# Section 6 - **Domestic Water**

## 6.1 General

These improvement standards shall govern the engineering design and construction of all domestic water systems intended for operation and maintenance by the City of Gridley.

All work shall be installed in accordance with the requirements of the American Water Works Association (AWWA), these Standards, the California Building Code, the California Plumbing Code and as recommended by the manufacturer. These Standards and manufacturer's guidelines shall always be present at the construction site.

## 6.2 Connection to Existing Facilities

Connections to existing City water facilities shall be made after approval by the City Engineer and all permits have been issued.

All work related to the connection shall be done by the Contractor with full-time inspection by the City or a contracted City inspector. A gate valve shall be provided at the point of connection to isolate new water mains from the existing system. New water facilities shall remain isolated from the existing system source water using a backflow preventer tested in place until the connection is approved.

Hot tap connections may be allowed if approved by the City Engineer. Hot tap connections will not be allowed on existing steel pipelines, nor when the diameter of the service line is equal to or greater than the diameter of the main. If hot tapping is approved by the City Engineer, the Contractor shall have the tapping sleeve and valve fully installed, thrust blocked or fully restrained, supported and approved by the City prior to making the hot tap, and the tap shall be the full nominal diameter of the tapping sleeve and valve.

The Contractor shall tie into the new system or to an existing stub under the following conditions:

1. With specific approval of the City.
2. Care shall be taken to provide a clean, sanitary tie in site.
3. Dewatering of both the new and existing water mains shall take place in a way as to prevent contamination by trench water.
4. All materials used in the tie in shall be clean, new, and swabbed with chlorine to the satisfaction of the City Inspector.
5. All tie ins shall take place in the presence of the City Inspector. City inspector shall be notified no later than 48 hours prior to the start of work.
6. Notify customers of pending service outages 24 hours in advance using door hangers approved by the City Engineer.
7. Tie ins may take place only after the newly constructed water system has successfully passed all required testing procedures as established in these Standards or Standard Details as determined by the City Engineer.
8. Under no circumstances shall anyone other than a representative of the City open or close valves in a City operated system, unless approved by the City Engineer.

### A. Construction Staking

The water main shall be staked prior to excavation. Staking shall provide the station and the offset to the water main, as well as the cut to the nearest 0.1 foot. Stakes shall be provided at a minimum of every 100 feet in tangent sections, every 25 feet in curved sections, and every 10 feet in approved vertical curve sections, and at all valves and appurtenances.

### B. Cross Connection Control on Fire Sprinkler Systems

According to the California Health and Safety Code Section 13114.7, no backflow prevention devices other than those specified in the Standards of the National Fire Protection Association (NFPA) may be required for Class I and II fire sprinkler systems. Class I automatic fire sprinkler systems are those systems supplied by public water mains only (i.e., no pumps, tanks or reservoirs, physical connection from other water supplies, and no anti-freeze or other additives of any kind).

Class II systems are the same except that booster pumps, whose sole source of supply is the public water system, may be installed in the connection from the street main.

Automatic fire sprinkler systems which have cross-connections to unapproved sources of water, in addition to being connected to the public water mains, shall have backflow protection as required by American Water Works Association M-14 for Class III, IV, V, and VI fire systems.

All automatic fire sprinkler systems shall be installed in accordance with provisions of National Fire Protection Association (NFPA) 13, "Installation of Sprinkler Systems". All systems shall have a fire department connection as required by NFPA #13, unless waived by the Fire Chief. All Class I and II automatic fire sprinkler systems, as with all fire extinguishing systems, shall be serviced and maintained on a regular basis in accordance with the provisions of Chapter 1.8 (starting with Section 13195) of Part 2 of Division 12 of the California Health and Safety Code.

In accordance with NFPA 13, each automatic fire sprinkler system shall have an alarm check valve, or equivalent, which is listed and approved for fire system use. Each fire department connection shall have a listed double detector check valve as required by NFPA 13. Further, the fire department connection shall be attached to the sprinkler system above the alarm check valve assembly and not on the supply side. Class I and II systems connected to public mains only do not require double backflow protection devices. Since Class I and II systems are located on public water mains and fire hydrants, the public mains shall be used for supplementary water except in cases of extreme emergency situations where a fire progresses beyond the design criteria of the system and additional water, either in volume or pressure, is required to control the fire situation.

When such added water is needed, it shall be taken from fire hydrants on the public mains through the appropriate fire department pumper and hose lines. The connection shall not be used to pump water from any source other than the public water system.

## 6.3 Design Criteria

These criteria shall apply to the engineering design of all water systems intended for operation and maintenance by the City. The intent of these criteria is to provide a water system that will dependably and safely convey high quality water throughout the distribution system.

All work shall comply with the pertinent and current requirements of the following agencies.

1. United States Environmental Protection Agency (EPA) Drinking Water Regulations.
2. Laws and Standards of the State of California, Department of Public Health Services relating to Domestic Water Supply.
3. Title 17, Chapter V, Sections 7583-7622, California Administrative Code regarding cross-connections and backflow prevention
4. Latest Edition of the American Water Works Association (AWWA) Standards.
5. Gridley Fire Code

In the case of conflicting design criteria, the requirements of these standards shall take precedence.

## 6.4 Water Supply Quality and Pressure

The quality of water supplied to the system shall conform to the Environmental Protection Agency Drinking Water Act, and the State Department of Health Services Drinking Water Standards.

Normal operating pressures of not less than 50 PSI nor more than 75 PSI shall be maintained at service connections to the system, except that during periods of peak domestic and fire demand, the pressure shall not be less than 20 PSI.

## 6.5 Flow Determination

Determination of flow volumes required for a specific land use category shall consider maximum day domestic demands occurring in conjunction with an emergency fire flow demand. For design of the distribution system, the following unit demand factors shall be assumed.

Factors assume a 30% FAR. 50% FAR for senior living.

*Table 6-1 Flow Determination*

| **Land Use Category** | **Average Day unit Demand Factors** |
|---|---|
| Very Low Density Residential (0.5-3 DU/AC) | 728 gpd/DU |
| Low Density Residential (2-4 DU/AC) | 600 gpd/DU |
| Medium Density Residential (5-8 DU/AC) | 478 gpd/DU |
| High Density Residential 1 (9-15 DU/AC) | 306 gpd/DU |
| High Density Residential 2 (15-30 DU/AC) | 177 gpd/DU |
| Agricultural | 2,000 gpd/AC |

| | |
|---|---|
| Agricultural Industrial | 2,598 gpd/aC |
| Industrial | 2,562 gpd/AC |
| Commercial | 2,598 gpd/AC |
| Neighborhood Center Mixed Use | 2,598 gpd/AC |
| Open Space | - |
| Park | 2,988 gpd/AC |
| Public | 1,780 gpd/AC |
| Elementary School | 3,454 gpd/AC |
| High Schools | 4,068 gpd/AC |
| Railroad Yard | 109 gpd/AC |

### A. Peaking Factors

The average day demand to maximum day demand peaking factor shall be 2.0. The maximum day demand to peak hour demand peaking factor shall be 1.7 (3.4 average day to peak hour).

### B. Required Fire Flows

For areas of the general type noted below, the indicated water supply for fire flows shall be provided with the initial development. Expansion or changing in zoning of the development shall be subject to the requirements of the California Fire Code (CFC) as adopted by the City.

**Residential Areas**

Single family homes equipped with automatic fire sprinklers systems shall require a 1" minimum water service and meter. The minimum 1" water line shall start from the public main to the required water meter.

**Multi-Family Areas**

For attached multi-family units, the fire flow shall be determined by the Gridley Fire Department. The maximum fire flow however shall not exceed 4,000 gpm provided the building is fully sprinklered in accordance with the CFC as adopted by the City. For buildings that are not sprinklered, contact the GFD.

## 6.6 Water System Design

Standard distribution main sizes are 6, 8, and 12 inches in diameter. Sizes of mains shall be such that the stated normal pressures, and the minimum requirements for main spacing, specified below, are maintained. The distribution system shall be designed in grid form to provide equalized pressures throughout the system equalized under varying rates and location of demand. The minimum pressures and flows specified in these standards shall govern the design. The following shall be considered during system design:

### A. Hydraulic Analysis

A network hydraulic analysis shall be provided to the Public Works Department upon request. The hydraulic analysis submittal shall include two copies of the following items:

1. The data input files, as well as the analysis results in electronic format.

2. Information on the proposed development (e.g. type of development, number of acres, number of units, fire flow requirements, etc.).
3. Data sheets outlining all assumptions (e.g. method used to assign demands to corresponding junction nodes and source HGL's used).
4. Map identifying pipe and node numbers and their locations.
5. Fire hydrant locations.
6. The name and version of software used for the analysis.
7. Elevations of junction and source nodes. The elevations used in the network hydraulic analysis shall be based on a project grading plan or the anticipated final elevations. If the final grading plan deviates significantly from the elevations used in the analysis, a revised analysis will be required.
8. Staging or phasing of the development.
9. Appropriate off-site demands.

## B. The Hazen -Williams formula shall be used in the analysis of the system. Pipe Size and Materials

For transmission lines between wells the minimum pipe size is 10 inches. Standard distribution main sizes are 6, 8, and 12 inches in diameter as stated above. For looped mains and interconnections, the minimum pipe size is 6 inches.

Pipe materials for mains shall be ductile iron pipe or C-900 PVC pipe with cast iron dimensions.

## C. Cover

A minimum cover of 36 inches and a maximum cover of 60 inches shall be maintained as measured from the outside bell of the pipe to the pavement or final grade, unless approved by the City Engineer.

## D. Stubs

Stubs for future developments shall be a minimum of 18 feet fully restrained ductile iron pipe, originating from the water main.

## E. Water Main Location

If it is necessary to install a water main outside of the public right-of-way, an easement dedication to the City shall be required. Water mains shall be centered (suggest 20' and off set from centerline) within their easement. Easements shall be located completely on one side of a property line or fence. Dedicated easements shall be clear of all permanent structures, building eaves, roof lines and the future trunks of large tree species. Temporary construction easements of adequate size shall also be provided. The easement width shall be a minimum of 20 feet. Dead End mains shall be eliminated wherever possible by looping the system. Blow-offs conforming to these standards shall be installed at all permanent or temporary dead-end mains.

### F. Minimum Separation Requirements

Water mains shall maintain separation from all sanitary sewers and recycled water mains per the most current state water code on vertical and horizontal separation. (Title 22, Chapter 16, Section 64572)

**Key Requirements for Water Main Separation (CCR §64572):**

1. **Horizontal Separation:** New water mains must be at least 10 feet away from parallel sewage or hazardous fluid pipelines.
2. **Vertical Separation:** Water mains must be installed at least 1 foot *above* sewer pipelines when parallel.
3. **Crossing:** When crossing, water mains must be at least 1 foot *above* the sewage pipe.
4. **Recycled Water:** For disinfected tertiary recycled water or storm drains, the requirement is a minimum of 4 feet horizontally and 1 foot vertically above the pipe.
5. **Exceptions:** If 10-foot horizontal/1-foot vertical separation is not possible, the water main must be encased or the alternative design must be approved by the State Water Resources Control Board.

All other utilities shall maintain a minimum 5-foot separation sidewall of pipe to sidewall of pipe.

### G. Vertical Elevation Changes

Mains designed with a vertical elevation change using angle fittings use a segment of ductile iron pipe with an approved restraint system between the two fittings. All water mains shall be fully restrained for the length required by the pipe diameter, type of pipe used, trench and bedding classification. Thrust blocks shall only be used if approved by the City Engineer. High and low points (exceeding 2 pipe diameters) shall be addressed with blow offs or ARV's as appropriate.

### H. Warranty Inspection of Water Main Stubs

As a requirement, water stubs are provided to subdivisions as a courtesy by developers during the construction of backbone infrastructures in streets to prevent cutting up the newly paved streets when the subdivisions are ready to develop. These stubs become an integral part of the water system and subsequently the responsibility of the developers of the subdivision and are therefore imperiled to both construction and warranty inspections. This practice saves future developers' construction time and cost that would have otherwise been spent on tie-ins and street repairs and in some instances prevents delays in the event a street has a moratorium. Since these stubs are provided at no cost to future developers, it is our policy, that it is the responsibility of the contractors to test and repair these stubs, if found damaged, prior to tie-ins. A note of this effect shall be placed on the improvement plans.

## 6.7 Valves

Sufficient valves shall be provided on water mains to minimize customer service interruptions and sanitary hazards during repairs and future development or at a maximum of 500' from the nearest valve.

### A. Location

Valves will generally be located as follows. No single shut down will result in shutting down a transmission main. Valves will be installed at minimum intervals of 500 feet in school, commercial, industrial, or multi-family residential developments.

In residential areas, valves shall be spaced such that no single shutdown will result in shutting off water to more than 20 services or 800 feet of water main whichever comes first.

Valves shall be located such that any section of main can be shut down without going to more than three valves to shut down the main section. All tees shall have a minimum of two valves. All crosses shall have a minimum of three valves.

Commercial services 6 inches and greater shall have a valve on each branch of the tee for a total of two valves.

Valves should not be located in; gutters, valley gutters, or driveways. A valve shall be installed on each side of a creek, canal, bridge, major highway or as required by the City Engineer.

A gate valve shall be installed at the point of connection when connecting a new water main to the existing water system.

### B. Removal and Abandonment

Any valve outlet installed prior to lot development and subsequently not required shall be removed in its entirety. If removal is not practical, the valve shall be abandoned in the closed position and the lateral shall be cut, capped, and finished with an adequate thrust block. The lid shall be welded shut and painted red. The following note shall appear on the construction drawing:

*The Contractor shall cut the existing pipe where shown on the drawing and install a restrained cap complete with thrust block. Where a joint or couplingin the existing pipe is uncovered at the cut and cap locations, the installation of a plug may be permitted with approval from the City Engineer.*

### C. Valve Extension Stems

Valve extension stems are required where the distance from the top of the valve box to the top of the operation nut exceeds 40 inches. The valve extension stem shall be a minimum of 24 inches long and shall be within 24 inches of the surface.

### D. Air Relief/ Vacuum Valves

In the absence of services to relieve air trapped in high points of the water main, air relief or air vacuum relief valves are required on pipeline high points and changes in grade (exceeding 2 pipe diameters).

## 6.8 Hydrant and Blow Offs

### A. Location

Hydrants and blow-offs shall adhere to the following criteria.

1. Fire hydrants shall be placed at street intersections wherever possible. Hydrants located at intersections shall be installed at the curb return on the same side of the water main connection.

2. Fire hydrants and blow-offs not located at intersections shall be installed on property lines between lots.
3. Not more than three hydrants shall be installed on an 8-inch main between intersecting 12-inch mains. The pipeline connecting the hydrant and the main shall be a minimum of 6 inches, with a flanged gate valve connected to the main.
4. A blow-off assembly shall be installed on all permanent and temporary dead-end runs. A 2-inch blow-off shall be used on mains 12 inches and smaller. A 6-inch blow-off shall be used on mains 16 inches and larger. In no case shall the location be such that there is a possibility of back- siphonage into the distribution system.
5. Blow-off assemblies shall be located at low points along mains.
6. Hydrants, valves and buries shall be installed per the standard details.

### B. Spacing

Fire hydrants and blow-offs shall have a maximum spacing of 500 feet measured along the street frontage in residential areas and a maximum spacing of 350 feet in all other areas. Where new water mains are extended along streets where hydrants are not needed for protection of buildings or similar fire problems, fire hydrants shall be provided at spacing not to exceed 1,000 feet to provide for transportation hazards.

Hydrant valves shall be placed at the tee on the main.

### C. Cul-de-sacs and Dead End Streets

Hydrants shall be required within a cul-de-sac or dead-end street measuring more than 250 feet as measured from the curb return of the intersecting street and the end of the bulb or street. A minimum 8-inch water main shall extend up to the hydrant tee.

## 6.9 Water Services

Water services shall be installed at the time the water main is constructed. Service stubs 2 inches and smaller shall be polyethylene (CTS). Service stubs 3 inches and larger shall be fully restrained ductile iron pipes. Services from mains installed in private roads shall be extended 1-foot beyond the edge of pavement. Water services shall also conform to the following requirements.

### A. Location

The building service shall be located to provide the most direct connection to the main. Every effort shall be made to pair services. Single and double residential water services shall be installed on lot/property lines.

The curb shall be stamped with a “W” at all service locations.

### B. Sizing

The standard size of a single-family residential service line shall be a minimum 1- inch service or as determined by the City Engineer. Schools, commercial, industrial, or a multi-family residential developments shall be provided with a larger service subject to approval by the City Engineer.

For service laterals 2 inches in diameter or smaller, service saddles shall be a minimum of 12 inches from the end of the main and 24 inches to any other service saddle or pipe joint.

### C. Service Taps

The City reserves the right to make all water service taps onto existing mains upon application for a service tap and authorization for payment. Work by the City shall be performed on a time and materials basis. A note to this effect shall be placed on the plan sheet which shows a detail of the area that requires such tapping. The service tap application shall be made to the City a minimum of two weeks in advance of the time the tap is desired. All connectionfees must be paid prior to the time of application. All excavation, backfill and the installation of the remainder of the water service shall be performed by the Contractor.

### D. Water Meters

Water meters shall be installed on all water services. Meters shall be purchased through the City and installed by City forces upon plan approval and payment of the connection fees.

## 6.10 Water improvement Plan Requirements

Plans for the construction of water infrastructure, whether in conjunction with other improvements or for a water project only, shall conform to these standards, meet the following requirements.

### A. Water Study

A water study or water master plan as determined by the City may be required prior to review of the water design if there is a possibility that adjacent areas might require service through the subject property.

### B. General Requirements

Plans for the water improvement project shall include a layout sheet, plan and profile of each public water line, and necessary detail drawings.

### C. Layout Sheet

Improvement plans shall include an overall map which showsthe project boundaries, water mains, valves, services, and other important items of the work.

A parcel which benefits from and financially participates in a water construction project, but is not included within the project boundaries, shall have a note to this effect placed on the layout map and on the plan and profile sheet if the parcel appears thereon. Parcels which make use of those facilities may be subject to additional fees at the time of connection, if the participation has not been so noted.

## 6.11 Restraint

Joint restraint shall be achieved by means of a mechanical joint restraint device. Full pipe restraint shall be required within bridges, casings, dead end runs, temporary dead end runs, at all angle points, and as determined by the City. Restrained pipe within casings or bridges shall be fully extended or “stretched out” to remove the slack between the joints the entire length of the structure. A note shall be placed on the plans. Thrust blocks shall not be used unless specifically called out on the plan set and approved by the City. Restraint calculations shall be submitted with the plan review. Restraint calculation parameters are as follows: soil type ml, granular fill, 1.5 to 1 safety factor, trench type 4, and minimum test pressure of 150 psi.

## 6.12 Work Near Existing Mains

Existing transmission water mains shall be clearly shown on the plans. The plans shall have a caution note on the cover sheet, plan/profile sheets, and grading sheets where the main is shown as existing. The notes shall read as follows: *CAUTION EXISTING (name size) WATER MAIN.*

No construction shall be permitted within the water main easement without the presence of the City's inspector. Prior to start of construction, 48-hour notice shall be given to the Public Works Department. Heavy equipment and vibratory equipment may cross designated segments of the water main with a minimum of 10 feet of cover or approved equivalent. The City shall inspect the condition of the existing main prior to paving. Request for inspection shall be made two weeks in advance.

## 6.13 Pipe Bedding

Pipe bedding shall conform to the standard details and the following.

Bedding shall provide uniform and continuous support along the barrel of the pipe. The minimum (6" for mains, 4" for service lines) depth of bedding material shall be provided under the bell. Blocking of the pipe is not permitted.

Loose material shall be removed from the trench bottom and replaced with imported material.

Where rocky, unyielding, or unsuitable foundation material is encountered, the subgrade shall be excavated a minimum of 12 inches below the pipe and the trench width shall be increased a minimum of 12 inches. The over-excavation shall be replaced with imported material.

Where the trench bottom is soft, yielding or unstable, the trench bottom shall be over-excavated. ¾" crushed rock shall be placed in the trench to provide a stable foundation. The rock is in addition to the required pipe bedding used in the pipe zone.

Bell holes shall be excavated per manufacturer's recommendations. The minimum depth of bedding material shall be 6" for mains, 4" for service lines provided under the bell. Care shall be taken to ensure that the bell hole is no larger than necessary to accomplish proper joint assembly.

## 6.14 Installation

Water pipe shall be installed in accordance with the following provisions.

The contractor shall keep the pipe interior free from foreign materials and in a clean and sanitary condition until acceptance by the City. At times when pipe laying is not in progress, the open pipe end shall be sealed with a water tight cap or plug to prevent foreign matter from entering the pipe. Provisions shall apply overnight.

Trenches shall be in a reasonably dry condition when pipe is laid. Care shall be taken when lowering pipe into the trench to protect the pipe from damage. Chains are not permitted. The pipe shall be laid carefully to the lines and grades shown without grade breaks, unless designed with such, or to minimum depths shown on the approved plans. If field conditions exist such that the pipe may not be laid to the specified grade, the approved plans will require revisions prior to proceeding with construction.

Pipe sections shall be closely jointed to form a smooth flowline. Care shall be taken in placing the pipe and making field joints.

No facility is to be backfilled without inspection by the City. Improvements installed without proper inspection shall be exposed and inspected as required by the City. All installations shall follow manufacturer's recommendations unless otherwise noted on the approved plans. The manufacturer's installation guide shall be on the job site at all times.

Pipes shall be fully restrained to the length specified in the approved plans, using materials specified herein.

Thrust blocks shall only be used where specifically shown on the plan /profile sheets and/or standard detail sheets. All fittings and appurtenances shall maintain a minimum of 18 feet of restrained pipe into the fitting from all directions. Plans should reflect the restraint lengths required for each segment and transition.

A continuous number 12 insulated tracing wire shall be attached to mains, service lines and appurtenances per these Standards, Details and the following:

1. Tracing wire shall be continuous between mainline valve boxes and fire hydrants. It shall be attached to the top of the pipe with 10-mil vinyl tape every5 feet.
2. Tracing wires through valve boxes shall be placed outside of riser, but inside the box. (24 inches coiled)
3. Tracing wire in manholes and vaults shall be attached inside the facility within 1 foot of the rim.
4. Wire splices shall be located above ground and inside of valve boxes, per Details and as follows: Install a copper split bolt connector on the splice, twist the wire together with a minimum of 5 twists, solder all connections, and cover and splice with mastic tape and wrap with vinyl tape. A 12 inch wide, blue plastic non-detectable water pipe marking tape, marked "Buried Water Main Below," shall be placed in all main line trenches. The detectable tape shall be installed between the aggregate base backfill and the bedding sand layers. The warning tape shall extend to the nearest valves located on each side of said intersection.

Mains in unpaved areas shall be marked every 150 lineal feet with a blue composite utility marker having a decal stating: "Caution Water Pipeline." Appurtenances (valves, ARV's, test stations, etc.) and angle points shall also be marked. Mains in landscaped areas shall be delineated with a brass marker set in an 8 inch concrete cylinder 4 inches above finished grade every 300 lineal feet. The brass marker shall state "City of Gridley Water Main."

All underground metal (ductile iron, valves, fittings, copper, brass, etc.) shall be wrapped in 10 mil minimum thickness polyethylene encasement with ends taped off with vinyl pipe wrap tape.

## A. Polyvinyl Chloride (PVC) Pressure Pipe

PVC shall be installed in accordance with the AWWA Manual M23 and the manufacturer's recommendations, except as otherwise provided herein:

1. PVC Pipe shall have been manufactured within the 18 month period prior to installation.

2. Pipe and gaskets shall be kept clean and protected against sunlight and heatdamage.

3. Pipe showing signs of physical damage or excessive ultraviolet exposure will be rejected and shall be immediately removed from the job site.

4. The pipe shall be installed with the manufacturing label showing on the top. Pipe segments shall be continuous of one manufacturer.

5. The reference mark or stab line on the spigot end must be flush with the bell end and visible for inspection

6. The beveled end of the pipe shall be cut off before placement into a mechanical joint.

7. Minimum length of pipe for installation shall be 5 feet.

### B. Ductile Iron Pipe (DIP)

DIP shall be installed in accordance with the standards for "Installation of Ductile Iron Water Mains and Their Appurtenances"(ANSI/AWWA C-600) and the manufacturer's recommendations, and as provided herein:

1. DIP shall be polyethylene encased in accordance with these Standards and the standard for "Polyethylene Encasement for Ductile-Iron Piping for Water and Other Liquids" (ANSI/AWWA C-105/A21.5).
2. At the direction of the City, the Contractor shall repair damages to the polyethylene encasement as described within ANSI/AWWA C-105/A21.5 or shall replace all damaged polyethylene film sections.
3. Metallic lines shall be exothermically welded and electrically continuous on DIP runs exceeding 100 feet or as approved by the City. Each joint shall have 2 individually welded wires. Exothermic welds shall be installed as follows:
    - Weld only against bare metal adjacent to both bell and spigot ends of pipe.
    - Care must be taken not to remove excess metal when removing the pipe coating.
    - Correct horizontal molds must be used for pipe diameters from 4 to 24 inches in diameter. Pipes 30 inches and larger may use flat mold.
    - After a solid weld is made, coat the bare metal with an acceptable bituminous coating material and cover with exothermic weld cap.
    - Corrosion test stations shall be installed on metallic lines at intervals not to exceed 1,000 lineal feet or as specified on the approved plans.
    - Minimum length of pipe for installation shall be 5 feet

### C. Ductile Iron Pipe Fittings

In addition to requirements set by these standards,fittings shall be constructed per the following requirements. Flanged and mechanical joint fitting bolt threads and nuts shall be coated with an approved bituminous material.

Transitions between DIP and PVC may be made by the use of a DIP repair sleeve or a PVC pipe spigot may be inserted into a DIP bell by cutting off the PVC bevel on the spigot and leaving no more than a ½ inch taper. The City's inspector shall be present to witness this process.

## 6.15 Service Installation

Water services shall be installed in accordance with manufacturer's recommendations, the Details and with the following provisions.

Services shall be continuous from the main line to the service box. Bends in polyethylene tubing shall be made in a manner that does not crimp or flatten the tubing.

Taps, service saddles and fittings attached to mains shall be separated from each other by a minimum of 24 inches.

Service saddles shall be wrapped and sealed in 8-mil minimum thickness polyethylene and backfilled with sand. Use pipe wrap tape to secure and seal the polyethylene wrap.

Service lines shall be encased in 8-mil minimum thickness poly tubing. Use pipe wrap tape to secure and seal the polyethylene wrap.

Service manifolds shall be constructed per the following criteria:

1. Where a service line is extended a distance greater than 40 feet, a construction jumper shall be installed per the standard details. The new service line and manifold shall be tested in accordance with these standards.
2. Where a service line is extended a distance less than 40 feet, the extension shall be cleaned, swabbed with chlorine and flushed in the presence of the City. The new service line and manifold shall be pressure tested in accordance with these Standards. In both cases, the installation shall be fully restrained by an approved restraintsystem, starting at the main and as required by the approved Improvement plans.
3. Service lines and manifolds 3 inches and larger shall be ductile iron.
4. No water shall be drawn through a service prior to installation of the water meter and testing of the backflow assembly.
5. A backflow assembly shall be required for construction and sales trailers having a landscape irrigation system or a septic holding tank.
6. Backflow assemblies shall be covered with a freeze protection insulated bag.
7. The curb in front of residential water services shall be stamped with a “W.”
8. Service saddles shall be installed with zinc caps on all bolts per these Standards.

## 6.16 Abandonment of Services and Mains

All water services requiring abandonment shall be disconnected from the main line at the corporation stop unless otherwise approved by the City. Mainline stubs shall have the valve removed and replaced with a blind flange or as approved by the City. The abandoned piping shall be removed or left in place as approved by the City.

## 6.17 Appurtenance Installation

All appurtenances, including fire protection, blow-offs, sample stations, air release valves and fire hydrants shall be installed in accordance with manufacturer’s recommendations, these standards, and the following provisions.

1. All valves, fittings, DIP, copper and underground brass shall be wrapped and sealed in an 8 mil minimum thickness clear polyethylene encasement. Use 8 mil pipe wrap tape to secure and seal to the polyethylene encasement. Damage or scratched surfaces on epoxy coated valves and appurtenances may be repaired with an epoxy kit per manufacturer’s

recommendations and to the satisfaction of the City prior to wrapping, otherwise the damaged valve shall be replaced with a new valve.

2. Gate valves shall be centered in one piece 8" riser stock. Riser stock shall be blue PVC C-900. An operator nut extension shall be installed on valves where the operation nut exceeds 40 inches in depth from final grade. Valve extensions shall be continuous and within 24" of finished grade.
3. Buried nuts and bolts shall be coated with a bituminous material. This includes exposed bolts found on manufactured appurtenance (i.e. valve bonnets, etc.) "T" bolt heads do not require coating.
4. Break-away bolts shall be used in connecting the fire hydrant to the hydrant break-off spool. Bolts shall be installed nut side up with the bolts filled and covered with silicone caulking. Clearance shall be made for removal of all bolts.
5. Fire hydrants shall be marked with a blue reflector placed 6 inches off the street centerline on the fire hydrant side of the street. Fire hydrants located at intersections shall be marked on both streets.
6. Fire hydrants use a yellow factory applied coating.
7. Dead end lines, permanent and temporary, shall have a blow-off.
8. Insulating kits shall be installed at transitions between dissimilar metal pipes and as required by the City.

## 6.18 Testing Procedures

Testing of the water system may proceed only after joint utility crossings are completed, the sewer mains and services have passed pressure test and TV inspections and subgrade elevations have been met. Road bases to be lime-treated shall be pressure tested before and after the lime treatment process. Testing prior to subgrade placement may be subject to additional pressure tests at the discretion of the City. The new system shall be filled with potable water through an approved backflow device. During the filling of the line with water, precautions shall be taken to prevent air pockets at high points.

### A. Pressure Test

The contractor shall verify with the City that all system valves are open prior to testing, and the City inspector will be present during the duration of the test.

Water may be allowed to stand in the line for several hours prior to the test. During the test, which shall be conducted for the time period determined by the City Engineer, but not less than two (2) hours, the leakage shall not exceed 5 gallons per 24 hours per thousand feet of pipe per inch of nominal diameter. Test sections shall be as short as valve configurations permit. If any valved section of pipe shows greater leakage than specified, the Contractor shall locate and repair the leaks and shall retest that section of line at no additional cost to the Owner.

All parts of the pipeline installation shall be tested at 100 psi minimum pressure or a pressure of 50 psi above the maximum working pressure. Tests shall be made in the presence of the City Engineer or the City Inspector.

## B. Topside Improvements

When all water and sewer infrastructures have passed air, vacuum, pressure, and CCTV inspection the City shall notify the Contractor that the project is ready for road bases and top side improvements. This does not constitute approval for use of the infrastructure.

## C. Chlorine Disinfection

Chlorine disinfection shall comply with the the most current American Water Works Association Standard for Disinfection of Water Mains and as specified below.

Disinfection inspections shall begin only after passing the pressure test. Prior to chlorination, pre-flush water mains and services. Pre-flushing is not permitted if using the Tablet Method for chlorination. If the tablet method is permitted by the City Engineer the tablets shall be secured to the top of the pipe with an approved adhesive.

Chlorine shall be drawn through all mains, hydrant runs and services. The City shall verify that a minimum chlorine residual of 50 parts per million has been achieved. Portions of existing mains which have been connected to the new line or otherwise contaminated by the construction shall be included in the system sterilization. During the chlorination process, all valves shall be operated.

After a 24-hour holding period, the City will verify that a minimum chlorine content of 25 ppm remains in the system. Upon approval by the City, the water system shall be flushed to remove concentrated chlorine. Flushing shall be continued until the remaining water has a chlorine residual below 1 ppm and a turbidity equal to or less than 1 NTU. Chlorinated water shall be neutralized to 1 ppm chlorine residual or less prior to discharge. Discharge location and neutralization methods shall be documented in the SWPPP and coordination with and approved by the City.

Chlorinated water resulting from flushing newly installed water lines may only be discharged into the City's sewer system with the specific permission of the City. Prior to discharging into the sewer system, the Contractor shall sign a form authorizing the City to bill for the amount of water discharged into the system. The City shall prepare a bill for water usage based on the meter reading. This bill must be paid before the project is signed of on by the City.

The discharged chlorinated water shall be classified as "low-strength metered commercial users". The sewer unit for low-strength metered commercial users shall be one sewer unit per 1,000 cubic feet. The City shall determine the allowable volume of discharge. Chlorinated water shall not be disposed of into environmentally sensitive areas (i.e., under oak trees, vernal pools, man- made or natural streams, drainage systems, etc.) during any time of the year.

All discharges into the sewer system shall be governed by the following conditions:

1. Water used for the purpose of flushing shall be metered.
2. Discharge into the sewer system shall be done in such a manner as to avoid surcharging the sewer system.
3. No discharge into the sewer system shall be permitted on rainy days.
4. No discharge shall be permitted upstream of a small lift station.
5. An approved air gap shall be maintained at all times. Air gap distances shallbe calculated as 2.5 times the pipe diameter. In no case shall the air gap be less than 12 inches.

## D. Water Quality Testing

Water quality samples shall be taken per the following procedure.

Once flushing has lowered the chlorine residual below 1 ppm and the turbidity is equal to or less than 1 NTU, the water system shall observe a minimum 24 hour detention time. Water may not be drawn during this time period.

After the 24 hour holding period has elapsed, water quality samples shall be collected and processed by a third party laboratory at the cost of the developer.

The laboratory shall conduct a final chlorine and turbidity test. If the sample lot does not meet the minimum chlorine residual and turbidity criteria, additional flushing shall be required. The procedure shall be repeated until the criteria are met.

Bacteriological samples shall be collected from locations approved by the City, which may include, but are not limited to:

- The ends of new mains
- High points in the system
- Representative intermediate locations as directed by the City

Sampling shall be performed by a State-certified laboratory or by City personnel, as directed by the City. The Contractor or Developer shall be responsible for all costs associated with sampling and testing.

A minimum of two consecutive sets of bacteriological samples, collected at least 24 hours apart, shall show satisfactory results in accordance with State drinking water requirements prior to acceptance.

If any bacteriological sample fails, the affected facilities shall be re-disinfected, flushed, and resampled until acceptable results are obtained.

Water mains shall not be connected to the active City distribution system or placed into service until all bacteriological testing requirements have been successfully completed and accepted by the City.

If Coliform is present:

- Results from 0-1,000: Connect to the City
- Results from 1,000-1,250: Flush and rechlorinate water system and retest
- Results 1,250+: Flush and rechlorinate water system and retest

## E. Tying into the City System

A tie-in procedure shall be submitted and approved by the City prior to the proposed work. The Contractor shall allow for up to 7 days review of the procedures by the City. The water system shall be tied into the City system within 10 working days upon completing and passing all the testing procedures. Tie-ins shall be conducted as specified in these Standards. After the tie-in has been made, the Contractor shall flush the segment tied-in to the approval of the City.

If the new water system cannot be tied into the City system within 10 working days, the new system shall maintain a chlorine residual of 0.5 to 1.0 ppm or be subject to water quality testing and re-chlorination. This shall be discussed with the City.

On site private systems may connect into the City System upon passing all testing procedures, backflow tests and meters have been paid for and installed. A tie-in procedure shall be required per this Section.

## 6.19 Repairing Installed Improvements

All PVC and DIP water mains shall be repaired per the following procedures.

Damaged or failed pipe sections shall be removed and replaced with new pipe in the presence of the City. Replacement can be accomplished by the use of City approved ductile iron mechanical joint repair sleeves. Pipe restraints will be required.

After the repair has been completed, the excavation shall be backfilled and compacted to grade as specified. The repairs shall then be retested per these Standards.

At the direction of the City, the Contractor shall repair damage to the polyethylene encasement as described within ANSI/AWWA C-105/A21.5 or shall replace all damaged polyethylene film sections.

## 6.20 Materials

### A. Water Main

Unless noted on the approved plans, all water mains shall be either Polyvinyl Chloride Pressure Pipe (PVC) or Ductile Iron Pipe (DIP).

PVC Pressure Pipe- PVC Pressure Pipe shall be manufactured to a minimum Class 150 rating and shall conform to the "Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 6 inches through 12 inches, for Water" (AWWA C-900), and shall also include the following.

PVC Pressure Pipe shall be blue or white in color and shall have been manufactured within 18 months of installation. The pipe shall be manufacturer date coded and the City provided the manufacturer's coding for translation. Sun damaged pipe may be rejected at the Inspectors discretion.

Rubber rings shall conform to the "Standard Specifications for Elastomeric Seals (Gaskets) for Joining Plastic Pipe" (ASTM F-477).

Approved PVC Pressure Pipe manufacturers include: NAPCO, Certa-Lok, Diamond Plastics Corporation, J-M Manufacturing, Pacific Western pipe, Vinyl Tech-White Knight, Pressure Flex Pipe, PW Eagles, North American Pipe corporation or approved equal.

Ductile Iron Pipe- DIP shall be manufactured to conform to the standards ANSI/AWWA C-150/21.50 thickness design of ductile iron pipe and to "DuctileIron Pipe Centrifugally Cast in Metal Molds or Sand-Lined Molds for Water and Other Liquids" (ANSI/AWWA C-151/A21.51) and shall also include the following:

DIP shall be cement-mortar lined in accordance with the standard for"Cement-Mortar Lining for Ductile Iron Pipe and Fittings for Water" (ANSI/AWWA C-104/A21.4).

Approved DIP manufacturers include: McWane, Tyler, US Pipes, Griffin,American, Electrosteel USA, or approved equal.

## B. Services

**Brass Material**

In compliance with California State Assembly Bill 1953 and any amendments thereto, all brass components and pipe in contact with potable water intended to convey or dispense water for human consumption through drinking or cooking shall be “lead free.”.Compliant brass product shall be marked indicating the product is ”lead free.” Non-compliant product shall be immediately removed from the construction site.

Brass pipe - Brass pipe shall conform to ASTM B-43 standards. A listing ofapproved pipe include: Hallstead ¾” through 2” Red Brass, Cambridge-Lee,Federal WW—351, Wolverine, or approved equal.

Brass fittings- Brass fittings shall conform to ANSI Standard B16.15, B16.24,B2.1, T-94-1 and be a minimum of Class 125. A listing of approved manufacturers include: Lee Brass, Merritt Brass, New England Union Co. or approved equal.

Brass fittings for Copper Tubing - An approved listing for brass fittings for copper tube includes: Jones, Mueller, Ford or approved equal. Parts reference numbers are shown below:

Jones (¾through 2): Jones Super Grip CTS x CTS E-2609SG, Jones Super Grip CTS x MIP E-2605SG, Jones Super Grip CTS x GIP E-2607SG, (2 Compression x Compression)

Mueller (¾through 2): Mueller-110-CTS H-15403N, Mueller-110-CTS H-15428N, Mueller-110-CTS H-15451N

Ford (¾ inch through 2 inch):

¾ inch”- - Ford Quick Joint CTS x CTS C44-33-Q-NL1– Ford Quick Joint CTS x MIP C84-44-Q-NL

2 – Ford Quick Joint CTS x FIP C14-77-Q-NL(2  Compression x Compression)

## C. Copper Tubing

Copper tubing shall be seamless, annealed copper tube andshall conform to ASTM B88 “Standard Specification for Seamless CopperWater Tube” and shall be Type K. Copper shall be grade UNS-C12200. For diameters ranging from ¾to 1 ”, inch, use Type K Roll Soft Copper. Fordiameters ranging from 1 ¼ to 2”, inch, use Type K Soft 20Sticks. Approved tubing includes: Cambridge Lee, Mueller Streamline, Aqua Shield or approvedequal.

## D. Corporation Stops

Corporation Stops shall be male, iron pipe thread by compression and full throat ball valve design. A corporation stop shall be installed at the water main for all service laterals 2 inches and smaller. Approved manufacturers of corporation stops include: James Jones, Mueller, Ford, or approved equal. Curb Stops

Approved curb stop manufacturers include: Jones, Mueller, Ford, or approved equal. Service Saddles

PVC Pressure Pipe Service Saddles manufacturers include: Smith-Blair, Jones, Mueller, Ford, or approved equal.

1 inch S912

## E. DIP Service Saddles manufacturers include: Smith-Blair, Jones, Mueller, or approved equal. Appurtenances

In compliance with California State Assembly Bill 1953 and any amendments thereto, all brass components and pipe in contact with potable water intended to convey or dispense water for human consumption through drinking or cooking shall be “lead free”. Compliant brass product shall be marked indicating the product is ”lead free”. Non-compliant product shall be immediately removed from the construction site.

**Air Release Valves**

Air release valves shall be epoxy coated vacuum breaktype. A listing of approved manufacturers includes: Crispin, Valvematic, or approved equal.

**Backflow Assembly**

Backflow Assemblies shall be listed on the “List of an Approved Backflow Prevention Assemblies” published by the University of Southern California.

**Backflow Assembly Support Stands**

Placer Waterworks series PW/PS or approved equal.

**Backflow Assembly Support Stand Saddles**

Placer Waterworks series PW/SDL or approved equal.

**Backflow Assembly Color:**

All brass/copper backflow preventer assemblies shall be painted a:” Forest Green“ color to provide a deterrent to theft with the proper outreach to recyclers.

**Blocking for Boxes**

A listing of approved materials includes: Slump Block-4 inch x 4 inch x 15 ½ inch, or approved equal.

**Blow-Off**

Approved manufacturers and products include: 2” Waterous Resilient Seat valve or approved equal.

**Fittings**

PVC- Unless otherwise specified or shown on the approved plans, all fittings to be used with PVC Pressure Pipe shall conform to the standard for“Ductile Iron Compact Fittings for Water and Other Liquids” (ANSI/AWWAC-153/A21.53 for MJ compact fittings; C110 for flange fittings). Approved fitting manufacturers include Sigma, Star, Tyler, Union and US Pipe.

All ductile iron fittings shall be mortar lined in accordance with the standard for “Cement Mortar Lining for Ductile Iron Pipe andFittings for Water” (ANSI/AWWA C-104/A21.4).

All fittings shall be wrapped and sealed in accordance with these Standards.

The Contractor may use a ductile iron mechanical joint flange adapter designed for AWWA C-900 pipe with connecting PVC Pressure Pipe to flanged fittings or flanged valves. Pipe ends mustbe cut smooth and square with no bevel. The joint shall be restrained to the PVC pipe using an approved restraint method.

Ductile Iron Pipe- Unless otherwise specified or shown on the approved plans, all fittings to be used with DIP shall employ either mechanical jointsor restrained joints conforming to the standard for "Ductile Iron Compact Fittings for Water and Other liquids" (ANSI/AWWA C-153/A21.53).Approved fitting manufacturers include Tyler, Union, and US Pipe.

All ductile iron fittings shall be mortar lined in accordance with the standard for "Cement Mortar Lining for Ductile Iron Pipe and Fittings for Water" (ANSI/AWWA C-104/A21.4 – Double thickness mortar).

All fittings shall be wrapped and sealed in clear polyethylene encasement in accordance with these Standards.

**Freeze Protection for Backflow Assemblies**

The backflow assembly freeze protection materials shall be comprised of the following:

Laminated forest green fabric conforming to Herculite #10 by HerculiteProducts (fabric shall be a minimum of 10.6 oz/sq. yd.), or approved equal. Brass Rolled Rim Grommet and spur washer by Astrup, or approved equal. Polyester thread with a minimum strength of 14.2 pounds, Coats American'sStar Ultra product line, or approved equal. Fiberglass insulation R-19 rated, 6 inch minimum thickness. 2 inch minimum width Velcro, or approved equal. Nylon zip ties.

**Gaskets**

Gaskets shall conform to the following specifications:

Flange Gaskets – Flange gaskets shall be neoprene rubber, red rubber, USPipe, Flange Tite, or approved equal.

Push On Gaskets – Pipe manufacturers recommendations.

MJ Gaskets – Pipe manufacturers recommendation.

**Hydrants**

Hydrants shall be wet barrel type – lead free. Exterior shall be have a factory applied yellow (or Red) coating. Caps shall be cast iron. Approved hydrants include: Clow 960 or approved equal. The Part Number shall contain the letter "NL" to indicate the hydrant is lead free.

**Hydrant Bury**

Hydrant buries shall be ductile iron mechanical jointed crossflange, cement-mortal lined per manufacturers recommendation and per AWWA C104. A list of approved hydrant buries include: South Bay Foundry MJ x Size, Clow MJ x Size or approved equal.

**Hydrant Bury Extensions**

Hydrant bury extensions shall only be used with prior City approval.

**Location Stakes**

A list of approved off-site location stakes include: Carsonite-, 4 inch x 5 feet with anchor barb kit, Caution stickers attached and organization decal, City of Gridley-Call Before Digging-, or approved equal.

**Main Line Valve Lock-Out**

A list of approved manufacturers and part reference numbers include: SW Services PC800, DC600, or approved equal.

**Manhole Frame and Cover**

A listing of approved manufacturer and part reference number includes: South Bay Foundry (SBF1957-W), GMI CompositeFrame and Cover 2600 and 3800 series, or approved equal. Manholes constructed outside of paved area shall use a GMI composite lid and frame.

**Meters**

All meters shall be purchased through the City**.**

**Meter Idlers**

Meter Idlers shall be coordinated with the City to be the same brand as City provided meter. A listing of approved meter idler manufacturers include: Ford,Jones, Spears, or approved equal. Part reference numbers are shown below:

**Meter Setters**

Meter Idlers shall be coordinated with the City to be the same brand as City provided meter. Meter Spud Couplers

Meter spud couplers shall be coordinated with the City to be the same brand as City provided meter.

**Nuts and Bolts**

Flange Bolts and Nuts-Flange bolts and nuts shall conform to a minimum ASTM #A307. Bolts less than ¾ inches in diameter shall be ~~a~~ minimum Grade B (heavy hex). Bolts ¾ inches and larger in diameter shall be a minimum Grade A (standard hex).

**Hydrant Bolts**

Hydrant bolts shall be Hollow Break Away and per manufacturer's recommendation.

**Meter Bolts** are to be stainless steel, Grade 316 with brass nuts.

**Tee Bolt**- Steel bolts are to be ¾ inch high strength, low alloy steel with a heavy nut, conforming to AWWA Standard C-111-90.

**Nylon Bushings**

Nylon bushings shall be 76-76R, 2 ½ inch MIPT x 2inch FIPT.

**Patching Material**

A listing of approved manufacturers and part reference numbers for patching Dip include: Cop-Coat Carboline Company (Bitumastic No. 50, Coal Tar), Coppers Coat 50, or approved equal.

**Pipe Wrap Tape**

10 mil vinyl tape manufactured by Calpico Inc. (Calpico VI-10) or approved equal.

**Polyethylene Encasement**

Black non-colored polyethylene film shall beused. The polyethylene film shall have a minimum thickness of 8 mils. The thickness shall not be less than 10 percent of the nominal

thickness. The polyethylene shall be in either tubular or in sheet form. Polyethylene film shallbe manufactured from a Type 1, Class A raw polyethylene material conformingto "Polyethylene Encasement for Ductile-Iron Piping for Water and Other Liquids" (ANSI/AWWA C-105/A21.5). Approved manufacturers include: Fee Spec's-LP378D Northtown, Fulton Enterprise Inc., Global Polymer Tech, Unisource, or approved equal.

**Pressure Regulators**

A listing of approved all brass pressure regulator systems include: Watts (¾ inch through 2 inch, UB5-series), Wilkens (¾ inchthrough 2 inch 600 series, 2 ½ inch through 3 inch 500YSBR), or approved equal.

**Reinforcement Bar**

Rebar shall be grade 40 steel, deformed type. Smooth bar shall not be allowed. All rebar shall be number four unless otherwise specified on plans.

**Restraints**

PVC - Approved restraint systems for PVC Pressure Pipe include: NAPCO Certa Lock (for straight runs only), Romac Grip Rings, EBAA Iron Series 2000 PV, Sigma One Lok Series "SLC", DR18JM Eagle Loc, eagle lock, PVC Star Grip 4000 series, (See section 81- 16,H for additional conditionally approved options) or approved equal.

DIP - Approved restraint systems for DIP include: Field Lock Gaskets(3 inch through 12 inch diameter only), Mega Lug 1100 Series, TR Flex,sigma One Lok Series "SLD", Star Grip 3000 series, American Fastite Joint Assembly or approved equal. If Field Lock gaskets are used it requires pulling back the slack in the pipe.

**Riser Aligners**

Riser aligners shall be per the City Standard Details.

**Riser Stock for Curb Stops**

Riser stock shall be schedule 40 PVC, SDR 35 or C-900. The riser shall be 4 inch diameter inside meter boxes.

**Riser Stock for Main Line Valves**

Riser stock shall be 8 inch diameter PVC C-900 for all main line valves.

**Service Boxes**

All box lids are to be permanently marked with the appropriate label (i.e., Water, ARV, Blow-Off, CPT, etc.). Lids shall have a 1 7/8 inch hole offset at upper 1/3 portion of lid measured along the longaxis. In commercial project, meter lids shall be stenciled with the number address it serves. The numbers shall be painted using white enamel paint and 2 inch stenciling. A list of approved box manufacturers include: Carsonite, Christy, BES, Armorcast, CDR, Placer Water Works, or approved equal.

**Traffic Boxes**

A list of approved traffic box manufacturers include: Bes, Christy, Placer Waterworks or approved equal.

**Tracing Wire**

Tracing wire shall be light blue in color and minimum 12 gauge solid copper with UF rated plastic insulation.

**Tracing Wire Mastic Tape Seal**

Tracing wire mastic tape shall be 3M Mastic Tape #2229 or approved equal.

**Valves**

Butterfly Valves- Butterfly valves to be used on pipe diameters ranging from 12 inch to 72 inch. A list of approved valves include: Standard Pratt Ground Hog, with MDT Traveling Nut Actuator, Mueller Lineseal III, Dezurik butterfly valve with square nut actuator,(LA series) , or approved equal. NOTE: All valves shall be Holiday freeepoxy, interior lining and standard black asphalt varnish exterior. Certification shall be provided by the valve manufacturer stating the epoxy lining is holiday free. The epoxy coating shall be spark tested and approved for installation by the City inspector.

Gate Valves- Gate valves used on diameters ranging from 3 inch to 12 inch shall be grey cast iron or approved equal. A list of approved valves includes: M & H 4067 RW Gate Valve, Mueller-A-2360 RS GateValve, Clow, AFC or approved equal.

2 part epoxy repair kit shall be provided by valve manufacturer.

**Valve Boxes**

All valve boxes in street and other traffic areas shall bedesigned to H-20 loading conditions. A list of approved manufacturers and part reference numbers include: Christy (Type G5, Type B 17 by 30 H-20), BES, Brooks, D&L (#K-6004), or approved equal.