained and shall be constructed of Special Pipe Material. Water main inverts under existing sewer or storm drain piped shall be constructed as shown on HMWC Standard Drawings P-39, P-40, P-41 or P-42.

IV. Crossings of a Sewer Force Main

- a. In addition to other sewer requirements, when a new water main crosses over an existing sewer force main the water main shall be constructed of pipe materials with a minimum rated working pressure of 200 psi.
- b. No water main shall cross under a sewer force main.

V. Crossings of Gravity Sewer Laterals

- a. Special construction criteria, as defined above, shall apply to sewer laterals that cross above a potable water main but not to sewer laterals that cross below a potable water main.

VI. Definition of Special Pipe Material

- a. Ductile iron pipe (Class 350) with bitumastic coating (AWWA C151), or
- b. Welded steel pipe, CML & wrapped or CML&C rated at 200 psi or greater, or
- c. PVC water pipe (Class 305 DR14) (AWWA C-900) or equivalent, or
- d. Reinforced Concrete Pressure Pipe, Steel Cylinder Pipe, 200 psi minimum, (AWWA C300, C301 or C303, latest revisions), or
- e. HDPE pipe with fusion welded joints, (DR-18, 200 psi minimum) (AWWA C906)

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GENERAL MANAGER

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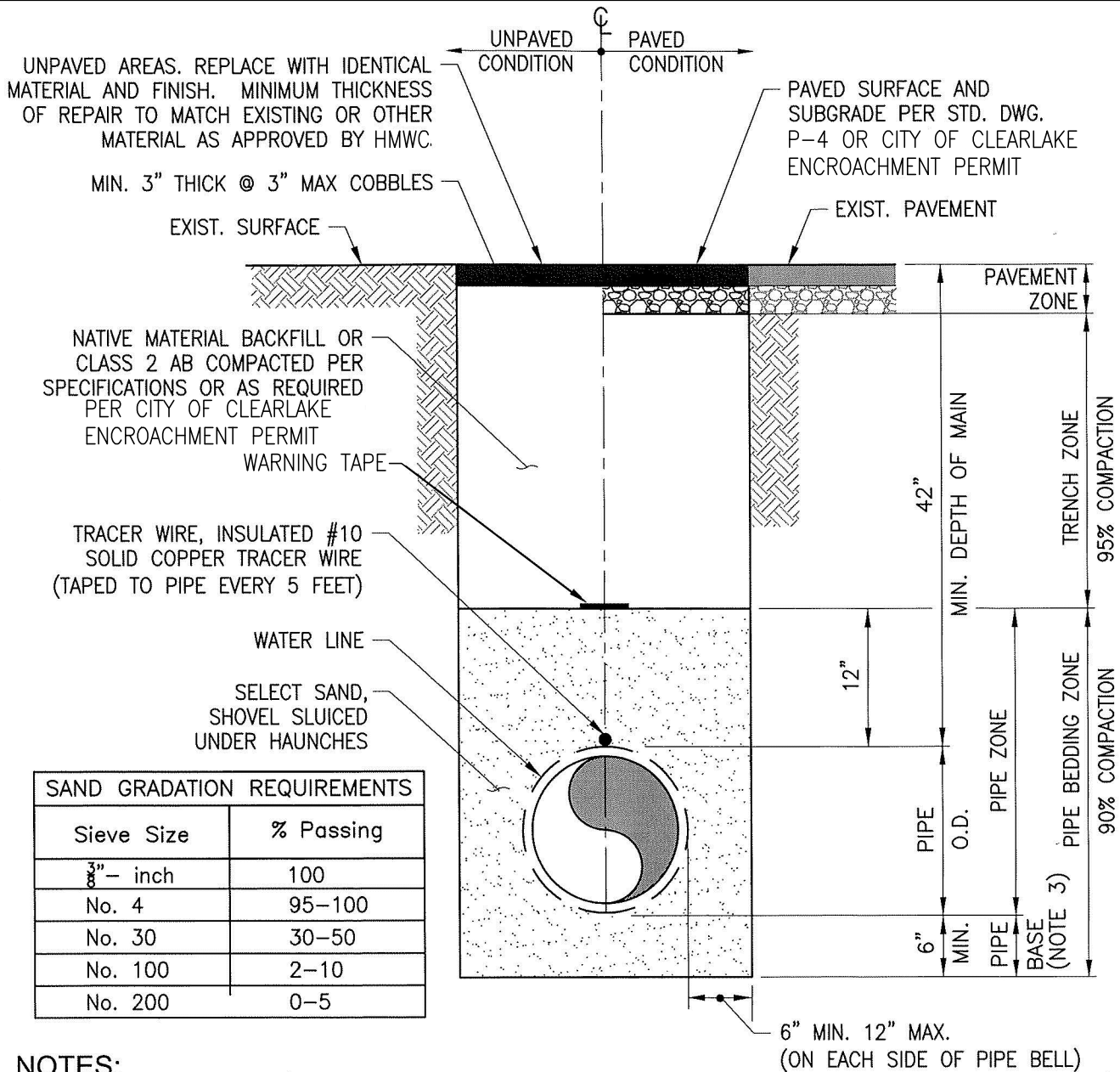


**HIGHLANDS
MUTUAL WATER
COMPANY**

TITLE:

**PIPELINE SEPARATION
REQUIREMENTS**

SCALE:	DATE:	REV	STANDARD DWG. NO.
NONE	6/23	-	P-2C



SAND GRADATION REQUIREMENTS	
Sieve Size	% Passing
3/8" - inch	100
No. 4	95-100
No. 30	30-50
No. 100	2-10
No. 200	0-5

NOTES:

1. Trench and pavement per City of Clearlake Encroachment permit requirements or as noted on the drawing and Std. Dwg. P-4
2. Compaction of backfill per specifications.
3. Pipe base shall be 12" thick where native material has rocks larger than 6 inches in trench bottom.
4. Contractor shall hand excavate "bell hole" for each pipe joint so that the weight of the pipe does not rest on the bell. Contractor to refill and hand-tamp each "bell hole" prior to completing the placement of the bedding.
5. For areas where native soil contains cobbles and large stones place geotechnical filter fabric between Pipe Zone and Trench Zone backfill to prevent migration of rocks to the pipe.
6. Encase D.I.P. and fittings in polyethylene encasement per AWWA Standard C-105, latest edition.
7. Table shows gradation requirements for backfill in Pipe Bedding Zone.
8. Tracer wire shall be tested for electrical continuity by the Contractor prior to acceptance of the project.

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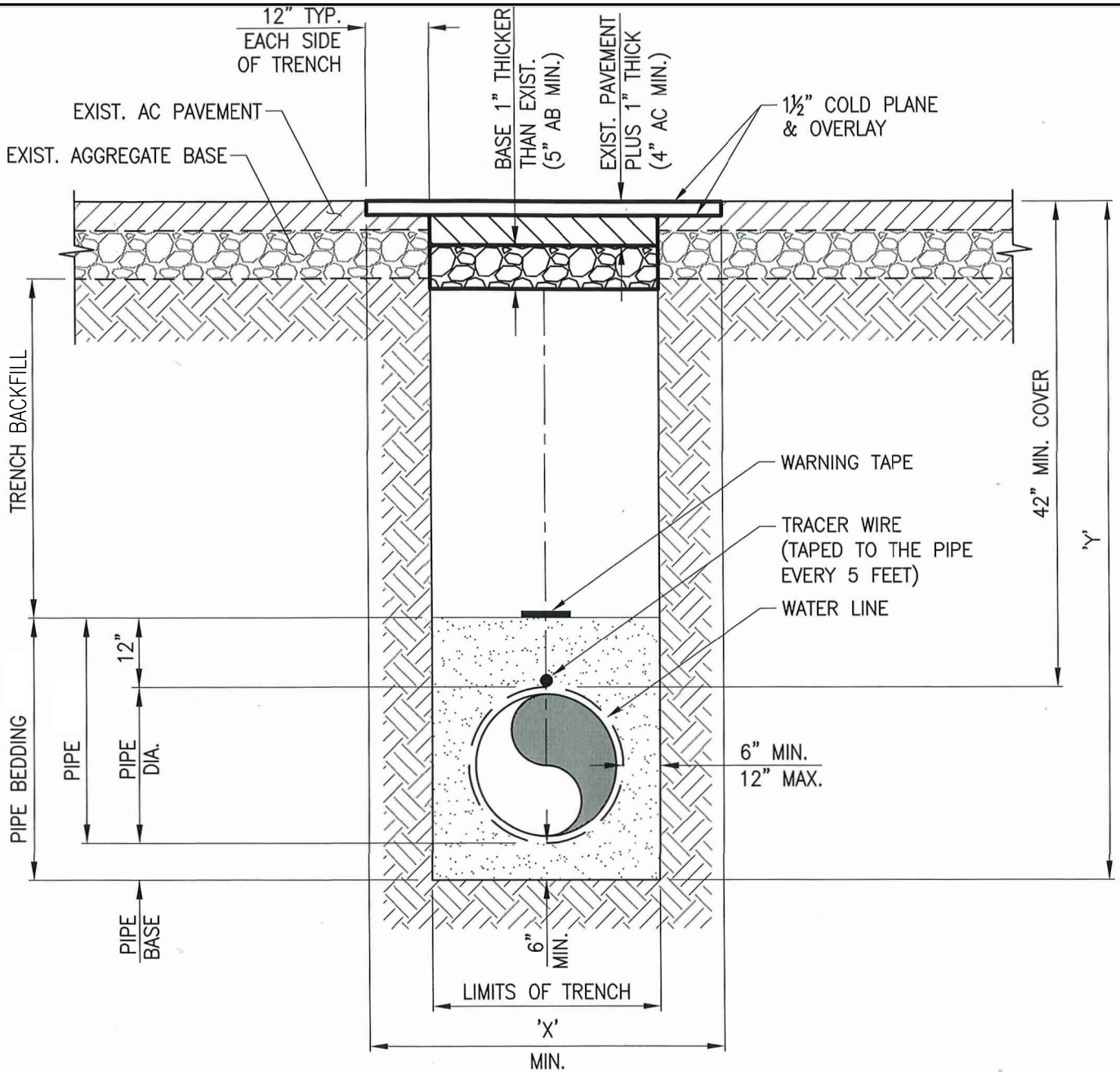
GENERAL MANAGER

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TITLE:
**WATER PIPE BEDDING AND
TRENCH BACKFILL**

SCALE: NONE	DATE: 6/23	REV: -	STANDARD DWG. NO. P-3
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NOTES:

1. For specific repaving requirements see encroachment permit from City of Clearlake.
2. Contractor to clean surfaces that are adjacent new paving and remove rocks, dirt, old paving and/or old concrete that would prevent pavement compaction equipment from keeping contact with the new paving and prevent proper compaction of the new pavement.
3. Temporary paving shall be min. 2-inches thick and installed over a trench zone section that is level and square.

TRENCH DIMENSIONS		
PIPE DIA. (Inches)	X DISTANCE (Inches)	Y DISTANCE (Inches)
6	42	54
8	44	56
12	48	60
16	52	64
24	60	72
30	66	78

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GENERAL MANAGER

DATE

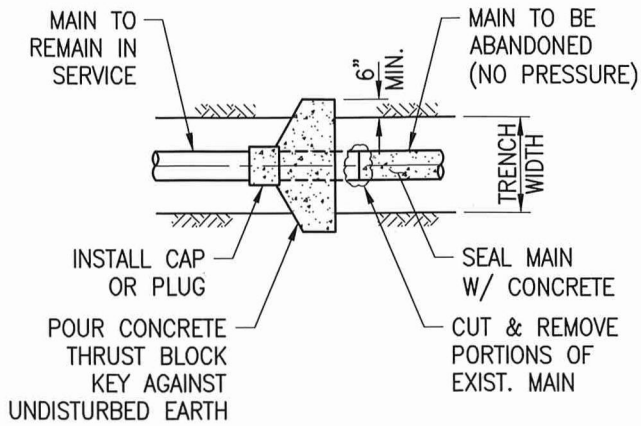


**HIGHLANDS
MUTUAL WATER
COMPANY**

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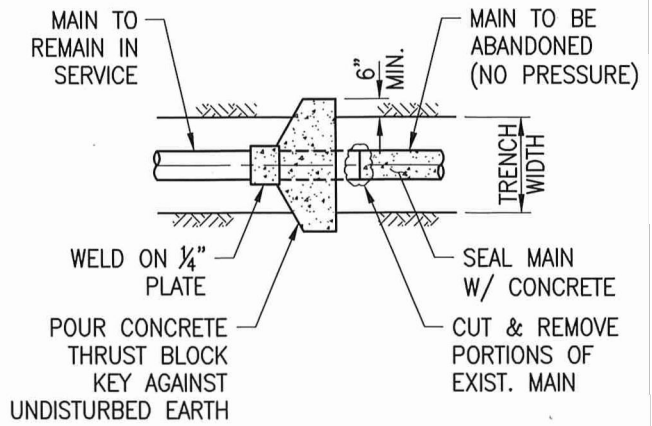
TRENCH REPAVING

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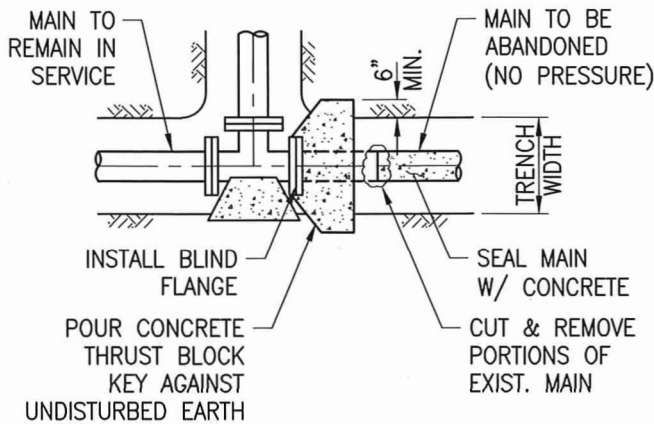
CONDITION "A"

EXIST. AC, PVC, CI OR DIP MAINS



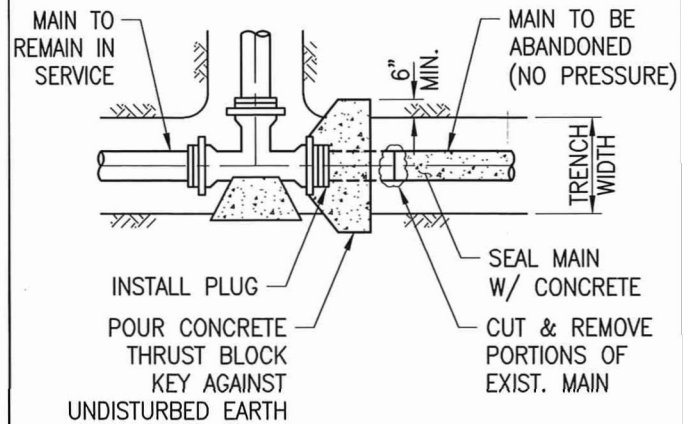
CONDITION "B"

EXIST. STEEL MAINS



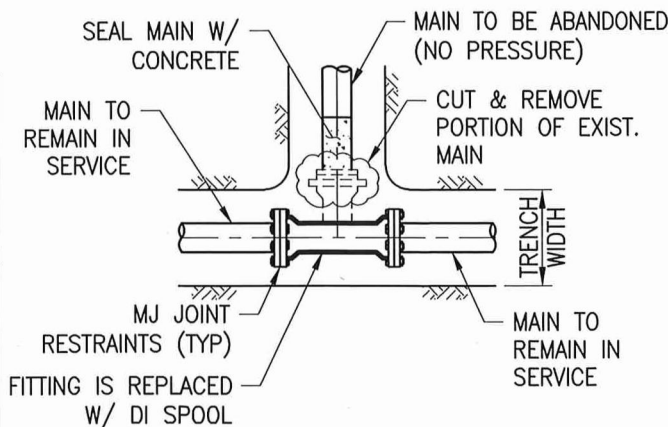
CONDITION "C"

EXIST. FLANGED FITTING OR VALVE



CONDITION "D"

EXIST. HUB END FITTING OR VALVE



REMOVE EXIST. TEE

COMMON WHEN ABANDONING MAINS IN ALLEYWAYS & BACKYARD EASEMENTS

NOTES:

1. Bearing area against undisturbed soil shall be the same as for dead ends. See Std. Dwg. P-18 for required thrust block area.
2. When called out on plans, install blow-off.
3. Thrust blocks shall be class 560-C-3250 concrete, unless otherwise specified.
4. All buried bolts shall be coated with "Devwrap 142S".
5. Pipe plugs shall be installed to the satisfaction of HMWC
6. Unless otherwise approved by HMWC abandoned pipes 12"Ø and larger shall be broken into every 50' and shall be filled completely with a flowable fill material approved by HMWC

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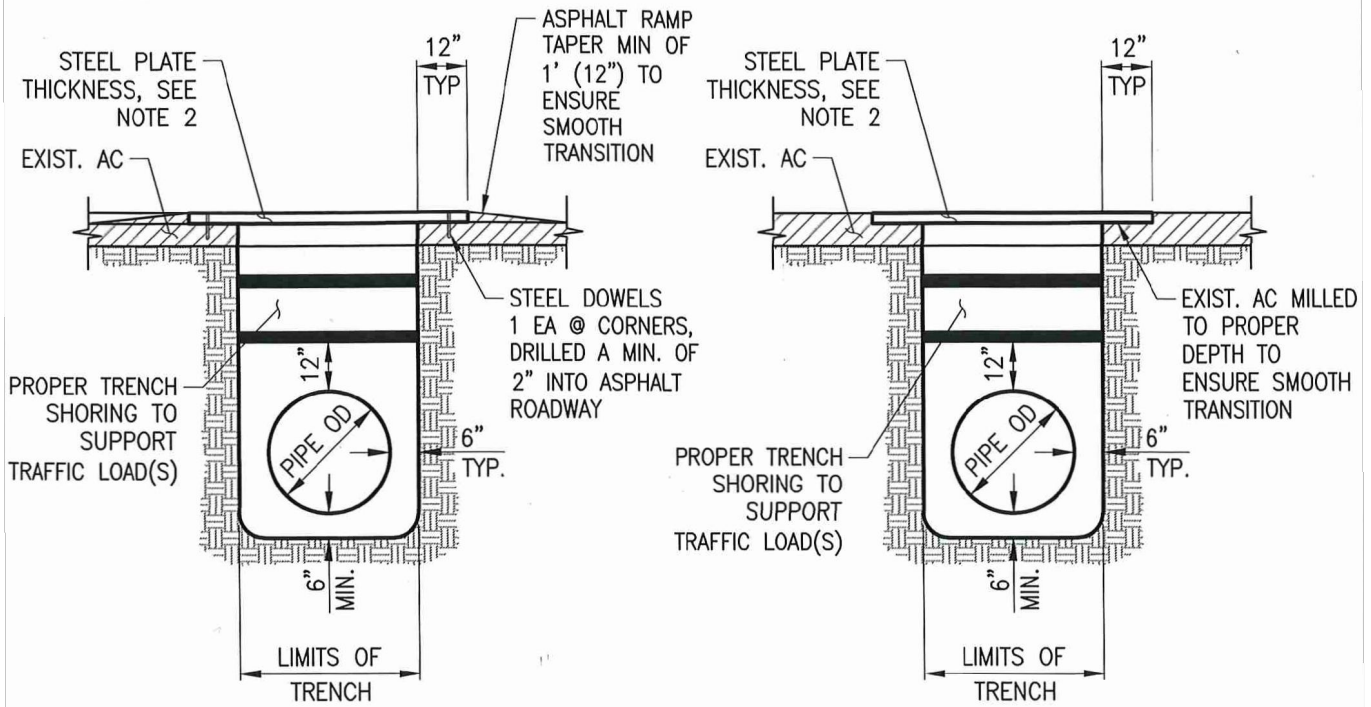


**HIGHLANDS
MUTUAL WATER
COMPANY**

TITLE:

**CUTTING & PLUGGING
WATERMAINS**

SCALE: NONE	DATE: 6/23	REV: -	STANDARD DWG. NO. P-6
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**TRENCH PLATE STANDARD DRAWING
FOR SPEEDS UNDER 45 MPH**

**TRENCH PLATE STANDARD DRAWING
FOR SPEEDS OVER 45 MPH**

NOTES:

1. Use of trench plates shall meet the current requirements of the City of Clearlake jurisdiction where the work is being done or this drawing, whichever is more stringent.
2. Minimum steel plate thickness based on using A-36 grade steel designed for HS20-44 truck loading per Caltrans Bridge Design Specifications Manual.

Trench Width	Min. Plate Thickness
0"-10"	1/2"
11"-23"	3/4"
23"-31"	7/8"
31"-41"	1"
41"-63"	1 1/4"

3. For spans greater than 63" a structural design shall be prepared by a California registered civil engineer.
4. All steel plates used in or out of the traveled way shall be without deformation. The HMWC representative shall determine the trueness of the steel plate by using a straight edge and will reject any plate that is permanently deformed.
5. Steel plates used in the traveled portion of the right of way shall have a surface that was manufactured with a nominal Coefficient of Friction (COF) of 0.35. The contractor shall determine what amount of surface wear is acceptable, and independently ascertain when to remove, test, or resurface an individual steel plate.
6. Contractor shall not install any steel plate that is permanently deformed or delivered without the required surfacing.
7. A warning sign meeting Caltrans standards shall be placed in advance of steel plate bridging. This sign shall be used with all other required construction signing.

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GENERAL MANAGER

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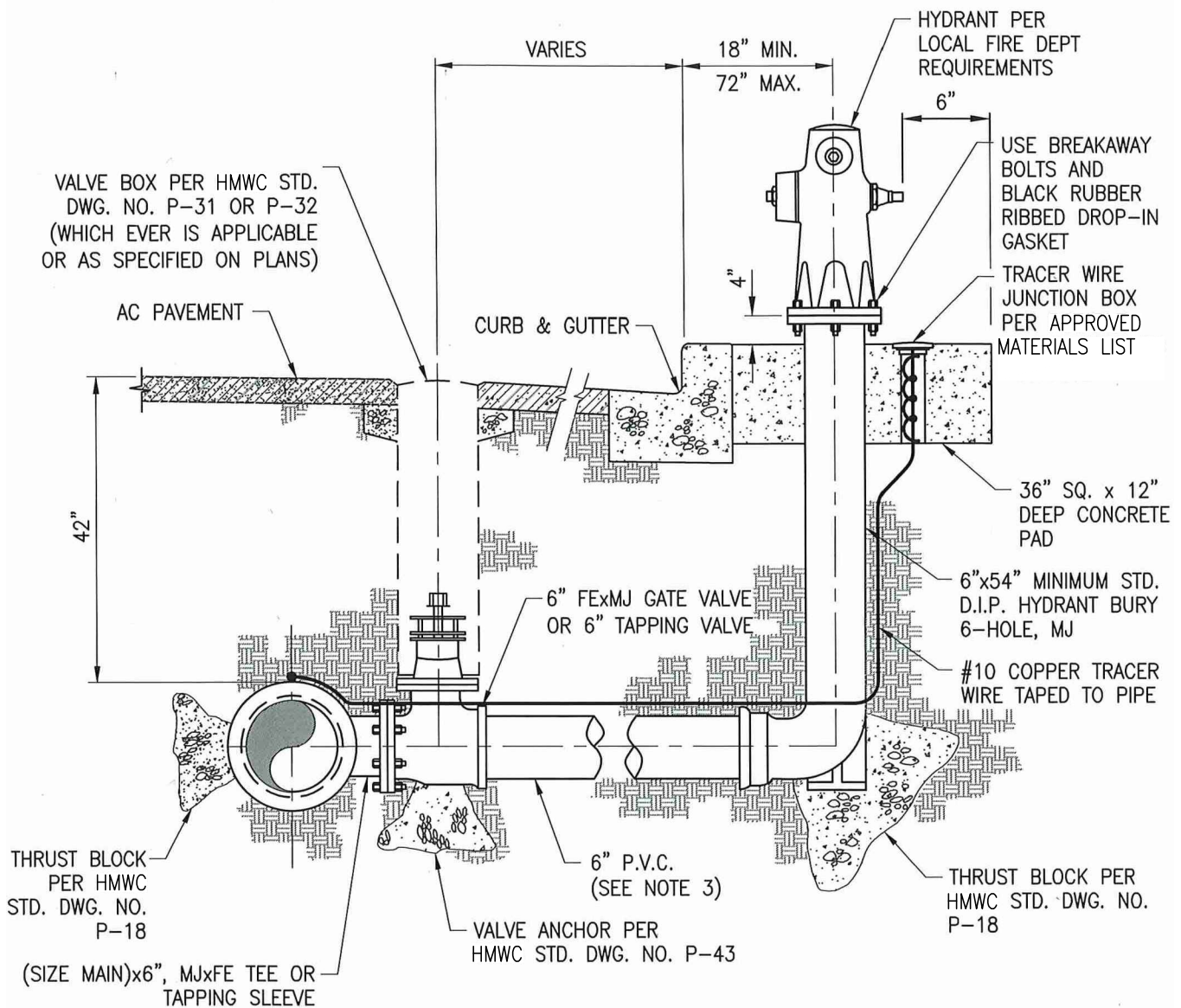


**HIGHLANDS
MUTUAL WATER
COMPANY**

TITLE:

TRENCH PLATES

SCALE: NONE	DATE: 6/23	REV: -	STANDARD DWG. NO. P-7
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NOTES:

1. On roads without curbs, fire hydrants shall be located within the road right of way, one foot clear from the property line unless otherwise indicated on the plans. The 3' square concrete pad under the hydrant shall be constructed.
2. Hydrants, risers and curbs are to be painted per Lake County Fire Protection District
3. Ductile iron pipe shall be used when the main line is DIP.
4. Install 2 valves if distance from main is greater than 25'. Include a 90° bend on 6" lateral pipe.
5. Fire hydrants shall be located per HMWC Std. Dwg. No. P-44.

APPROVED BY:
JEFF DAVIS

GENERAL MANAGER

DATE

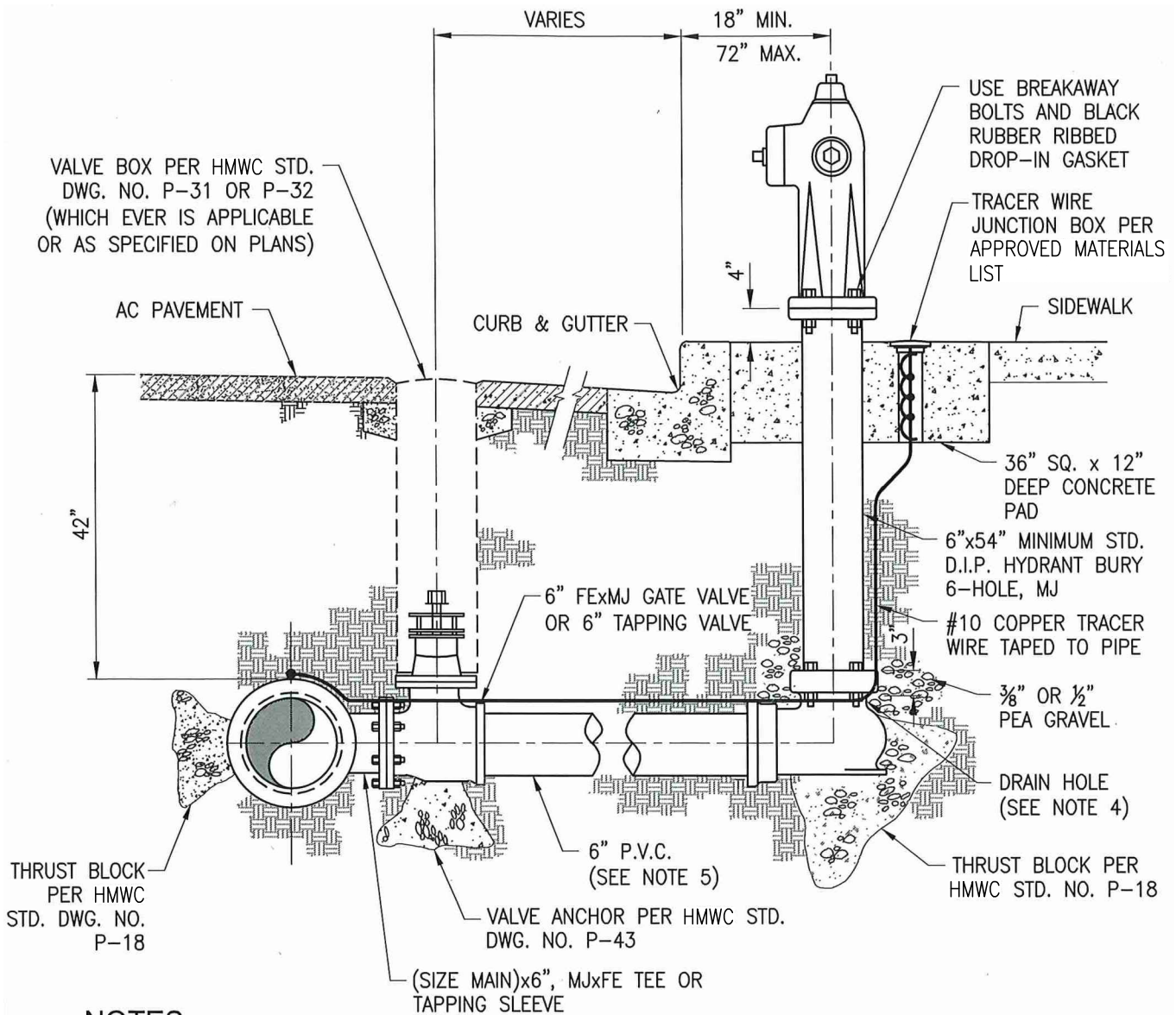


**HIGHLANDS
MUTUAL WATER
COMPANY**

TITLE:

**6-INCH STANDARD WET
BARREL FIRE HYDRANT**

SCALE:	DATE:	REV:	STANDARD DWG. NO.:
NONE	6/23	-	P-8



NOTES:

1. On roads without curbs, fire hydrants shall be located within the road right of way, one foot clear from the property line unless otherwise indicated on the plans. The 3' square concrete pad under the hydrant shall be constructed.
2. Hydrants, risers and curbs are to be painted per Lake County Fire Protection District Requirements
3. Use hydrant with minimum 54" bury length
4. Adequate clearance between thrust block and drain hole shall be provided to assure proper drainage.
5. Ductile iron pipe shall be used when the main line is DIP.
6. Install 2 valves if distance from main is greater than 25'. Include a 90° bend on 6" lateral pipe.
7. Fire hydrants shall be located per HMWC Std. Dwg. No. P-44.

APPROVED BY:
JEFF DAVIS

GENERAL MANAGER

DATE



**HIGHLANDS
MUTUAL WATER
COMPANY**

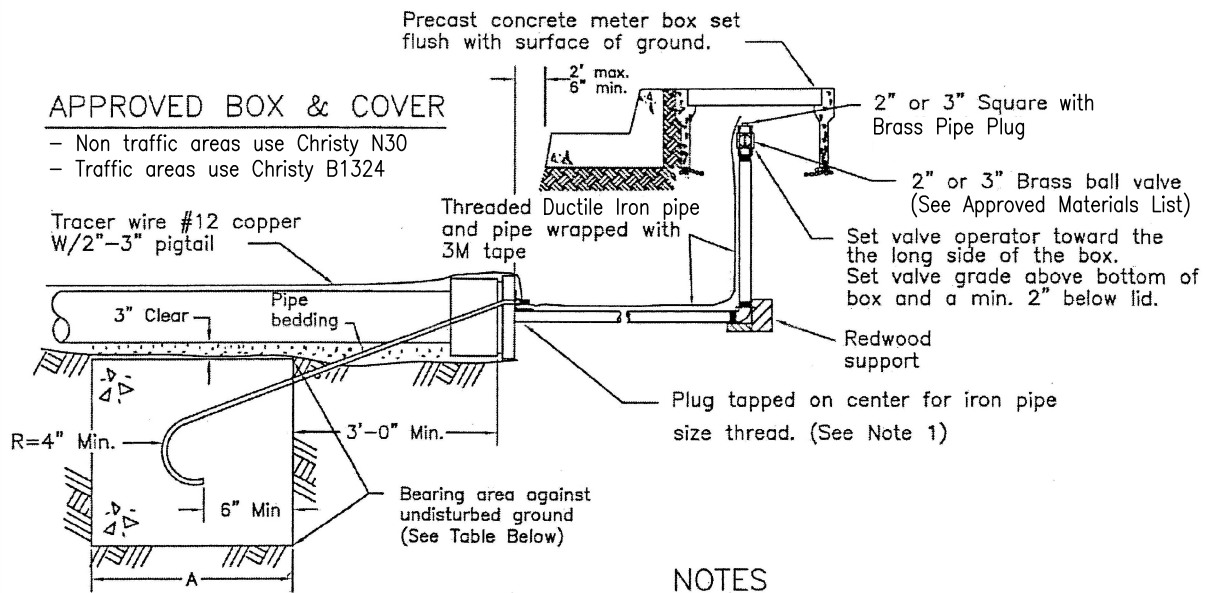
TITLE:

**6-INCH STANDARD DRY
BARREL FIRE HYDRANT**

SCALE: NONE	DATE: 6/23	REV: -	STANDARD DWG. NO. P-9
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APPROVED BOX & COVER

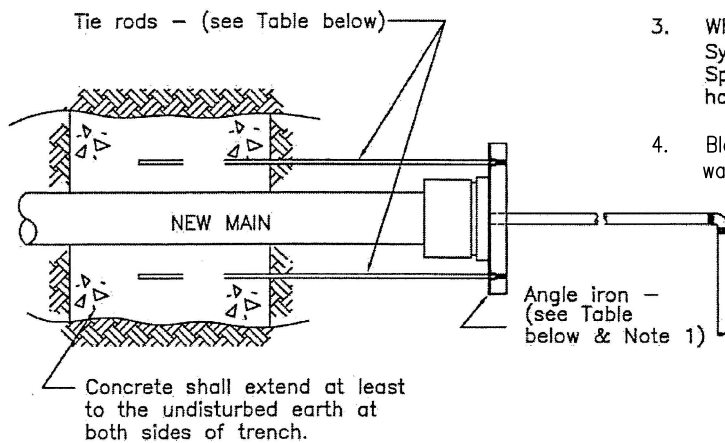
- Non traffic areas use Christy N30
- Traffic areas use Christy B1324



ELEVATION

NOTES

1. For 6" & 8" mains, M.J. plugs or caps with dilly lugs or starr bolts and 2" center tap may be used in lieu of angle iron. Install angle iron off-center to accommodate center tap.
2. Blow-off shall not be installed within the traveled way. If main ends within street area, blow-off to be extended to area outside of traveled way and installed as shown above.
3. Where possible, design a "Restrained Joint System" per HMWC Standards and Specifications in lieu of, or in addition to harness and tie rods.
4. Blow-offs are to be sized to provide proper water velocity for flushing.



PLAN

MINIMUM DIMENSIONS					
PIPE SIZE	TIE RODS	ANGLE IRON	BEARING AREA	A	SIZE B.O.
6"	5/8"	3"x3"x1/4"	* 4 Sq. Ft.	2'	2"
8"	3/4"	3 1/2"x3"x1/4"	* 7 Sq. Ft.	3'	2"
12"	1-1/8"	4"x3"x1/2"	15 Sq. Ft.	3'	3"
OVER 12"	BY THE DESIGN ENGINEER				3"

* (see note 1)

APPROVED BY:
JEFF DAVIS

GENERAL MANAGER

DATE



**HIGHLANDS
MUTUAL WATER
COMPANY**

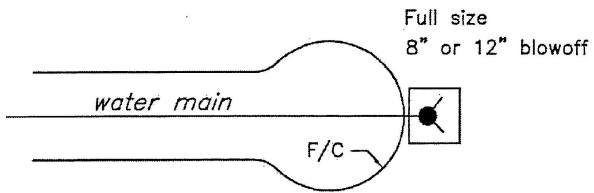
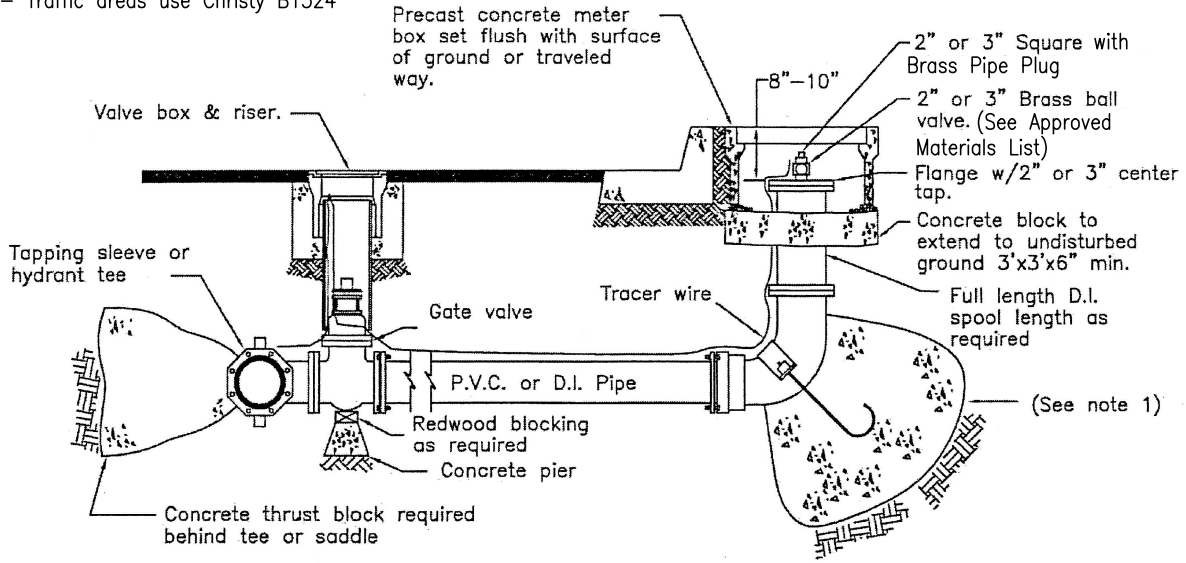
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**PERMANENT BLOW-OFF
ASSEMBLY**

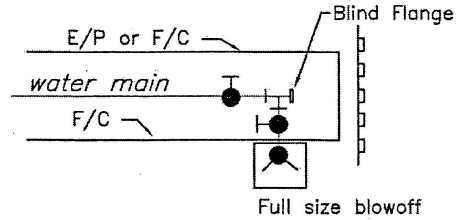
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Approved Box & Cover

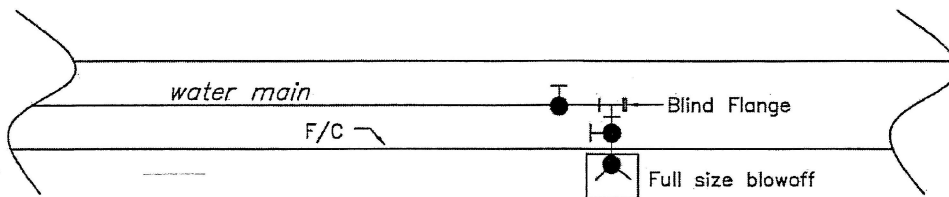
- Non traffic areas use Christy N30
- Traffic areas use Christy B1324



Cul-de-Sac



Deadend Street



Thru-Street

NOTES

1. Restrained joints are required for all new construction from tee or saddle to 90° bend. Thrust blocks are only required where existing services are being modified and restrained joints are not used.
2. Elbow and riser pipe to be the same size as the main.
3. Blow-offs are to be sized to provide proper water velocity for flushing.

APPROVED BY:
JEFF DAVIS

GENERAL MANAGER

DATE

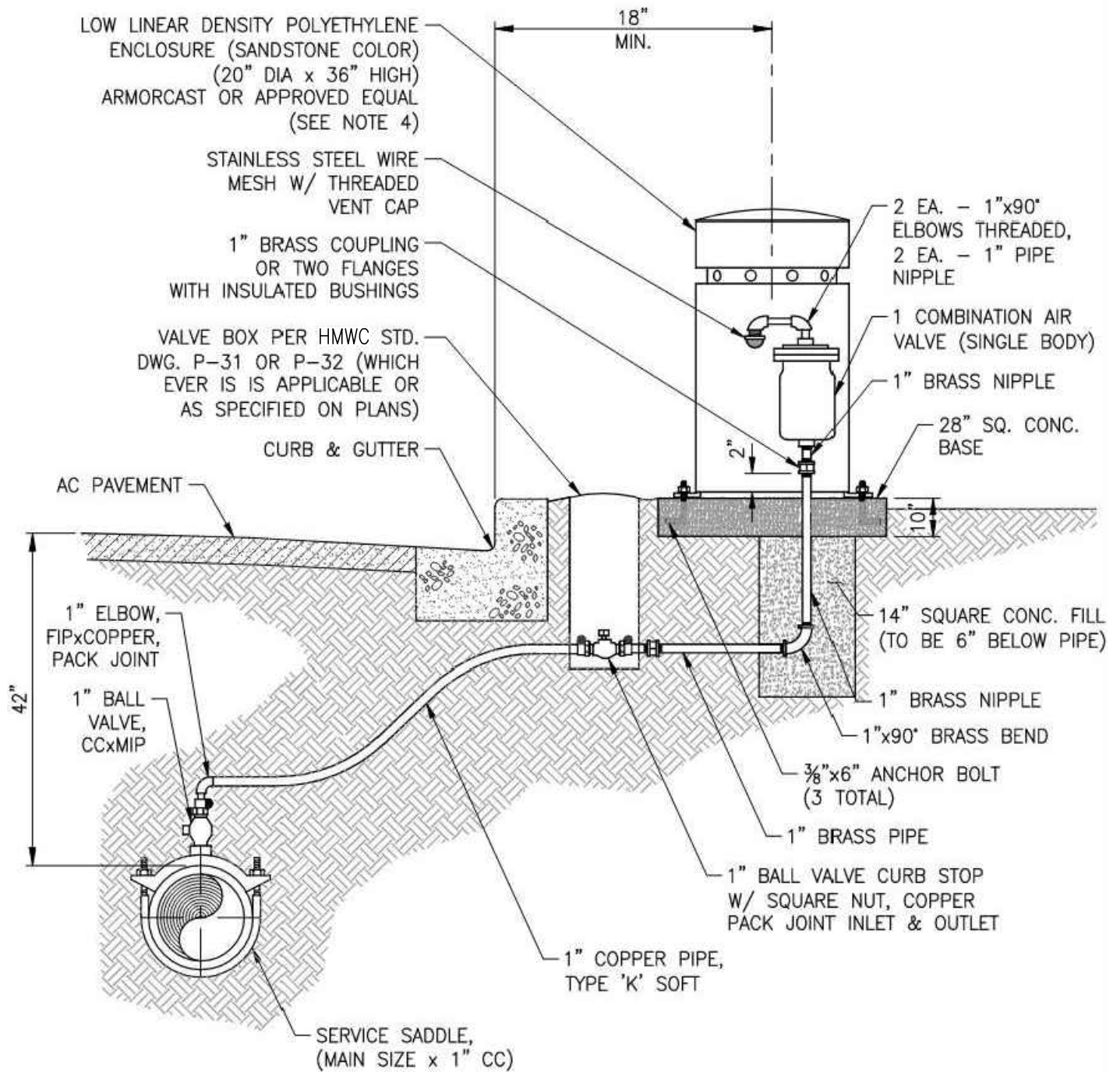


**HIGHLANDS
MUTUAL WATER
COMPANY**

TITLE:

**FULL SIZE BLOW-OFF
ASSEMBLY**

SCALE: NONE	DATE: 6/23	REV: -	STANDARD DWG. NO. P-12
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NOTES:

1. Maintain positive slope from main to air release valve.
2. Slip-on or copper fittings with silver solder brazing shall be used in lieu of copper pack joints.
3. Air valve assembly shall be located similar to HMWC Std. Dwg. No. P-44 for fire hydrants.
4. As an alternative the enclosure can be 12" dia. x 24" high.

APPROVED BY:
JEFF DAVIS

GENERAL MANAGER

DATE

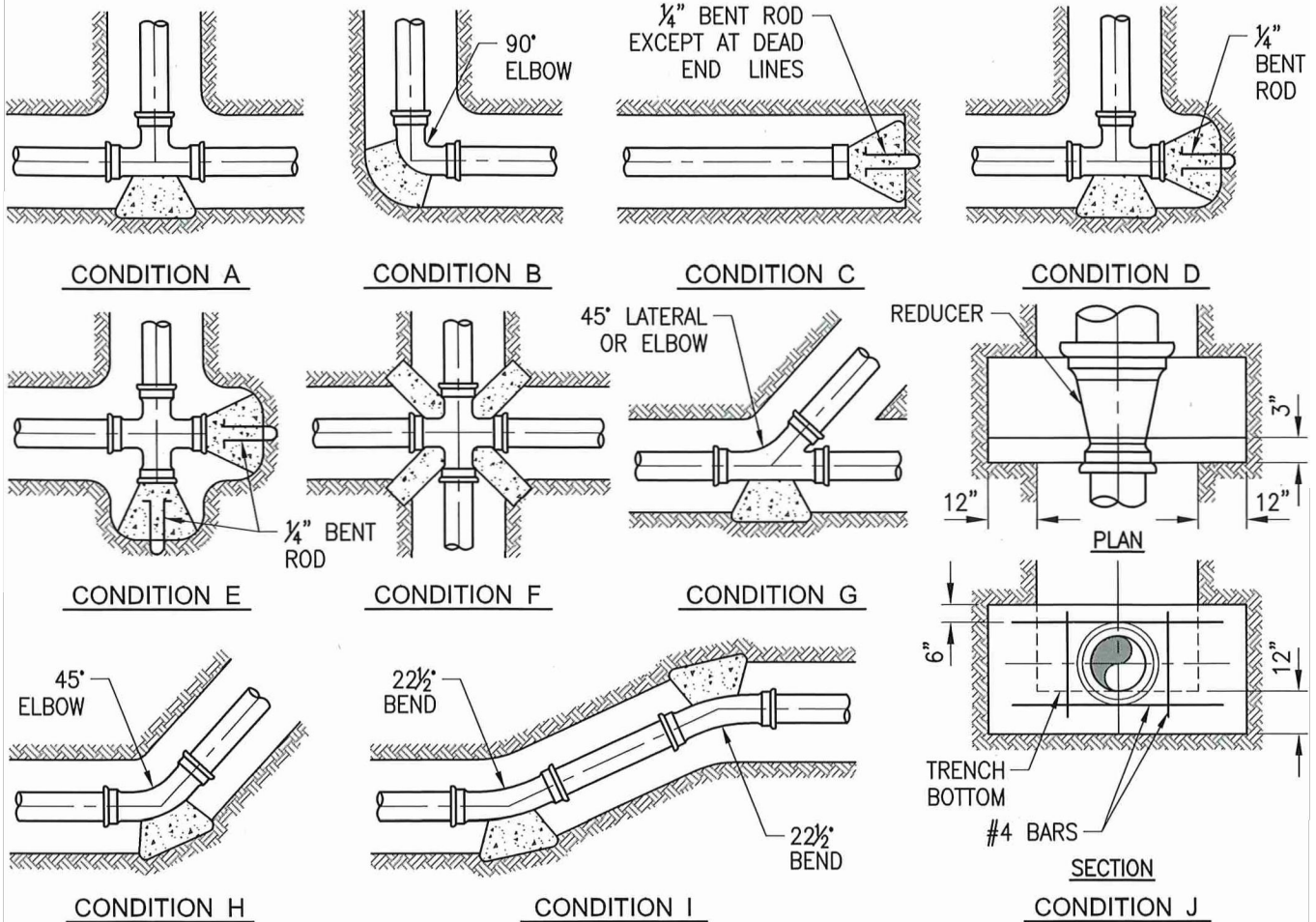


**HIGHLANDS
MUTUAL WATER
COMPANY**

TITLE:

**1-INCH COMBINATION AIR RELEASE
AND VACUUM RELIEF VALVE**

SCALE:	DATE:	REV:	STANDARD DWG. NO.:
NONE	6/23	-	P-14



NOTES:

1. All buried bolts shall be coated with "Bitumastic No. 50" or approved equal.
2. Thrust block areas based on 225 PSI pressure and 2,000 PSF allowable soil pressure with 2½ feet of cover minimum. Additional bearing area required for special conditions shall be approved by HMWC
3. Thrust block bearing faces shall be placed against undisturbed soil, approved compacted backfill or class 100-E-100 slurry.
4. Thrust blocks shall be 560-C-3250 concrete, unless specified otherwise.
 - A. Install ¼" bend rod handles.
 - B. Use cardboard separators between blocks, if needed.

THRUST BLOCK BEARING AREA IN SQUARE FEET

PIPE SIZE	DESCRIPTION									
	A	B	C	D	E	F	G	H	I	J
4"	3.1	4.3	3.1	2 @ 3.1	2 @ 3.1	4 @ 1.2	2.3	2.3	2 @ 1.2	8.0
6"	6.3	8.9	6.3	2 @ 6.3	2 @ 6.3	4 @ 2.5	4.8	4.8	2 @ 2.5	9.0
8"	10.9	15.4	10.9	2 @ 10.9	2 @ 10.9	4 @ 4.2	8.3	8.3	2 @ 4.2	10.1
10"	16.3	28.1	16.3	2 @ 16.3	2 @ 16.3	4 @ 6.4	12.5	12.5	2 @ 6.4	11.3
12"	23.1	32.7	23.1	2 @ 23.1	2 @ 23.1	4 @ 9.0	17.7	17.7	2 @ 9.0	12.5
14"	31.0	43.9	31.0	2 @ 31.0	2 @ 31.0	4 @ 12.1	23.8	23.8	2 @ 12.1	13.8
16"	40.1	56.7	40.1	2 @ 40.1	2 @ 40.1	4 @ 15.7	30.7	30.7	2 @ 15.7	15.1

APPROVED BY:
JEFF DAVIS

GENERAL MANAGER

DATE

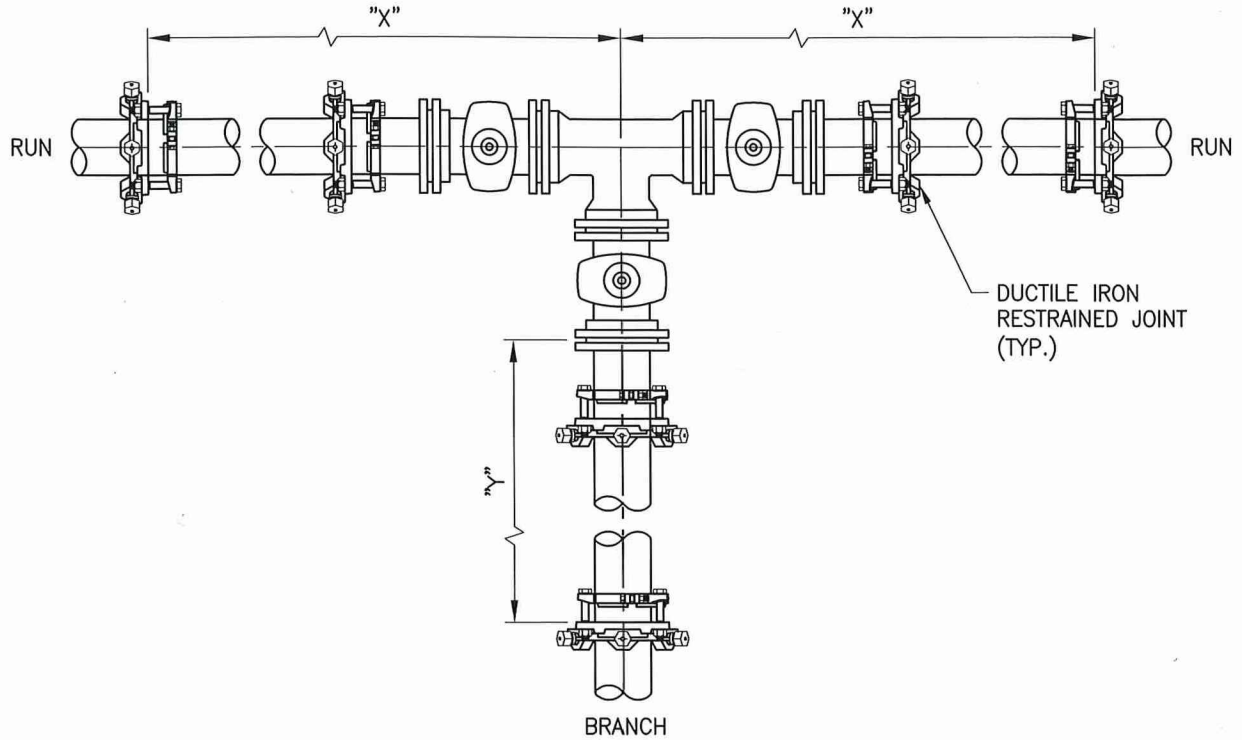


**HIGHLANDS
MUTUAL WATER
COMPANY**

TITLE:

**STANDARD THRUST
BLOCK**

SCALE: NONE	DATE: 6/23	REV: -	STANDARD DWG. NO. P-18
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		"X" PIPE LENGTH							
		4	6	8	12	16	18	20	24
"Y" PIPE LENGTH	4	100	100	100	120	150	150	150	150
	6		120	120	150	150	150	150	150
	8			191	169	169	169	169	169
	12				240	240	240	240	240
	16					309	309	309	309
	18						342	342	342
	20							374	374
	24								438
		RESTRAINED LENGTH IN FEET							

NOTES:

- "X" and "Y" shall be determined by length values using the DIPRA design method if conditions differ from assumptions given on Std. Dwg. No. P-21.
- If actual conditions differ from those listed above or the required restrained length cannot be met, the restrained length shall be determined by the design engineer and concurred with the HMWC engineer.

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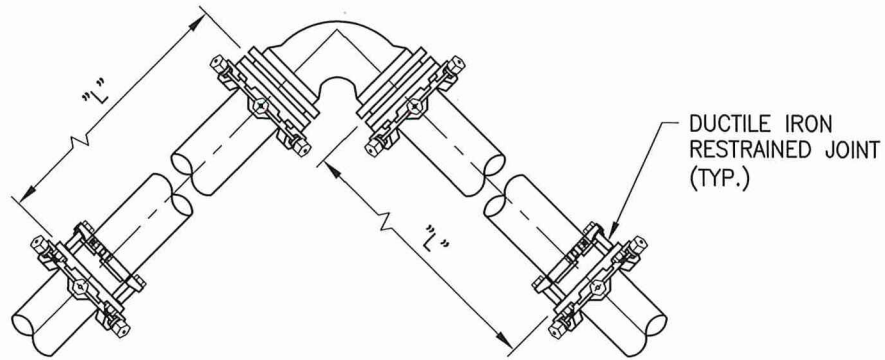
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**HIGHLANDS
MUTUAL WATER
COMPANY**

TITLE:
**RESTRAINT OF JOINTS FOR
DUCTILE IRON & PVC PIPE AT
TEE CONNECTION**

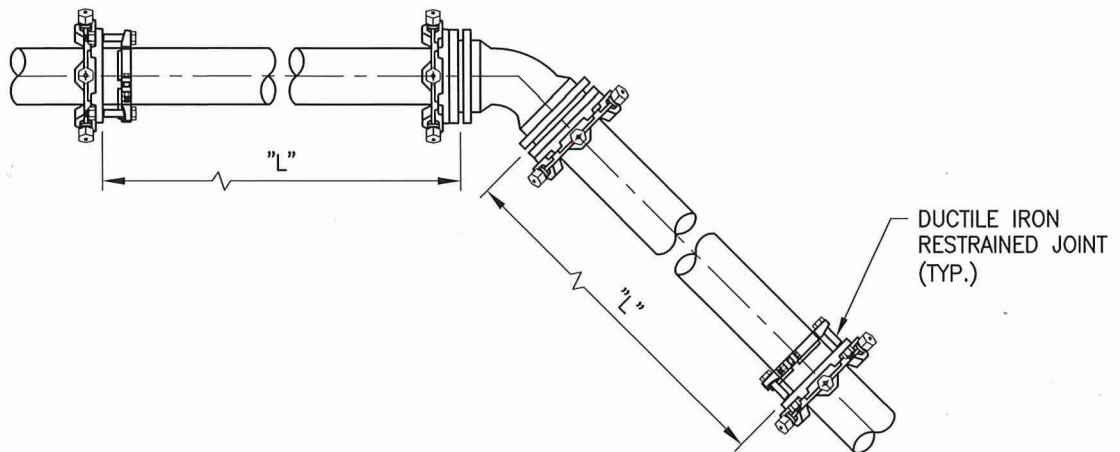
SCALE: NONE	DATE: 6/23	REV: -	STANDARD DWG. NO. P-19
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		PIPE SIZE							
		4	6	8	12	16	18	20	24
BEND ANGLE	11.25°	3	5	6	7	9	10	11	13
	22.5°	7	9	12	15	19	21	23	26
	45°	14	19	25	31	39	49	47	54
	90°	33	45	59	74	94	104	113	131

RESTRAINED LENGTH "L" IN FEET

HORIZONTAL BEND



		PIPE SIZE							
		4	6	8	12	16	18	20	24
BEND ANGLE	11.25°	10	15	19	24	30	34	37	43
	22.5°	21	29	38	48	61	66	74	87
	45°	43	61	79	100	128	142	155	181

RESTRAINED LENGTH "L" IN FEET

VERTICAL BEND

NOTES:

1. If actual conditions differ from those listed above or the required restrained length cannot be met, the restrained length shall be determined by the design engineer and concurred with the HMWC engineer

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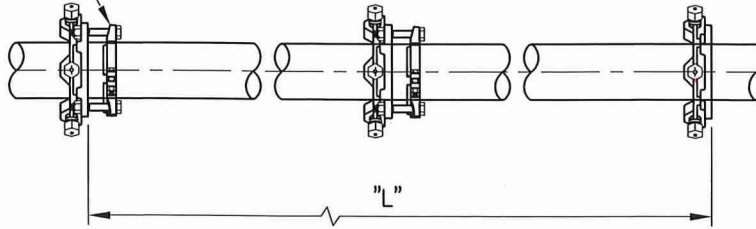


**HIGHLANDS
MUTUAL WATER
COMPANY**

TITLE:
**RESTRAINT OF JOINTS FOR DUCTILE
IRON & PVC PIPE AT 90-DEGREE
VERTICAL OR HORIZONTAL BEND**

SCALE:	DATE:	REV	STANDARD DWG. NO.
NONE	6/23	-	P-20

DUCTILE IRON
RESTRAINED JOINT
(TYP.)



PIPE SIZE IN INCHES	4	6	8	12	16	18	20	24
RESTRAINED LENGTH "L" IN FEET	104	148	191	240	309	342	374	438

DEAD END

NOTES:

(Use for Std. Dwg. NO. P-19, P-20, & P-21)

1. All joint within length "L" shall be restrained.
2. Assumed Depth of cover for 8" pipe or less to be 3.5' min. (42"); 16" pipe or greater to be 4.0' min. (48").
3. Assumptions for determining length shown:
 - Test pressure: 225 psi
 - Type 4 laying conditions
 - A safety factor of 2
 - Sand/silt soil conditions
 - Polyethylene wrap
4. Length calculated using DIPRA restrained joint program.
5. If actual conditions differ from those listed above or the required restrained length cannot be met, the restrained length shall be determined by the design engineer and concurred with HMWC engineer.

APPROVED BY:
JEFF DAVIS

GENERAL MANAGER

DATE



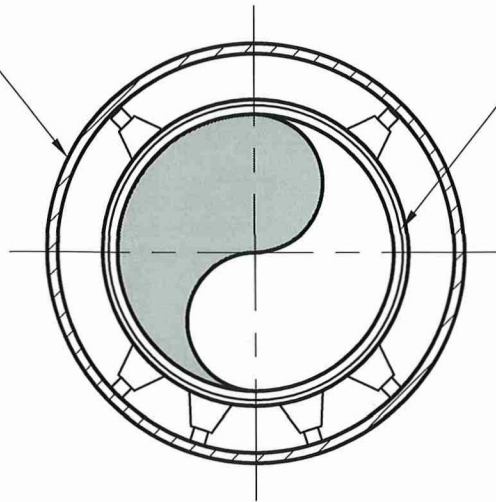
**HIGHLANDS
MUTUAL WATER
COMPANY**

TITLE:

**RESTRAINT OF JOINTS FOR
DUCTILE IRON & PVC PIPE AT
DEAD END OR EACH SIDE OF VALVE**

SCALE:	DATE:	REV	STANDARD DWG. NO.
NONE	6/23	-	P-21

STEEL PIPE WITH MINIMUM
PLATE THICKNESS AND
MINIMUM INSIDE DIAMETER
PER SCHEDULE HEREON
(SEE NOTE 9)



CARRIER PIPE CENTERED
IN CASING

CASING SCHEDULE

NOMINAL PIPE SIZE	NOMINAL CASING SIZE	MINIMUM WALL THICKNESS	
		OPEN TRENCH	JACK AND BORE
8"	16" I.D.	1/4"	3/8"
12"	20" I.D.	5/16"	1/2"
16"	30" I.D.	3/8"	1/2"
18"	32" I.D.	3/8"	1/2"
20"	36" I.D.	3/8"	1/2"
24"	42" I.D.	1/2"	1/2"
30"	48" I.D.	1/2"	5/8"
36"	56" I.D.	5/8"	3/4"
42"	60" I.D.	3/4"	7/8"

NOTES:

1. For PVC carrier pipe, use polyethylene casing insulators with polyethylene skids.
2. For ductile iron carrier pipe, use stainless steel band spacers and insulators with glass filled polymer plastic runners.
3. All casing insulators shall be designed by the manufacturer for application given the particular carrier pipe O.D. and casing pipe I.D.
4. All bolts and bands shall be Type 304 stainless steel.
5. Spacing between the basing insulators shall be per the manufacturers recommendations except that there shall be at least 4 casing insulators per pipe section, one 12" from each joint and two centered in between.
6. Both ends of the casing between the casing and carrier pipe must be sealed watertight using an end seal selected from the Approved Materials List. Bands shall be Type 304 stainless steel. Casing end seal shall be 1/4-inch thick styrene butadiene rubber.
7. All steel casing pipe joints shall be welded full circumference.
8. Materials shall be selected from the Approved Materials List.
9. HDPE casing may be used if it meets adequate strength for geotechnical conditions and with written approval from HMWC.

APPROVED BY:
JEFF DAVIS

GENERAL MANAGER

DATE

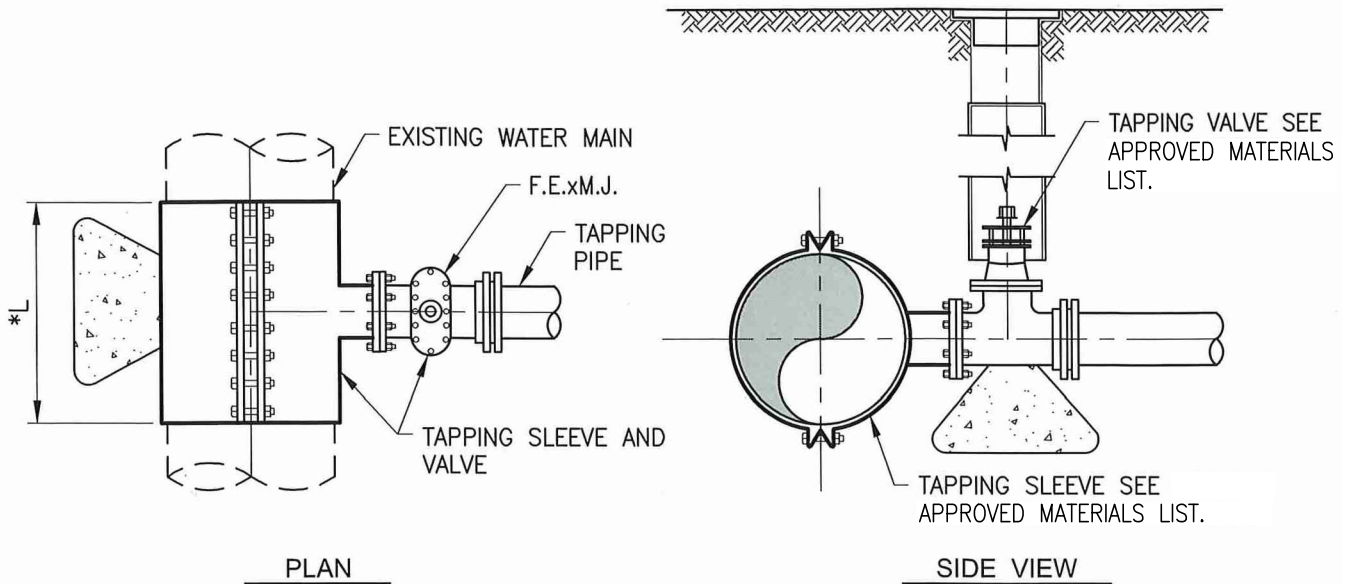


**HIGHLANDS
MUTUAL WATER
COMPANY**

TITLE:

**CASING FOR
WATER MAINS**

SCALE: NONE	DATE: 6/23	REV -	STANDARD DWG. NO. P-22
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NOTES:

1. Tapping sleeve to be stainless steel per Approved Materials List.
2. Tapping sleeve and valve are to be completely wrapped with 8 mil. polyethylene encasement.
3. After installation and before hot tap is complete, the tapping sleeve shall be tested at system pressure, for a minimum of 15 minutes with no visible leakage.
4. Tapping sleeve shall have a full length and width gasket. O-Ring gaskets are not acceptable.
5. Diameter of the hot tap shall be one pipe size smaller than the main line diameter. Size on size hot taps will require special approval by HMWC.
6. Tapping valve shall have a flange insulation kit between ductile iron valve and stainless steel tapping sleeve.

EXISTING WATER MAIN SIZE (INCHES)	TAPPING PIPE SIZE (INCHES)									
	4	6	8	10	12	14	16	18	20	24
4	X									
6	15	X								
8	15	15	X							
10	15	15	20	X						
12	15	15	20	20	X					
14	15	15	20	20	24	X				
16	16	16	20	20	24	24	X			
18	16	16	20	20	24	24	32	X		
20	16	16	20	20	24	24	32	36	X	
24	16	16	20	20	24	24	32	36	40	

* L = LENGTH OF TAPPING SLEEVE (INCHES)

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JEFF DAVIS

GENERAL MANAGER



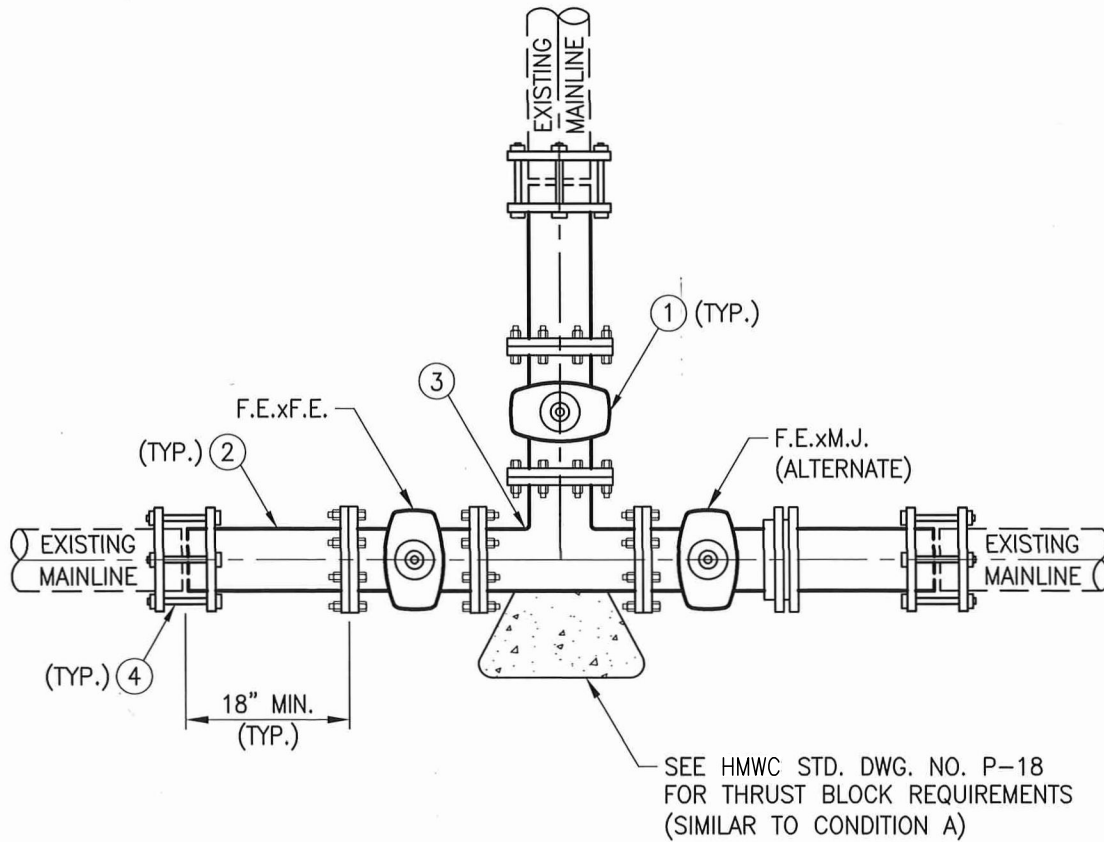
**HIGHLANDS
MUTUAL WATER
COMPANY**

DATE

TITLE:

TAPPING SLEEVE & VALVE

SCALE: NONE	DATE: 6/23	REV: -	STANDARD DWG. NO. P-23
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NOTES:

1. Cut-in tee may use F.E.xF.E. or F.E.xM.J. as called out on the drawings.
2. Use pipe material similar to existing mainline (PVC pipe shall be 3' min. length).

ITEM	DESCRIPTION
①	F.E.xF.E. (or F.E.xM.J.) gate valve per Approved Materials List.
②	D.I.P. F.E.xP.E. per Approved Materials List.
③	F.E.xF.E. tee per Approved Materials List.
④	Flexible coupling per Approved Materials List. For same size O.D. use Ductile Iron M.J. sleeve.

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JEFF DAVIS

GENERAL MANAGER

DATE



**HIGHLANDS
MUTUAL WATER
COMPANY**

TITLE:

CUT-IN TEE

SCALE: NONE	DATE: 6/23	REV -	STANDARD DWG. NO. P-24
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NEW SERVICE INSTALLATION NOTES:

1. Meter box placement shall be per HMWC Std. Dwg. No. P-28 and/or as shown on plans. No meters shall be installed beyond limits of public right of way without easements, unless otherwise indicated on plans.
2. 12" minimum spacing between service taps, except on ACP and PVC mains where 24" minimum spacing shall be provided.
3. For HDPE service lines, snake the service line in the trench to provide enough slack to allow at least one foot of thermal contraction per 100 feet of length. Attach tracer wire to HDPE service line.
4. No joints permitted in service lines unless an elbow is used for the 2" water service connection.
5. All new services shall be installed using service saddles.
6. For $\frac{5}{8}$ " x $\frac{3}{4}$ " meter, use an A24 adapter.
7. For $\frac{3}{4}$ " x $\frac{3}{4}$ " meter, use an A34 adapter.
8. For a 1" angle meter valve, 1" copper pack joint x $\frac{3}{4}$ " meter nut may be utilized when specified on construction plans.
9. Services shall be installed a minimum of 10 feet from all sewer laterals and proposed street tree or street light locations.
10. In areas with corrosive soils use HDPE service lines with tracer wire.
11. Use silver solder (lead free) for all copper service work.
12. Applicant to install backflow prevention assembly per requirements of HMWC.
13. Curb marking will be as allowed by the local governing agency.

REPLACEMENT HOUSELINE NOTES:

1. Minimum size shall be no less than 1 inch.
2. If the existing houseline is copper, it will be replaced with type K same size copper. If the existing houseline is standard galvanized or plastic, it will be replaced with HDPE or PVC SCH 80 unless the local building code specifies other material.
3. There is to be no PVC above grade. Above grade pipe shall match customer's existing material. For bidding purposes contractor shall bid copper pipe with dielectric couplings.
4. A gate valve will be installed on new houselines that bypasses an existing valve.
5. Depth of houseline shall meet the requirements of the local plumbing code.
6. Reconnect the houseline no closer than 14 feet to the house. Cap the original houseline at the location of the original meter, unless otherwise noted. Flush original line in both directions until clear before installing cap.
7. Contractor will supply a list of materials used for each houseline and an as-built drawing of houseline installation.
8. Contractor shall restore impacted areas to equal or better than condition prior to performing work.
9. Curb marking will be as allowed by the City of Clearlake.

APPROVED BY:
JEFF DAVIS

GENERAL MANAGER

DATE

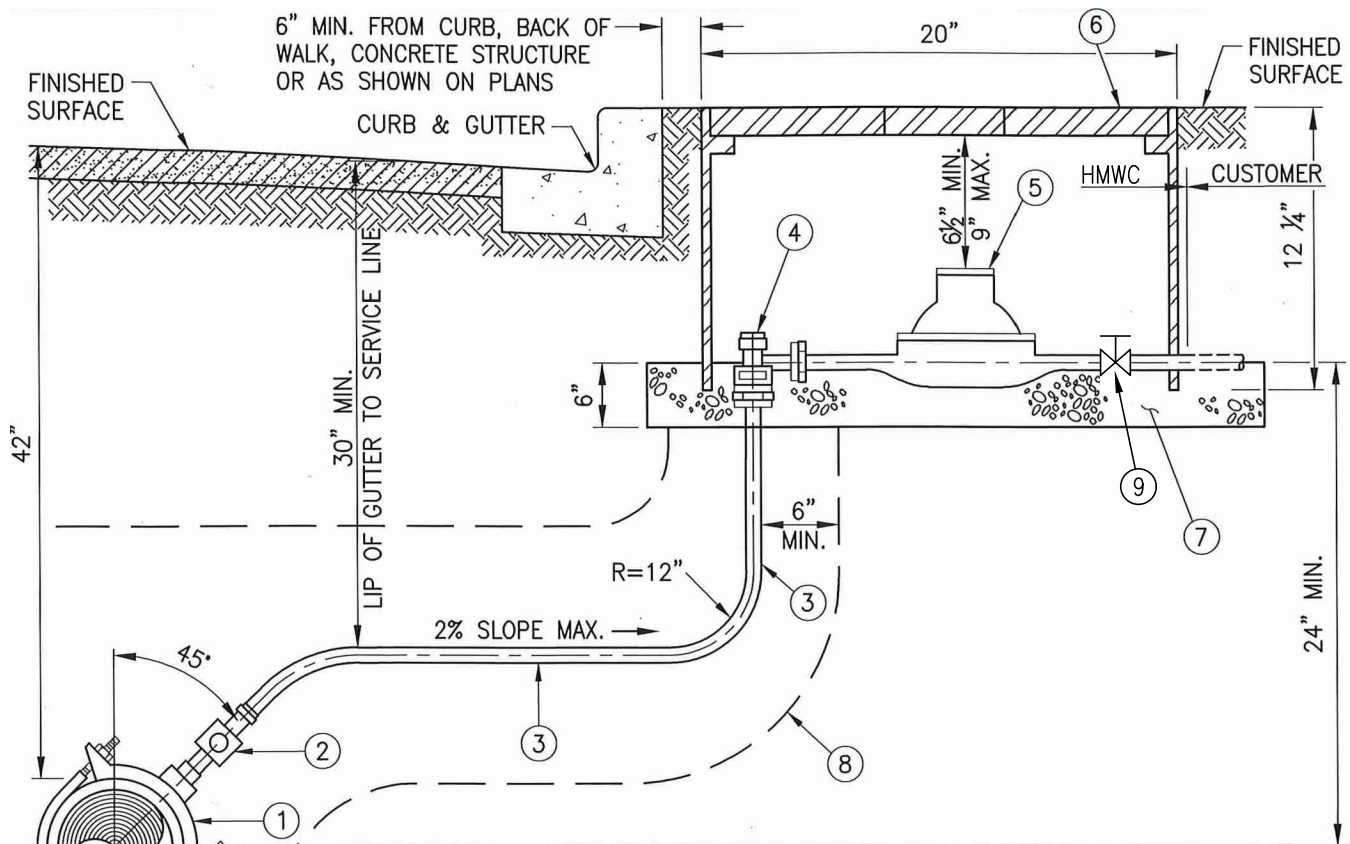


**HIGHLANDS
MUTUAL WATER
COMPANY**

TITLE:

**WATER SERVICE
CONSTRUCTION NOTES**

SCALE:	DATE:	REV	STANDARD DWG. NO.
NONE	6/23	-	P-25



NOTES:

1. No water meter box shall be installed in driveway or sidewalk unless shown on the plans. Meter boxes shall be set to prevent water runoff into the box.
2. No service closer than 24 inches to pipe bell.
3. HDPE service line shall be installed with a tracer wire that will terminate with a 12" coil in the meter box.
4. HMWC may provide a meter spacer in lieu of a meter.
5. Meter box shall have one 3"x4" opening on one end of the box (customer side).

ITEM	EACH	DESCRIPTION	SPECIFICATION	REMARKS
①	1	Service saddle	Strap to be S.S.	See Approved Materials List.
②	1	1" bronze ball valve corp. stop	I.P.S. x compression	
③	1	HDPE	P.E. 3408 or approved equivalent, 200 PSI, SDR-7 and NSF approved.	One piece only, no splices
④	1	1" angle meter stop (ball valve)	1" I.P.S. compression x meter lock wing w/ 1/8" thick cloth inserted in gasket	
⑤	1	Water meter	5/8", 3/4" or 1"	Supplied by HMWC; installed by contractor
⑥	1	Water meter box	12"x20" meter box	See Approved Materials List.
⑦	1	Water meter box pad	14"x24"x6", 3/4" crushed rock	Pad for meter and box
⑧	1	Trench with sand envelope	Imported with SE > 30	12" min. & 24" max. trench width
⑨	1	Gate Valve	With cast iron wheel	Match meter size.

APPROVED BY:
JEFF DAVIS

GENERAL MANAGER

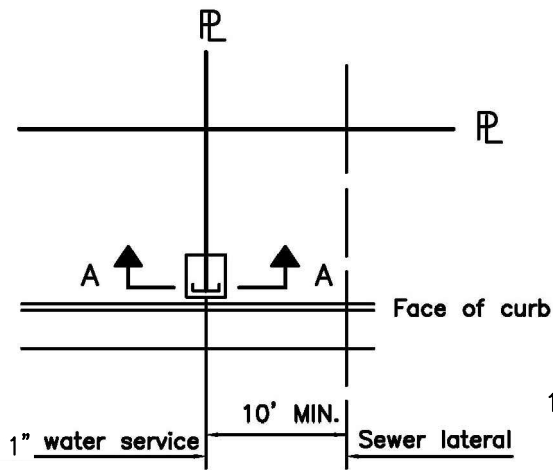
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**HIGHLANDS
MUTUAL WATER
COMPANY**

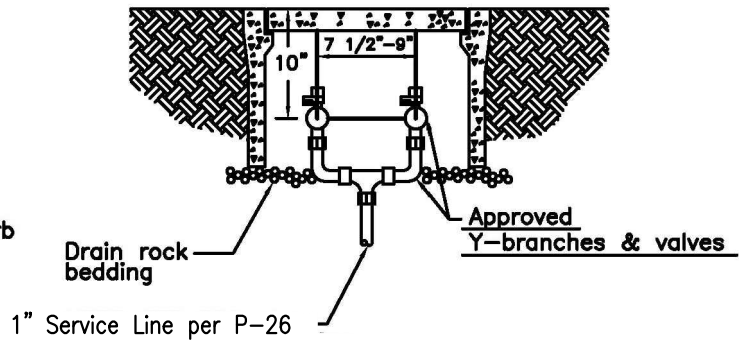
**TITLE: 1-INCH WATER
SERVICE CONNECTION FOR
5/8", 3/4", OR 1" METER**

SCALE: NONE	DATE: 6/23	REV: -	STANDARD DWG. NO. P-26
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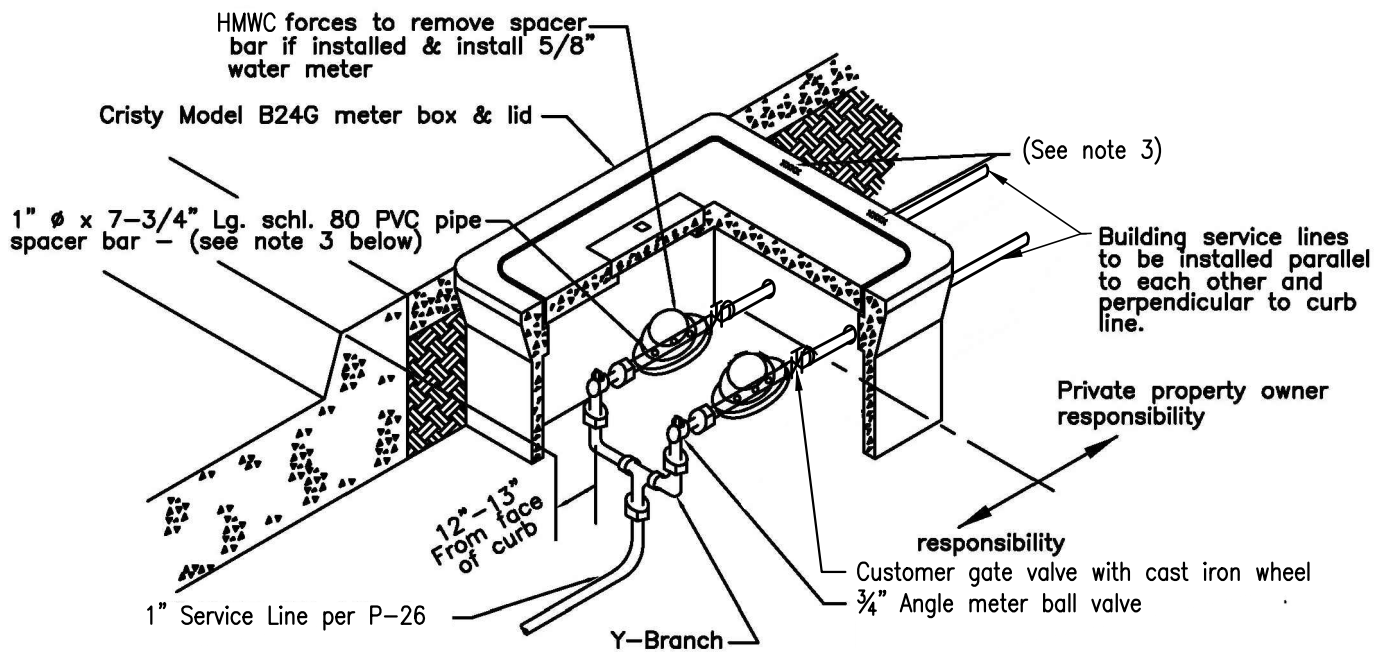
PLAN VIEW

APPROVED CONCRETE METER BOX & LID



SECTION A-A

SINGLE METER BOX INSTALLATION
FOR DUAL 3/4\"/>



NOTES:

1. Meter box to be installed so that the reading lid is centered over the meter registers.
2. Contractor to install schl. 80 pvc spacer with threads on both ends. Drill 1/2" holes @ 2" O.C. through pipe after testing service lateral.
3. Prior to meter set, address to be clearly marked on topside lip of meter box over each service with permanent felt marker.

APPROVED BY:
JEFF DAVIS

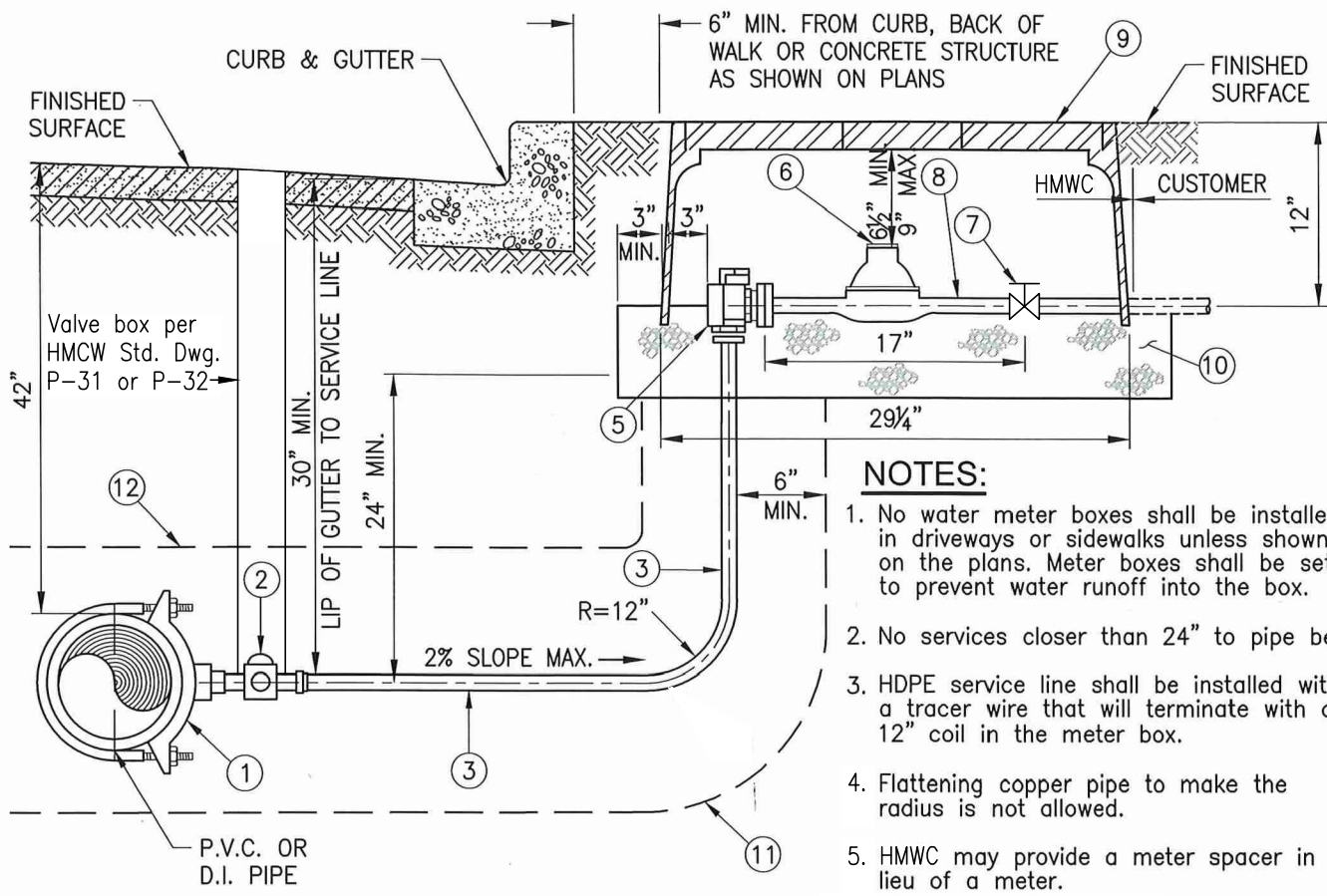
GENERAL MANAGER



**HIGHLANDS
MUTUAL WATER
COMPANY**

TITLE: **1-INCH WATER
SERVICE CONNECTION W/
TWIN 5/8\"/>**

SCALE: NONE	DATE: 6/23	REV: -	STANDARD DWG. NO. P-26A
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- NOTES:**
1. No water meter boxes shall be installed in driveways or sidewalks unless shown on the plans. Meter boxes shall be set to prevent water runoff into the box.
 2. No services closer than 24" to pipe bell
 3. HDPE service line shall be installed with a tracer wire that will terminate with a 12" coil in the meter box.
 4. Flattening copper pipe to make the radius is not allowed.
 5. HMWC may provide a meter spacer in lieu of a meter.

ITEM	EACH	DESCRIPTION	SPECIFICATION	REMARKS
①	1	Service saddle	Strap to be S.S.	See Approved Materials List.
②	1	2" bronze ball valve corp. stop	2" I.P.S. x compression	See Approved Materials List.
③	1	HDPE	P.E. 3408 or approved equivalent, 200 PSI, SDR-7 and NSF approved.	One piece only, no splices
⑤	1	Angle meter stop (ball valve)	2" I.P.S. compression x meter lock wing w/ 1/8" thick cloth inserted in gasket	1/8" thick cloth gasket at both meter flanges.
⑥	1	Water meter	2" flg meter	Supplied by HMWC; installed by contractor
⑦	1	Gate Valve	With cast iron wheel	Match meter size
⑧	1	Brass nipple	2" brass close nipple, M.I.P. x M.I.P.	
⑨	1	Water meter box	17"x30" meter box	See Approved Materials List.
⑩	1	Water meter box pad	20"x34"x6", 3/4" crushed rock	Pad for meter box
⑪	1	Trench with sand envelope	Imported with SE > 30	12" min. & 24" max. trench width

APPROVED BY:
JEFF DAVIS

GENERAL MANAGER

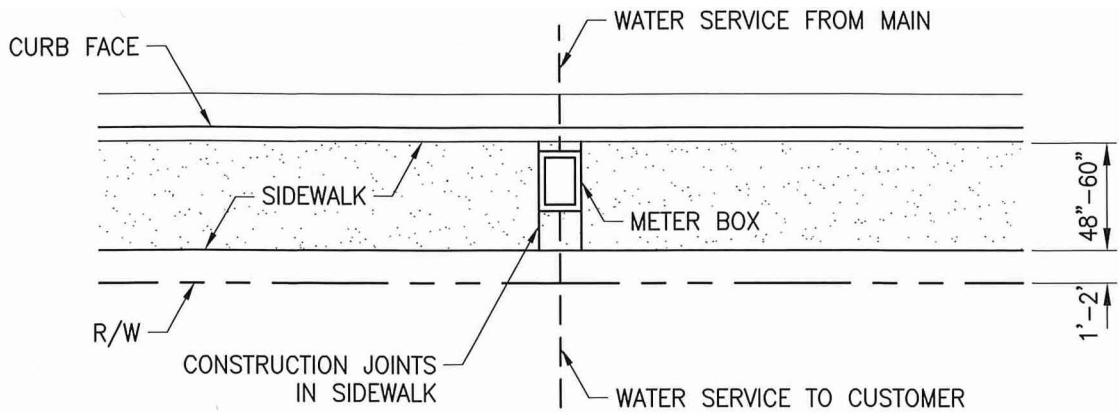
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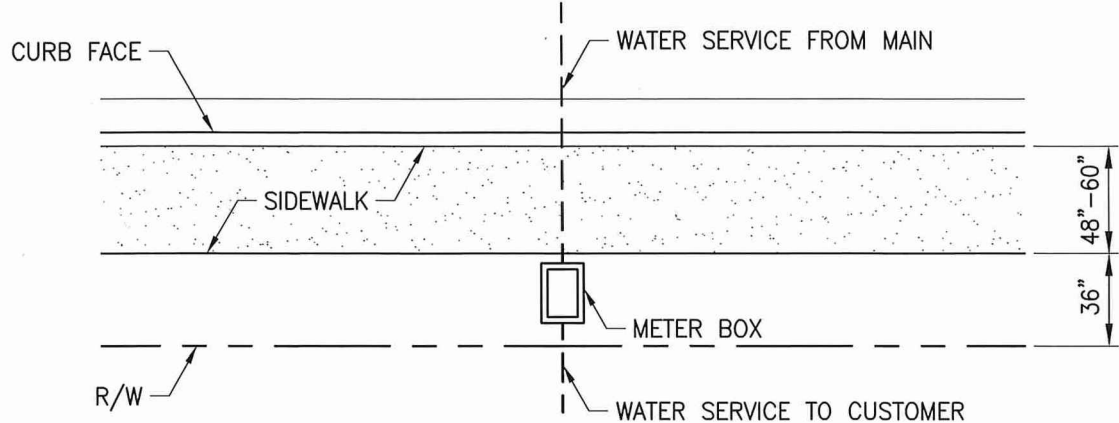
**HIGHLANDS
MUTUAL WATER
COMPANY**

TITLE: **2-INCH WATER
SERVICE CONNECTION FOR
1-1/2" OR 2" METER**

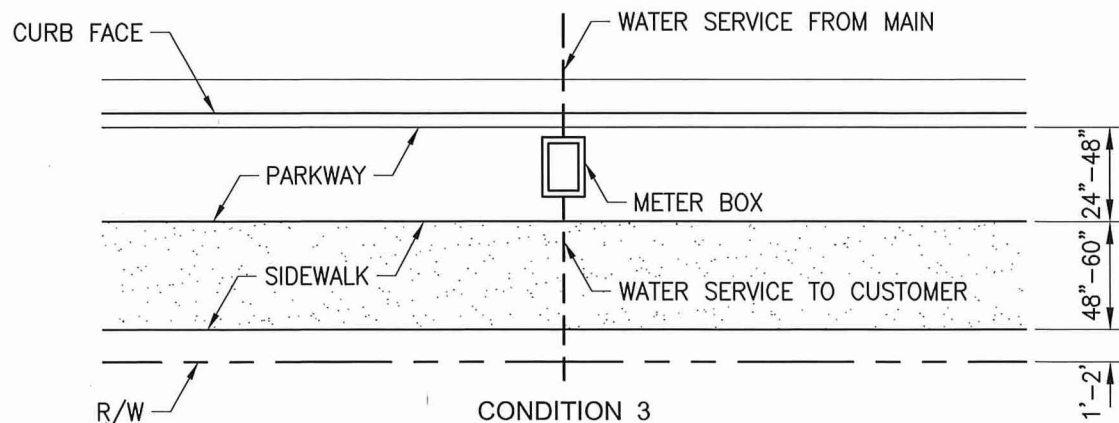
SCALE: NONE	DATE: 6/23	REV: -	STANDARD DWG. NO. P-27
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CONDITION 1
IN THE SIDEWALK



CONDITION 2
BEHIND THE SIDEWALK



CONDITION 3
IN THE PARKWAY

NOTES:

1. Meter box size for 1" service will be 12"x20".
2. Meter box size for 2" service will be 17"x30".
3. For Meter Box Details see HMWC Std. Dwg. No. P-26 and P-27.
4. Location of meter box shall be called out on the plans by referencing this standard drawing.

APPROVED BY:
JEFF DAVIS

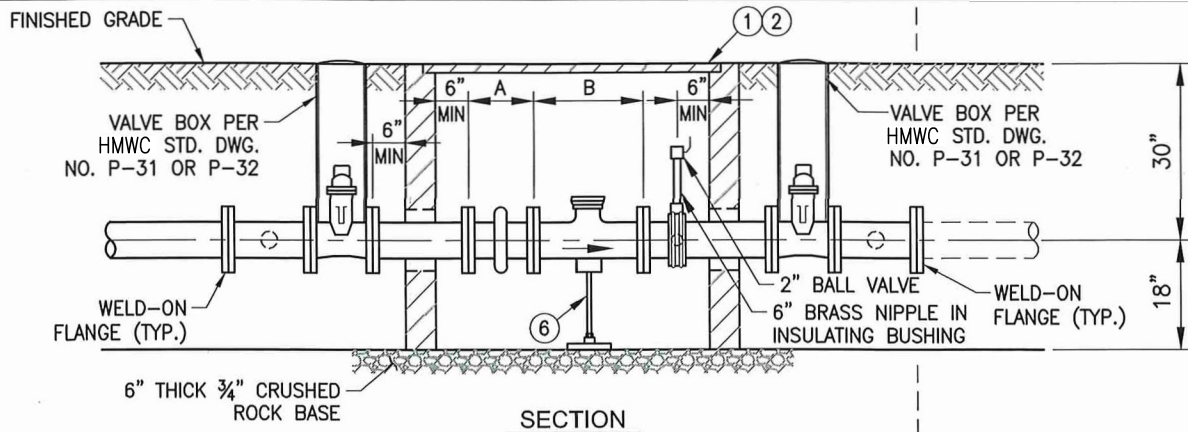
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DATE

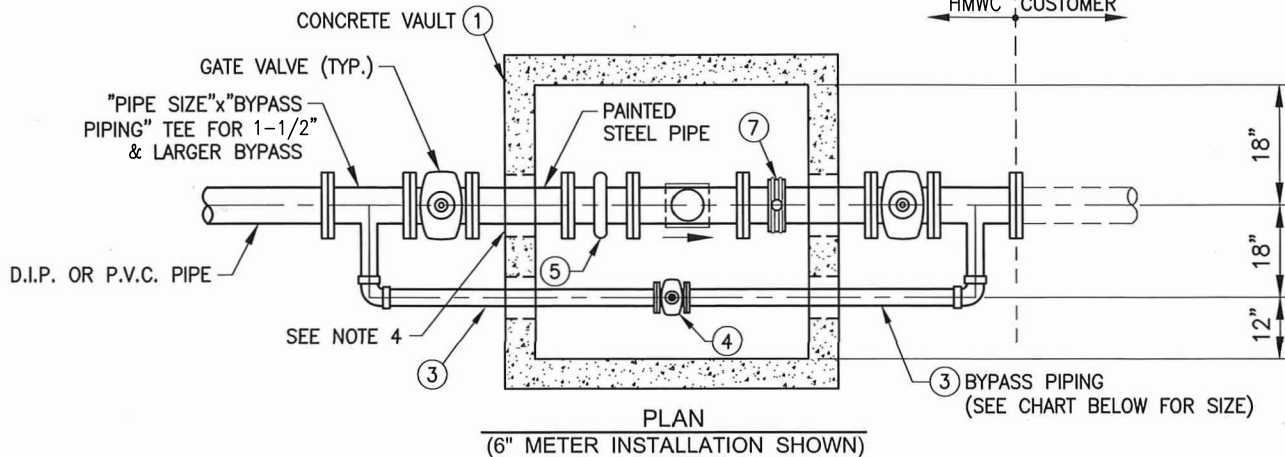


**HIGHLANDS
MUTUAL WATER
COMPANY**

TITLE: TYPICAL METER BOX LOCATION			
SCALE: NONE	DATE: 6/23	REV: -	STANDARD DWG. NO. P-28



SECTION



PLAN
(6" METER INSTALLATION SHOWN)

ITEM	DESCRIPTION
①	Non-traffic bearing 20k rated vault located behind curb and/or parkway, with open bottom. Lid shall be lockable, torsion spring assisted aluminum design for 10K loading. Use 20K rated vault and lid in traffic locations. See Approved Materials List. for acceptable manufacturers and HMWC Std. Dwg. No. P-36 for vault details.
②	Alternate hatch cover: 3 piece steel bolt down traffic/parkway cover. See HMWC Std. Dwg. No. P-36.
③	Bypass piping shall be wrapped and epoxy lined Sch. 80 steel for 1-1/2" or larger bypass pipe.
④	Bypass shut off valve shall be epoxy lined gate valve for 1-1/2" or larger bypass pipe.
⑤	Victaulic coupling shall be AWWA approved Style 31 for DI pipe or style 77 for steel pipe.
⑥	Pipe support per HMWC Std. Dwg. No. P-45
⑦	Service saddle with ball curb stop for meter testing.
⑧	All dissimilar metals shall be insulated from each other by insulated flanges or bushings.
⑨	Install tracer wire from main to inside the vault.

VAULT DESCRIPTION					
PIPE/ METER SIZE	A (UPSTREAM SPOOL)	B (METER)	VAULT SIZE	FLOW RANGE (GPM)	BYPASS PIPE
3"	5"	12"	4'x4'	1-500	3"
4"	7"	14"	4'x4'	1½-1,000	3"
6"	12"	18"	4'x4'	3-1,600	3"
8"	16"	20"	4'x5'	5-2,800	4"
10"	20"	18"	4'x5'	14-5,500	6"

NOTE:

1. Bypass piping not required for irrigation services.
2. Ultra sonic meter shall be of a type approve by N.S.F., F.M. and A.W.W.A.
3. Ultra sonic meter body shall be Type 316 stainless steel or epoxy coated ductile iron.
4. See HMWC Std. Dwg. No. P-37 for sealing of pipe openings.
5. All pipes on both sides of vault shall be fully restrained.

APPROVED BY:
JEFF DAVIS

GENERAL MANAGER

DATE

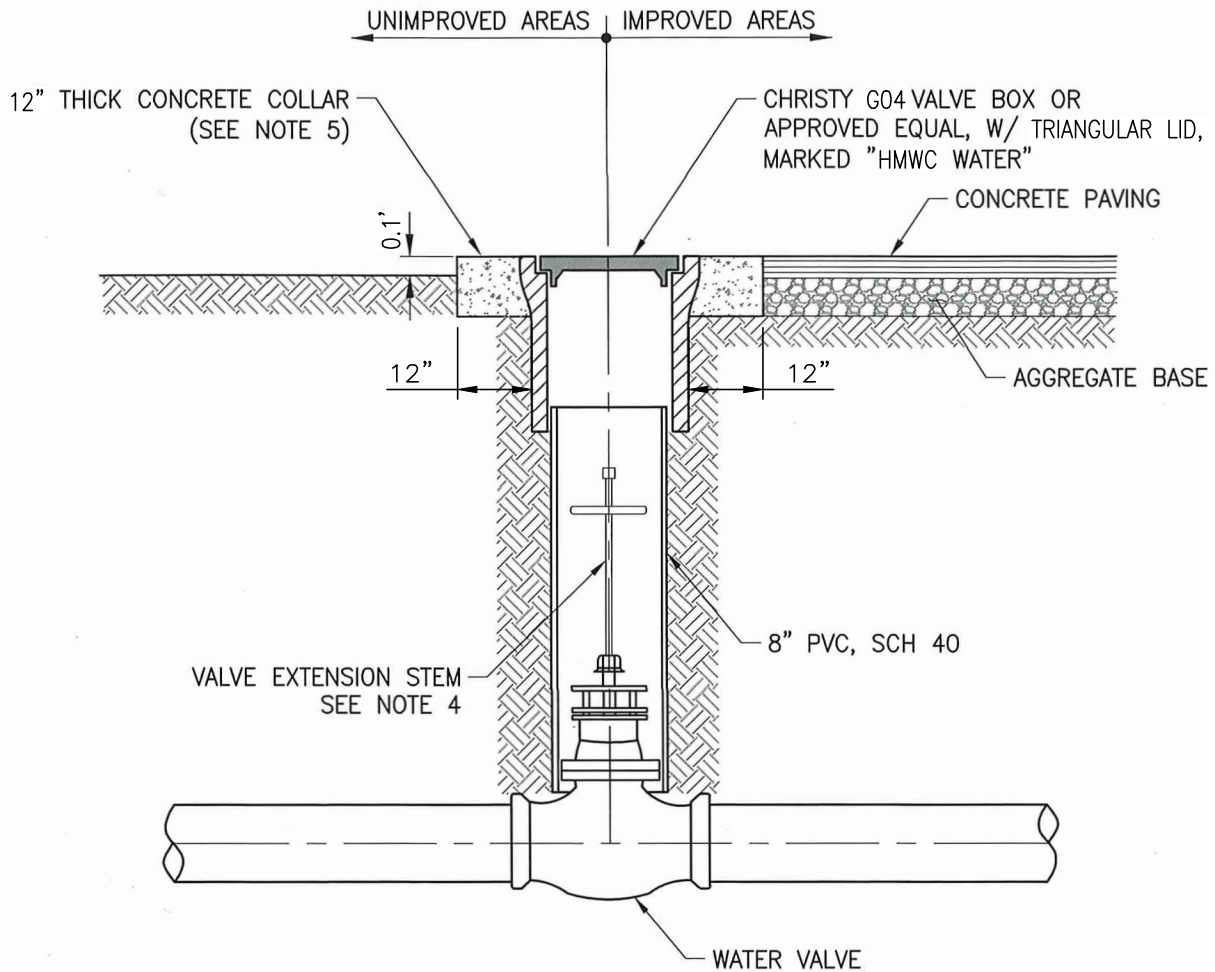


**HIGHLANDS
MUTUAL WATER
COMPANY**

TITLE:

**LARGE METER WITH BYPASS
(3-INCH THRU 10-INCH METER)**

SCALE: NONE	DATE: 6/23	REV: -	STANDARD DWG. NO. P-30
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NOTES:

1. The following valve box types shall be used unless otherwise noted:
 Type 1 – Unimproved areas, concrete surfaced streets, concrete pads, or as called out on the plans.
 Type 3 – All other locations as called out on the plans.
2. Final rim elevation to be $\frac{1}{8}$ " to $\frac{1}{4}$ " below final street grade.
3. More stringent installation requirements may be imposed by the entity having the jurisdiction over the valve box installation location.
4. A valve extension stem shall be provided where the depth to the operating nut exceeds 4 feet.
5. Contractor to form 12" thick concrete collar.
6. See Approved Materials List for all approved products.
7. For paving around valves not in the pavement, see HMWC Std. Dwg. No. P-46.

APPROVED BY:
JEFF DAVIS

GENERAL MANAGER

DATE

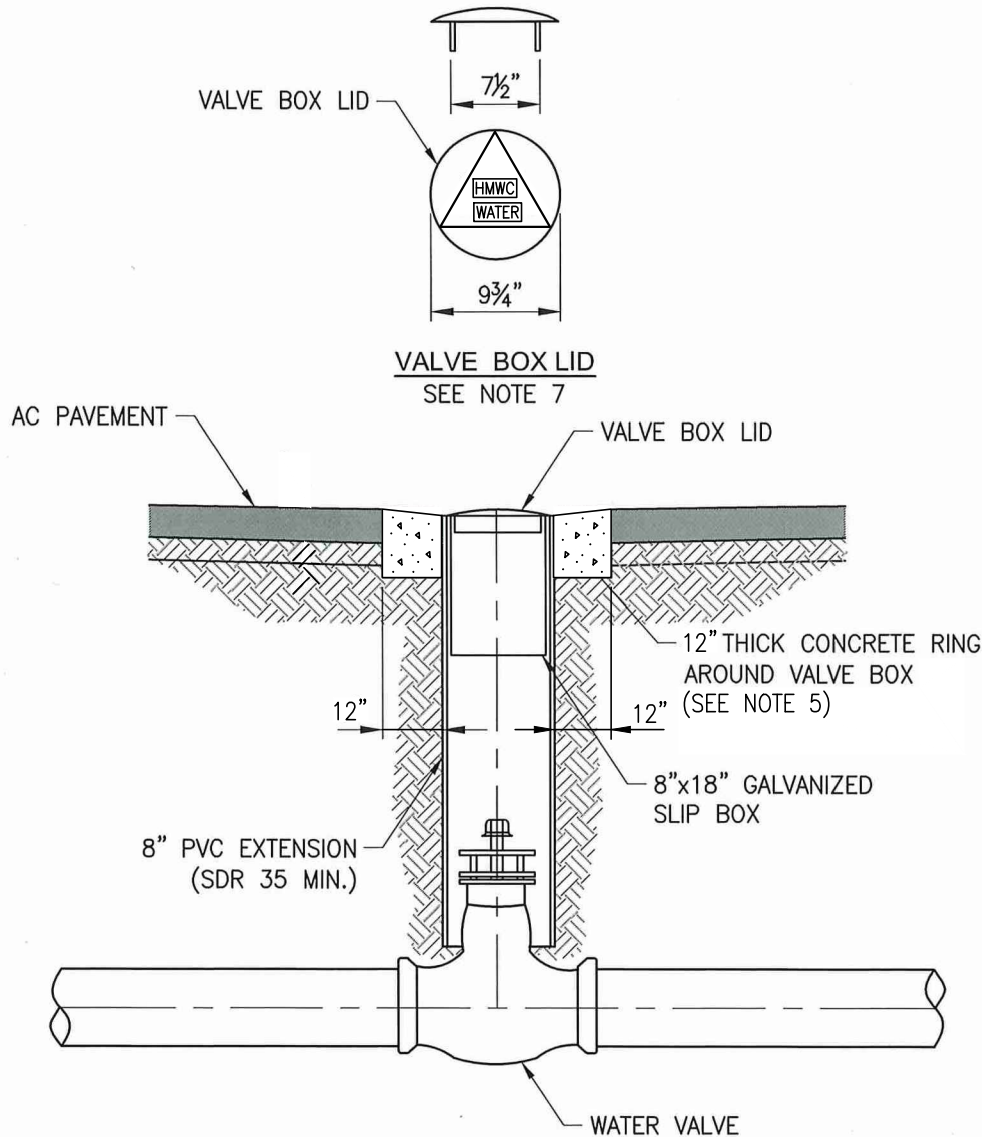


**HIGHLANDS
MUTUAL WATER
COMPANY**

TITLE:

**VALVE BOX -
TYPE 1**

SCALE: NONE	DATE: 6/23	REV: -	STANDARD DWG. NO. P-31
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NOTES:

1. The following valve box types shall be used unless otherwise noted:
 Type 1 – Unimproved areas, concrete surfaced streets or pads or as called out on the plans.
 Type 3 – All other locations as called out on the plans.
2. Final rim elevation to be $\frac{1}{8}$ " to $\frac{1}{4}$ " below final street grade.
3. More stringent installation requirements may be imposed by the entity having the jurisdiction over the valve box installation location.
4. A valve extension stem shall be provided where the depth to the operating nut exceeds 4 feet.
5. Contractor to form 12" thick concrete collar.
6. See Approved Materials List for all approved products.
7. For paving around valves not in the pavement, see HMWC Std. Dwg. No. P-46.

APPROVED BY:
JEFF DAVIS

GENERAL MANAGER

DATE

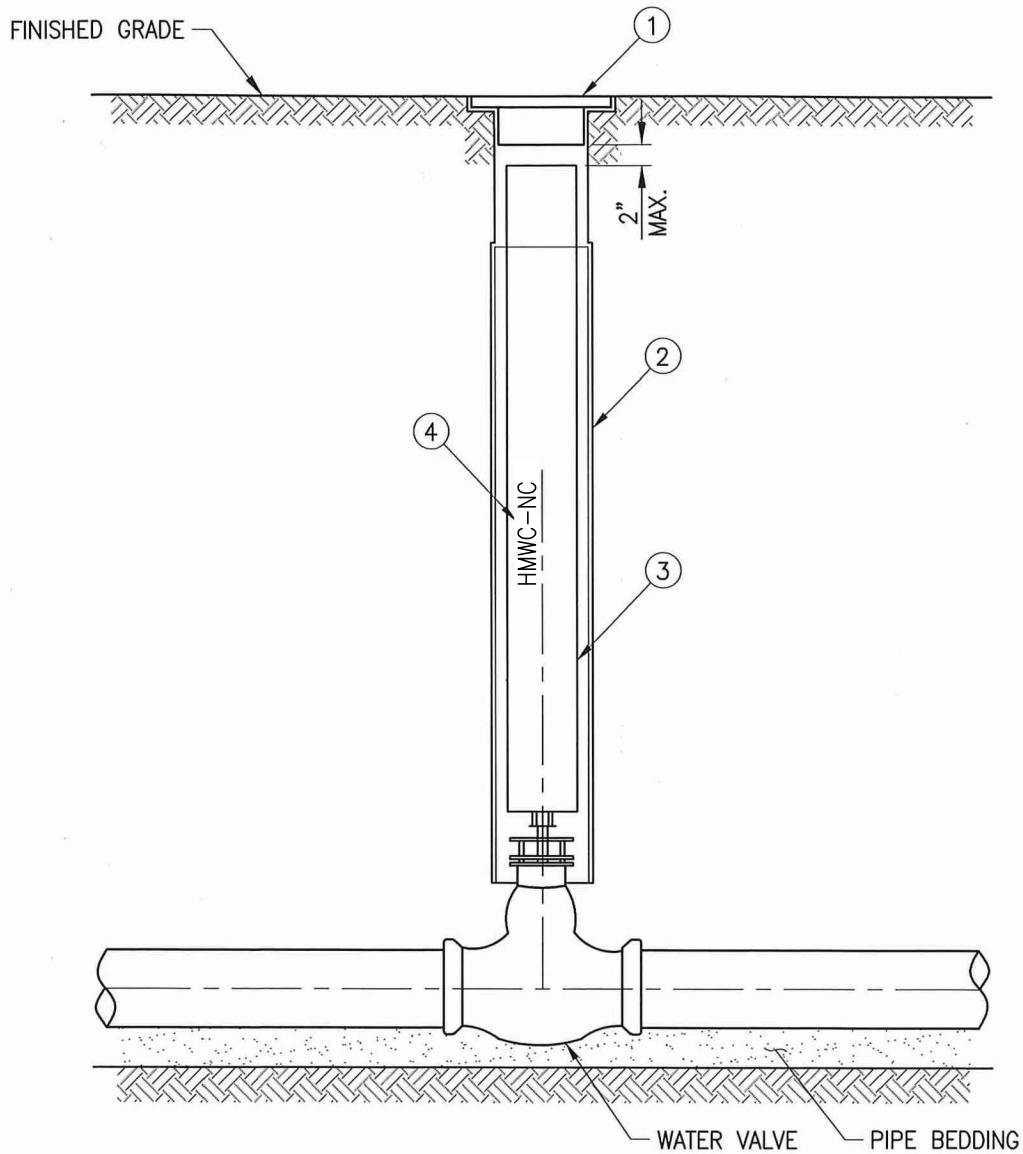


**HIGHLANDS
MUTUAL WATER
COMPANY**

TITLE:

**VALVE BOX -
TYPE 3**

SCALE: NONE	DATE: 6/23	REV: -	STANDARD DWG. NO. P-32
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ITEM	DESCRIPTION
①	Box and lid assembly per HMWC Std. Dwg. No. P-31 or P-32
②	Valve box
③	4"x4" redwood post
④	Route initials "HMWC-NC" for (normally closed) on all sides in 1½" high letters, ½" deep, clearly legible or security attach 1½" high brass label on all four sides engraved with "HMWC-NC"

APPROVED BY:
JEFF DAVIS

GENERAL MANAGER

DATE

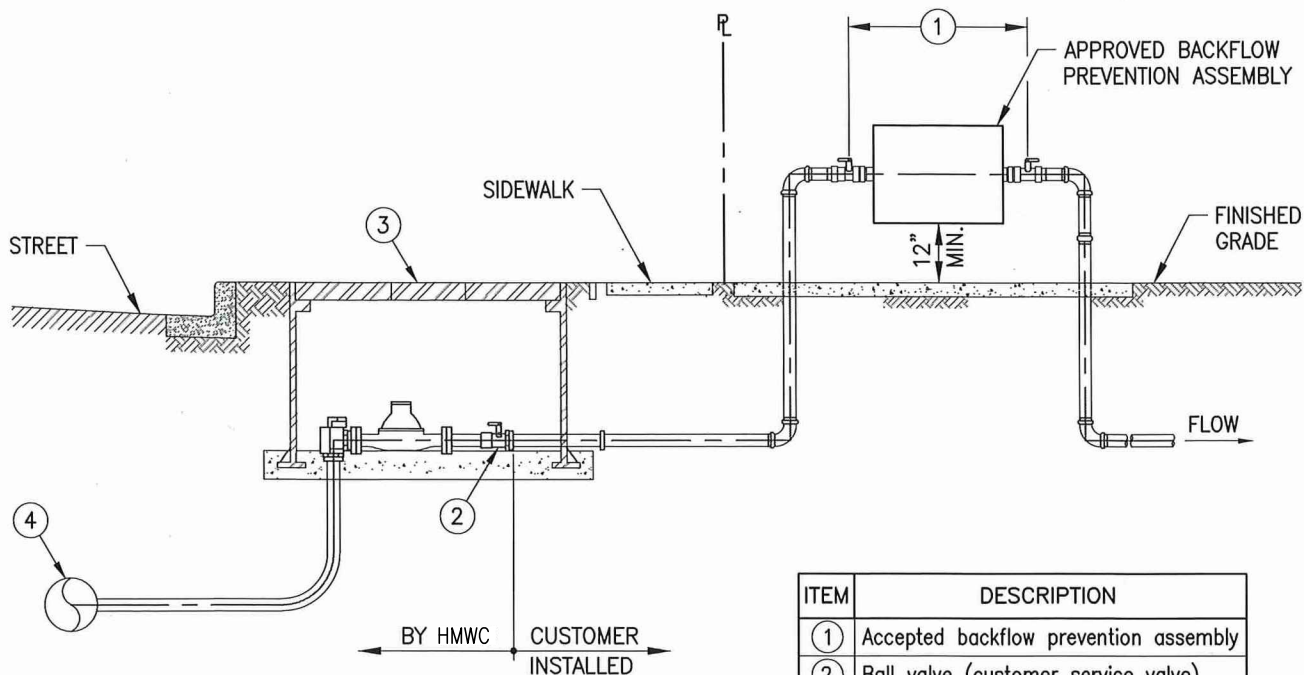


**HIGHLANDS
MUTUAL WATER
COMPANY**

TITLE:

**NORMALLY CLOSED
VALVE BOX**

SCALE: NONE	DATE: 5/23	REV: -	STANDARD DWG. NO. P-33
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ITEM	DESCRIPTION
①	Accepted backflow prevention assembly
②	Ball valve (customer service valve)
③	Service meter and meter box
④	Water main

NOTES:

- The backflow preventer assembly shall consist of an approved Reduced Pressure or Double Check Valve in accordance with the HMWC Water Quality Department requirements. The assemblies shall be suitable for supply pressures.
- A backflow preventer assembly for a fire service shall consist of an approved Reduced Pressure Principle Detector Assembly (RPDA) or Double Check Valve Detector Assembly (DCDA) in accordance with the HMWC water quality department requirements. The assemblies shall be suitable for supply pressure.
- It is recommended that an angle style pressure reducing valve be installed on the upstream line of the backflow preventer when pressure in excess of 80 P.S.I. or more is supplied per section 608.2 of the Uniform Plumbing Code.
- It is recommended that wye strainers be installed on the upstream side of the backflow preventer body. If required, a pressure regulator with a serviceable screen can be substituted for the wye strainer.
- Location and installation shall be per plan as submitted to and accepted by HMWC.
- It is recommended that all assemblies 2-1/2" and larger to be installed shall be equipped with resilient wedge gate valves.
- Locate the assembly within 5 feet of customer service valve as possible. Other locations must be approved prior to installation.
- Assemblies shall not be located in areas subject to flooding.
- Only security enclosures providing adequate clearances and full view of assemblies are permitted.
- Landscape or construction around assembly shall permit an unobstructed view of the assembly from the street.
- Final inspection and acceptance test shall be provided to HMWC by the customer using a certified backflow tester.
- No connections or tees are permitted between meter and backflow preventer.
- It is recommended that sizes 3" and larger have additional pipe support.
- It is recommended that the backflow assembly be the same size or one size larger than the meter.
- Materials may be selected from the HMWC Approved Materials List.

APPROVED BY:
JEFF DAVIS

GENERAL MANAGER

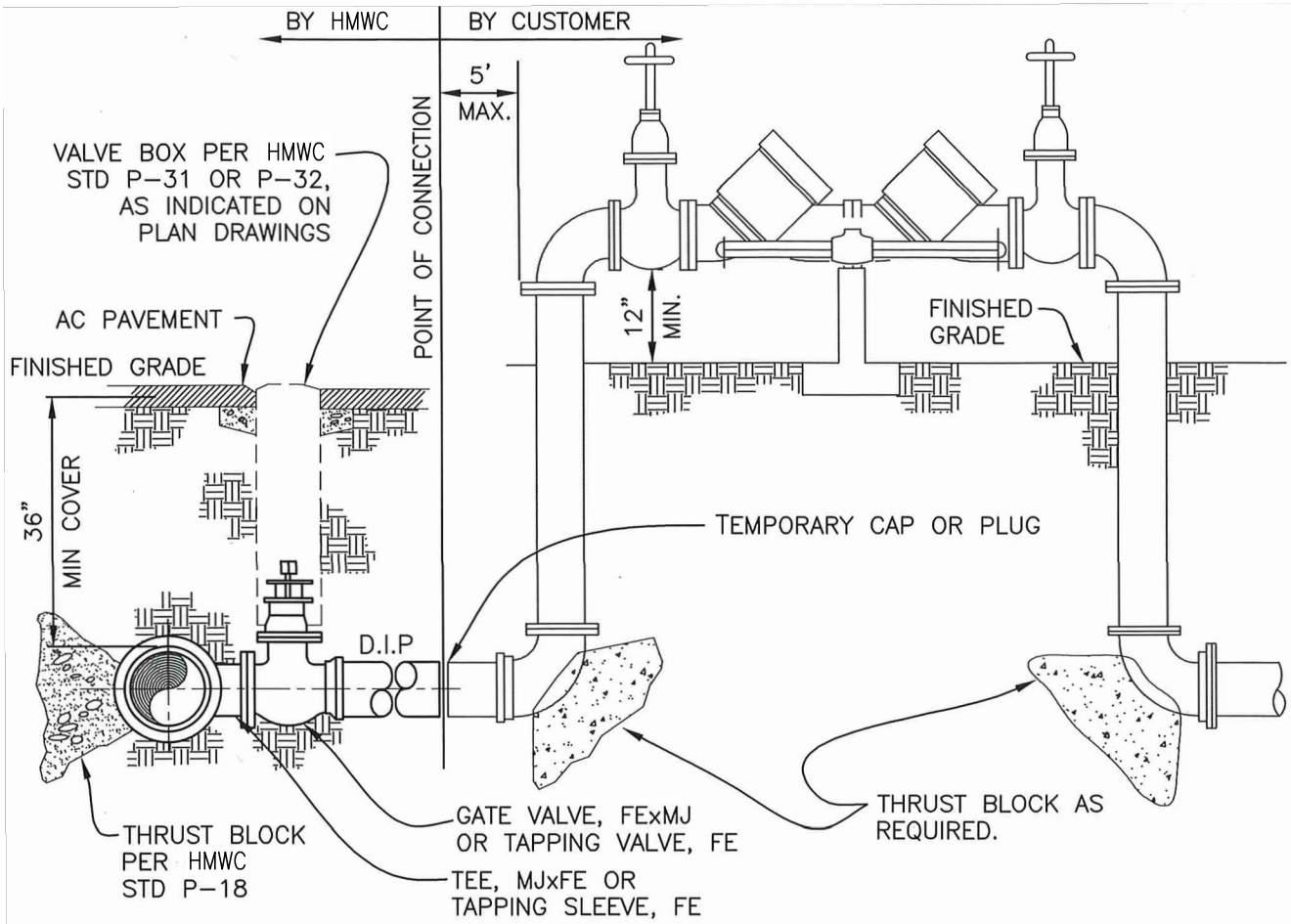
DATE



**HIGHLANDS
MUTUAL WATER
COMPANY**

TITLE:
**BACKFLOW PREVENTION ASSEMBLY -
OVERFLOW FOR ABOVE GROUND
INSTALLATION**

SCALE:	DATE:	REV	STANDARD DWG. NO.
NONE	6/23	-	P-35A



NOTES:

1. Developer shall install a HMWC acceptable backflow preventer. Installation shall comply with all applicable rules, regulations, and ordinances. Depending on the application, a Reduced Pressure Principle Detector Assembly (RPDA) or Double Check Valve Detector Assembly (DCDA) may be required.
2. The assembly must be accessible for testing and maintenance. The assembly shall be installed above ground and a minimum of 12" above finished grade with a maximum of 36" and a minimum clearance of 12" or as needed if installed close to a building or structure.
3. All newly installed Backflow Prevention Assemblies must be tested in accordance with applicable regulations prior to being put in service and yearly thereafter. Copies of test results shall be submitted to HMWC prior to activation.
4. The Backflow Assembly shall be installed within five feet of the point of connection to the utility. There may be no connections or tees between the meter or point of connection and the Backflow Assembly.
5. Assemblies shall be horizontal and level unless approved for other orientations.
6. Backflow Assemblies are to be used within their rated operating conditions.
7. All installations of Backflow Assemblies must be in compliance with state and local plumbing and building codes. Contact local administrative authority for detailed requirements.

APPROVED BY:
JEFF DAVIS

GENERAL MANAGER

DATE

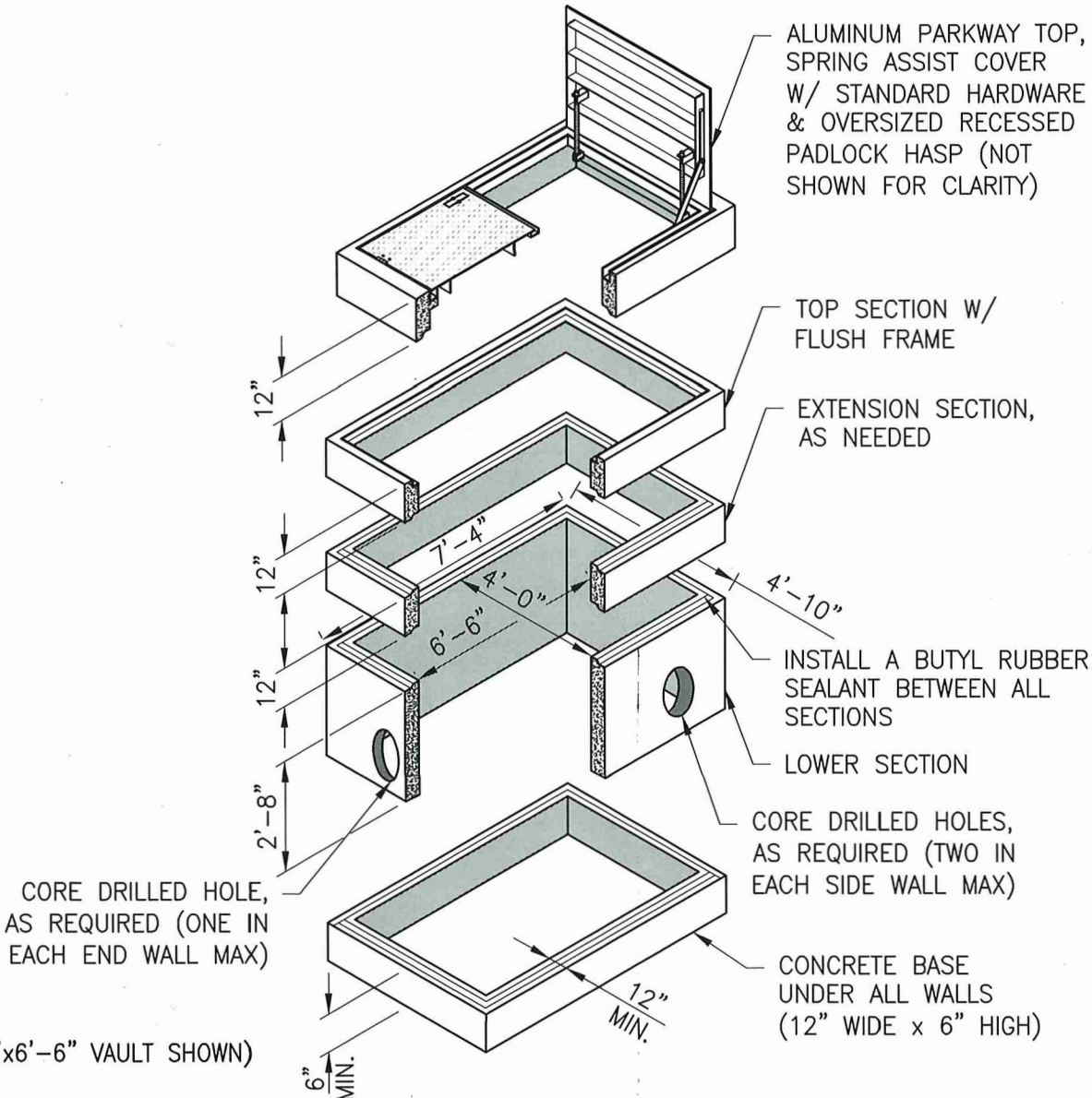


**HIGHLANDS
MUTUAL WATER
COMPANY**

TITLE:

**BACKFLOW ASSEMBLY
FOR FIRE SERVICE**

SCALE:	DATE:	REV	STANDARD DWG. NO.
NONE	6/23	-	P-35B



NOTES:

1. Vaults shall be designed for AASHTO 20K loads with open bottom and lockable torsion spring assisted aluminum lids.
2. When total depth is greater than 5 feet an attached aluminum ladder shall be provided with a Ladder-up Safety Pole.
3. Vaults for meter installation shall be equipped with a meter reading lid centered over the meter if called for on the plans.
4. Joints between vault sections shall have a butyl rubber sealant installed.
5. Install 6" high x12" wide concrete base under all vault walls.
6. Bottom of vault shall be filled with 8" thick minimum layer of compacted ¾" crushed rock compacted or Class 2 AB.
7. Core wall for pipe spool. Core diameter shall be pipe O.D. +4" min. See Std. Dwg. No. P-37 for details.

APPROVED BY:
JEFF DAVIS

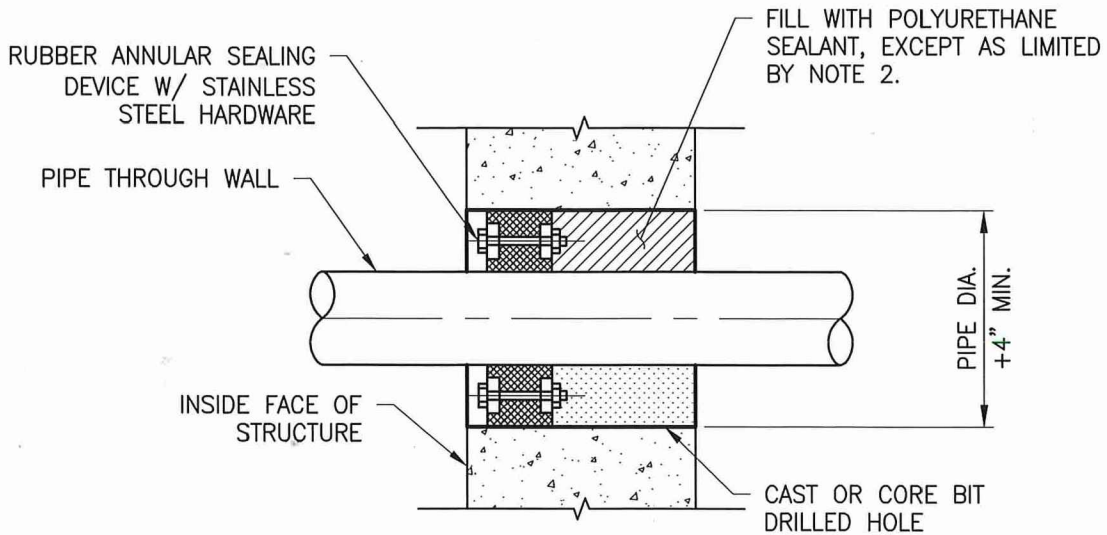
GENERAL MANAGER

DATE



**HIGHLANDS
MUTUAL WATER
COMPANY**

TITLE:			
UTILITY VAULT INSTALLATION			
SCALE:	DATE:	REV:	STANDARD DWG. NO.:
NONE	5/23	-	P-36



NOTES:

1. Opening thru vault wall shall be sized to accommodate pipe and rubber sealing device.
2. Buried application is shown. Where outside face of structure is above grade, fill the outside 2" of the sleeve with non-shrink grout.
3. See Approved Materials List for approved list of manufacturers.

APPROVED BY:
JEFF DAVIS

GENERAL MANAGER

DATE

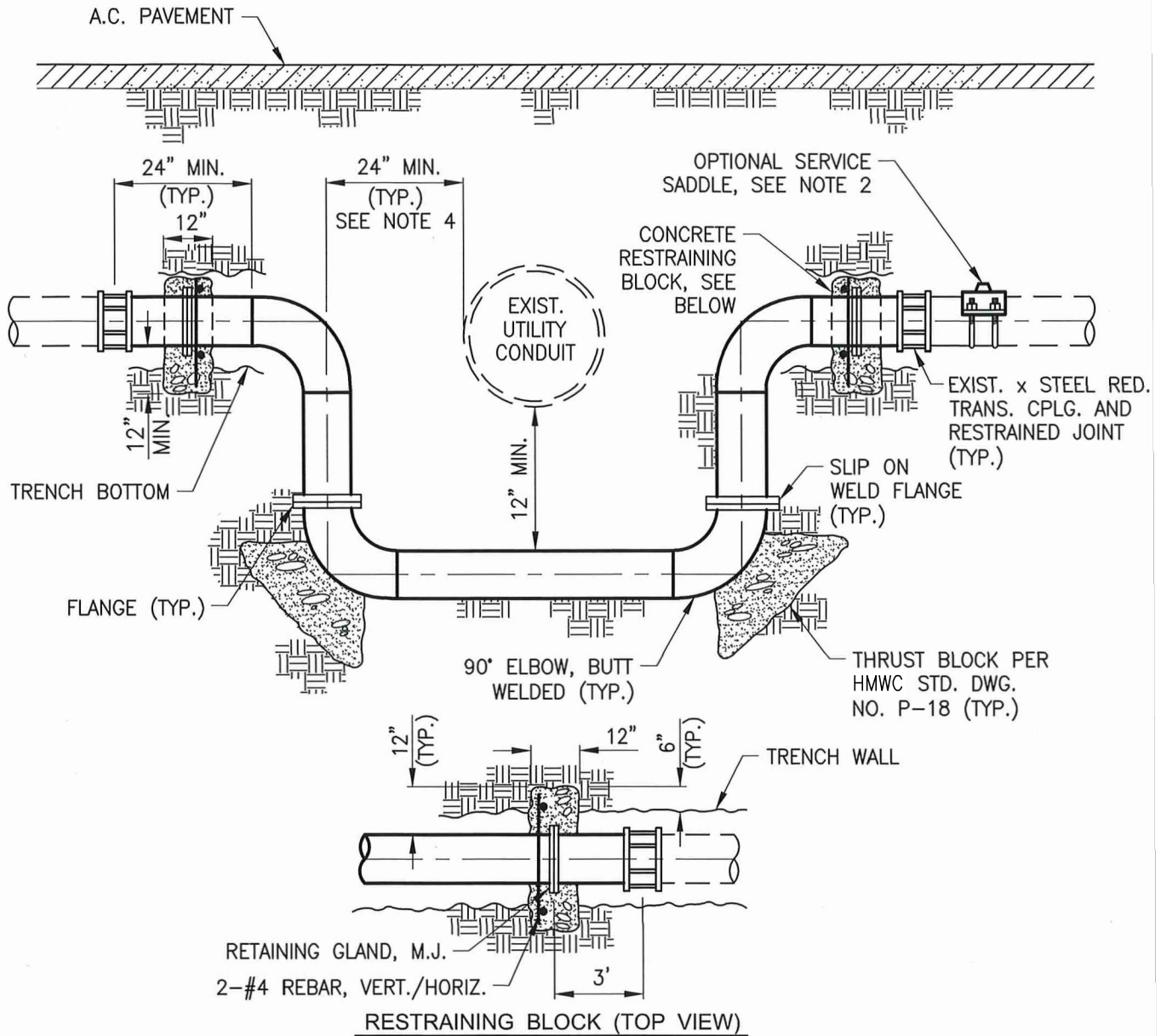


**HIGHLANDS
MUTUAL WATER
COMPANY**

TITLE:

**SEALING PIPE OPENING
- THRU VAULT**

SCALE: NONE	DATE: 6/23	REV -	STANDARD DWG. NO. P-37
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NOTES:

1. Pipe and fittings shall be standard weight steel, fusion bonded epoxy lined and coated per AWWA C550. All inverts shall be shop fabricated with exception of field installation of weld-on-flanges. Units shall provide 12" extra vertical length.
2. Service saddle shall be installed on the high points of the offset for the installation of combination air release vacuum relief valve, as shown on the plan. Service saddle shall be 1" on 8" and smaller mains, and 2" on larger existing mains.
3. If utility conduit is non-potable, minimum distance shall comply with Division of Drinking Water (DDW) Waterworks Standards and Std. Dwg. P-2
4. Trench backfill and bedding shall be as shown on Standard Drawing No. P-3 or as required by the local agency.

APPROVED BY:
JEFF DAVIS

GENERAL MANAGER

DATE

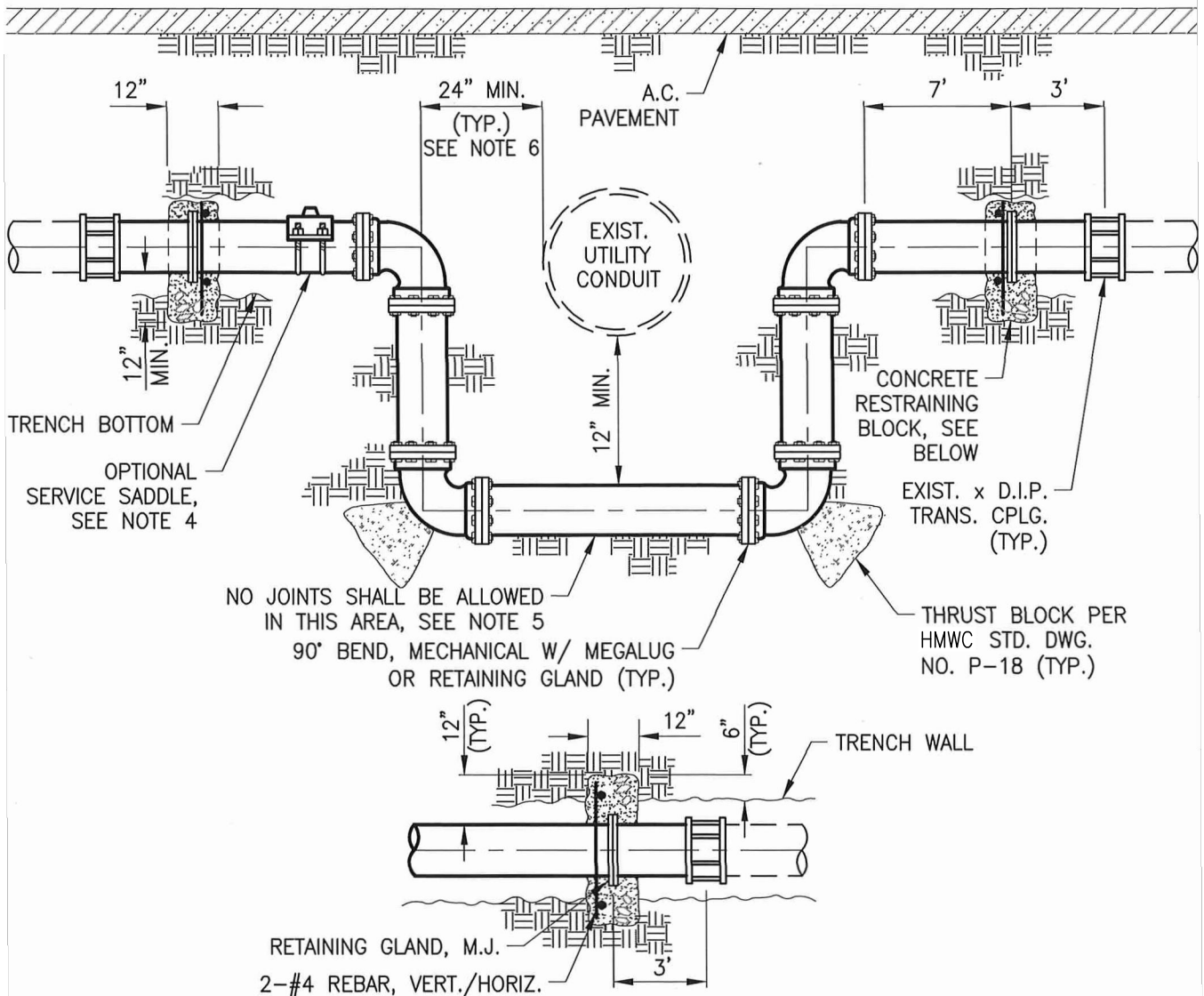


**HIGHLANDS
MUTUAL WATER
COMPANY**

TITLE:

**90-DEGREE WELDED STEEL
UTILITY INVERT**

SCALE:	DATE:	REV	STANDARD DWG. NO.
NONE	6/23	-	P-39



NOTES:

RESTRAINING BLOCK (TOP VIEW)

1. The concrete restraining blocks shall be a minimum of 24" high and 12" thick. The top of the block shall be no more than 6" above top of pipe.
2. All pipe joints at 90° bends shall be mechanical joint with Megalug or retaining gland. Flanged joints may be used where conditions warrant.
3. Installation shall be encased in a polyethylene wrapper per AWWA Standard C105.
4. Service saddle and combination air release vacuum relief valve shall be installed on the high points of the offset as shown or the plans. Service saddle shall be 1" on 8" and smaller existing mains and 2" on larger existing mains.
5. If bottom spool piece exceeds 18 feet, connect pipe sections with HMWC approved joint restraints.
6. If utility conduit is non-potable, minimum dimension shall comply with Division of Drinking Water (DDW) Waterworks Standards and Std. Dwg. P-2
7. Trench backfill and bedding shall be as shown on Standard Drawing No. P-3 or as required by the local agency.

APPROVED BY:
JEFF DAVIS

GENERAL MANAGER

DATE

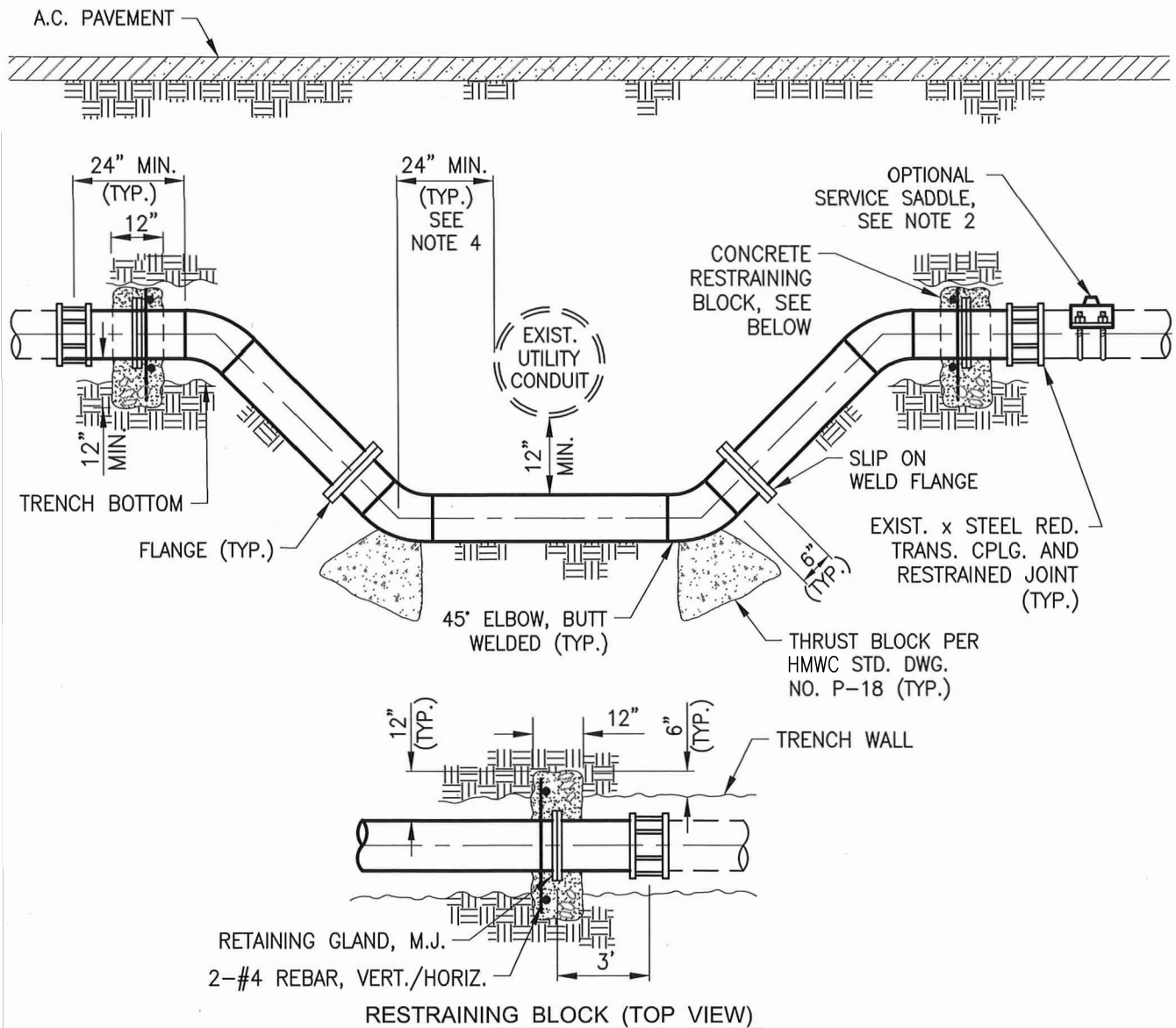


**HIGHLANDS
MUTUAL WATER
COMPANY**

TITLE:

**90-DEGREE MECHANICAL
JOINT D.I.P UTILITY INVERT**

SCALE: NONE	DATE: 6/23	REV: -	STANDARD DWG. NO. P-40
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NOTES:

1. Pipe and fittings shall be standard weight steel, fusion bonded epoxy lined and coated per AWWA C550. All inverts shall be shop fabricated with exception of field installation of weld-on-flanges. Units shall provide 12" extra vertical length.
2. Service saddle shall be installed on the high points of the offset for the installation of combination air release vacuum relief valve, as shown on the plan. Service saddle shall be 1" on 8" and smaller mains and 2" on larger existing mains.
3. If utility conduit is non-potable, minimum distance shall comply with Division of Drinking Water (DDW) Waterworks Standards and Std. Dwg. P-2
4. Trench backfill and bedding shall be as shown on Std. Dwg. No. P-3 or as required by the City of Clearlake

APPROVED BY:
JEFF DAVIS

GENERAL MANAGER

DATE

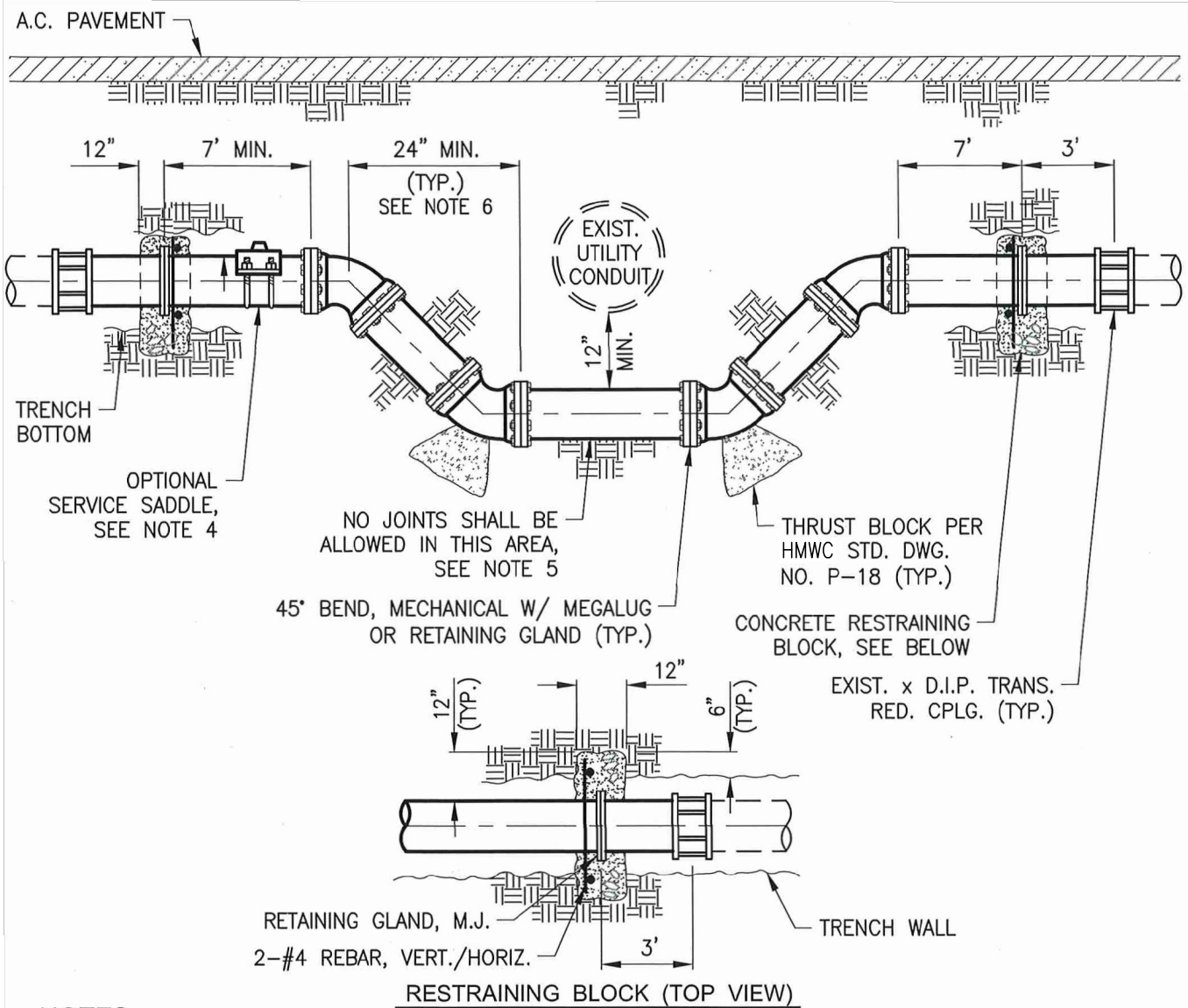


**HIGHLANDS
MUTUAL WATER
COMPANY**

TITLE:

**45-DEGREE WELDED STEEL
UTILITY INVERT**

SCALE: NONE	DATE: 6/23	REV: -	STANDARD DWG. NO. P-41
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NOTES:

1. The concrete restraining blocks shall be a minimum of 24" high and 12" thick. The top of the block shall be no more than 6" above top of pipe.
2. All pipe joints at 90° bends shall be mechanical joint with Megalug or retaining gland. Flanged joints may be used where conditions warrant.
3. Installation shall be encased in a polyethylene wrapper per AWWA Standard C105.
4. Service saddle and combination air release vacuum relief valve shall be installed on the high points of the offset as shown on the plans. Service saddle shall be 1" on 8" and smaller existing mains and 2" on larger existing mains.
5. If bottom spool piece exceeds 18 feet, connect pipe sections with HMWC approved joint restraints.
6. If utility conduit is non-potable, minimum dimension shall comply with Division of Drinking Water (DDW) I. Waterworks Standards and Std. Dwg. P-2
7. Trench backfill and bedding shall be as shown on Std. Dwg. No. P-3 or as required by the City of Clearlake

APPROVED BY:
JEFF DAVIS

GENERAL MANAGER

DATE

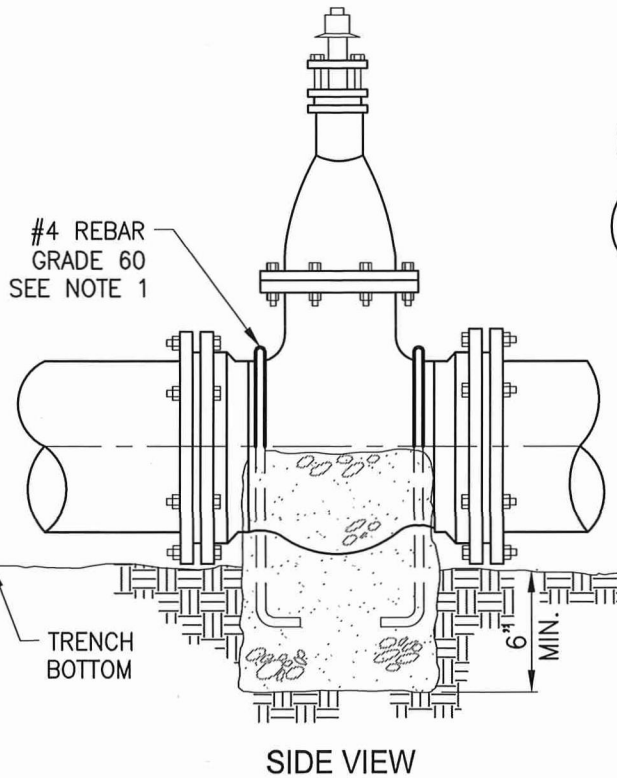
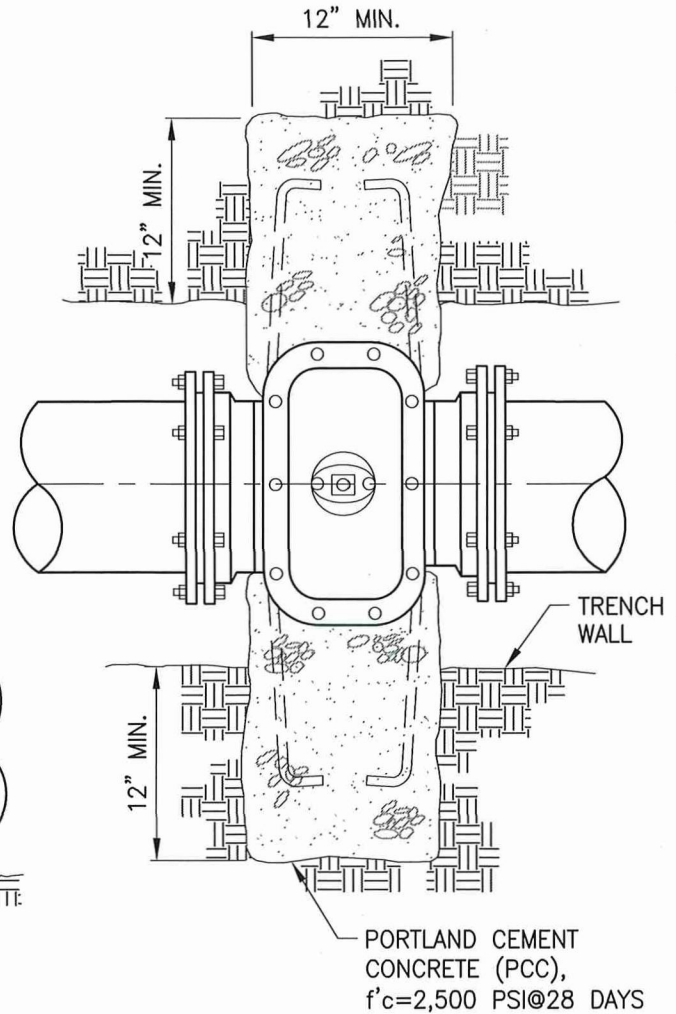
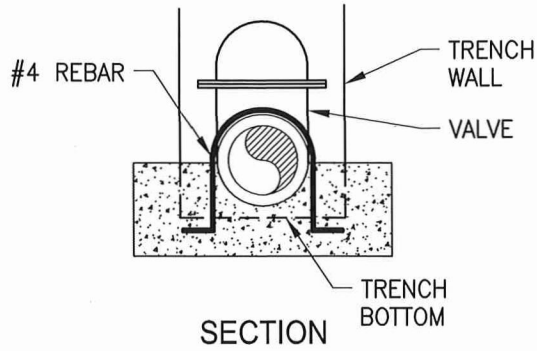


**HIGHLANDS
MUTUAL WATER
COMPANY**

TITLE:

**45-DEGREE MECHANICAL
JOINT D.I.P. UTILITY INVERT**

SCALE:	DATE:	REV	STANDARD DWG. NO.
NONE	6/23	-	P-42



NOTES:

1. All anchor rods are to be covered with 80 mils of bitumastic compound.
2. The anchor block shall be keyed no less than 12 inches into undisturbed soil of the trench wall and no less than 6 inches into the trench bottom.
3. Anchor block required only when valve is not flanged to a tee or cross.
4. Concrete shall be 2500 psi minimum with 3-inches minimum cover rebar. No concrete shall be poured on valve or joint.
5. Wrap exterior of valve, actuator and rebar with 8 mil polyethylene sheeting and tape.

APPROVED BY:
JEFF DAVIS

GENERAL MANAGER

DATE

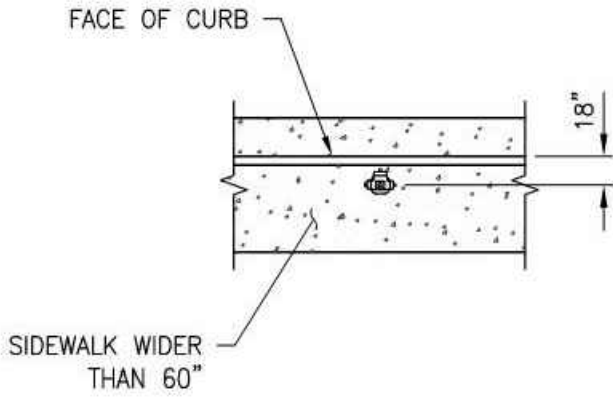


**HIGHLANDS
MUTUAL WATER
COMPANY**

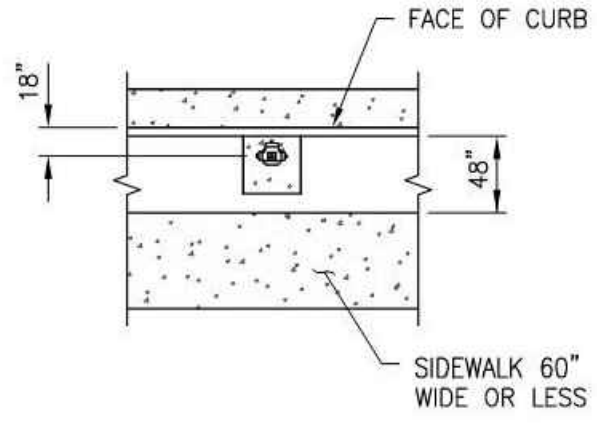
TITLE:

VALVE ANCHOR

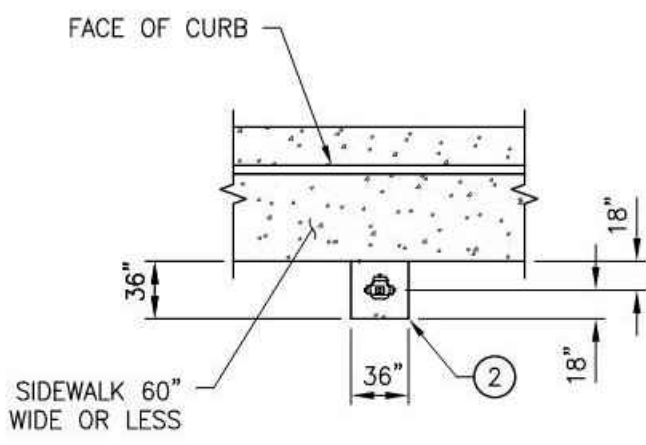
SCALE:	DATE:	REV:	STANDARD DWG. NO.
NONE	6/23	-	P-43



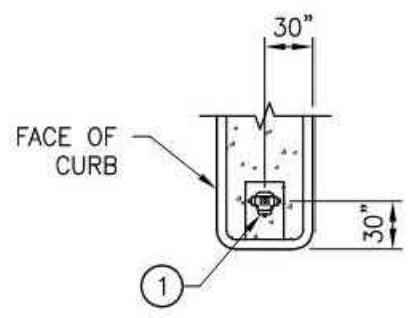
CONDITION 1
(IN THE SIDEWALK)



CONDITION 3
(IN THE PARKWAY)



CONDITION 2
(BEHIND THE SIDEWALK)



CONDITION 3
(IN THE PARKING LOT)

MATERIALS:

- ① Residential hydrant with (1) 4" and (1) 2 ½" fire hose outlets. Non-residential hydrant with (2) 4" and (1) 2 ½" fire hose outlets.
- ② Construct 48"x36"x6" thick or 36"x36"x6" thick concrete pad reinforced with W.W.M. 1.6x1.6.
- ③ See Std. Dwg. No. P-8 and P-9 for fire hydrant details.

APPROVED BY:
JEFF DAVIS

GENERAL MANAGER

DATE

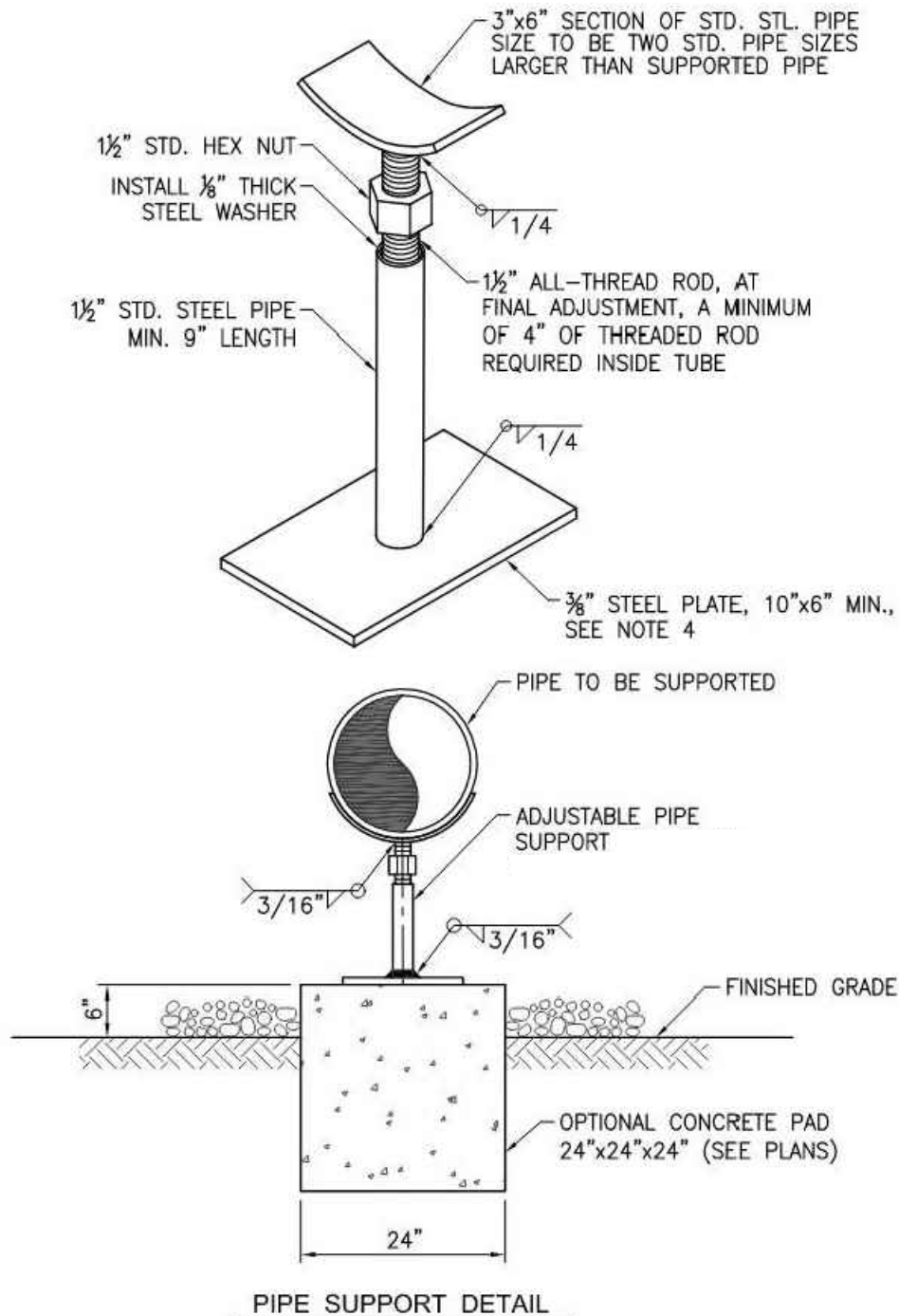


**HIGHLANDS
MUTUAL WATER
COMPANY**

TITLE:

**TYPICAL
FIRE HYDRANT LAYOUT**

SCALE: NONE	DATE: 6/23	REV: -	STANDARD DWG. NO. P-44
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NOTES:

1. Pipe supports shall be painted and coated in accordance with the HMWC standard paint specifications. Color to match piping.
2. All threaded areas shall be coated with "never-seize" or other equivalent anti-rust lubricant.
3. Support to be installed under all valves and at 10 foot maximum spacing.
4. Steel plate can be attached to a concrete pad if necessary using wedge type anchor bolts designed for use in concrete. Anchor bolts shall be installed at least 2" into concrete and be 1/2" diameter x 3" long to allow for a washer and nut on the end. Bolt, washer and nut shall be galvanized for corrosion protection.

APPROVED BY:
JEFF DAVIS

GENERAL MANAGER

DATE

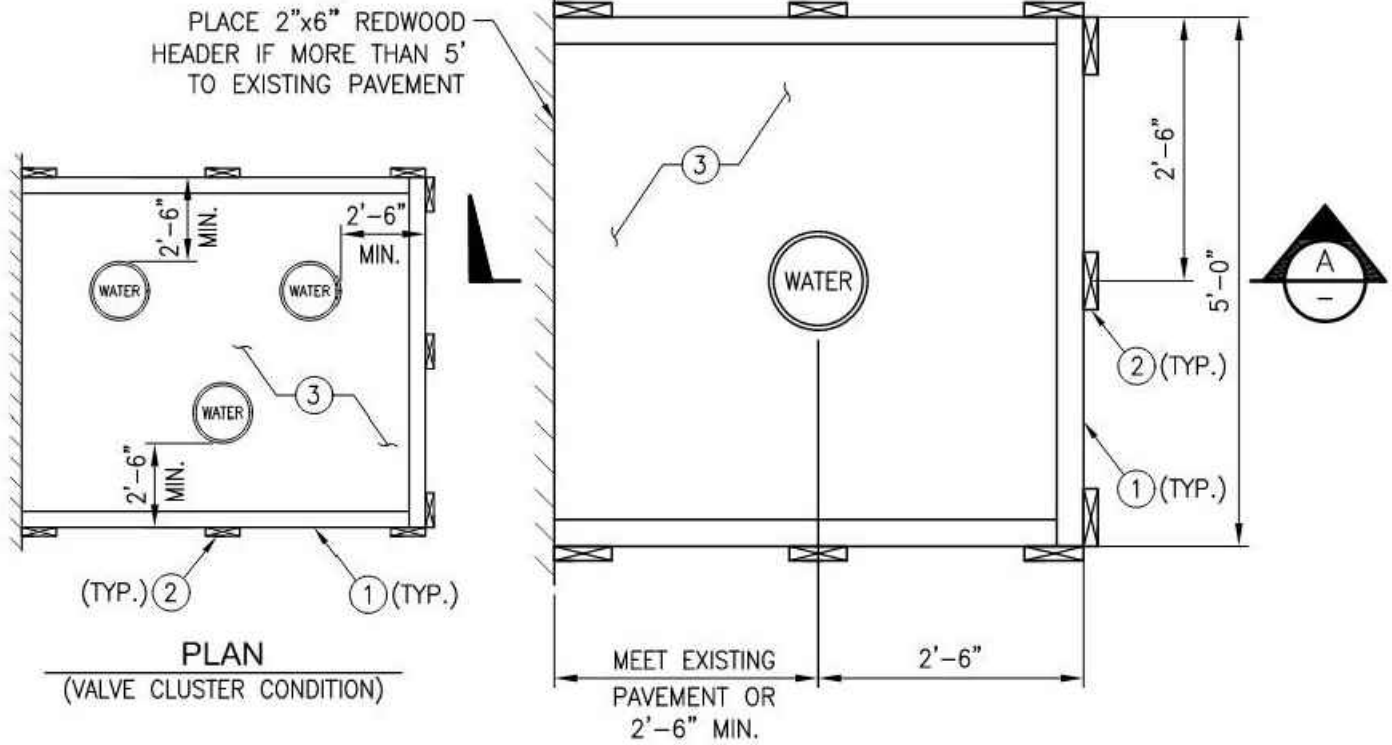


**HIGHLANDS
MUTUAL WATER
COMPANY**

TITLE:

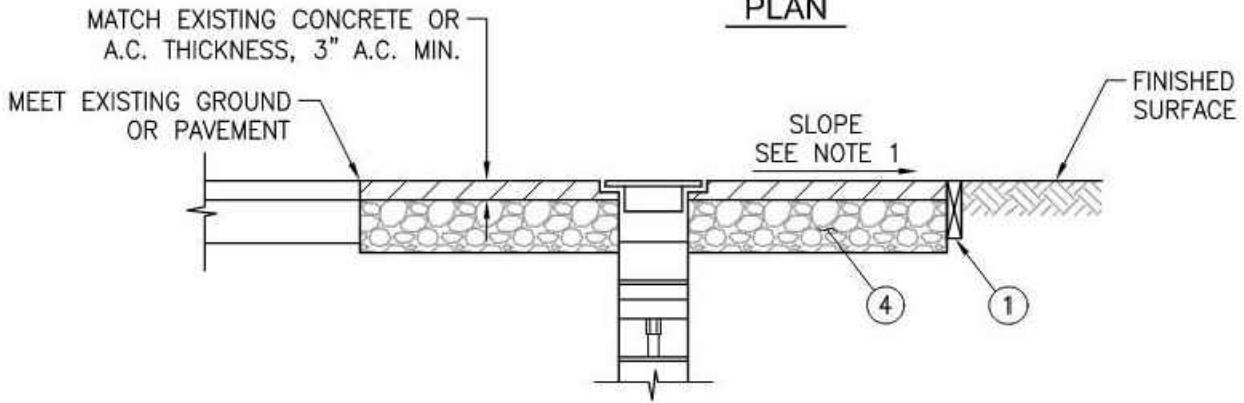
**ADJUSTABLE PIPE
SUPPORT**

SCALE: NONE	DATE: 6/23	REV: -	STANDARD DWG. NO. P-45
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PLAN
(VALVE CLUSTER CONDITION)

PLAN



SECTION A

NOTE:

1. Slope will conform to City of Clearlake road improvement standards and specifications, or meet existing condition as directed by city engineer. Pad shall be sloped away from valve lid.
2. Valves located in landscaped areas shall have a 2'x2' concrete pad installed around each valve.
3. AC or concrete pad.

ITEM	DESCRIPTION
①	2"x6" redwood headers
②	2"x4"x18" stakes (3 per side) at 30" O.C.
③	Area to be paved
④	6" of ¾" Class 2 A.B.

APPROVED BY:
JEFF DAVIS

GENERAL MANAGER

DATE

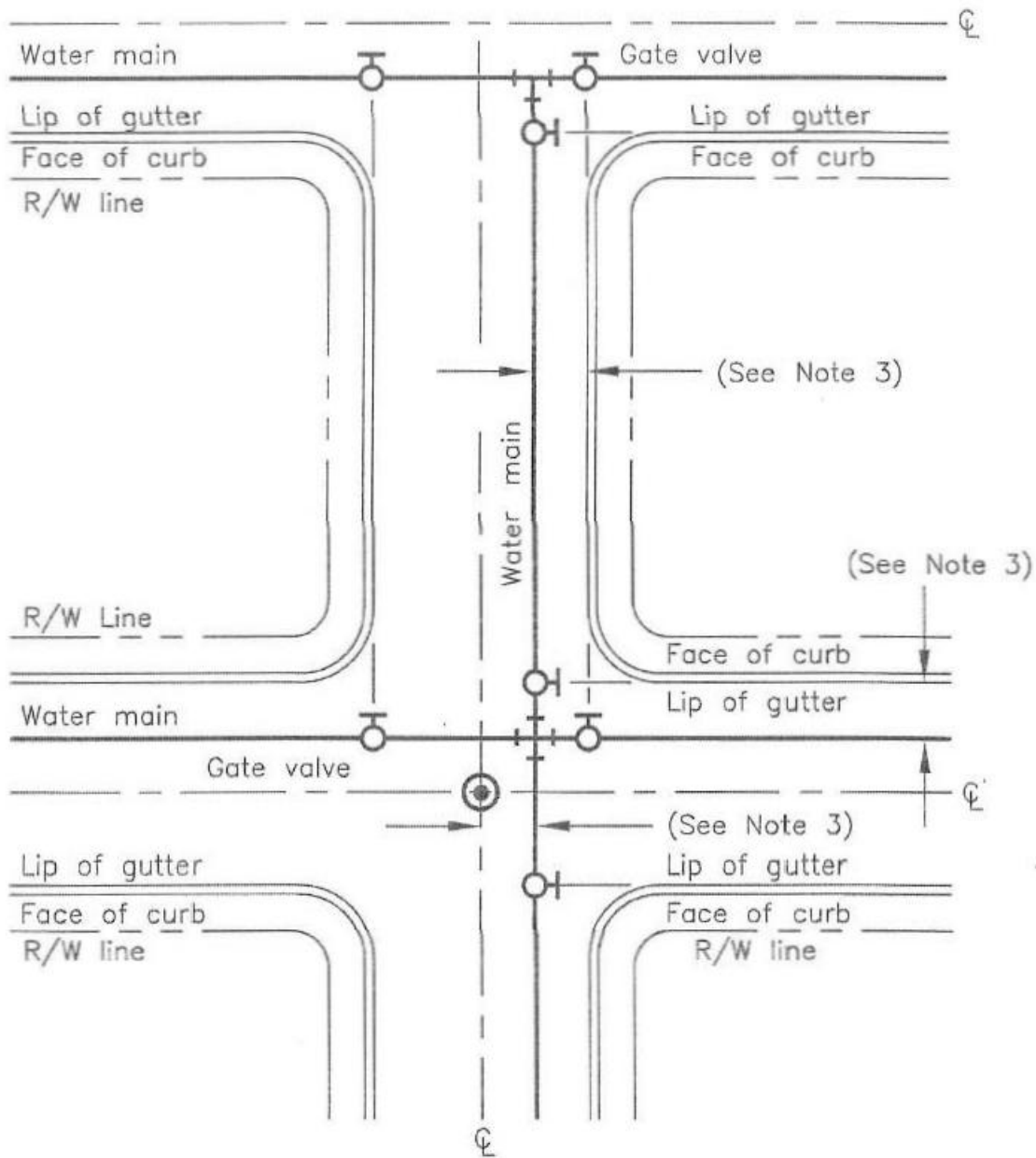


**HIGHLANDS
MUTUAL WATER
COMPANY**

TITLE:

**PAVING AROUND VALVES
(NOT IN THE PAVEMENT)**

SCALE: NONE	DATE: 6/23	REV: -	STANDARD DWG. NO. P-46
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NOTES

1. Water mains shall be located parallel to street centerlines unless conflicts with other underground facilities cannot be avoided.
2. Non-standard alignments must be approved by Highlands Mutual Water Company prior to installation. Mainline valves, except hydrant valves and tapping valves, shall be on face of curb extended where feasible.
3. Install mains with constant alignment whenever possible, minimums from nearest outside edge of pipe are; 3' to lip of gutter; 4' to centerline of monuments; and 5' to outside edge of structures such as manholes.

APPROVED BY:
JEFF DAVIS

GENERAL MANAGER

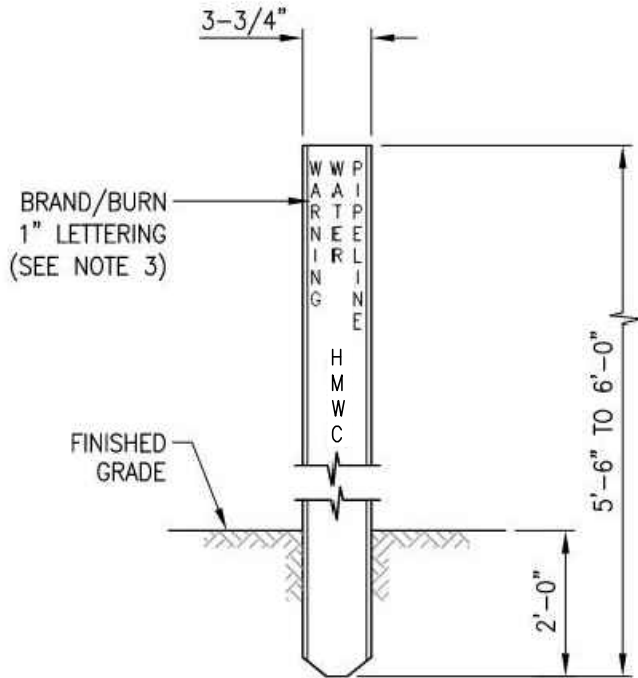
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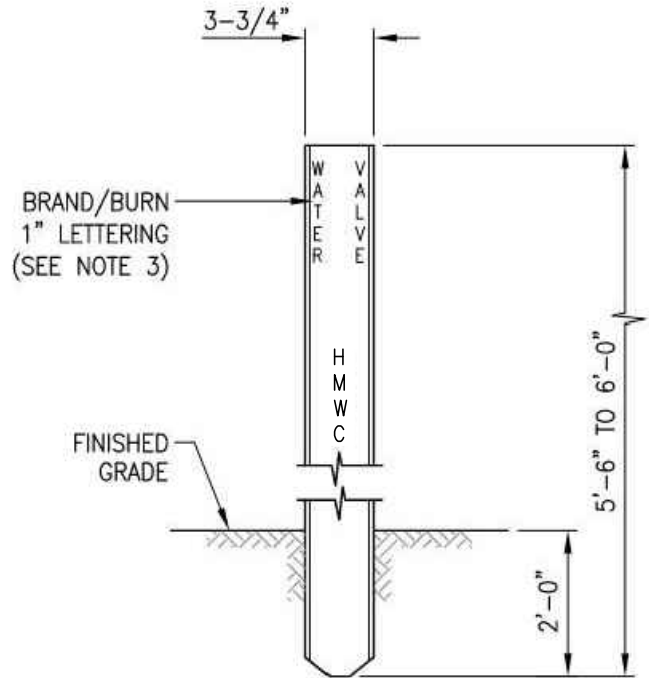
**HIGHLANDS
MUTUAL WATER
COMPANY**

TITLE:
**ALIGNMENT OF WATER
MAINS AND PLACEMENT
OF MAINLINE VALVES**

SCALE: NONE	DATE: 6/23	REV: -	STANDARD DWG. NO. P-47
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**MARKER POST
PIPELINE MARKER**



**MARKER POST
VALVE MARKER**

NOTES:

1. Waterline marker post shall be installed where called for on the plans or as directed by the engineer. Spacing shall be approximately 200' between markers, curved alignments less than 800' in length shall have a minimum of four markers to define the curve.
2. Waterline marker post shall be installed 12" to the south and west of the utility.
3. Marker shall incorporate 1" high lettering branded/burned into paddle. Lettering shall include HMWC along with the utility identified. The color of the paddle shall be blue.
4. Lettering shall be white.
5. On back of marker write: "Call HMWC at (707)-994-2393" and "Before digging in this area call 811".

APPROVED BY:
JEFF DAVIS

GENERAL MANAGER

DATE

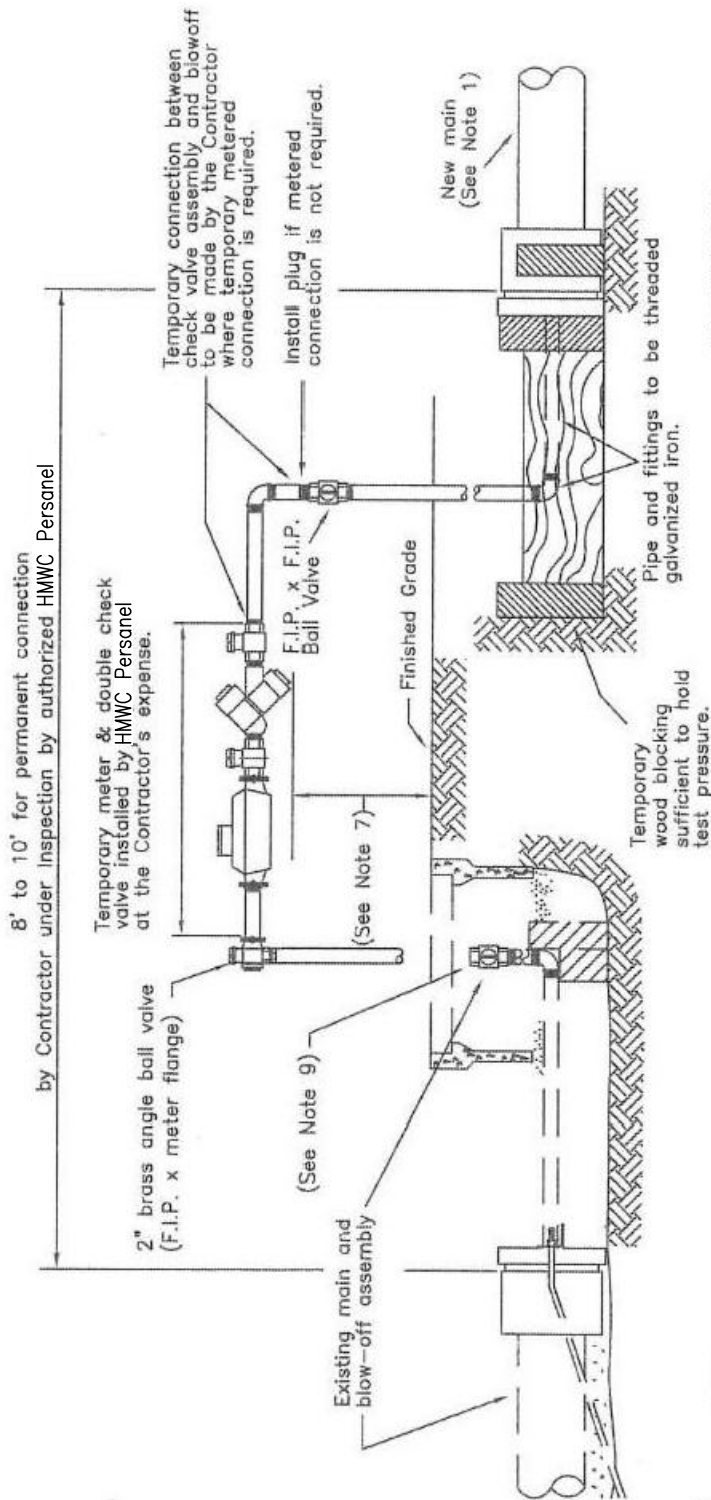


**HIGHLANDS
MUTUAL WATER
COMPANY**

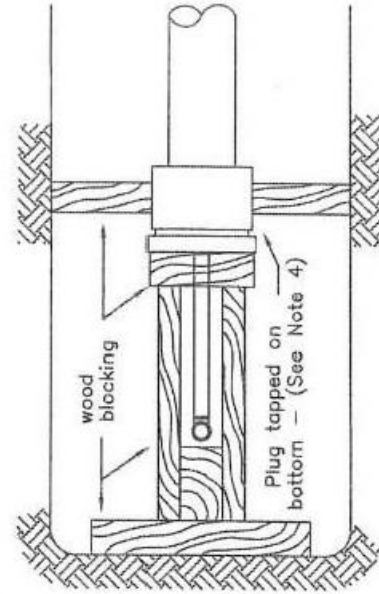
TITLE:

**WATERLINE MARKER POST
INSTALLATION**

SCALE: NONE	DATE: 6/23	REV: -	STANDARD DWG. NO. P-48
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ELEVATION



PLAN

NOTES:

1. End of new main to be on same line and grade as existing where feasible.
2. Wood blocking to be used for thrust produced by test pressure plus 50 P.S.I.
3. Safe bearing load of soil for horizontal thrust shall not be exceeded.
4. Contact HMWC for blowoff size requirements
5. The Contractor shall make the final tie-in under the inspection of a representative. Inspection fees shall be paid prior to scheduling tie-in
6. Should the blowoff on the existing main be located out of the traveled way as indicated on Std. P-11, the temporary blowoff piping shall be extended out of the traveled way and the risers, meter, and check valve will be installed out of the traveled way.
7. Clearance to be 12" min. above finished grade or 6" above the inundation level, whichever is higher.
8. This installation is not acceptable when combustible material is stored on site or construction above grade begins.
9. If blow off is 3", install 3" x 2" reducer.

APPROVED BY:
JEFF DAVIS

GENERAL MANAGER

DATE



**HIGHLANDS
MUTUAL WATER
COMPANY**

**TITLE:
TEMPORARY BLOWOFF AND/OR
METERED CONNECTION FOR
MAINS UNDER CONSTRUCTION**

SCALE: NONE	DATE: 6/23	REV: -	STANDARD DWG. NO. P-49
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HIGHLANDS MUTUAL WATER COMPANY
 CONSTRUCTION GENERAL NOTES
 (REQUIRED ON ALL PLANS)

GENERAL NOTES

1. THE EXISTING UNDERGROUND UTILITIES ARE PLOTTED FROM AVAILABLE RECORDS. THE CONTRACTOR SHALL PROTECT THESE EXISTING UTILITIES AND SHALL DO NO EXCAVATION UNTIL ALL UTILITY AGENCIES HAVE MARKED THEIR FACILITIES IN THE FIELD. CALL UNDERGROUND SERVICE ALERT (48 HOURS NOTICE REQUIRED) (800) 227-2600 OR 811.
2. THE LOCATIONS OF ALL EXISTING UTILITIES OR OTHER UNDERGROUND OBSTRUCTIONS SHOWN ON THE PLANS ARE APPROXIMATE ONLY AND SHOULD NOT BE TAKEN AS FINAL OR ALL INCLUSIVE. THE CONTRACTOR IS CAUTIONED THAT THE PLANS MAY NOT INCLUDE THE LOCATION OF ALL UNDERGROUND OBSTRUCTIONS WHICH MAY BE ENCOUNTERED.
3. PRIOR TO CONSTRUCTION OF ANY UNDERGROUND UTILITIES, INCLUDING WATER, SEWER AND STORM DRAINS, THE CONTRACTOR SHALL EXPOSE ALL EXISTING UTILITY FACILITIES WHICH ARE TO BE CONNECTED TO OR CROSSED AND THE ENGINEER SHALL VERIFY THEIR GRADE.
4. THE CONTRACTOR SHALL NOT OPERATE ANY MAIN LINE WATER VALVES. SUCH VALVES SHALL BE OPERATED BY THE HIGHLANDS MUTUAL WATER COMPANY PERSONNEL ONLY OR AS DIRECTED.
5. CONTRACTOR SHALL OBTAIN AN ENCROACHMENT PERMIT FROM THE CITY OF CLEARLAKE AND PROVIDE THE HIGHLANDS MUTUAL WATER COMPANY WITH AN APPROVED COPY, INCLUDING ALL OTHER RELATED INFORMATION, BEFORE ANY WATER FACILITY WORK SHALL COMMENCE.
6. ALL WATER SYSTEM WORK SHALL CONFORM TO THE STANDARDS OF THE HIGHLANDS MUTUAL WATER COMPANY. CONTRACTOR SHALL CONTACT THE HIGHLAND MUTUAL WATER COMPANY (707-994-8201) 72 HOURS PRIOR TO COMMENCEMENT OF CONSTRUCTION TO ARRANGE FOR A PRE-CONSTRUCTION MEETING AND INSPECTION, AS ALL WATER MAIN CONSTRUCTION MUST BE INSPECTED BY THE HIGHLANDS MUTUAL WATER COMPANY. IN THE EVENT OF ANY BREAKS IN THE CONSTRUCTION PROCESS, CONTRACTOR SHALL CONTACT HIGHLANDS MUTUAL WATER COMPANY 24 HOURS PRIOR TO RECOMMENCEMENT OF CONSTRUCTION.
7. CONSTRUCTION OF WATER FACILITIES SHALL CONFORM TO THE WATER DISTRIBUTION SYSTEM CONSTRUCTION STANDARD SPECIFICATIONS OF THE HIGHLANDS MUTUAL WATER COMPANY, INCLUDING STANDARD PLANS.
8. CONTRACTOR, WHEN APPLYING FOR ENCROACHMENT PERMIT WITH CALTRANS, SHALL INDICATE ON THE PERMIT THAT THE HIGHLANDS MUTUAL WATER COMPANY WILL BE OWNER OF THE WATER FACILITIES AFTER THEY ARE CONVEYED TO THE WATER COMPANY.
9. CONTRACTOR SHALL OBTAIN ALL PERMITS AND PAY ALL FEES TO ALL RELATED AGENCIES PRIOR TO COMMENCEMENT OF ANY WORK.
10. WATER CONSTRUCTION, TESTING, CLEANING, AND DISINFECTION SHALL BE SUBJECT TO INSPECTION AND APPROVAL OF THE HIGHLANDS MUTUAL WATER COMPANY. PRESSURE / LEAKAGE TESTS SHALL NOT BE MADE UNTIL A MINIMUM 72 HOURS AFTER THE LAST THRUST BLOCK HAS BEEN POURED.
11. ALL FLUSHING, TESTING AND DISINFECTION OF WATER MAINS SHALL BE COMPLETED PRIOR TO CONNECTING TO EXISTING WATER MAINS.
12. CONTRACTOR SHALL PROVIDE HIGHLANDS MUTUAL WATER COMPANY REPRESENTATIVES WITH A VALID COPY OF A "CALIFORNIA DIVISION OF INDUSTRIAL SAFETY PERMIT" FOR THE PROJECT.
13. CONSTRUCTION OF WATER FACILITIES SHALL BE IN COMPLIANCE WITH BASIC SEPARATION STANDARDS "CALIFORNIA WATERWORKS STANDARDS" CONTAINED IN SECTION 64630, TITLE 22, CALIFORNIA ADMINISTRATIVE CODE.
14. MINIMUM DEPTH OF COVER FROM FINISHED GRADE, EXCEPT AS NOTED ON PLANS, SHALL BE: 36" FOR 6" MAINS, 36" FOR 8" MAINS, 44" FOR 12" MAINS, AND 48" FOR 16" AND LARGER MAINS. 4" AND 10" MAINS MUST BE SPECIFICALLY APPROVED BY THE HIGHLANDS MUTUAL WATER COMPANY. 6" AND 8" MAIN LINE VALVES SHALL BE RESILIENT SEAT GATE VALVES WITH TOTALLY ENCAPSULATED GATE. 12" AND LARGER MAIN LINE VALVES SHALL BE BUTTERFLY VALVES. BLOW-OFF SPECIFIED ON THE IMPROVEMENT PLANS.
15. NO. 10 AWG SOLID COPPER WIRE SHALL BE LAID ON TOP OF AND ALONG ENTIRE LENGTH OF ALL NON METALLIC MAINS, AND SHALL BE EXTENDED TO THE SURFACE AT ALL VALVE LOCATIONS, BLOWOFFS AND METER BOXES SUFFICIENTLY FOR LOCATOR EQUIPMENT TO BE ATTACHED. WIRE TO BE AFFIXED TO TOP OF PIPE SO AS NOT TO BE DISPLACED BY BACKFILLING PROCEDURE. AFFIX THE WIRE TO THE TOP OF THE PIPE WITH DUCT TAPE AT APPROXIMATELY 5 FEET INTERVALS. WHERE SPlicing OF THE TRACER WIRE IS REQUIRED, ONLY WATERTIGHT CONNECTORS SHALL BE USED AND SHALL BE EITHER COPPERHEAD SNAKEBITE, 3M DBR, OR APPROVED EQUIVALENT.
16. ALL EXPOSED BOLTS INSTALLED UNDERGROUND SHALL BE STAINLESS STEEL OR STEEL COATED WITH BITUMASTIC PAINT OR PERMATAX SPRAY-ON HEAVY DUTY REUBERIZED UNDERCOATING OR AN APPROVED EQUIVALENT. THIS INCLUDES, BUT IS NOT LIMITED TO, FLANGE AND FLEXIBLE COUPLING BOLTS.

SHEET 1 OF 3

APPROVED BY: JEFF DAVIS _____ GENERAL MANAGER	 <p style="text-align: center;">HIGHLANDS MUTUAL WATER COMPANY</p>	TITLE: <p style="text-align: center;">CONSTRUCTION GENERAL NOTES</p> <table border="1" data-bbox="1063 1942 1550 2016"> <tr> <td>SCALE:</td> <td>DATE:</td> <td>REV</td> <td>STANDARD DWG. NO.</td> </tr> <tr> <td>NONE</td> <td>6/23</td> <td>-</td> <td>P-50</td> </tr> </table>	SCALE:	DATE:	REV	STANDARD DWG. NO.	NONE	6/23	-	P-50
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HIGHLANDS MUTUAL WATER COMPANY
 CONSTRUCTION GENERAL NOTES
 (REQUIRED ON ALL PLANS)

GENERAL NOTES (CONTINUED)

17. THERE SHALL BE NO UNMETERED CONNECTIONS TO THE HIGHLANDS MUTUAL WATER COMPANY SYSTEM INCLUDING CONNECTIONS BYPASSING METER FOR TESTING ON-SITE PLUMBING OR FOR OBTAINING CONSTRUCTION WATER. PRESSURE TESTING AGAINST VALVES WILL ALSO NOT BE ALLOWED. WHEN A SUBDIVISION WATER MAIN HAS BEEN ACCEPTED AND TIED-IN, THE INDIVIDUAL CURB STOPS WILL BE LOCKED OFF WITH CABLE TIES. CUTTING OFF OR TAMPERING WITH THE CABLE TIES WILL CONSTITUTE A STRAIGHT TIE-IN CONNECTION. SUCH CONNECTIONS SHALL BE SEVERED BY THE DISTRICT AND WILL RESULT IN PENALTIES INCLUDING PAYMENT OF FINES AND ESTIMATED WATER USAGE FEES.
18. SERVICE LATERALS OTHER THAN THOSE SHOWN OR NOTED ON THE PLANS SHALL NOT BE INSTALLED PRIOR TO OBTAINING HIGHLANDS MUTUAL WATER COMPANY APPROVAL.
19. WATER AND SEWER SERVICE LATERALS SHALL BE SEPARATED HORIZONTALLY BY A MINIMUM OF 10 FEET.
20. METER MANIFOLDS MUST BE DETAILED AND APPROVED BY HIGHLANDS MUTUAL WATER COMPANY. IN GENERAL, MANIFOLDS WHERE ALL FITTINGS ARE 2" OR LESS, SHALL BE CONSTRUCTED FROM THREADED BRASS PIPE AND FITTINGS FROM THE END OF THE SERVICE LATERAL TO THE METER CONNECTION. NO PLASTIC PIPE SHALL BE USED IN CONSTRUCTION MANIFOLDS OF ANY SIZE. NO MORE THAN SIX METERS MAY BE MANIFOLDED OFF A SINGLE WATER SERVICE LATERAL, WITH NO MORE THAN 3 ON EITHER SIDE OF THE SERVICE.
21. ALL METER BOXES, VAULTS AND PITS SHALL BE BEDDED ON 6" MINIMUM THICK, 3/4" DRAIN ROCK BED AGAINST COMPACTED OR UNDISTURBED BASE. THE GRAVEL BED SHALL EXTEND TO 4" MINIMUM BEYOND ALL SIDES OF THE METER BOX. BOX SHALL BE SET FLUSH WITH TOP OF CURB, SIDEWALK OR GROUND, WHICHEVER IS APPLICABLE. LOT NUMBERS MUST BE NOTED ON TOP SIDE OF METER BOX WITH PERMANENT MARKING PEN.
22. CONTRACTOR AGREES THAT HE SHALL ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOB SITE CONDITIONS DURING THE COURSE OF CONSTRUCTION OF THIS PROJECT, INCLUDING SAFETY OF ALL PERSONS AND PROPERTY; THAT THIS REQUIREMENT SHALL APPLY CONTINUOUSLY AND SHALL NOT BE LIMITED TO NORMAL WORKING HOURS, AND THAT THE CONTRACTOR SHALL DEFEND, INDEMNIFY AND HOLD HIGHLANDS MUTUAL WATER COMPANY AND THE ENGINEER HARMLESS FROM ANY AND ALL LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF WORK ON THE PROJECT, EXCEPTING FOR LIABILITY ARISING FROM THE SOLE NEGLIGENCE OF THE HIGHLANDS MUTUAL WATER COMPANY AND THE ENGINEER.
23. TREES SHALL NOT BE REMOVED, UNLESS OTHERWISE SHOWN, WITHOUT AUTHORIZATION BY HIGHLANDS MUTUAL WATER COMPANY AND THE CITY OF CLEARLAKE. ROOTS LARGER THAN 2 INCHES IN DIAMETER SHALL NOT BE CUT; TUNNELING UNDER LARGE ROOTS MAY BE REQUIRED. DAMAGE TO LIMBS, TRUNKS OR ROOTS SHALL BE REPAIRED BY QUALIFIED PERSONNEL.
25. WATER MAINS SHALL BE INSTALLED IN STRAIGHT ALIGNMENTS BETWEEN FITTINGS. CURVED MAINS SHALL REQUIRE PRIOR HIGHLAND MUTUAL WATER COMPANY APPROVAL. THE RADIUS OF CURVED MAINS SHALL NOT EXCEED THE PIPE MANUFACTURER'S RECOMMENDED LIMITS. FITTING SHALL BE REQUIRED WHERE THE RADIUS EXCEEDS THE LIMITS, OR IF PRIOR DISTRICT APPROVAL FOR CURVED MAINS WAS NOT OBTAINED.
26. APPROVAL OF THE PLANS BY CITY OF CLEARLAKE AND OR THE COUNTY OF LAKE DOES NOT CONSTITUTE APPROVAL OF PLANS BY HIGHLANDS WATER COMPANY.
27. THE CITY OF CLEARLAKE REQUIRES THAT TO WORK WITH IN THE THE CITY THAT CONTRACTORS ACQUIRE A CITY BUSINESS LICENCE. CITY PHONE NUMBER (707) 994-8201
28. HIGHLANDS MUTUAL WATER COMPANY RESPONSIBILITY ENDS AT THE OUTLET OF THE WATER METER.
29. THE PROPERTY OWNER IS RESPONSIBLE FOR THE BACKFLOW DEVICE AND ITS SUPPLY LINE.
30. HIGHLANDS MUTUAL WATER COMPANY RESPONSIBILITY ENDS AT THE VALVE ON THE WATER MAIN FOR FIRE PROTECTION SERVICES.
31. HIGHLANDS MUTUAL WATER COMPANY MARKING OF UNDERGROUND FACILITIES SHALL BE CONSIDERED TO BE WITHIN 2 FEET (24 INCHES) OF EITHER SIDE OF THE MARKING.
32. CONTRACTOR IS TO SUPPLY VACUUM EQUIPMENT ONLY TO POT HOLE WHEN REQUIRED TO LOCATE LINES AND MAINS.
33. TRAFFIC CONTROL SHALL BE TO STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION TRAFFIC CONTROL SYSTEM FOR LANE CLOSURE, STANDARD PLANS, ACCORDING TO ROAD TYPE.
34. THE CITY OF CLEARLAKE AND THE LAKE COUNTY FIRE PROTECTION DISTRICT SHALL BE KEPT INFORMED ON THE LOCATION OF WORK AND TRAFFIC CONTROL STATUS.

APPROVED BY: JEFF DAVIS _____ GENERAL MANAGER	 <p style="text-align: center;">HIGHLANDS MUTUAL WATER COMPANY</p>	TITLE: <p style="text-align: center;">CONSTRUCTION GENERAL NOTES</p> <table border="1" data-bbox="1063 1942 1542 2016"> <tr> <td>SCALE:</td> <td>DATE:</td> <td>REV</td> <td>STANDARD DWG. NO.</td> </tr> <tr> <td>NONE</td> <td>6/23</td> <td>-</td> <td>P-50</td> </tr> </table>	SCALE:	DATE:	REV	STANDARD DWG. NO.	NONE	6/23	-	P-50
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HIGHLANDS MUTUAL WATER COMPANY
 CONSTRUCTION GENERAL NOTES
 (REQUIRED ON ALL PLANS)

GENERAL NOTES (CONTINUED)

35. INSPECTION OF FACILITIES:
 1. HIGHLANDS MUTUAL WATER COMPANY WILL INSPECT ALL MATERIAL BEFORE COMMENCEMENT OF WORK.
 2. HIGHLANDS MUTUAL WATER COMPANY WILL INSPECT ALL FACILITIES BEFORE BEING COVERED.
 3. HIGHLANDS MUTUAL WATER COMPANY REQUIRES 48 HOURS ADVANCE NOTICE FOR INSPECTION OF HIGHLANDS MUTUAL WATER COMPANY FACILITIES
 4. INSPECTION OF FACILITIES BY HIGHLANDS WATER COMPANY IS NOT DONE IN WEEKENDS.
 5. DISTRIBUTION SYSTEM SHUTDOWNS AND OTHER ITEMS THAT REQUIRE THE PARTICIPATION OF HIGHLANDS WATER COMPANY ARE NOT TO BE DONE ON WEEKENDS. FRIDAY'S OR THE DAY BEFORE A HOLIDAY.
36. LOCATING OF UTILITY FACILITIES:
 1. CONTRACTOR SHALL VERIFY ALL UTILITY LOCATIONS BEFORE COMMENCEMENT OF WORK, BY CALLING UNDERGROUND SERVICE ALERT (USA) AT (800) 642-2444
 2. USA REQUEST FOR UTILITY LOCATION MUST ALLOW 48 HOURS DURING THE NORMAL WORKWEEK FOR MARKING UTILITIES.
36. DISTRIBUTION SYSTEM SHUTDOWNS AND OTHER ITEMS THAT REQUIRE PARTICIPATION OF HIGHLANDS MUTUAL WATER COMPANY
 1. TWO WEEKS NOTICE IS REQUIRED OF WORK THAT REQUIRES PARTICIPATION OF HIGHLANDS MUTUAL WATER COMPANY.
 2. HIGHLANDS WATER COMPANY MUST INSPECT ALL PROJECT MATERIAL 48 HOURS PRIOR TO JOB.
37. EXCEPT WHERE NOTED IN THIS, DOCUMENTS SPECIFICATIONS AND MATERIALS WILL CONFORM TO AWWA AND CALIFORNIA STATE DEPARTMENT OF HEALTH SPECIFICATIONS.
38. INSTALLATION OF UNDERGROUND FACILITIES, FILL MATERIALS AND COMPACTION
 1. FILL MATERIAL
 - A) RED SAND IS USED AS BEDDING AROUND WATER LINES AND MAINS.
 - B) RED SAND IS PLACED 6" UNDER AND 12" OVER WATER MAINS,
 - C) COMPACTION OF THE RED SAND IS REQUIRED BEFORE CLASS 2 GRAY BASE IS ADDED. NO JETTING.
 - D) CALTRANS CLASS 2 GRAY BASE AS FILL OVER THE BEDDING SAND
 2. COMPACTION OF FILL
 - A) COMPACTION REQUIREMENTS AND TESTING SHALL BE TO THE CITY OF CLEARLAKE SPECIFICATIONS.
 - B) IF THE CITY PERMITS USE OF NATIVE FILL SCREENING IS REQUIRED, SO THAT THERE SHALL BE NO MATERIAL OVER 2" IN DIAMETER IN THE FILL
39. THE DEVELOPER WILL PROVIDE PROPERTY BOUNDARIES AND GRAD FOR METER PLACEMENT.
40. THE LOCATION OF METER PLACEMENT IS DETERMINED BY HIGHLANDS MUTUAL WATER COMPANY.
41. HIGHLANDS MUTUAL WATER COMPANY SUPPLIES THE WATER METERS FOR ALL NEW CONNECTIONS.
42. HIGHLANDS MUTUAL WATER COMPANY INSTALLS SINGLE 5/8" METER SERVICES FOR TIME AND MATERIALS.
43. INSTALLATION OF TWO OR MORE METERS AND ALL METER SERVICES 3/4" AND OVER IS THE RESPONSIBILITY OF THE DEVELOPER, UNDER HIGHLANDS MUTUAL WATER COMPANY SUPERVISION AND WATER DISTRIBUTION SYSTEM CONSTRUCTION STANDARD SPECIFICATIONS.
44. ALL METER CONNECTION MATERIALS OTHER THEN THE WATER METERS IS THE RESPONSIBILITY OF THE OF THE DEVELOPER.
45. SERVICE LINES SHALL NOT SHARE A COMMON TRENCH WITH ANY OTHER FACILITY; THIS INCLUDES WATER MAINS AND FIRE SERVICE LINES.
46. CONTRACTOR SHALL IMMEDIATELY HALT EXCAVATION/GRADING/LAND-CLEARING ACTIVITIES AND CONTACT THE CITY OF CLEARLAKE AND HIGHLANDS MUTUAL WATER COMPANY IMMEDIATELY IF ARCHAEOLOGICAL, HISTORICAL OR PALEONTOLOGICAL RESOURCES ARE ENCOUNTERED, OR IN THE EVENT OF ACCIDENTAL DISCOVERY OF HUMAN REMAINS.

SHEET 3 OF 3

APPROVED BY:
 JEFF DAVIS

GENERAL MANAGER

DATE



**HIGHLANDS
 MUTUAL WATER
 COMPANY**

TITLE:

**CONSTRUCTION
 GENERAL NOTES**

SCALE: NONE	DATE: 6/23	REV -	STANDARD DWG. NO. P-50
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SECTION 3
WATER DISTRIBUTION SYSTEM
CONSTRUCTION STANDARD SPECIFICATIONS

WATER DISTRIBUTION SYSTEM CONSTRUCTION STANDARD SPECIFICATION

3.01 DESCRIPTION

All water distribution system components and related items for new construction and rehabilitation projects shall be constructed in accordance with all applicable Highlands Mutual Water Company Standards, the latest version of the Caltrans Standard Plans and Specifications as they apply, and any modifications herein. Any proposed deviations must first be approved in writing by Highlands Mutual Water Company.

Approval of Improvement Plans by the City of Clearlake and/or the County of Lake does not constitute approval of plans by Highlands Mutual Water Company. In order for Improvement Plans to be approved, the plans must be signed by Highlands Mutual Water Company.

The Contractor shall provide a full size (24"x36") set of water distribution system "record plans" for their project to Highlands Mutual Water Company within 7 calendar days from the final connection to the Highlands Mutual Water Company's Water Distribution System (Water Distribution System). All deviations from the improvement plans shall be recorded on the plans in red ink.

Prior to start of any work within the City of Clearlake's Right-of -Way, the Contractor shall acquire a City Business License and encroachment permit from the City of Clearlake

The Contractor shall locate all utilities within the project limits prior to the commencement of work by calling Underground Service Alert (USA) at (800) 642-2444. USA requests shall be made 48 hours in advance during the normal work week before the commencement of work to allow for marking of utilities.

Highlands Mutual Water Company's marking of their underground facilities shall be considered accurate to within 2 feet (24 inches) of either side of their facility. When potholing Highlands Mutual Water Company's facilities, the Contractor shall use vacuum type equipment only.

The contractor shall provide traffic and pedestrian control measures meeting the requirements of the Caltrans Standard Plans and Specifications and encroachment permit requirements from the City of Clearlake. The Contractor shall keep the City of Clearlake and the Lake County Fire Protection District informed of the location of work and traffic control status at all time.

Permanent paving shall not take place until all underground work is finished, except as otherwise noted, and the Highlands Mutual Water Company and City Engineer for the City of Clearlake (City Engineer) has given written notice of acceptance to the Contractor.

3.01A MATERIALS

The Contractor shall use a single manufacturer for each of the following types of items supplied for their project unless otherwise approved by the Highlands Mutual Water Company;

- Pipe
- Fittings
- Valves
- Meter Boxes (per sizes)

Connections to cast iron (CI), polyvinyl chloride (PVC), or ductile iron (DI) pipe shall be made with mechanical joint solid sleeves. When connecting to asbestos cement (AC) and/or “over-sized” cast iron pipe, “wide range” style couplings from Ford, Smith-Blair, Romac or an approved equivalent shall be used. Submittals are required for all couplings.

Highlands Mutual Water Company reserves the right to reject any material that may be supplied for use, whether on the “Approved Materials List” or not. If Highlands Mutual Water Company obtains information indicating that a listed item is not performing satisfactorily or is found to be defective, that item will be rejected and the Contractor shall submit a replacement for review at no additional cost to Highlands Mutual Water Company.

All materials used shall be lead free per California Health & Safety code, Section 116875.

Per U.S. et al., ex rel. Hendrix v. J-M Manufacturing Co., Inc., et al., Case No. ED CV-06-0055-GW (C.D. of CA), the Highlands Mutual Water Company is not currently accepting PVC pipe manufactured by J-M Manufacturing Co. or JM Eagle for installation on Highlands Mutual Water Company projects.

3.01B MATERIAL SUBMITTALS

The Contractor shall submit to the Highlands Mutual Water Company’s Engineer (Engineer), in writing, a list of all materials proposed to be used on their project, and any supporting documentation and/or samples required by the Highlands Mutual Water Company.

For material listed on the “Approved Materials List” the Engineer shall be provided with the name of the manufacturer and model/part number for all material proposed for this project, unless that item has been replaced as shown on the Plans or in other contract documents.

For any material not listed on the “Approved Materials List” the Contractor shall provide to the Engineer, the name of the manufacturer and model/part number along with supporting documentation and/or samples that will allow the Engineer to make an informed decision on acceptance or rejection of the material.

The Contractor shall submit the installation location for any proposed use of flange fittings. Use of flanged fittings other than those already specified herein must be approved by the Engineer.

3.01C HIGHLANDS MUTUAL WATER COMPANY PARTICIPATION

Highlands Mutual Water Company requires 48 hours advance notice from the Contractor for inspection of the following:

- Inspection of all materials before commencement of work;
- Watermain tie-ins and connections;
- Inspection of all facilities before being covered.

Highlands Mutual Water Company does not perform inspections on weekends.

When Highlands Mutual Water Company water distribution system shutdowns are required, the Contractor shall provide a minimum of two (2) weeks' notice in writing prior to the requested participation date. Water distribution system shutdowns are not to be done on weekends, Fridays, or the day before a holiday.

3.02 PIPE

Unless otherwise approved by the Engineer, water distribution pipe shall be either Ductile Iron Pipe (DIP) or Polyvinyl Chloride (PVC) all in accordance with the following:

- A. Ductile Iron Pipe (DIP) shall be cement lined, new pipe conforming to AWWA Standard C151, pressure class 350. The pipe shall be furnished with either Bell and spigot end, "Tyton Joints" or Mechanical Joints unless otherwise approved by Highlands Mutual Water Company.

All Ductile Iron pipe buried underground shall be encased with 8 mil (minimum) polyethylene film in tube form. Polyethylene material and installation procedure for the encasement shall conform to AWWA C105 or most recent issue.

- B. Polyvinyl Chloride (PVC) Pipe, 4" through 12", shall be new pipe, with a minimum pressure class (PC) rating of PC235, DR18 conforming to the requirements of AWWA C900 "Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4" through 12" for Water Transmission and Distribution. 16" Polyvinyl Chloride (PVC) pipe, shall be new pipe, with a minimum pressure class (PC) rating of PC165, DR25 conforming to the requirements of AWWA C905 "Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14" through 48".

An affidavit shall be provided that all delivered materials comply with the requirements of AWWA C900 and these specifications.

The pipe manufacturer shall legibly mark pipe materials. Name and/or trademark of manufacturer, nominal pipe size and manufacturing standard reference number shall be printed on the pipe.

Water distribution pipes of different sizes and/or materials than those specified above shall only be used when first approved by the Engineer.

Any pipe that is delivered to the job site that, in the opinion of the Engineer, shows signs of contamination, damage and/or defect, may result in the rejection of any pipe that was delivered to the supplier on the same shipment.

3.03 HIGH DENSITY POLYETHYLENE (HDPE) WATER SERVICE TUBING

All 1 inch HDPE water service tubing shall be standard pipe size (IPS) SDR9 tubing, and shall conform to both AWWA C901 and ASTM D2239, and shall be either PE3608 - 200psi tubing or PE4710 - 250psi tubing. Use Muller Insta-Tite's on their ends.

All 2 inch HDPE water service tubing shall be blue copper tubing size (CTS) SDR9 tubing, and shall conform to both AWWA C901 and ASTM D2737, and shall be either PE3608 - 200psi tubing or PE4710 - 250psi tubing.

Tubing shall be continuously marked at a minimum with; manufacturer, size, specification information and manufacturing codes.

If soil contamination is suspected during construction the Contractor shall notify the Engineer prior to the installation of HDPE material. Use of HDPE material within or adjacent to areas of known contaminated soils is strictly prohibited.

3.04 FITTINGS

All fittings 3" through 16" shall be new ductile iron fittings conforming to AWWA C110, or new ductile iron compact fittings conforming to AWWA C153 of the latest revision and shall be compatible with the type and pressure class of pipe used.

Unless otherwise approved herein or by the Engineer, all tees, valves, and fittings shall be mechanical joint type, or flange ends, no push on fittings.

Flanged fittings shall only be used on above ground installations or on tees or crosses when attached to a flange (FL) x mechanical joint (MJ) valve or approved fitting, or as otherwise approved by the Engineer.

The end taper of pipe shall be removed and the pipe cutoff square before inserting into a mechanical joint.

All non-stainless-steel bolts, nuts and threads shall be coated with bitumastic paint or Permatex spray-on heavy duty rubberized under-coating or an approved equivalent. All nuts shall be fully tightened and surfaces to be coated dried prior to application. The use of an anti-galling agent is required on all stainless-steel bolts.

3.04A RESTRAINED JOINTS AND FITTINGS

In general, and unless otherwise specified or allowed by the Engineer, all new water distribution system installations of 4" and larger shall be a "Restrained Joint System" where, in lieu of, or in addition to concrete thrust blocks and/or harnesses, approved mechanical restraint devices are used to restrain the system. The Project Design Engineer shall show joint restraint, at a minimum, on all tees, crosses and on all joints required to make a bend in the alignment of the water system. This is to include all joints on either side of a bend to a calculated distance with the calculation including, at a minimum, a safety factor of 2 to 1, size of pipe(s), angle of bend(s), depth of cover, type of compaction, and test pressures as specified herein.

All water distribution system installations that are 12" or larger and are in an area where the static system pressure is 90psi or greater shall comply with the above requirements and shall include concrete thrust blocks and/or harnesses in their design and construction per applicable Highlands Mutual Water Company Water Distributions System Construction Standards (Construction Standards).

Restrained joint fittings shall be mechanical joint type ductile iron in accordance with the applicable requirements of AWWA C111 and AWWA C153 of latest revision and shall be compatible with the type and pressure class of pipe used. Mechanical restraint devices of 4" through 16" shall have a minimum working pressure of 350 psi.

Ductile iron pipe locking gaskets such as "Field Lok 350 Gaskets manufactured by U.S. Pipe", or an approved equivalent, may be approved by Highlands Mutual Water Company for use on specific installations. Requests and submittals for use shall be accompanied by supporting documentation. Information provided shall include, at a minimum, specifications of product, manufacturer's installation instructions, and compatibility acceptance from the pipe manufacturer.

3.04B CUT-IN TEE OR CROSS

Contractor shall install a new tee or cross on an existing main, with or without valve(s), by "cut-in" at the location(s) shown on the Plans and per Construction Standard P-24. In general, and to mitigate the necessity for prolonged shutdown times, the "cut-in assembly" shall be assembled as much as possible prior to shutting down the Water Distribution System. Connection to the existing mains shall be by approved couplings as noted herein unless otherwise approved by the Engineer.

3.05 GATE VALVES

Gate valves shall have ductile iron bodies and bonnets and resilient seated gates, and shall conform to AWWA Standard C509 and/or AWWA Standard C515 of the latest revisions. All gate valves, unless otherwise specified, shall be non-rising stem (NRS) type with O-ring stem seals. Gate valves installed above grade or in vaults shall be equipped with an approved hand wheel. Outside screw and yoke (OS&Y) rising stem type gate valves shall only be installed where specified or approved by Highlands Mutual Water Company. All gate valves shall open in the counter clockwise direction. Where elevations on buried installations will not allow a minimum of six inches of cover over the valve nut, the Contractor shall submit for approval, by Highlands Mutual Water Company, the installation of a horizontally installed gate valve with manufacturer installed bevel gearing. Bonnet direction of horizontally installed gate valves must be approved by Highlands Mutual Water Company and shall be recorded on the record plans.

The working pressure rating of gate valves shall meet or exceed the pressure rating of the pipe specified on the plans. Gate valve bolts and nuts shall be stainless-steel, and joint connection bolts and nuts shall be 304 stainless-steel or coated as specified herein.

Gate valves shall be Mechanical Joint type unless otherwise specified herein or approved by the Engineer.

New gate valves shown to be installed by "cut-in" on an existing main shall be done by removing a section of the existing main and installing the required gate valve, pipe and couplers as specified in the Highlands Mutual Water Company Water Distribution System Design Standards (Design Standards). Sections of pipe used shall be at least 18 inches in length.

When any part of the new water system is pressurized, all affected gate valves shall be at grade and accessible to Highlands Mutual Water Company personnel at all times. Valves that require "valve stem risers" shall not be considered accessible unless the riser is in place and operational.

3.06 BUTTERFLY VALVES

Butterfly valves shall only be installed where approved by the Engineer.

3.07 VALVE BOXES, VAULTS AND PITS

Each gate valve shall be covered by a precast 9" valve box set flush with street surface with cast iron ring and cover marked "HMWC WATER" with triangle lid. Triangle lids on valve boxes are to indicate facilities direction. Highlands Mutual Water Company shall inspect valve box orientation before final valve box setting. Valve boxes shall have a 12" wide by 12" thick concrete collars with one ring of rebar around the valve box for support. On unpaved roads, valve boxes shall be 0.17 feet above grade with the concrete collars tapering from the valve box to grade

When a color coated box cover is called for, the coating shall be TIGER Series 49 Polyester TGIC, or an approved equivalent, in the color specified by Highlands Mutual Water Company. Finish shall be a rough texture matte. Cover shall be prepared per manufacturer's recommendations prior to coating. Film thickness shall be 2.5 to 3.5 mils.

Valve box riser pipe shall be installed centered over and plumb with the valve nut prior to final paving. If riser pipe needs to be lowered for paving it shall be cut by hand perpendicular to the axis of the pipe and free of jagged edges. If sections need to be added after paving it shall be done per Construction Standards P-31 and P-32. The riser pipe shall extend into the bottom of the valve box a minimum of 2 inches and the upper section shall be no shorter than 1-foot in length.

If valve stem risers are required, they shall be installed and checked for operation prior to paving.

All meter boxes, vaults and pits shall be bedded on 6" minimum thick, 3/4" drain rock, or other approved clean material with minimum sand equivalent percent of 20, uncontaminated by native soil, against compacted or undisturbed base. The gravel bed shall extend to a 4" minimum beyond all sides of the meter box. Box shall be set flush with top of curb, sidewalk or ground, whichever is applicable. Addresses shall be clearly marked on top side lip of meter box with a permanent marking pen.

Meter boxes and vaults shall be set so that the reading lids are aligned over the meter registers as closely as possible.

3.08 LOCATING AND ADJUSTING WATER VALVE BOXES

After a street has been paved, mark the location of all water valve boxes in white paint before the close of that work day. If multiple paving lifts are required, remark box locations after each lift.

Within 48 hours of paving, adjust all water valve boxes up to grade.

If an existing valve box riser pipe is found to be asbestos cement, the entire pipe shall be removed and new riser pipe installed per Section 3.07 and Construction Standards P-31 and P-32. See Section 3.10 Asbestos Cement Pipe herein for additional requirements.

3.09 FIRE HYDRANTS AND LATERAL ASSEMBLY

Unless stationing is specifically called out, fire hydrant locations, as shown on the plans, are approximate and shall be field located with the Engineer's approval.

Fire hydrant and lateral assemblies that are installed on an existing water main by "cut-in" requires that the disinfection and bacteria test sampling shall take place prior to hydrostatic testing. The Contractor shall request, and the Engineer shall provide the proper procedures for this operation.

No bends are allowed in fire hydrant laterals without approval of the Engineer.

Hydrants shall be 4-1/2" streamers of American Darling or Waterous brands, with 5-1/4" main valve opening.

Apply two coats of paint to fire hydrants in accordance with Lake County Fire Protection District and AWWA C503. Any damaged paint surfaces shall be corrected by touch up prior to acceptance.

Before a fire hydrant may be placed in service, a high velocity flushing of the hydrant lateral shall be witnessed and approved by Highlands Mutual Water Company personnel.

All concrete which is to be removed from sidewalk areas for fire hydrant removal or installation shall be removed to the nearest transverse score mark across the full width of sidewalk and replaced as specified per applicable City of Clearlake Design Standards and Construction Standard Specifications.

3.10 ASBESTOS CEMENT PIPE

The installation of asbestos cement pipe is prohibited.

Cutting of Asbestos Cement Pipe (ACP) shall be done utilizing a Pipe Cutter (snapper), of the proper type and size for the intended use. A ratcheting hand snapper shall only be used on ACP sizes of 6 inch and smaller. The "snapper", and all appurtenances shall have been inspected by the Contractor to ensure that it is in good working order prior to use.

If field conditions require an alternative method for cutting the ACP, the alternative method shall comply with all laws and requirements as specified by OSHA, the Contractor's State Licensing Board, and any other governing body for this type of work.

In all cases, cutting, handling and disposal shall be done per the above stated governing bodies. Cut pipe shall be properly enclosed as soon as possible after removed from the trench.

3.11 EXCAVATION, BACKFILL, AND RESURFACING

All trenching, backfill and resurfacing required for installation of water distribution system facilities shall be in accordance with all applicable Highlands Mutual Water Company Standards and City of Clearlake's Construction Standards. Prior to start of any work within the City of Clearlake's Right-of-Way, Contractor shall acquire a City Business License and encroachment permit from

the City of Clearlake.

If existing utility crossings or other potential conflicts are shown on the plans or specified in other contract documents, the Contractor shall pot hole said areas prior to the start of pipe laying. If conflicts are discovered during this investigation the Engineer shall be notified immediately.

An **air gap** shall be in use at all times when dewatering to the sanitary sewer system.

It is the Contactor's responsibility to ensure that water system components are laid and bedded on sound, stable material. All existing material that has been disturbed shall be removed from the trench prior to installation of new material, The Contractor shall promptly notify the Engineer of any field conditions that may affect alignment and/or grade.

All stumps and large roots encountered during trenching operations shall be removed to the satisfaction of the Engineer.

Where excavations occur within the drip line of any tree, the Contractor shall hand dig to protect tree roots. If necessary for installations, roots one inch in diameter or smaller may be cut neat by hand tool. Unless otherwise specified, cutting roots larger than one inch in diameter shall only be done with the Highlands Mutual Water Company's and the City Engineer's approval.

The trench shall be opened sufficiently ahead of the pipe laying operations to reveal obstructions. Trench crossings shall be provided as necessary to accommodate public travel and to provide convenient access to adjacent properties. Flow shall be maintained in any sanitary sewers, storm drains, water lines, or water courses encountered in trenching.

When the improvements involved will exceed an estimated \$25,000 for the excavation of any trench or trenches five feet or more in depth, the Contractor shall, except for subdivisions, submit to the Engineer for acceptance in advance of job 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 such trench or trenches. If such plan varies from the shoring system standards established by the construction safety orders, the plan shall be prepared by a registered civil or structural engineer. A permit to do the above-described work must be obtained from the State of California, Division of Industrial Safety. Proof of such permit shall be submitted to the Engineer prior to starting the trench work.

Unless otherwise specified, excess material from excavation shall become the property of the Contractor and shall be disposed of to the satisfaction of the Engineer. If the work is in existing City of Clearlake's streets the excess material shall be removed from the site daily unless it has been preapproved for reuse by City Engineer.

Prior to disposal of any materials or operation of any equipment on sites provided by the Contractor for disposal of excess trench excavation owned by him, the Contractor shall submit to the Engineer written authorization for such disposal of materials and entry permission signed by the owners of the disposal site and the required permits.

All excavations shall be able to accommodate any typical compaction and testing equipment and personnel used to backfill the trench. If, in the opinion of the Engineer, typical methods cannot be used, the Engineer may require the use of a pneumatic Pogo Stick/Powder Puff type compactor

at no additional cost to the Highlands Mutual Water Company.

All lateral services constructed under curb, gutter and driveway culverts shall be accomplished by use of a trenchless method approved by the City Engineer, unless otherwise specified. Boring under sidewalks and/or concrete filled planter strips will not be allowed. Boreholes shall be only large enough to allow for the size of pipe to be installed. If the Contractor's operations disturb the supporting soil, the Engineer may require the removal and replacement of any undermined sidewalk, curb, gutter or culvert; and/or the use of CDF backfill at the Contractor's expense. The limits of curb and gutter replacement and any required doweling will be at the discretion of the City Engineer.

Blasting shall not be permitted unless first approved of, in writing, by Highlands Mutual Water Company and the City Engineer.

Bedding material around water lines and mains shall be red sand. Place red sand 6 inches under and 12 inches over water lines and mains. Compact red sand to 90% relative compaction prior to placing backfill. Jetting is not allowed.

Backfill material shall conform to the City of Clearlake's Construction Standards.

Controlled density fill (CDF), when required, shall conform to City of Clearlake's Construction Standards and a material submittal is required for approval. All excavations in a traveled way with CDF backfill shall be plated or otherwise safely covered to allow for safe passage during curing.

Trenching operations shall be conducted in such a manner that will not disturb existing facilities. The Contractor shall incur all costs associated with repairs needed, in the opinion of and to the satisfaction of the Engineer and the City Engineer, by any such damage due to their operations.

Tracer wire shall be laid on the top of and along the entire length of all water pipe and HDPE tubing and shall be extended to the surface at all valve locations, blow-offs and meter boxes sufficiently for locator equipment to be attached. Tracer wire shall be neatly trimmed inside the Valve Riser and Meter Box so that the Tracer wires will not snag on valve keys or other tools. Tracer wire shall be 10 AWG solid copper wire with a blue type UF 60 mil insulation that is designed for use in the detection of underground utilities. Where splicing of the tracer wire is required, only watertight connectors shall be used and shall be either Copperhead Snakebite, 3M DBR, or an approved equivalent

On water mains tracer wire shall be half hitched around the End-Bell of each pipe section. Tracer wire shall be run up the outside of each stand-pipe riser then between the valve box and stand pipe riser for connection purposes.

On service lines, the trace wire shall be tied to the base of the corporation valve, and the curb-stop or y-yoke in the meter box. Tracer wire shall be tape to the service line every 5 feet , or more to prevent a separation of more than 2 inches.

Detection tape shall be placed on top of the bedding sand layer (12 inches) directly over the water main.

Unless otherwise approved by Engineer and the City Engineer, all excavated material shall be

removed from the job site each day.

Five days prior to cutting into any traffic detector loop the Contractor shall notify and coordinate with the City Engineer.

3.11A TRENCH BRACING AND SHORING - WATER

All bracing and shoring shall conform to Section 7-1.02K(6) of the State of California Department of Transportation 2022 Standard Specifications, the Division of Industrial Safety Construction Safety Orders which are currently in use, and any additional requirements specified by the Engineer.

Trench sheeting or boxes shall be withdrawn in such a manner as to prevent caving at the walls of excavations or damage to piping or other structures. Sheeting shall be completely removed from the trench and no backfill shall be installed against the sheeting before it is removed. Trenching operations shall be conducted in such a manner that will not disturb existing utilities.

The Contractor shall take all necessary measures to protect workers, adjacent areas, and structures, and all other facilities from the hazards of the trenching operations.

3.12 LAYING AND HANDLING PIPE MATERIALS

All pipe stockpiled on the job shall be stored with the ends covered to prevent the entrance of foreign matter. Highlands Mutual Water Company may reject stockpiled pipe with exposed ends.

Proper implements, tools, and facilities satisfactory to Engineer shall be provided and used by the Contractor for safe, convenient, and workmanlike prosecution of the work.

Prior to start of pipe laying, the Contractor shall expose the ends of the existing mains to determine individual lines and grades. New mains shall begin approximately 8 feet from and on the same line and grade as the existing main unless otherwise shown or approved. New mains shall be installed at minimum standard cover conforming to the requirements of the Design Standards, or as shown on the Improvement Plans. Where, in the opinion of the Engineer, new mains cannot start on the same lines and grades as the existing main, restrained fittings shall be used to make grade and/or alignment transitions for tie-ins to existing mains. This does not eliminate the requirement for thrust blocking unless specifically specified elsewhere.

All pipe fittings and valves shall be carefully lowered into the trench in such a manner as to prevent damage to pipe coatings. Under no circumstances shall pipe or accessories be dropped or dumped into the trench. Before lowering and while suspended, the pipe shall be inspected for defects and the cast iron pipe rung with a light hammer to detect cracks. Any defective, damaged, or unsound pipe shall be rejected and sound material furnished. Cutting of pipe for inserting valves, fittings, or closure pieces shall be done in a neat and workmanlike manner without damage to pipe. All pipe stockpiled on the job shall be stored with the ends covered to prevent the entrance of foreign matter.

Installation of all pipe joints shall be per manufacturer's recommendations and installation instructions, and all PVC bell and spigot joints, up to and including 8 inches, shall be assembled using the bar and block method. At any time and at no additional cost to the Highlands Mutual

Water Company, the Engineer may require the use of a device to prevent "over-insertion" such as a Mega-Stop Series 5000 from EBAA Iron, or an approved equivalent. All joints that are, in the opinion of the Engineer, over-inserted, shall be pulled back to the proper insertion point or removed and replaced at the Engineer's discretion. Any adjacent joint that may have been disturbed due to the over-insertion shall be allowed to be inspected by the Engineer and if required shall be pulled back or removed and replaced.

Whenever it is necessary either in vertical or horizontal plane, to avoid obstructions or when long radius curves are permitted, the amount of deflection shall not exceed the maximum recommended by the pipe manufacturer or that required for satisfactory jointing.

Each length of pipe shall be free of any visible evidence of contamination, dust, and foreign material before it is lowered into its position in the trench, and it shall be kept clean by approved means during and after laying. Whenever pipe laying is not in progress, the open ends of installed pipe shall be closed watertight by mechanical plug, cap or other means approved by Highlands Mutual Water Company to prevent the entrance of foreign material or small animals. Trench water shall not be permitted to enter the pipe.

Existing utilities shall be supported in place with service maintained during construction.

If proper separation between water mains and non-potable pipelines, per the latest guidelines from the California State Water Resources Control Board cannot be maintained, the Contractor shall inform the Engineer immediately to get direction, unless direction has been already provided in the contract documents. See Standard P-2A, 2B, 2C

Proposed water main elevations may need to be adjusted in the field to allow for the required separation between non-potable pipelines and other facilities. If water system components are proposed to be installed prior to sanitary sewer or storm drain components, the Contractor shall investigate for the possibility of conflicts or inadequate separation of facilities. The Contractor shall perform this investigation prior to water system installation and provide all relevant information in writing to the Engineer immediately upon discovery of any conflict.

3.13 LAVING P.V.C. PIPE

Individual pieces of pipe, valves, and fittings shall be joined by placing the rubber rings on the machined ends of the pipe and pulling the couplings, valves, or fittings in accordance with the manufacturer's recommendations. The rings shall be checked to be sure they are in the proper position after the coupling is in place. Care shall be taken to ensure proper seating of the rings, and adapters shall be utilized for connections as required by the manufacturer.

Where ground water occurs, pumping shall continue until back filling has progressed to a sufficient height to prevent flotation of the pipe. Water shall be disposed of in such a manner as to cause no property damage or not be a hazard to public health.

3.14 LAVING OF DUCTILE IRON PIPE

Ductile iron pipe, and their appurtenances, shall be as specified in and installed per AWWA C600 of latest Revision, in accordance with the manufacturer's recommendations and any modifications herein.

3.14A WATER MAIN LOWERING/OVER-STRUCTURE

Attention is directed to Sections 3.04 and 3.04A of these Construction Specifications.

Where shown on the Plans or as directed by the Engineer to lower or raise the alignment of the water main or 3" or larger service lateral using fittings, the alignment change shall be done in accordance with Section VI. "B" of the Design Standards and these Construction Specifications.

If the Contractor elects to install a partial or full water main lowering to make a grade transition in place of roping the pipe if roping is shown on the plans, they shall first receive written approval from the Engineer. The lowering shall be installed per Highlands Mutual Water Company Water Distribution System Design Standards and shall include restrained joints beyond the lowering to a calculated distance as directed by the Engineer.

The flame cutting of pipe by means of oxyacetylene torch shall not be allowed.

3.15 SERVICE LATERALS

Service laterals other than those shown or noted on the plans shall not be installed prior to obtaining approval from the Engineer. Service laterals encountered in construction that will not be used shall be abandoned.

3.15A WATER SERVICES

The Contractor shall install new water service laterals per applicable Design Standards, Construction Standard Plans, and at the locations shown on the Plans.

If a new water service lateral is replacing an existing lateral, the work shall include abandoning the old service lateral pipe or tubing, removal of curb stop valve(s), removal and disposal of old meter boxes, and removal, disposal and replacement of any existing sidewalk, curb and gutter as needed.

Typically, replacement service laterals shall be designed and constructed per all other Highlands Mutual Water Company requirements and as close as practical to the existing laterals they are replacing, unless the existing is in a driveway. If the existing service lateral is in a driveway the replacement lateral shall be designed and constructed out of the driveway and where practical. Exact locations shall be determined in the field and approved by the Engineer. New service laterals shall be installed with a minimum horizontal clearance of 5 feet from service laterals.

HDPE water services shall be one continuous length (no splices), from the water distribution main to the water meter. For water service laterals of other material types, the Contractor shall minimize joints as much as possible.

When connecting to any service line under 4" that has a backflow prevention device, threaded brass shall be used unless otherwise shown on individual Construction Standards. If the existing pipe between the meter and backflow device is found to be plastic, the Contractor shall inform the Engineer, and replace the existing pipe with threaded brass.

When an existing service line is found to be galvanized iron, an approved dielectric fitting shall be required. The use of PVC material as dielectric protection is not acceptable.

Except as required to comply with the Design Standards, bends and/or fittings shall not be installed under sidewalk or concrete planter strips.

Connections to existing water service lines shall be made behind sidewalk or at the back of P.U.E.

Submittals are required on all material used for service tie-ins.

After the new water system is connected to the existing Water Distribution System, the Contractor shall purge the new service of air and sediment prior to new meter installation or the transferring of the existing water meter.

Prior to transferring an existing water meter, the Contractor shall notify the affected customer before shutting down their service. The Contractor shall coordinate this work to provide minimum customer out-of-service time and inconvenience. All existing water meter transfers and service tie-ins shall be witnessed by Highlands Mutual Water Company's Inspector (Inspector) and it is the Contractor's responsibility to coordinate this inspection.

The Contractor shall shut off any available property side valve on the existing service prior to cutting into the line and after the meter transfer, but prior to activating the new service, the Contractor shall notify the customer that the water is coming back on, then open the property side valve and flush the new service for a minimum of 5 minutes and until the water is clear and free of all air and foreign matter.

The existing building service line to be connected to may be metal or plastic and may not be the same size as the new service. The Contractor shall provide couplings, adapters and fittings as necessary to complete the connection to the new water service line.

Water service connections to existing building service lines of 3/4" or 1" in size shall be made with HDPE Standard Pipe Size (IPS) or schedule 80 PVC pipe and shall match the size of the existing service line. Schedule 80 PVC pipe shall only be used when approved by Highlands Mutual Water Company and follow manufacturer's specifications and guidelines. The ends of the PVC pipe to be glued must be beveled using a file, no sharp edges are allowed. Schedule 80 primer and glue shall be used on all PVC fittings. The primer shall first be applied inside and outside the fittings and allowed to dry. Primer shall then be reapplied and while still wet, glue shall be applied. All gluing and curing of PVC pipe and fittings shall not be done in direct sunlight.

Water service connections to existing building service lines of 1-1/2" to 2" in size shall be made with HDPE blue Copper Tubing Size (CTS) tubing and shall match the size of the existing service line.

Where a new service is connected to existing backflow device the Contractor shall provide documentation that the backflow device has been certified after installation. Certifications shall be completed by a certified tester. All necessary paperwork shall be completed by the Tester and one copy given to the property owner and one to the Highlands Mutual Water Company within 72 hours after connection.

Where new service laterals of 2" in diameter and smaller are connected to existing water mains, a minimum distance of 18" shall be maintained between taps, whether new or existing. For hot taps larger than 2" the Contractor shall request spacing requirements from the Engineer, which will be determined based on size and material.

Hot taps may be requested a minimum of ten (1) working days in advance. The Highlands Mutual Water Company will attempt to facilitate hot taps within these timeframes; however, extenuating circumstances may result in response times in excess of those mentioned above.

3.15B BACKFLOW DEVICE INSTALLATION

The Contractor shall install new backflow prevention devices at the locations shown on the Plans or as directed by the Engineer. Backflow prevention devices shall be installed per applicable Design Standards unless otherwise directed by the Engineer. The Contractor shall purge the water service at the meter of air and sediment, prior to installation. The Contractor shall coordinate this work to provide minimum out-of-service time to existing customers.

All piping downstream of the backflow device shall be of the same material called for between the meter and backflow device unless otherwise specified.

Unions, as required, shall be brass.

After installation, the backflow prevention device shall be certified. Certifications shall be completed by a certified tester. All necessary paperwork shall be completed by the Tester and one copy given to the property owner and one to the Engineer within 72 hours after connection to the existing building service line.

Submittals shall be required for all backflow devices and related materials.

3.16 THRUST BLOCKING

Unless other arrangements are made that are acceptable to the Highlands Mutual Water Company, the Contractor shall coordinate notification, and allow for visual inspection by the Highlands Mutual Water Company, of all concrete thrust blocking.

Regardless of restrained joint requirements specified elsewhere or actual installation, concrete thrust blocks shall be installed behind all tees, when connecting to any existing line larger than 2" in diameter, and where restrained joints cannot be used or alone are deemed insufficient by the Designer and/or the Engineer.

Concrete thrust blocks and/or harnesses shall also be installed per applicable Water Distribution System Standard Plans, and in addition to restrained joints, where the water main is 12" in diameter or larger and the static water pressure in the distribution system is 90 psi or greater.

Permanent concrete thrust blocks and/or harnesses restraints shall be installed at least 24 hours prior to reactivation of the water system when reactivation is required immediately after completion of any operation where a water system shut down is needed and temporary blocking is not feasible. If a joint restraint system can be installed to alleviate the need for concrete thrust

blocks and protects the existing and new water systems, it shall be used in place of this requirement.

Wherever concrete thrust blocking is deemed necessary, by the Engineer or the Contractor, it shall be installed per Standard Plans unless otherwise specified on the plans.

3.17 ABANDON OR REMOVAL OF WATER DISTRIBUTION SYSTEM COMPONENTS

Water mains and service laterals larger than 1-1/2" shown on the plans to be abandoned shall be abandoned per Standard Plan P-6. If the end of the pipe to be abandoned is connected in any way to an active main and allowed to stay in place with the approval from the Engineer, the abandonment shall consist of a watertight cap or plug and proper restraint, and the location shall be recorded on the plans.

Existing water system components shall be removed where shown on the Plans, or to facilitate the progress of work. The Contractor must first receive written approval from the Engineer prior to removing any component, fully or in part, that is active during construction, and the removed material shall be replaced to the satisfaction of Highlands Mutual Water Company.

Prior to abandoning an existing main that will be replaced with a new main, all water services shall be transferred to the new and active main.

Leaded joints encountered on water mains that are to stay active within the limits of excavations shall be removed by the Contractor as directed by Engineer. The Contractor shall remove the joints by cutting out the section of pipe containing the exposed joint and installing ductile iron pipe and approved couplers. The removed joint shall be handled, and disposed of according to the Contractor's State Licensing Law and all other applicable laws and regulations.

For all abandoned water services, up to and including 2", or 4" if connection is by hot tap, on mains that are to remain active, remove the valve and saddle and install a stainless-steel full circle clamp on the main under Highlands Mutual Water Company inspection.

All abandoned service laterals 6" and larger on water mains that are to remain active, shall be done as noted on the plans, and as specified in the Design Standards.

Tees or crosses shown to be removed on water mains that will remain in service, shall have the tee or cross, any related valves and thrust blocking removed, and the main shall be repaired with ductile iron pipe and approved couplers.

Barrels of existing fire hydrants to be removed shall be carefully separated from risers and buried by the Contractor, and the bury, it left in the ground, shall be capped or plugged in an acceptable manner. The hydrant only shall be delivered to the Highlands Mutual Water Company's Field Operations site located at 14580 Lakeshore Dr, Clearlake, CA 95422, unless the Contractor has obtained specific written approval by the Highlands Mutual Water Company Department to otherwise dispose of the materials.

Remove all valve boxes and risers on abandoned mains and backfill and resurface per Water Distribution System Standard Plans and the City of Clearlake's Construction Standards. If any portion of a gate valve that is to be abandoned is in the structural section of the street, the valve must be fully removed and the pipe ends abandoned per the Standard Plan P-6. Any valves not

in the structural section of the street may be abandoned in place in the fully closed position.

All system components located behind curb and gutter, or edge of pavement where there is no curb or gutter, on laterals to be abandoned shall be fully removed to a minimum of 1' below grade, unless otherwise directed or approved by the Engineer. All voids shall be back filled per Water Distribution System Standard Plans and the City of Clearlake's Construction Standards in an acceptable manner to match the surrounding area. Any sidewalk that must be replaced shall be done to the nearest transverse score mark on both sides and the full sidewalk width.

After a new water service lateral is installed on an existing main and the meter is transferred, the old service lateral shall be abandoned as specified herein.

Any abandonment that requires a system shutdown, such as removing an old water service from an active main, shall be done under inspection of Highlands Mutual Water Company personnel.

3.18 HYDROSTATIC TEST

Prior to being allowed to connect to the Water Distribution System, except where otherwise specified, all newly constructed water mains, and their appurtenances, shall be hydrostatically tested in accordance with AWWA C600, and any modifications herein.

4" and larger water service laterals, including fire lines, that are installed on an existing water main by cut-in or hot tap requires that the disinfection and bacteria test sampling shall take place prior to hydrostatic testing. The Contractor shall request, and the Engineer shall provide the proper procedures for this operation.

Methods and equipment used for hydrostatic testing shall be submitted to the Engineer for approval.

The Contractor, at their option, may test the system at any time during construction. However, the final test, which will be witnessed by the Highlands Mutual Water Company for acceptance, shall only take place after the system is fully constructed and trenches backfilled and compacted, but prior to final paving.

Each valved section of the system, or combined sections, as approved by Highlands Mutual Water Company, shall be hydrostatically tested to a pressure of not less than 150 psi measured at the highest point along the section to be tested. Where the static pressure in the Water Distribution System to be connected to is greater than 100 psi, the test pressure shall be 1.5 times the static pressure of the Water Distribution System.

If complying with the above requirements it appears that the specified test pressure may exceed the new system's designed thrust restraint, valving of joint pressures at the lowest elevation, the Contractor shall request direction from the Engineer.

Except where otherwise specified or approved by the Engineer, pressure testing against closed gate valves shall not take place. Where testing against a closed gate valve is approved, the valves supplied by the Contractor shall be rated to exceed the specified test pressure. Any damage to gate valves shall be the responsibility of the Contractor and must be connected to the satisfaction of the Engineer, including up to full replacement.

Each section of the new system shall be slowly filled with water, and all air expelled through an opening(s) located at the highest point(s) of the system. If necessary, tap the main at point(s) of the highest elevation(s) and install corporation stops to assist in expelling during filling of the systems. Unless the taps are located where combination air and vacuum valves have been designed into the system, the penetrations shall be sealed with stainless-steel full circle clamps once all air is expelled. All caps, plugs, fittings and any other appurtenance shall be properly braced prior to pressurizing the system.

When testing ductile iron pipe, it is advisable to allow some time for the lining to absorb water prior to the hydrostatic test.

After all air is expelled, the specified test pressure shall be applied by means of an approved pump connected to the new system in a manner approved of by the Engineer. The pump, connection fittings, and all other necessary apparatus except for the pressure gauge and measuring devices shall be furnished by the Contractor. Highlands Mutual Water Company will furnish the pressure gauge and measuring devices for the test. The Contractor shall construct all openings into the new system required for filling and expelling air, and shall furnish all necessary assistance for conducting the tests. Before applying the test pressure, all air shall be expelled from the pipe.

The gauge(s) used to measure pressure for the test shall be a liquid filled gauge with increments no greater than 5psi.

The duration of each pressure test shall be 2 hours, and the test pressure shall not vary by more than ± 5 psi. The pressure shall be maintained within this tolerance by adding makeup water through the approved test pump into the system. The makeup water shall be accurately measured in gallons by a meter or by pumping from an approved vessel of known volume, and shall not exceed the applicable testing allowance as specified in Table 1.

Table 1
Hydrostatic testing makeup water allowance per 100ft of pipeline*
Gallons per hour

Avg. Test Pressure	Nominal Pipe Diameter									
	psi	4"	6"	8"	10"	12"	14"	16"	18"	20"
150	0.033	0.050	0.066	0.083	0.099	0.116	0.132	0.149	0.166	0.199
175	0.036	0.054	0.072	0.089	0.107	0.125	0.143	0.161	0.179	0.215
200	0.038	0.057	0.076	0.096	0.115	0.134	0.153	0.172	0.191	0.229
225	0.041	0.061	0.081	0.101	0.122	0.142	0.162	0.182	0.203	0.243
250	0.043	0.064	0.085	0.107	0.128	0.150	0.171	0.192	0.214	0.256
275	0.045	0.067	0.090	0.112	0.134	0.157	0.179	0.202	0.224	0.269
300	0.047	0.070	0.094	0.117	0.140	0.164	0.187	0.211	0.234	0.281

*If sections of various diameter piping are to be tested at the same, the testing allowance shall be the sum of the testing allowances for each size.

Leakage is defined as the quantity of water to be supplied into the newly constructed water system, or any valved section thereof, necessary to maintain the specified test pressure.

If at any time during the pressure and leakage testing the specified test pressure can be maintained ± 3 psi for a consecutive 30 minutes without adding makeup water, the test can be discontinued and the system considered as passing. Should any test of combined or individual sections of the new system show leakage greater than the specified limit, the Contractor shall, at their own expense, locate the cause and repair the defect until the leakage is within the specified allowance.

Regardless of test results, the Contractor shall repair any leaks detected.

3.19 CLEANING, FLUSHING AND DISINFECTION OF THE NEW WATER SYSTEM

Cleaning, flushing and disinfection of new water system components purposed to be connected to the Water Distribution System shall conform to AWWA C651, all applicable Highlands Mutual Water Company Construction Standards, and any modifications herein and/or on the plans. To ensure the sanitary integrity of the new water system the Contractor shall practice proper sanitary technics during storage, handling and construction of the new water system.

Unless otherwise approved by the Engineer, cleaning and flushing of all mainline pipes shall be accomplished by propelling the swab down the pipeline to an exit point with an approved source of potable water. After removal of the swab(s) a unidirectional flush of the new system shall continue until the water is completely clear.

During the installation of new water line(s), the Contractor shall insert an appropriately sized flexible polyurethane foam sweeping or cleaning style swab, with a density of 2 pounds per cubic foot, complete with polyurethane drive seal, into the beginning or ending segment of each pipe run. The swab shall stay in place until utilized for cleaning operations as specified.

Where tees or crosses are installed as part of the new system, swabs shall be placed where practical so both the run and branch segments are able to be swabbed. If determined by the Engineer that sanitary techniques were practiced during construction, the Engineer may, at their discretion, allow segments of new pipe 80 linear feet or less to be cleaned by line flushing only. Highlands Mutual Water Company will not be responsible for extra time for locating lost swabs.

All temporary blow-offs installed for the purpose of removing foam swabs required for water main cleaning shall be constructed similar to Standard Plan P-49 with a "same size as main" elbow and vertical standpipe to prevent trench and dispelled water from flowing back into the main. After the swab is removed the end of the pipe shall be sealed watertight and all parts restrained to allow for testing. All temporary material shall be removed during operations to connect to the Water Distribution System.

After swabbing, as specified above, is complete, any segment that may have been allowed to be omitted by the Engineer, and every lateral, shall be flushed until clean and free of air and debris.

Water used for flushing shall be considered contaminated after exiting the new system and shall not be allowed to reenter the Water Distribution System. If, in the opinion of the Engineer, the new system becomes contaminated the, Contractor shall be required to re-disinfect the system, all or in part, at no additional cost to Highlands Mutual Water Company.

Except as otherwise specified or permitted by the Engineer, disinfection of the new system shall only take place after all lines have been cleaned and flushed, and each required hydrostatic test has been accepted by the Engineer.

All laterals, 2" and larger, including fire lines, installed on an existing main shall be disinfected and bacteriological test samples taken as specified herein.

All 1" and 1-1/2" service laterals components installed on an existing main shall be thoroughly swabbed with a 1 percent liquid chlorine solution during construction.

All laterals shall be thoroughly flushed just prior to being put into service.

Methods, material and equipment used for disinfection of the water system shall be submitted to the Engineer for approval.

Sodium hypochlorite (liquid chlorine) of 10.0%, 12.5% or 15.0% shall be utilized for disinfection operations and shall be applied as stated herein. The use of household bleach is not permitted for disinfection at any time.

The point of application of the disinfectant shall be through a permanent or temporary blow-off, or through a new fire hydrant installed as part of the new system. If none of the aforementioned components are available or practical for use, the Contractor may use a corporation stop of an

approved size, if approved by the Engineer. Adequate venting must be allowed, and both filling and venting port elevations shall be a minimum of 6 inches higher than all components to be disinfected.

Water from the Water Distribution System shall be used to fill the new mains at a slow controlled rate of flow during the application of the disinfectant; this rate of flow shall not exceed the limits of any openings used to expel water and/or air, including installed air release valves. Precautions shall be taken to prevent back pressure causing a reversal of flow into the Water Distribution System. In the process of disinfecting, all valves and other appurtenances on the new water system shall be operated in such a way to allow the disinfectant solution to be fully distributed to all components of the new water system.

The rate of disinfectant feed shall be in such proportion to the rate of water entering the pipe that the disinfectant dose applied shall be between 100ppm and 200ppm. The disinfectant solution shall be retained in the pipe for a period of at least 24 hours but no longer than 72 hours. After 24 hours, disinfectant levels shall not be less than 50% of the initial dosage, as recorded by the Inspector. If the disinfectant level is less than 50% of the initial dosage, the system shall be flushed and the above disinfection procedures repeated. When disinfectant levels are acceptable after the retention period, the chlorinated water shall then be discharged as specified in Section 3.20 "Discharge of Chlorinated Water", and all new mains and laterals shall be given a final flush and then filled with water from the Water Distribution System.

While the final flush of the new system is taking place, the Engineer, or their representative, will take a chlorine residual reading from the Water Distribution System and note it. If the reading is higher than 0.5 ppm, the new system shall be flushed until residual readings taken at all locations, as determined by the Engineer, are between the residual noted from the Water Distribution System and 1 ppm, but no higher. If the residual taken from the Water Distribution System is less than 0.05 ppm, the new water system shall be flushed until all locations are between 0.5 ppm and 1 ppm.

After the disinfectant is flushed from the new water system and all residual readings are as specified, an initial set, consisting of two bacteria test samples per location, shall be taken where specified by the Engineer per one of the following methods;

Method A:

Take a first set of sample tests just after flushing is complete, and the second after a minimum of 16 hours, but not more than 72 hours after flushing.

Method B:

After flushing is complete, let the system sit a minimum of 16 hours without any use, then collect both sets of sample tests from the same locations 15 minutes apart while allowing the sample port to maintain a slight flow in between samples.

The method used shall be determined by the Engineer at the time of sampling.

All residual readings and bacteria test samples specified herein shall be taken by the Engineer and witnessed by the Contractor.

The Engineer must receive written test results showing that all samples from both sets taken are negative for contamination prior to scheduling connection(s) to the Water Distribution System.

If bacteria test results indicate contamination the new water system shall be flushed and sampling shall take place again as specified above. If any results from the additional sampling still show indication of contamination the new system shall be disinfected and flushed again prior to any additional bacterial test sampling taking place.

Unless otherwise approved by Highlands Mutual Water Company, the initial two sets of bacteria tests will be considered valid for up to 14 calendar days after the second set has been taken. All other sets taken will be valid for up to 10 calendar days. If more time passes than those specified before connecting to the Water Distribution System, additional passing bacteria test samples will be required before connections are approved.

Costs for the collection and analysis of the initial sets of bacteria test samples will be paid for by Highlands Mutual Water Company. Samples shall be taken at a minimum; on each blow-off of the new water system and on at least one water service between each two blow-offs. The exact location and quantity of the samples will be determined in the field by the Engineer. There shall not be more than 1200 feet between sample points. Samples taken from fire hydrants, new or existing, shall be avoided where possible, if samples must be taken from a fire hydrant the hydrant shall first receive a high-volume flush to clean the interior.

Highlands Mutual Water Company will pay labor and analytical fees for collecting and analyzing up to two additional sets of bacteria test samples. If additional testing is required, costs shall be borne by the Contractor.

If deemed necessary by the Engineer, due to unsanitary or other construction practices, the Contractor may be required to do additional sampling with satisfactory results prior to connecting to the Water Distribution System.

3.20 DISCHARGE OF CHLORINATED WATER

Chlorinated water used to disinfect newly constructed water systems is the property of the Contractor and its disposal is the responsibility of the Contractor. Chlorinated water used to disinfect the new mains shall be disposed of in accordance with AWWA C655, all laws and regulations, and any modifications herein or specified on other contract documents.

Discharge to the storm drain system or a waterway is not permitted without a permit from the Central Valley Regional Water Quality Control Board.

Discharges may be allowed to be disposed of into the sanitary sewer system, but must first meet the following requirements:

- A. The Contractor shall coordinate approval with the City Engineer prior to the discharge being disposed of in the sanitary sewer system. The payment of any fees required shall be the responsibility of the Contractor.
- B. The pH of the water must be between 6.0 and 9.5.

- C. The Contractor shall maintain an approved “air gap” from the discharge conduit to the receiving sewer facility.

3.21 WATER MAIN CONNECTION WORK

Upon completion of construction and testing of new water mains, service laterals and other appurtenances, tie-in connection(s) can be made by the Contractor under inspection by Highlands Mutual Water Company.

The Contractor shall make a schedule request to the Engineer for any work which requires a Water Distribution System shutdown, including, but not limited to, connection to the Water Distribution System or a service hot tap. Connections to the Water Distribution System will not be scheduled until the Engineer has received documentation of all required passing bacteria tests. The Contractor shall submit a separate written request to the Engineer to schedule each individual shutdown required to facilitate a tie-in connection or any other work where a shutdown may be necessary. The Contractor shall submit written shut down requests at least 2 working days, and 3 working days in advance for residential and commercial shutdowns respectively. Highlands Mutual Water Company will attempt to facilitate shutdowns within these timeframes; however, extenuating circumstances may result in response times in excess of those mentioned above. Under such conditions, no claims related to work delays shall be considered. All shutdowns and valve turning operations shall be performed by authorized Highlands Mutual Water Company personnel only. Authorized Highlands Mutual Water Company personnel must be present during any operation requiring a shutdown unless otherwise approved by the Engineer and provided to the Contractor in writing. Connections to the Water Distribution System shall not be performed without prior authorization by the Engineer.

Individual hot taps may be requested a minimum of 2 working days in advance, if the request is for multiple hot taps to be done on the same day the request shall be made a minimum of 5 working days in advance. Highlands Mutual Water Company will attempt to facilitate hot taps within these timeframes; however, extenuating circumstances may result in response times in excess of those mentioned herein. Under such conditions, no claims related to hot tap delays will be considered.

4” and larger hot taps or any size cut-in shall not be allowed within 4’ of a joint unless first receiving written approval from the Engineer. 4” and larger hot taps that are within 4’ of a joint shall be replaced with a cut-in tee.

Any existing joint that is not specified to be replace and is disturbed by the Contractor's operations may be required by the Engineer to be removed and replaced with approved pipe and couplings under Highlands Mutual Water Company inspection, and at no additional cost.

Excavations for individual tie-in connections and hot taps shall be completed as much as possible without causing damage to new or existing facilities and plated a minimum of 1 working day in advance of the scheduled work. If this requirement is not met, the scheduled work will be cancelled. All connection materials shall be on site for inspection at the tie-in location the morning of the scheduled work.

Contractors who fail to keep field appointments shall be billed for Highlands Mutual Water

Company personnel and equipment time used, and the contractor shall bear the costs incurred by the Highlands Mutual Water Company for notification of its customers for the subsequent appointment.

Interruption of service to commercial customers shall, as much as practical, be coordinated with the customer's needs. After notification by the Contractor for such a need, the Highlands Mutual Water Company will contact commercial customers for service interruption needs and will inform the Contractor accordingly.

Inspection of Facilities by Highlands Mutual Water Company is not done on weekends. Water Distribution System Shutdowns and other items that require the participation of Highlands Mutual Water Company are not to be done on weekends, Friday's or the day before a Holiday.

Contractors requiring work of any kind by Highlands Mutual Water Company forces shall request such services a minimum of 48 hours in advance of the time such services are desired. Work requests, which will involve Highlands Mutual Water Company forces for more than 8 hours or an extensive number of Highlands Mutual Water Company supplied parts, shall be requested a minimum of 7 calendar days in advance.

If it is necessary to terminate service to any customer, the contractor shall make the request for such work an additional 72-hours (three additional working days for a total of five working days advance notice) in advance of the time such services are desired to allow the customers affected to have a minimum 72-hour notice.

When installing a cut-in-tee or cross that is larger than the existing pipe, the new assembly shall be installed at the depth appropriate to the size of the "cut-in" tee or cross, and shall include all fittings, pipe and couplers required to make the change in grade and connections unless otherwise directed by the Engineer. Depth shall also be sufficient to allow any valve(s) that may be part of the assembly to remain below the subgrade of the street.

When a connection is required to an existing water pipe, the contractor shall provide all excavation, shoring, backfill and trench resurfacing per Highlands Mutual Water Company's Water Distribution System Standard Plans and the City of Clearlake's Construction Standards.

All joints of a tie-in connection to the Water Distribution System shall be mechanically restrained.

Where the connection is to be a "hot tap", the contractor shall provide and install the tapping valve and sleeve, and any other hardware required and Highlands Mutual Water Company forces shall make the tap at the developer's expense, unless it is part of a Capital Improvement Project, in which case the hot tap shall be paid for accordingly.

Full circle tapping saddles shall be used when hot tapping 10" and larger PVC pipe with a static pressure of 85 psi or higher.

Where a "cut-in" tee or cross and valve(s) assembly is required to be installed, the contractor shall provide and install the entire assembly (including valves), and any other hardware necessary under Highlands Mutual Water Company inspection, and shall provide all other work and materials necessary to complete the installation to the Water Distribution System Standard Plans.

During the work, the Contractor shall exercise all necessary precautions to prevent the entrance of trench water or any other foreign material into the water main and appurtenances and shall conduct all operations in accordance with the most stringent sanitation practices. The interior of all appurtenances being installed, as well as the exterior of the pipe that will come into contact with the distribution water, shall be thoroughly swabbed with a 1 percent liquid chlorine solution prior to installation.

When connecting to an existing water main the Contractor shall install temporarily and permanent thrust blocking, as necessary, for restraint and to allow for reenergizing of the water main immediately after all plumbing is complete.

When installing new components by "cut-in" to an existing PVC or ductile iron main, all new joints shall be mechanically restrained.

Pipe and fittings furnished for tie-ins shall be no smaller than the existing water main to which each tie-in is made.

3.22 CONSTRUCTION WATER

All water required for the performance of work shall be legally obtained and furnished by the Contractor.

Prior to obtaining water from the Water Distribution System, the Contractor shall rent a hydrant or bridge meter from the Highlands Mutual Water Company, 14580 Lakeshore Dr, Clearlake, CA 95422, Ph# 707-994-2393. The Contractor is responsible for any deposits required, permits and moving fees, and the cost of all water used. Deposits shall be refunded upon removal of the meter by Highlands Mutual Water Company forces, less any charges for water used. Any damage to the meter may result in forfeiture of all or part of the deposit.

Unmetered connections are not permitted to the Water Distribution System, including connections that bypass meters for testing onsite plumbing, or for obtaining construction water. When a subdivision water main has been accepted and tied-in the individual curb stops will be locked off with cable ties/or locks. Cutting off or tampering with the cable ties/ or locks will constitute a straight tie-in connection. Such connections shall be severed by the Highlands Mutual Water Company and will result in penalties including payment of fines and estimated water usage fees.

Construction water shall be obtained from the Water Distribution System only at the point(s) designated by Highlands Mutual Water Company.

Contractors are prohibited from operating gate valves or fire hydrants on the Water Distribution System.

Use of water obtained from unmetered fire hydrants or other facilities is a violation of Highlands Mutual Water Company policy and State law. Use of construction water from sources other than the Water Distribution System must be approved by the Engineer.

Citations and fines will be levied for violation of these and other utility regulations and deductions will be made from progress payments if necessary.

Construction water for the work under this contract will **not** be furnished by the Highlands Mutual Water Company.

At no time shall water trucks or any other unapproved vessel be used in the application of loading water mains unless first approved of by the Highlands Mutual Water Company.

SECTION 4
APPROVED MATERIALS LIST FOR THE WATER
DISTRIBUTION SYSTEM

HIGHLANDS MUTUAL WATER COMPANY

APPROVED MATERIALS

ITEM	DESCRIPTION	MANUFACTURER
Air Release and Vacuum Relief Valve	1" air release and vacuum relief valve per AWWA C512; body and cover materials: reinforced nylon, DI or stainless steel; stainless steel or polypropylene float and plug.	APCO Cla-Val Valmatic A.R.I.
Air and Vacuum Valve, Enclosure	For 1" Air Vacuum Valves, use: 20" x 36" 12-gauge steel enclosure with clam shell hinged construction. Powder Polyester Coated Colored: Sandstone or Low Density Polyethylene Enclosure with UV inhibitors; 20" dia. X 36" high; Colored: Sandstone	Pipeline Products: VCDD, VCAS-2436-SM Armorcast: P6002002-SND
Air and Vacuum Valve, Insulation Jacket (for areas subject to freezing weather)	Expanded polyurethane foam jacket in two halves that fit around air valve, held in place with zip ties. Provide extension at the drain elbow at the top of the valve to allow drainage away from insulating jacket.	A.R.I.: D-040 1" Freeze Jacket A.R.I.: D-040 2" Freeze Jacket
Backflow Preventer (Reduced Pressure Principal Type)	Moderate to high hazard backflow preventer as approved by the USC Foundation for Cross-Connection Control & Hydraulic Research.	Any manufacturer device on the USC list of Approved Backflow Prevention Assemblies.
Backflow Preventer (Double check and/or double check detector assembly type)	Fire detector check or low hazard backflow preventer as approved by the USC Foundation for Cross-Connection Control & Hydraulic Research.	Any manufacturer device on the USC list of Approved Backflow Prevention Assemblies.
Casing End Seal	1/8" thick styrene butadiene rubber sheet end seal with one 1" or two 1/2" wide stainless steel bands.	Advances Products and Systems Calpico, Inc. CCI Pipeline Systems, LLC Ion Cathodic Protection Technologies
Casing Spacer with Restrained Joints	Polyethylene casing spacer, center restrained, position type with PVC liner, non-metallic, and anti-friction runners.	Advance Products and Systems Cascade Water Works Calpico, Inc. CCI Pipeline Systems Ion Cathodic Protection Technologies

HIGHLANDS MUTUAL WATER COMPANY

APPROVED MATERIALS

ITEM	DESCRIPTION	MANUFACTURER
Coating, Cold Applied Wax Tape	Petrolatum wax primer, cold applied petrolatum wax tape, and outerwrap applied to the exterior surface of buried steel pipe. Primer and tape shall be from the same manufacturer. Primer thickness = 3mil Tape thickness = 40mil Outer wrap = 1mil plastic	Trenton: #1 Wax-Tape Tapecoat TC Envirotape Wax Tape Denso
Coating, Fusion Bonded Epoxy	Baked on epoxy coating.	3M Scotchkote: 206N, 134W, 323(patch)
Coating, Liquid Epoxy	Liquid applied epoxy may be used with HMWC approval, when baked on epoxy coating is not practical.	Tnemec: Pota-Pox Plus L140 3M Scotchkote: 323
Coating, Mastic (for buried metal)	Cold applied coal tar or epoxy based single or double component, self-priming, heavy duty protective exterior coating.	Carboline: Bitumastic 50 Devoe: Devtar 5A Tnemec: 46-465, HB Tnemecol Tnemec: 46H-413, HB Tneme Tar Piccomastic: PC50
Corporation Stop, CC X Compression No-Lead	Bronze CC X Compression connection ball valve corp. for 1" and 2".	Ford: FB1000-4, FB1000-7Q Jones: E-1937SG Mueller Co.: B-25008N AY McDonald: 74701 BQ
Corporation Stop, MIP X MIP No-Lead	Male Iron Pipe X Male Iron Pipe ball valve corp. for 1" and 2".	Ford: FB500-4-NL, FB500-7-NL Jones: J-1943 AY McDonald: 73131 B
Coupling, Flange Adapter	3" to 16", Mechanical X Flange ductile iron or steel construction, without anchor pins, epoxy coated, 304 stainless steel bolts and nuts.	Ford: FFCA Romac: FCA501, FC400 Smith-Blair: 912, 913 911, 920 JCM Industries: 301,303 Krausz: Hymax Flange Adapter PowerSeal: 3526 Powermax
Coupling, High Deflection (C900 PVC for same diameter pipe)	4" to 12-inch PVC for deflection only.	North American Pipe Corporation

HIGHLANDS MUTUAL WATER COMPANY

APPROVED MATERIALS

ITEM	DESCRIPTION	MANUFACTURER
Coupling, Closure or Repair (C900 PVC) (for same diameter pipe)	4-inch to 12" for C900 PVC pipe for closure or repair.	North American Pipe Corporation
Coupling, Straight	4" and larger, or DI, epoxy coated with T304 stainless steel bolts and nuts.	Ford: FC4, FC2A Romac: 501, Macro HP, 400 Smith-Blair: 411, 441, 421, 422 JCM: 201, 210, 212 Krausz: Hymax PowerSeal: 3538
Coupling, Restrained, Straight	4" to 12". For use on PVC, DI or HDPE pipe.	Krausz: Hymax Grip Romac: Alpha Smith-Blair: 471, 472, 473
Coupling, Restrained, Flange Adapter for PVC	C900 Class 235 and Class 305, IPS 4" to 12", Class 160 3" 12".	Romac: Alpha FC, RFCA for PVC pipe Ford: RFAP Smith-Blair: 911, 920
Coupling, Restrained, Flange PVC, DI, Steel, HDPE	4" to 12". For use on PVC, DI, or HDPE pipe.	Krausz: Hymax Grip Flange Adaptor Ford: RFAD (DI), RFAP (PVC) Romac: RFCA Smith-Blair: 911, 920
Coupling, Transition	4" and larger, DI, epoxy coated with T304 stainless steel bolts and nuts. For use on AC, PVC, or DI.	Ford: FC2A, FC2W Romac: 501, XR 501, Macro HP Smith-Blair: 441, 442, 461, 462 JCM 212, 241, 242 Krausz Hymax PowerSeal: 3501
Fire Hydrant 200 psi	<p>WET BARREL DI: 6" Standard 250 psi wet barrel DI fire hydrant. Epoxy coated interior, shop primed and painted exterior with six-hole bolt pattern 1½" pent nut, iron caps per AWWA C502.</p> <p>DRY BARREL: 6" 3-WAY 4"x (2) 2 ½" 250 psi DI Fire Hydrant. Painted exterior. 1 ½" pent nut, iron caps, MJ shoe, drains open per AWWA C502.</p>	<p>American Flow Control: American-Darling B-84-B-5</p> <p>American Flow Control: Waterous Pacer</p>

HIGHLANDS MUTUAL WATER COMPANY

APPROVED MATERIALS

ITEM	DESCRIPTION	MANUFACTURER
Fire Hydrant, Bury Ductile Iron	6" ductile iron bury ells, 6H Flange x MJ/PO/FLG	Clow Valve Co. South Bay Foundry Sigma SIP Industries
Fire Hydrant, Extension Spools	6" cast iron spools shall be groove break-off and hollow bolts shall be breakaway.	Clow Valve Co. South Bay Foundry Sigma (DI) SIP Industries
Fire Hydrant, Raised Pavement Markers (Blue Reflectors)	Blue reflector attached to pavement to show location of fire hydrants at curb.	Hy-Viz Champion American Emedco
Fitting Ductile Iron	Flanged, mechanical, joint or push-on tees, bends, crosses, reducers, adapters, etc., for water lines 4" and larger. Manufactured per AWWA C110, C111, C115, and C153, cement mortar lined.	Tyler Union U.S. Pipe Sigma SIP Industries Star Pipe Products
Gasket	1/16" thick ring gasket, asbestos-free; aramid fiber bound with nitrile bounded rubber (NBR).	Tripac Klinger Teadit Garlock
Joint Restraint Assembly for Ductile Iron Pipe	Mechanical joint type restraint system for ductile iron pipe, size 6" to 24" and Steel 3" to 12".	Ford: Uniflange for DIP Romac: RomaGrip (DIP) Romac: Piranha Restraint (DIP) Romac: GripRing Romac: Alpha (DIP) EBAA Iron: Megalug (DIP) US Pipe: MJ Field Lok Gasket (DIP) Sigma Smith-Blair: 111 SIP Industries: EZ Grip
Joint Restraint Assembly for PVC Pipe	Radial wedge type joint restraint system for C900 PVC, size 6" to 24".	Ford: Uniflange for PVC Romac: PVC RomaGrip (PVC) Romac: Alpha (PVC) EBAA Iron: Megalug (PVC) US Pipe: MJ Field Lok Gasket (PVC) Smith-Blair: 120 SIP Industries: EZ Grip

HIGHLANDS MUTUAL WATER COMPANY

APPROVED MATERIALS

ITEM	DESCRIPTION	MANUFACTURER
Meter Box (for 5/8" to 1" meters)	12" x 20" polymer meter box and cover for 5/8" to 1" water services.	<u>Armorcast:</u> A6000485SA (Preferred) A6000484DQ (cover w/ read lid) A6000487 A6000484 (one piece cover) A6000484T (20K traffic lid) A6000484TDQ (20k traffic w/read lid) <u>Oldcastle Precast:</u> 1118PC FW Box 1-Mouse Hole FL12D001 1PC Cover "WATER" 1118PC Cover w/H Series Read Lid
Meter Box (for 1 1/2" to 2" meters)	17" x 30" polymer meter box and cover for 2" water services. Boxes are 12" deep; 18" deep box is available.	<u>Armorcast:</u> A6001640PCX12 (box) A6001643DZ (cover w/read lid) A6000482 (one piece cover) A6001643 (one piece cover) A6001947T (20K traffic lid) A6001643TDZ (20k traffic w/read lid) <u>Oldcastle Precast:</u> PC1730-12 T-22 Box 1-Mouse hole FL36TBOX12 1-Mouse Hole PC1730 Cover w/H Series Read Lid
Meter Box With Traffic Rated Reinforced Fiberglass Lid	Lid rated for H-20 loading. Box installed in parkways and behind curbs. Not intended for installation in traffic lanes.	J&R Concrete Products Oldcastle Precast Armorcast
Meter Stop, Angle Valve (Compression) X Meter Size	1" bronze angle meter stop (ball valve) with 90 degree lock wing, inlet Compression X Plain Swivel Meter Nut.	Ford: BA43-444W-Q-NL Jones: E-1963W Mueller: B-24258-1 AY McDonald: 74602BQ
	2" bronze angle meter stop (ball valve) with 90 degree lock wing, inlet Compression X Meter Flange.	Ford: BFA43-777W-Q-NL Jones: E-1975WSG Mueller: B-24276N AY McDonald: 74602BQ

HIGHLANDS MUTUAL WATER COMPANY

APPROVED MATERIALS

ITEM	DESCRIPTION	MANUFACTURER
Meter, Small Water Service (3/4" to 2")		HMWC to supply
Meter, Large Water Service (3" to 12")	Ultra-sonic flow meter	Master Meter: Octave Ultrasonic Meter (Reading in CCF)
Mortar Repair	Two component, non to low shrinkage, cement based with high compressive and bonding strength.	SikaTop: 122 Plus, 123 Plus Vexcon: Certi-Vex All-Patch
Pipe – Service Line, HDPE Tubing	Water service line HDPE tubing for 1" and 2".	1" ADS PolyFlex Water Service Tubing (IPS) SDR 9 2" ADS PolyFlex Water Service Tubing (CTS) PE4710
Pipe, Ductile Iron (DIP)	Used for water lines 4" and larger; manufactured per AWWA C104, C111, C115, C150 and C151. Cement mortar lined. Class 350 minimum.	McWane Ductile U.S. Pipe American Cast Iron Pipe Company
Pipe, HDPE (High Density Polyethylene)	Size 3" and smaller shall meet AWWA C901. Pressure Class 200 minimum. Size 4" to 12" shall meet AWWA C906, Pressure Class 200 minimum and shall comply with ductile iron pipe sizes.	Any brand that meets the specification
Pipe, Marker Posts	Used to mark pipeline alignments and valve locations in unimproved areas.	Rhino Marking & Protection Systems Compliance Signs Energy Control Systems, Inc Carsonite
Pipe, PVC AWWA C900	Used for water lines 4" to 30" and 8" valve cans. Class 235 (DR18) minimum and AWWA compliant.	Vinyltech PVC Pipe North American Pipe Corporation Diamond Plastics Corporation
Polyethylene Encasement	8-mil polyethylene encasement for buried DIP per AWWA C105. Clear color for potable water pipe.	Any brand that meets the specification

HIGHLANDS MUTUAL WATER COMPANY

APPROVED MATERIALS

ITEM	DESCRIPTION	MANUFACTURER
Repair Clamps and Bands	Repair clamps and bands shall be full circle stainless steel with stainless steel lugs, bolts & nuts.	Ford Romac Smith-Blair Mueller Co. PowerSeal Pipeline Products Corporation
Service Saddle for Asbestos Cement Pipe	Bronze saddle Silicon bronze flattened double straps. Threaded outlet for sizes 1" and 2".	Ford: 202B Jones: J-979 Mueller: BR2B Series AY McDonald: 3825 AY McDonald: 3826
Service Saddle O.D. Controlled Sized for PVC C900 Pipe Sizes 4" to 12"	Bronze saddle with double or wide stainless steel bands and four bolts. CC threaded outlet for sizes 1" and 2".	Ford: 202BS Jones: J-969 Mueller Co.: BR2S Series Romac: 202BS AY McDonald: 3845
Service Saddle for Ductile Iron Pipe for Pipe Sizes 4" to 16"	Ductile iron nylon coated saddle with double or wide stainless steel bands and four bolts. CC threaded outlet for sizes 1" and 2".	Romac: 202NS Mueller Co.: DR2S JCM: 406 Ford: FC 202 Smith-Blair: 317
Tape, Warning And Identification	6" wide, warning and identification (non-metallic) marking tape for buried facilities.	Reef Industries, Inc.: Terra Tape Seton: Detectable Underground Tape Brady: Detectable Identoline Warning Tape
Tapping Sleeve for ACP, CI, DIP, PCCP, and PVC pipe	Fabricated stainless steel tapping sleeve for hot taps of existing water mains; includes T304 stainless steel flange, T304 stainless steel bolts, nuts and full mat SBR gasket. See the Standard Drawings for detail information.	Ford: FTSS (S.S. Flange) Romac: SST III (S.S. Flange) Smith-Blair: 665 JCM: 432 Mueller Co.: H-304SS (S.S. Flange) Koppl PowerSeal: 3490AS
Tracer Wire Junction Box	For ground level termination of tracer wire and a connection point.	Copperhead Industries, LLC: Snakepit
Tracer Wire	No. 10 gauge AWG solid copper wire with a blue type UF 60 mil insulation. Use 3M gel filled wire connectors at all splices.	Copperhead Industries, LLC: Snakebite 3M: DBR

**HIGHLANDS MUTUAL
WATER COMPANY**
APPROVED MATERIALS

ITEM	DESCRIPTION	MANUFACTURER
Tracer Wire, Pin Brazing Connections	Connects tracer wires to metal pipes, valves or junction boxes.	ION Cathodic Protection Technologies GMC Electrical, Inc. Farwest Corrosion Control Co.
Valve, Ball (No-Lead)	1" and 2" brass, straight, various end connections configurations 110 compression, FIP, MIP.	Ford Jones Mueller Co. AY McDonald
Valve, Ball With Locking Tabs (No- Lead)	1" and 2" brass, straight, various end connections configurations 110 compression, FIP, MIP locking tabs, lever handle	Ford Jones Mueller Co. AY McDonald
Valve, Insulated Ball (No-Lead)	1" brass, straight, Compression X Compression, insulated type.	Mueller Co.: N-35209
Valve, Lockable Ball (No-Lead)	¾" and 1" brass customer shut-off ball valve, inlet FIP X Plain Meter Swivel Nut; lockable tabs with lever handle.	Ford: B13-332W-HB-34S-NL, B13-444W-HB-34S-NL Jones: E-1908 Mueller Co.: B-24351N-3 w/B-20298 AY McDonald: 76101MWHDLB
	2" brass customer shut-off ball valve, inlet FIP X Meter Flange; lockable tabs with lever handle.	Ford: BF13-777W-HB-67S-NL Jones: E-1913W Mueller Co.: B-24337N-3 w/B-20298 AY McDonald: 76101MW/SHDLB
Valve, Check	Check valves shall be resilient seated and shall comply with AWWA C508-09. Interior and exterior ferrous surfaces shall be coated per AWWA C550.	Mueller Co. Valmatic Cla-Val Clow Kennedy M&H
Valve, Resilient Wedge Cut-In and Sleeve,	4" to 8" non-rising stem, bronze stem, cast iron body and bonnet, rubber encapsulated wedge, T316 stainless steel body, bolts and nuts, 2" op nut open left manufactured to AWWA C509 with epoxy coated interior/exterior per AWWA C550	Mueller Co.: C-2360
Valve, Gate, Resilient Wedge (RWGV) (Pressure Class 150 Minimum)	4" to 12" non-rising, low zinc bronze stem, full wall ductile iron body and bonnet, EPDM rubber encapsulated wedge, T316 stainless steel body bolts & nuts, 2" op nut open left. Manufactured to AWWA C515 with epoxy coated interior/exterior per AWWA C550.	Clow: 2638 Kennedy: KS-RW M&H: Style 7000 Mueller: 2362 American AVK: 65 American Flow Control: 2500-1

HIGHLANDS MUTUAL WATER COMPANY

APPROVED MATERIALS

ITEM	DESCRIPTION	MANUFACTURER
Valve, Insertion	4" to 12", A-36 steel sleeve, bolts and nuts T304 stainless steel, SBR gasket, sleeve, lined/coated fusion bonded epoxy per AWWA C213.	Romac: QuikValve (4"-8") Romac: InsertaValve (10"-12") AVT: EZ Valve (4"-24")
Valve, Pressure Regulating	For reducing water pressure to the customers on 1" and 2" services.	Cla-Val Wilkins Watts Febco
Valve Box	Cast iron machined frame with Cast iron lid. See standard drawings for markings.	Brooks Products Christy
Vault, Pipe Opening Seal	Seal pipe opening in vault and wall with a mechanical/rubber ring that is tightened to produce a water tight seal.	GPT: Link-Seal Modular Seal
Vault, Traffic Bearing	Vault shall meet the requirements for traffic bearing vault and be designed in accordance with AASHTO H-20-wheel loading. Access hatches, frames and covers shall be rated for heavy duty traffic meeting AASHTO H-20-wheel loading. When total depth is greater than 5 feet, vaults shall be equipped with an aluminum ladder and a ladder-up safety pole. Vaults for meter installation shall be equipped with meter reading lid centered over the meter. Joints between vault sections shall have a butyl rubber sealant installed	Brooks Products Jensen Precast J & R Concrete Products, Inc. Oldcastle Precast Olsen Precast Co. (OPC)