

WATER DISTRIBUTION SYSTEM DESIGN STANDARDS

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WATER DISTRIBUTION SYSTEM DESIGN STANDARDS

I. 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 the Water Department or other departments of the City of Santa Rosa or other government agencies. These guidelines establish minimum acceptable design criteria. More stringent requirements may be imposed by the Director of Santa Rosa Water based on specific project conditions.

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

Wherever the approval, discretion or opinion of the Water Department Director, or any other City staff, 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. Any final decision by City staff may be appealed pursuant to the City Code, but may be first directed to the Board of Public Utilities for a recommendation.

II. REQUIREMENTS FOR IMPROVEMENT PLANS AND SUBDIVISION MAPS

- A. Provide a detailed utility plan showing onsite and offsite public and private water and fire protection systems, including mains, services, hydrants, and all other required appurtenances, and their connections to existing City-maintained water facilities. Show the location, type, and diameter of public and private water mains. Reference any existing fire hydrants within 300' of the project boundary. 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. Annotate the local agency information sheet of the Subdivision Map with any information that is needed to notify property owners of requirements for connection to the City's water distribution system. These include, but are not limited to:
 - 1. Payment of fees prior to issuance of Building Permits.
 - 2. Lots requiring pressure regulating valves or booster pumps.
 - 3. Backflow protection.
 - 4. Public water access requirements, such as gates or access roads.

The appropriate information may be obtained from Santa Rosa Water Engineering.

- C. Miscellaneous specific items required on improvement plans are indicated throughout these Standards.
- D. Before combustible materials may be delivered, stored or constructed on site, fire flow and access must be provided and approved by the Fire Department per current City Fire Code. In addition, public 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 City 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 the City Water Department for inclusion into the Geographic Information System (GIS).
- E. Any known areas of contamination shall be delineated on the improvement plans.

III. WATER MAINS - GENERAL

- A. Public water mains may not be designed outside the street right-of-way without approval from the Director of Santa Rosa Water..
- B. In general, publicly maintained 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 City 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 (Carsonite 492 CW-112 or an approved equivalent) at approximate 500' intervals, at any angle point, and at the entrance to an easement. Stakes should have vandal-proof metal bottoms. Access requirements as established in Section XIV of the Sanitary Sewer System Design Standards may be imposed on a project based on site conditions.
- 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) public water system 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 Fire Department for residential and nonresidential developments.

F. For purposes of leak detection and maintenance access, no reinforced concrete may be designed over publicly 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.

H. Streets with both water and sewer mains must be at least 20 feet wide, face-of-curb to face-of-curb. Streets having a width of 16 feet or less may only have one public utility. Public Water and public sewer mains may not be installed in alleys.

IV. MATERIALS

- A. All materials used shall be lead free per California Health & Safety code, Section 116875.
- B. Service laterals shall be high density polyethylene (HDPE), blue polyethylene coated type "K" copper, Polyvinyl Chloride (PVC), or Ductile Iron Pipe (DIP) per applicable City Standards.
- C. 8" and 12" public water mains and 4"-12" private fire mains shall be; Polyvinyl Chloride (PVC) Pressure Class (PC) 235, DR18 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: Fire Department 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, DR18 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 the Director of Santa Rosa Water.
- F. Asbestos cement pipe shall not be allowed under any circumstances.

V. CONNECTION TO AN EXISTING PUBLIC 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 the City's Water Distribution System Construction Specifications Section 132-1.20. 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 City water distribution system shall be inspected by an authorized City 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 the Director of Santa Rosa Water. 12" size-on-size taps are allowed only under emergency situations and with the specific approval of the Director of Santa Rosa Water.
- F. In most major streets, or where the street surface is less than five years old, installation methods other than open cutting may be required. The Encroachment Officer or the City Engineer, as appropriate, will determine the requirements based

on the condition of the existing street.

VI. ALIGNMENT

A. Horizontal

1. Alignment shall be in accordance with the provisions of Standard 871 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 and Rehabilitation Specifications, or on the plans. The Design Engineer shall show system restraint lengths on the plans, and all restraint calculations shall be provided to the Engineer.
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 the Director of Santa Rosa Water.
5. Conform to the latest revision of the State of California State Water Resources Control Board (SWRCB) "Criteria for the Separation of Water Mains and Non-Potable Pipelines" (See Appendix "A") and any modifications herein or as approved by both the SWRCB Division of Drinking Water and the Water Department Director. 4" and larger service laterals shall 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 the Director of Santa Rosa Water.
8. All public 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 the Director of Santa Rosa Water and the Chief Building Official, and shall comply with all applicable Codes and Regulations. (See City Std. 517)
10. Where dual water mains are designed, a minimum of 5 feet clear horizontal separation shall be maintained unless otherwise approved by the Director of Santa Rosa Water.
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, fiber optic lines, and the County's Aqueduct mains. 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 the Director of Santa Rosa Water. . 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), "Criteria for the Separation of Water Mains and Non-Potable Pipelines "(See Appendix "A"), and any modifications herein or as approved by both the SWRCB Division of Drinking Water and the Water Department Director.
3. Comply with section VI-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 the Director of Santa Rosa Water.

VII. MAIN SIZING CRITERIA

- A. Allowable nominal sizes for public water mains are 8", 12", and 16". Any main size other than those specified must first be approved by the Director of Santa Rosa Water.
- B. Public 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 XII-L for fire flow requirements).
- C. The minimum new public main size shall be 8 inches. New public 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. Analysis and design of water systems shall be based upon the criteria listed in the City's Water Distribution System Master Plan where applicable. The Director of Santa Rosa Water may require an increased pipe size for overall system benefit. When the project is required to provide larger water mains than needed for the development, the applicant may apply to Water Department Engineering for oversize reimbursement.
- E. Maximum flow velocity for new public or private water mains shall be 10 feet per second, to be calculated by applying the demands from Section VII-B above.

VIII. 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 public 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 the Director of Santa Rosa Water. is required. All new water mains shall be shown in a profile on the Improvement Plans or Encroachment Permit applications. 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 the Water Department 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 City 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 the City of Santa Rosa Water Department for review. Approval by the SWRCB does not guarantee an approval by the City.

- E. The minimum cover for service laterals shall be as shown on the appropriate City 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.

IX. VALVING

- A. Valve installations at intersections shall be in accordance with the provisions of Standard 871. 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 public 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 the Director of Santa Rosa Water.
- 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 City Standard 877.
 - 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.

G. Butterfly Valves

- 1. In general, butterfly valves will not be allowed without special permission from the Director of Santa Rosa Water.
- 2. Butterfly valves shall comply with City Standard 878.
- 3. Butterfly valves shall typically be mechanical joint type and shall conform to AWWA Standard C504 of the latest revision and shall be the rubber seat type. (flanged connections may be approved for specific installations)

4. Butterfly valve discs shall rotate 90 degrees from the full open position to the tight shut position.
5. Butterfly valve seat shall provide a tight shut off at a pressure differential of 150 psi upstream and 0 psi downstream in either direction.
6. The butterfly valve operator shall be the travelling nut type.
7. The butterfly valve shall open with a counter-clockwise rotation on the operating nut.
8. External bolts and nuts shall be 304 stainless steel.

X. SERVICE LATERALS AND METERS FOR DOMESTIC AND IRRIG. SERVICE

- A. Developments will be provided City domestic and/or irrigation water service via water meters located at the frontage of a public street.
- B. The City may allow meters to be located on private street frontages and/or within public utility/water easements if a Santa Rosa Water Departmentt 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 City's Fire Department, and submit to the Director of Santa Rosa Water 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 City 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. Where conditions allow, install a dual water service lateral per Standard 864 to serve two single-family residential lots, providing each lot is less than 2 acres. Upon approval by the Engineer, individual 1" services may be

installed where conditions are not practical for a dual water service lateral installation.

3. Provide a 1-1/2" HDPE water service lateral with a 1" meter for any lot greater than 2 acres. The Santa Rosa Water Department may, at their discretion at specific sites, require the installation of a 1" copper water service lateral in place of the 1-1/2" HDPE.
4. Water service laterals shall not cross lots they do not serve.

I. Residential with second unit (as defined in the City Zoning Code Section 20-03.111 Article 6), 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 Water Department Engineering staff. If first approved by the Director of Santa Rosa Water, the existing lateral may be utilized and an additional water service lateral installed to serve the second unit.
3. If the primary unit and the second unit are to be constructed at the same time, design a 1-1/2" Dual water service per Standard 864 for the site. The Santa Rosa Water Department may, at their discretion at specific sites, require the installation of a 1" copper dual water service lateral in place of the HDPE.
4. The appropriate service lateral shall be shown on the Public Improvement Plans and/or Encroachment Permit submitted 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 complexes 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 X-O for irrigation meter requirements for 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 if 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 X-O for common area irrigation meter requirements.

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

M. Commercial

1. See Section X-O below for irrigation requirements.
2. A minimum 1-1/2" HDPE domestic service lateral is required for commercial use. The Santa Rosa Water Department may, at their discretion at specific sites, require the installation of a 1" copper water service lateral in place of the HDPE.
3. Critical use facilities such as hospitals, jails, elderly care facilities, and others as determined by the Director of Santa Rosa Water, shall require at least two separate water services for domestic use that must be connected to separately valved sections of the public water distribution system.

N. Combination Services for Private Fire Service with Domestic and/or Irrigation Service

1. Only 6", 8" and 12" combination service laterals are allowed.
2. The combination service lateral shall equal or exceed the size of the required fire line and shall be hydraulically sized to provide adequately combined domestic, irrigation, and fire flows without exceeding the allowable velocity of 15 feet per second.
3. A minimum 8" combination service lateral shall be required for lots with unknown commercial, multi-family, industrial and shopping center uses where onsite hydrants are not likely to be required for development.
4. A minimum 12" combination service lateral shall be required for lots with unknown commercial, multi-family, industrial or shopping center uses where onsite hydrants are likely to be required for development.

O. 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 City Standard 876 and the most current USC Approved List of Devices at time of installation.
4. Sizing of irrigation meters shall be determined by the Water Department after reviewing the landscape plans. 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.

XI. PUBLIC IMPROVEMENTS FOR PRIVATE FIRE SYSTEMS

- A. Santa Rosa Water is responsible for mapping private fire systems, including hydrants, for the Fire Department and for assuring properly sized services. Design plans showing private fire systems shall be submitted to the appropriate Fire and/or Building jurisdiction for approval and;
 1. may be included with the Public Improvement Plans for the project, or
 2. copies of the approved plans may be submitted to Santa Rosa Water Engineering prior to requesting a meter set and activating the fire system.
- 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 public 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, combined with the peak domestic flow.

- C. All private fire systems that only serve onsite hydrants require aboveground single detector check valves in accordance with Standard 888. Where aboveground installations are not reasonable due to site constraints, in the opinion of the Water Department and Santa Rosa Fire, design for single detector check valves in vaults per Standard 879.
 - a. Double-check detector backflow assemblies per Standard 880 are required for:
 - 1. All connections serving commercial fire sprinkler systems; or
 - 2. Any property with multiple fire service connections; or
 - 3. Any fire line connections to properties with auxiliary water supply.
- D. 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.
- E. 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 system connects 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.
- F. The location of any Fire Department connection shall be approved by the Fire Department.
- G. Critical use facilities such as hospitals, jails, elderly care facilities, and others as determined by the Director of Santa Rosa Water and/or the Fire Marshal, require at least two fire line service connections to separately valved sections of the public water main, so that service can be maintained in the event of a main line shutdown.

XII. 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 public.
- C. Design of hydrant locations shall meet the Fire Code requirements and must be approved by the Fire Department for logistics and by Santa Rosa Water Department for maintainability.

Each hydrant shall be connected to a water distribution system main with a 6" diameter or larger lateral controlled by an independent valve.

- D. Whenever possible, locate hydrants near street intersections.
- E. 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.
- F. Locate hydrants a minimum of 10' from roll down of driveways for commercial or multi-family sites and 5' from residential driveways.
- G. On streets with raised medians or with four or more travel lanes, design hydrants on alternate sides of the street per current City Fire Code. Each side of the street will be considered independently relative to hydrant placement per subsections XII-J and XII-K below.

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 Fire Department. Design hydrants at a maximum spacing of 300' in Wildland – Urban Interface Fire Areas as designated by the City Fire Department.
- 2. Generally, design hydrants at intersections and then evenly distribute hydrants throughout the project.
- 3. Specify "residential" hydrants per City Std. 857 on the plans.

I. Commercial, Industrial, and Multi-family (3 or more units) - Typical locations

- 1. Generally, design hydrants at intersections 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 City Fire Code. Onsite fire hydrants and mains shall be provided where required by the Fire Department per City Ord. 3958.
3. Specify "commercial" hydrants per City Std. 857 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) (138kPa) residual pressure, measured in the water main in the vicinity of the flowing hydrant, that is available for firefighting. (City Ord. 3852)
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 City 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 Fire Department. The guidelines given above are general. Actual flow requirements shall be verified with the Fire Department prior to submittal of plans. Calculations may be required by the Fire Department to verify the adequacy of the proposed design.

XIII. BACKFLOW DEVICES (EXCEPT FOR FIRE LINES)

- A. Backflow device installations shall be in accordance with State of California Title 17 and current City of Santa Rosa Code, Section 14-16, Backflow Regulations.
- 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 Standards 874, 875 and 876.
- D. Backflow preventer type shall be designed in accordance with Appendix "B". For uses not listed contact Santa Rosa Water Engineering.

XIV. PRESSURE

- A. To obtain water distribution system data for these calculations, contact the City's Engineering Department. 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. In the Aqueduct zone or other reduced pressure zones, calculate the pressure by using the high setting of the pressure regulating valve at the nearest aqueduct connection or system regulator.
 - 4. The minimum allowable pressure in a high level zone is calculated by assuming the reservoir drawn down 10' from the high water level. In the Aqueduct zone or other reduced-pressure zones, use the low setting of the pressure regulating valve at the nearest aqueduct connection or system regulator.
- C. Domestic service
 - 1. The minimum allowable 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 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.

XV. SPECIALTY VALVES AND WATER SAMPLING STATIONS

- A. Specific locations shall be reviewed for each project by the City's Engineering Department.
- 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.

- E. Water sampling stations shall be required to provide representative sampling within each pressure zone. At a minimum, one water sample station shall be required in each pressure zone, at each reservoir and at pump stations.

XVI. SPECIAL CONDITIONS FOR DELINEATED FAULT ZONES

- A. Fault zones shall be identified on improvement plans.
- B. Ductile iron pipe shall be indicated on the improvement plans in delineated fault zones and extend to 100' outside each side of the delineated fault boundaries.
- C. Pumper connections or fire hydrants shall be designed approximately 50' outside each side of the delineated fault zone. Gate valves shall be designed between the fault zone and the fire hydrant/pumper connection.
- D. Mechanical joint double-ball Flextend assemblies with 8" expansion/contraction capability, as manufactured by EBAA Iron, Inc. of Eastland, Texas, or an approved equivalent, shall be designed adjacent to each side of the fault zone.

XVII. EASEMENTS

- A. An easement shall be provided over any public water system when it is installed outside a public right-of-way.
- B. The easement shall be a minimum of 15' wide if it only contains a water main or 20' wide if it contains another facility as well, such as sewer, storm drain, or other utility. The easement will be dedicated as a "public 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 publicly 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 so noted on the Subdivision Map or on the Easement Deed if the easement is not dedicated as part of a subdivision. Required notes are:
 - 1. No structures may encroach on, above or below the surface of the ground

in any public 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 Director of Santa Rosa Water.

2. No trees shall be planted in a public water easement without first obtaining approval of the Director of Santa Rosa Water. 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.

XVIII. 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 507 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 City 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 City 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 within the public right-of-way as removed or broken into every 50' and filled with an approved flowable fill per Standard 507.
- 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 507. Abandonments of fire hydrants must first be approved by the Fire Department.

SANITARY SEWER SYSTEM CONSTRUCTION STANDARD SPECIFICATIONS

SECTION 130 – SANITARY SEWER SYSTEM CONSTRUCTION

130-1.01 Description

All sanitary sewer system components and related items for new construction and rehabilitation projects shall be constructed in accordance with all applicable City Standards, the latest version of the Standard Specifications as they apply, and any modifications herein. Any proposed deviations must first be approved in writing by the Director of Santa Rosa Water.

The Contractor shall provide all means necessary, to the satisfaction of the Engineer, to ensure continuous service to all existing customers during and after work hours, weekends and holidays, including the installation of temporary lines and/or temporary pumping equipment. Sewage shall be controlled in a pipeline at all times and flows or leaks in the street or open ditches shall not be allowed.

The Contractor shall provide a full size set of sanitary sewer system “record plans” for their project to the Engineer within 7 calendar days from the final connection to the City’s sanitary sewer system. All deviations from the improvement plans shall be recorded on the plans in red ink.

Permanent paving shall not take place until all underground work is finished, except as otherwise noted, and the Engineer has given written notice of acceptance to the Contractor.

130-1.02 Materials

Sewer pipe shall be ductile iron pipe (DIP), or SDR 26 polyvinyl chloride (PVC) pipe.

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.

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

- Pipe
- Fittings
- Manhole components
- Lateral cleanout plug

For a list of approved manhole components see the “Engineer’s List of Approved Items”.

Lateral bends from the cleanout to main shall be SDR 26 PVC gasket x spigot long radius bends.

Couplers used to connect PVC pipe to PVC pipe shall be SDR 26 PVC gasketed type. Transition couplings shall have Series 300 stainless steel shear bands with a minimum thickness of .012". Couplers used for ductile iron pipe shall be per the City's Water System Standards.

Bolt-down lids, as required per City Standards, shall be equipped with minimum 1/2" stainless steel bolts with a 3/4" hex-head. All bolts shall receive an application of an anti-galling lubricant prior to installation.

The City reserves the right to reject any material that may be supplied for use, whether on the "Engineer's List of Approved Items" or not. If the City 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 the City.

130-1.02A Material Submittals

The Contractor shall submit to the Engineer, in writing, a list of all materials proposed to be used on this project, and any supporting documentation and/or samples required by the Water Department.

For materials listed on the current "Engineer's List of Approved Items" the Engineer shall be provided with the name of the manufacturer and model/part number for all material proposed for this project.

For any proposed material not listed on the "Engineer's List of Approved Items" 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 provide submittals to the Engineer for all manhole components and their proposed construction prior to the start of work. Manholes shall be constructed per an accepted submittal and any request and approval for alteration must be in writing.

130-1.02B Polyvinyl Chloride (PVC) Pipe

PVC solid wall sewer pipe and fittings for gravity sewers shall be made from all new, rigid, unplasticized polyvinyl chloride in accordance with ASTM D-3034 and ASTM F-679 and shall have a minimum pipe stiffness of 46 psi. Joints shall be gasketed and conform to the requirements of ASTM D-3139 and ASTM F-477.

All pipe shall have a manufacturer marked insertion line to indicate proper insertion of the spigot into the bell when the joint is made. Bevel and lubricate all field cut PVC pipe per manufacturer's instructions before joining. Where field cutting of pipe removes the manufacturer's insertion line, the cut pipe shall be remarked per manufacturer instructions prior to installation. Pipe joints that are not installed per manufacturer's instructions may be required to be removed and relayed at the

discretion of the Engineer.

All PVC pipe entering or leaving a concrete structure shall have an approved manhole gasket firmly fitted around the pipe exterior and cast into the structure base or near the structure wall center as a water stop.

130-1.02C Restrained Joint (PVC) Pipe and Fittings

Restrained joint PVC pipe and fittings shall conform to the requirements of ASTM D-2241. Joints shall be gasketed and conform to the requirements of ASTM D-3139 and ASTM F-477.

130-1.02D Ductile Iron Pipe

Ductile iron pipe shall be new pipe conforming to AWWA Standard C151/A21.51, pressure class. The pipe shall be furnished with rubber gasket push-on, or mechanical joint ends, except where otherwise specified on the plans.

Ductile iron sewer pipe and fittings shall be lined with Protecto401 Ceramic Epoxy or an approved equivalent. The interior of the pipe and fittings shall not have been previously lined and the liner shall be applied by a certified applicator where the pipe and/or fittings are manufactured or at a certified off site coating facility approved by the pipe and/or fitting manufacturer. The pipe and/or fitting manufacturer shall be fully responsible for insuring the liner complies with all manufacturer's recommendations, including, but not limited to, pipe wall preparation, wet and dry film thickness, coating integrity and curing prior to shipment to jobsite.

Any request for substitution shall be accompanied by documentation showing a history of successful use in sanitary sewer systems and that the liner was applied by a certified applicator with a history of applying linings to the interior of ductile iron pipe and fittings.

All ductile iron pipe buried underground shall be encased in polyethylene film in the tube form. Polyethylene material and installation procedure for the encasement shall conform to ANSI/AWWA C105/A21.5.

130-1.02E Ductile Iron Restrained Joint Fittings

Restrained joint fittings shall be ductile iron in accordance with applicable requirements of AWWA C111/A21.11 and AWWA C153/A21.53 of latest revision and shall be compatible with the type and pressure class of pipe used.

130-1.03 Excavation, Backfill and Resurfacing

Excavation and backfill shall conform to Standard 215, "Standard Trench Detail" of the City of Santa Rosa Standard Plans.

Trench resurfacing shall conform to Standard 215 unless otherwise specified elsewhere.

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 as well as proposed connection points to the City's sanitary sewer system prior to the start of pipe laying. If conflicts are discovered during this investigation the Engineer shall be notified immediately.

It is the Contractor's responsibility to ensure that sewer 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.

Abandoned utilities found to reside in a common trench with sewer components shall be removed and disposed of prior to the installation of any new sewer facility unless otherwise directed by the Engineer. Any exposed pipe ends on abandoned lines that remain shall be plugged per Standard 507.

All excavations shall be able to accommodate equipment and personnel required for backfilling and compaction testing. If, in the opinion of the Engineer, typical compaction 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 City. Excavations around new and existing manholes shall be a minimum of 24 inches wider than the outside of the barrel section.

Blasting shall not be permitted unless first approved of, in writing, by the Building Department and the Director of Santa Rosa Water.

Control density fill (CDF) shall be placed at the locations shown on the plans and where cover is less than 3 feet. CDF shall conform to Standard 215. A material submittal is required. All excavations in a traveled way with CDF backfill shall be plated or otherwise safely covered to allow for safe passage during curing.

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

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, by any such damage due to their operations.

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.

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.

When the public works 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 shall 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 streets the excess material shall be removed from the site daily unless it has been preapproved for reuse.

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.

On projects to remove and replace existing sewer facilities and the existing sewer main is a material other than asbestos, the Contractor shall assume that approximately 15% of all existing sanitary sewer laterals to be replaced are constructed of asbestos cement pipe. Where the existing sewer main material is asbestos cement, it should be assumed that all laterals are asbestos cement pipe. All related disposal costs shall be the bourn by the Contractor.

All excavated material shall be removed from the jobsite at the end of each day unless otherwise approved by the Engineer.

130-1.04 Trench Bracing and Shoring

All bracing and shoring shall conform to Section 7-1.02K(6) of the Standard Specifications or any later revision, and the Division of Industrial Safety Construction Safety Orders which are currently in use.

The Contractor shall take all necessary measures to protect the workers and adjacent areas and

structures from the hazards of the trenching or excavation operations.

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 the existing curb, gutter and existing utilities that are to remain in place.

130-1.05 Pipe Laying

The Contractor shall provide the equipment, materials and personnel to maintain continuous sanitary sewer service to all customers, 24 hours a day and 7 days a week during construction, including but not limited to the installation of temporary lines and pumping equipment at no additional cost to the City unless otherwise specified. Any deviation from this requirement must first be approved by the Engineer.

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.

Where construction consists of constructing a new main or extension of an existing main, the downstream end of the new main shall be securely closed with a tight fitting plug until the construction is accepted by the Engineer.

Sewer pipe shall be installed on the alignment and grade as shown on the plans and in accordance with applicable City Standards and the Standard Specifications, or as directed by the Engineer. Existing sewer laterals shall be removed and replaced at the locations shown on the plans, or as directed by the Engineer.

Sewer pipe shall be laid in straight lines and on uniform rates of grade between points where changes in alignment or grade are shown on the plans. The interior of the pipe shall be free of foreign matter before lowering into the trench.

If proper separation between new sewer lines and water mains, 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 already been provided in the contract documents. See Appendix "A" of the City of Santa Rosa Water Distribution System Design Standards for additional information and direction.

The pipe manufacturer's written instructions covering the installation of their pipe, and any related materials, shall be closely followed unless otherwise directed or approved in writing by the Engineer. The trench shall not be backfilled until authorized by the Engineer. Pipe laying shall proceed upgrade with the spigots pointing in direction of flow. The invert of the pipe shall be set

at required line and grade as determined from batter boards set not over 25 feet apart.

Electro-optical grade setting devices may be used provided that the device will be operated by a person proficient in its operation.

Any section of pipe found to be defective or which has had grade or joints disturbed shall be re-laid by the Contractor at their expense.

Proper implements, tools and facilities satisfactory to the Engineer shall be provided and used by the Contractor for the safe and efficient execution of the work. All pipe, fittings and accessories shall be carefully lowered into the trench by means of derrick, ropes, or other suitable equipment in such a manner as to prevent damage to pipe and fittings. Under no circumstances shall pipe or accessories be dropped or dumped into the trench. The pipe and accessories shall be inspected for visible defects prior to lowering into trench. Any visibly defective or unsound pipe shall be replaced.

The line and grade of existing utilities shall not be altered. Any leakage caused in existing utilities by reason of the Contractor's operations shall be immediately repaired at the Contractor's expense.

Existing storm drains shall be supported or removed and replaced at the Contractor's option and at no additional cost to the City. In any case, the Contractor shall be responsible for maintaining the existing line and grade of the storm drains. If the Contractor elects to remove and replace, it shall be done in conformance with all applicable City Standards and to the satisfaction of the Engineer.

Existing water lines shall be supported in place with service maintained during construction. The Contractor shall be responsible for any damage to the water lines during construction and any damage resulting from improper backfilling.

Existing sewer lines shall be supported in place with service maintained during construction. The Contractor may, at their option, remove and replace any sewer laterals which are not in use during construction. The Contractor shall be responsible for damage to sewer lines during construction and any damage resulting from improper backfilling.

Sewer lateral inverts shall be set above the midpoint of the sewer main unless otherwise directed by the Engineer in writing. Any lateral invert installed below the midpoint of the main without prior written approval shall be replaced and the lateral relayed at the Contractor's expense.

If the proposed sewer main is replacing an existing main but at a higher elevation, the Contractor shall submit a temporary connection plan to the Engineer for approval a minimum of 5 working days prior to start of work. The temporary connection plan shall include a schedule of work and will show how all existing flow will remain active. The Contractor shall continuously monitor the upstream manhole of any temporary connection.

Any temporary connections between new and existing sewer mains and/or manholes required for the progress of work shall be made with approved rigid piping and sheer band and/or gasketed

couplings. If bends are required to make the connection, the bends shall be long radius bends unless otherwise approved.

Any proposed temporary main connection that may be in place longer than 24 hours, except those specified in Section 130-1.06 herein, shall be submitted to the Engineer for approval prior to installation.

Both new and existing mains shall have the ability to be accessed individually for maintenance and emergency response by City personnel at all times. All temporary connection material shall be fully removed after its intended use.

Where a sewer main is to be installed in a pipe casing, installation shall be similar to City Standard 872 "Water Main Encasement and End Seal", including joint restraints. All proposed material shall be submitted to the City for review and approval.

130-1.05A Abandon or Remove Existing Sanitary Sewer System Components

Abandonment of existing sewer components shall conform to applicable City Standards, specifically Standards 507 & 508, and any modifications specified in the contract documents.

Existing sewer system components shall be removed where shown on the Plans or to facilitate the progress of work. The Contactor must receive written approval from the Engineer prior to removing any component, fully or in part, that is active during construction. Any removed components from an active system shall be replaced with approved materials to the satisfaction of the Engineer.

When a sewer lateral is to be removed or abandoned in place that is connected to an existing main 12" and smaller that is to stay active, the connection shall be fully removed by cutting out a section of the main, at least 4 feet in length, and replacing the removed section with approved pipe and couplers. Where the lateral is to be removed or abandoned in place on a main 15" or larger, and the connection is by "break in" or tap, the lateral pipe and all appurtenances shall be removed from the main and an approved full circle stainless steel clamp installed over the penetration. The length of the full circle clamp shall provide a minimum of 2 inches of overlap over the penetration. The plugging or capping of connections on mains that are to stay active shall only be done with prior approval from the Director of Santa Rosa Water. Where a wye or tee fitting that is not a tapped fitting is installed on a trunk sewer, approval to plug or cap the wye or tee in an approved watertight manner is acceptable but the method and material must first be approved by the Water Department. When allowed, the cap or plug must be visible from the pipe interior when televising the main. Any plugging or capping of connections shall be noted on the record plans.

130-1.06 Sewer Laterals

Sewer laterals shall be installed or replaced at the locations shown on the Plans and in accordance with City Standards.

Unless otherwise specified, sewer laterals shall be installed with a two-way cleanout per City Standard 513A. unless conditions, as noted in the Standard, do not allow their use, or if otherwise specified in contract documents.

If field conditions require the installation of a one-way cleanout per the conditions called out in City Standard 513A, the cleanout shall be installed behind the sidewalk or PUE, in accordance with City Standard 513, unless otherwise depicted on the Plans.

All two-way cleanouts shall be installed 18 to 24 inches behind face of curb unless otherwise shown on the Plans or approved by the Engineer.

Where a project involves the replacement of existing sewer laterals, the estimated locations of the existing laterals that are shown on the Plans are based on record information, television inspection, and field evidence. This information is available for review upon request. The City assumes no responsibility for the accuracy of this information or the inadvertent omission of any such information. Not all existing sewer laterals are guaranteed to be located through these means, the Contractor may, therefore encounter sewer laterals not shown on the Plans. The Contractor shall have the sole responsibility for determining the exact location for all existing laterals. During sewer mainline construction but prior to the installation of each individual new sewer wye on the main, the Contractor shall determine the exact location of the existing sewer lateral at back of sidewalk or PUE. Two acceptable methods of locating a sewer lateral at the back of sidewalk are:

- 1.** Removing sidewalk and/or potholing by hand digging at the back of sidewalk to locate the existing lateral pipe a minimum of 24-hours prior to sewer main installation in that area;
- 2.** Inserting a metallic electrician's "fish tape" into the existing lateral pipe after the pipe is exposed during sewer main excavation and tracing the "fish tape" to the back of sidewalk using a pipe and cable metal locator.

If the Contractor chooses to use method "2" above and cannot locate the existing sewer lateral at the back of sidewalk, they shall locate the lateral by potholing at back of sidewalk prior to the installation of the wye at the main.

Typically, each active sewer lateral found to exist shall be replaced, unless specifically deleted by the Engineer.

If a sewer lateral shown to be replaced appears to be inactive the Contractor shall notify the Engineer and then attempt to verify their conclusion.

All sewer laterals shall be installed perpendicular to the curb unless otherwise shown on the Plans or approved by the Engineer. Any lateral that is not installed perpendicular to the curb shall tracer wire installed in the following manner:

1. Wrap wire two times around wye connection at main and secure.

2. Lay both ends on top of and along the lateral to the cleanout and up the cleanout riser. Both ends of wire shall extend approximately 6 inches beyond riser.
3. Secure wire to top of lateral pipe at approximately 5 foot intervals. Ends of wire must be easily accessible inside the cleanout box.

For tracer wire specifications see Sanitary Sewer System Design Standards.

Any change in alignment needed from face of curb to back of sidewalk or PUE shall be accomplished using long radius bends. If the cleanout is installed 18 to 24 inches behind face of curb all alignment changes shall take place between the cleanout and the back of sidewalk or PUE. Any use of short bends in this area must first be approved by the Water Department.

Connections to existing laterals shall be made at back of sidewalk or PUE unless otherwise specified herein or depicted on the Project Plans. Prior to connecting, the Contractor shall investigate to see if there is an existing cleanout not already shown to be removed located beyond where the typical connection point would be and up to three feet behind the back of sidewalk. If an existing cleanout is discovered within these limits the Contractor shall remove it and any existing lateral piping as needed and then make the connection using approved pipe and couplings.

A 4-inch high letter 'S' shall be legibly inscribed in the face of new and existing curbs at the location of each lateral. Where bends are required behind the curb to make a connection an additional 'S' shall be legibly inscribed at the back of sidewalk where the connection to the existing lateral was made.

Whether shown to be installed on the plans or not, all sewer laterals that; have 3 feet or less cover at the connection to the main; or, that are connected to the main within 5 feet of an upstream manhole, shall have a same size as lateral "Clean Check PVC Extendable" or approved equivalent backwater valve installed. The valve shall be installed per Standard 527 within 5 feet of the building, if conditions allow. The exact location shall be determined in the field by the Engineer after the Contractor has located the onsite alignment of any existing lateral using a fish tape and pipe and metal locator or other approved method. Any valve installed onto an existing lateral shall have a minimum of 1 foot sections of approved pipe installed on both ends of the lateral and connected to the existing lateral with approved couplings. If installing a 6 inch valve, it shall be covered with a Christy G5 box, or approved equivalent set to grade with a lid marked "Sewer".

Active sewer laterals are to remain in service at all times, to facilitate this when removing and replacing an existing main the Contractor shall install a temporary connection between the new wye and the existing lateral until the new sewer lateral is constructed.

Plastic flex pipe may be used for temporary connections between active existing sewer laterals and the new wyes on the main. The flex pipe shall be the same size as the existing lateral pipe and shall be connected to the new wye and the existing lateral by means of an approved flexible sewer coupling. Squeezing the flex pipe and inserting it into the cut end of the existing lateral or into the lateral opening of the wye will not be allowed. All temporary connection material shall be removed

from the trench prior to final compaction.

Temporary sewer lateral connections shall be replaced with permanent laterals after installation of the sewer mainline is completed for each block, or at a maximum of 20 calendar days, whichever is sooner.

Provide 1-foot minimum clearance between wyes on all sewer mains as measured between adjacent bell ends.

Sewer wyes installed at incorrect locations shall be removed and replaced with a 4 foot minimum length of pipe and approved couplings. Capping of wyes installed at incorrect locations will not be allowed. Prior to installing wyes on the main, the Contractor shall investigate to ensure that the proposed alignment of new laterals will not be in conflict with any other facilities, existing or proposed. The Contractor shall promptly notify the Engineer of any field conditions that prohibit installing the wye in accordance with City Specifications and/or Standards.

A minimum separation of 3 feet shall exist between new sewer laterals and existing water services. If this separation requirement cannot be met the Contractor shall notify the Engineer immediately for direction prior to continuing work on this lateral. In all cases, a minimum of 5 feet separation is required between new sewer laterals and new water services.

Sewer laterals constructed under existing curb, gutter and driveway culverts shall be accomplished by use of a trenchless method approved by the 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 curb, gutter or culvert; and/or the use of CDF backfill at the Contractor's expense. The limits of the curb and gutter replacement and any required dowelling will be at the discretion of the Engineer at the Contractor's expense.

The Contractor shall remove and replace existing sidewalk and concrete planter strips for the installation of sewer laterals to the nearest transverse score mark on both sides of the lateral. All concrete removed shall be backfilled and compacted level with temporary asphalt concrete or covered with 1 inch thick plywood, laid flat with ADA compliant tapers on both ends.

Where an excavation for a new sewer lateral occurs within the drip line of any tree the Contractor shall hand dig to protect tree roots as directed by the Engineer. Root pruning shall be done only when directed by the Engineer and shall be accomplished by use of sharp tools appropriate for the size of the root to be cut. Each cut shall be clean with no torn bark or splintered wood remaining on the root. At no time shall roots be pulled on by excavating equipment.

Existing irrigation facilities not shown on the plans may be encountered during sewer lateral installation. The Contractor shall repair any damage to existing irrigation facilities caused by their operations.

Where an existing sewer main is a material other than asbestos cement, the Contractor shall assume that approximately 15% of all existing sanitary sewer laterals to be replaced are constructed of asbestos cement pipe. Where the existing sewer main material is asbestos cement, it should be assumed that all laterals are asbestos cement pipe. All related removal and disposal costs shall be the responsibility of the Contractor.

The Contractor shall notify and coordinate the replacement of individual sewer laterals with the effected resident or business.

130-1.07 Sewer Structures

All active manholes shall be considered as confined spaces.

Manholes shall be constructed per an accepted submittal and any request and approval for alteration must be in writing.

Manholes shall be standard precast concrete manholes as detailed on City Standard 500. Mains larger than 18 inches in diameter require 60 inch diameter manholes.

Manhole bases may be poured-in-place concrete on undisturbed earth. The bases shall be poured full thickness against the side of the manhole excavation or to dimensions shown on Standard 500. The manhole excavation site shall be dewatered before pouring.

Pre-cast manhole bases, conforming to City Standard 500 in dimensions and the requirements outlined below for materials may be used. Such pre-cast bases shall be placed on a minimum 6 inch thick cushion of drain rock, as specified in Standard 500. The drain rock shall extend a minimum of 6 inches beyond the outside edges of the base.

Precast manhole bases shall be constructed per ASTM C478. Concrete for cast-in-place manhole bases shall be portland cement concrete in compliance with Section 90 of the City Standards and Specifications.

If a new manhole is to be installed on an existing asbestos cement main, the Contractor shall remove all asbestos cement piping to a minimum of 12 inches beyond the manhole trench and into the mainline trench, any visible joints up to 36 inches beyond the manhole trench shall also be removed. All replacement materials shall be per City Standards, and all removed asbestos cement material shall be disposed of in accordance with all laws and regulations.

Except as noted below, or where otherwise specified, all manholes regardless of diameter shall have concentric tapered sections.

Prior to any work taking place in a new or existing manhole, a platform shall be constructed in the manhole above the top of the sewer to prevent any dirt or debris from entering into the sewer line. The platform shall remain in place until all work on the manhole has been completed. All dirt and debris shall be removed from the platform prior to its removal.

Eccentric tapered sections shall be installed when the installation of an inside drop is required.

Where a manhole has a single drop structure the opening of the eccentric tapered section shall be directly over the drop. When multiple drops are required, the alignment of the opening shall be determined by the Water Department.

Where the constructed height of a precast base does not allow for the installation of a tapered section due to rim to invert elevation constraints, the Contractor shall submit for a cast-in-place base for review. Slab sections shall only be considered where the height of a cast-in-place base will not allow for the installation of a tapered section.

Where steel reinforcement is required in manhole base construction, such reinforcement shall be furnished and placed as shown on the plans and in accordance with the applicable provisions of Section 52 of the Standard Specifications.

The base slab and initial riser section shall be connected with integrally poured concrete to create a watertight joint. Flow channels shall be constructed as shown on the plans. Changes in size and/or grade shall be made gradually in constructed channels, and changes in direction shall have smooth curves with proper radiuses that direct flow toward the outlet pipe and minimizes turbulence. All finished surfaces shall be smoothly troweled with a steel trowel. All manhole barrels and taper section shall be precast concrete sections using Type V portland cement complying with ASTM Designation: C 150 or low-alkali Type II cement meeting the requirements for Type V cement.

The 48-inch and 60-inch diameter barrels and taper sections shall be constructed in accordance with the applicable provisions of ASTM Designation: C 478 and shall be inspected by the Engineer to determine that the interior surfaces are smooth and free of pockets or depressions.

Manhole frames and covers shall be in accordance with Standard 512. Tops of manhole frames and covers shall be set accurately to finished grade in paved streets and 1 foot above finished grade in unimproved areas. The frames shall be evenly set on the manhole on a portland cement mortar bed. Where manholes are set above finished grade, the earth shall be mounded up around the manhole in a neat and acceptable manner to the satisfaction of the Engineer.

The entire interior surface of all new manholes, and existing manhole being connected to, shall be coated including the flow channel down to the spring line after all cracks and/or chips have been patched and existing surfaces prepared. Coating and patching materials shall be per the Engineer's List of Approved Items and shall be applied in accordance with the manufacturer's recommendations.

All joints in manholes shall be sealed by means of a preformed, self-bonding, self-sealing gasket from the Engineer's List of Approved Items, or an approved equivalent. Joint seals shall be installed in full compliance with the manufacturer's current recommendations.

The interior surface of all sanitary sewer main line cleanouts (area under frame and cover and around pipe), shall be troweled and brushed smooth and free of pockets or depressions.

Except as otherwise specified, all manholes on active mains shall be accessible at all times.

After placing the surface course of asphalt concrete, all manholes and cleanouts shall be located and marked with white paint before the close of that work day.

Within two working days of paving, all manholes and cleanouts shall be adjusted to grade and inspected.

130-1.07A Existing Manholes

Existing manholes and clean outs located within the street right of way shall be adjusted to conform to finished pavement grades in accordance with the details shown on the plans.

When a new sewer pipe is connected to an existing manhole, the manhole shall be modified to accept the new size of pipe and grouted to form a new flow channel in the manhole base. The wall of the manhole shall be breached by core drilling, sawing, or other approved method that does not disturb the manhole. The Contractor shall seal the penetration with StopAQ™ or SealGuard II, or an approved equivalent water stop, and shall grout the sealed penetration with a rapid set, high strength, non-shrink cementitious mortar to protect the sealer. The Contractor shall backfill the exterior of the manhole around the pipe penetration with concrete to stabilize the main and create a watertight connection.

When any modifications are made to a new or existing manhole, the Contractor shall use a bonding agent such as Sakrete Concrete Bonder and Fortifier, or approved equivalent, to adhere modification material to the existing structure.

Prior to the removal of an existing manhole frame, a platform shall be constructed in the manhole above the top of the sewer to prevent any dirt or debris from falling into the sewer. The platform shall remain in place until all work on the manhole has been completed. Prior to the removal of the platform from the manhole, all dirt and debris shall be removed.

Lowering of the manhole frame and cover can be accomplished by the removal of existing concrete grade rings below the manhole frame or by removing the upper section of manhole barrel and substituting therefore a shorter section of barrel.

At the Contractors option, in lieu of removing and replacing barrel sections as above provided, the top of the existing upper barrel section may be trimmed and the taper section replaced on such trimmed surface provided, however, that such trimming shall not crack or otherwise damage the remaining portion of barrel section and that the new joint can be sealed watertight.

In the event that the portion of barrel section to remain is cracked or damaged or otherwise made unsuitable for use by such trimming, the entire section shall be removed and replaced with a new section of barrel.

Trimming of taper sections is not permitted.

All sections of the manhole shall be set in cement mortar or in approved gasket material. Trim excess gasket material and plaster inside joints smoothly. Manhole sections set in cement mortar shall be smoothly plastered inside and out.

After placing the surface course of asphalt concrete, all manholes and cleanouts shall be located and marked with white paint before the close of that working day.

Within two working days of paving, all manholes and clean out shall be adjusted to grade and inspected.

Existing grade adjustment rings in the adjustment of manhole frames shall become the property of the Contractor and, if undamaged and thoroughly cleaned of mortar, may be reused in the work. If not so used, they shall be disposed of away from the site of the work at the expense of the Contractor.

130-1.08 Testing of Sewers

Testing of all portions of the sewer including manholes is required, and it's the Contractor's responsibility to coordinate all testing and inspections with the Engineer.

The Contractor, at their option, may conduct testing at any time during construction, however, final inspection and testing for acceptance shall take place only after all sewer facilities have been installed and all trenches backfilled and compacted, including roadway base rock as specified elsewhere in these specifications.

Manholes, after all inlets and outlets have been plugged, shall be filled with water to the rim of the frame casting and shall lose no more than 2 inches over a period of 30 minutes.

Even though the test for leakage is within the prescribed limits, the Contractor shall repair any obvious leaks.

In lieu of the water test, testing of sewer manholes may be done by vacuum testing as specified herein. If the vacuum testing method is used, all manholes shall be tested for leakage in accordance with ASTM C 1244-93 as modified herein.

Vacuum testing shall not take place until all permanent paving is complete.

Installation and operation of vacuum equipment and indicating devices must be in accordance with manufacturer's recommendations and performance specifications, which must be provided by the manufacturer and approved by the Engineer. The equipment must be capable of testing the entire manhole, including the cast iron frame and grade adjustment rings.

All new or rehabilitated sanitary sewer manholes shall be tested unless otherwise directed by the Engineer. If the manhole fails the test, the manhole shall be repaired and retested at the Contractor's expense. If manhole joint sealants are compromised during the vacuum test, the

manhole must be disassembled and the joint sealants replaced. If there is reason to believe that the manhole has been disturbed after the initial vacuum test, additional tests may be requested by the Engineer and performed at the Contractor's expense.

The Contractor may pre-test manholes at any time during construction. Any pre-test results are solely for the Contractor's use and shall not be accepted as the final test.

Testing shall be done in the following manner:

1. All lift holes and joints shall be grouted and the entire manhole, including grade rings, sealed prior to testing.
2. All pipes entering the manhole shall be temporarily plugged, taking care to securely brace the pipes and plugs to prevent them from being drawn into the manhole.
3. The test head shall be placed in accordance with the manufacturer's recommendations. The test unit shall be braced against the manhole frame and not the grade ring(s) or taper.
4. The vacuum gauge and test equipment used for this test shall be supplied by the Contractor and shall be operated per manufacturer's specifications by qualified personnel. Accuracy and calibration of the gauge shall be certified by a reliable testing firm at six month intervals, or when requested by the Engineer.

A vacuum of 10 inches Hg (4.91 PSI) of mercury shall be drawn on the manhole, the valve on the vacuum line of the test head closed, and the vacuum pump shut off. The time it takes the indicator gauge to drop from 10 inches Hg (4.91 PSI) to 9 inches Hg (4.4 PSI) shall be measured. The manhole will pass the vacuum test if the time is greater than shown in the following table:

Minimum Test Time Based On Manhole Diameter (sec.)

<u>Manhole Depth in Feet</u>	<u>Manhole Diameter in Inches</u>			<u>Time in Seconds</u>
	<u>48</u>	<u>60</u>	<u>72</u>	
0-4	10	13	16	
4-8	20	26	33	
8-12	30	39	49	
12-16	40	52	67	
16-20	50	65	81	
20-24	59	78	97	
24-30	74	98	121	

After the vacuum test, manholes shall be visually inspected for leaks and defects and repaired as required by the Engineer.

For either exfiltration or infiltration test on sewer lines, the maximum leakage shall not exceed 250 gallons per inch of pipe diameter per mile per 24 hours as measured over a period of 30 minutes

minimum. Should the leakage exceed the maximum allowable rate, the contractor shall repair, overhaul, or rebuild the defective portion of the sewer line to the satisfaction of the Engineer at no additional cost to the City. After repairs have been completed by the Contractor, the line shall be retested as specified above, all at no cost to the City.

In the event that the exfiltration test prescribed above is impractical due to wet trench conditions, these portions of the sewer line where such conditions are encountered will be tested for infiltration. The Engineer shall determine whether the exfiltration or infiltration test will be used.

Low pressure air testing may be used on sewer lines in lieu of water testing at the option of the Contractor. Water testing may still be required by the Engineer for certain installations.

The following procedure shall be used for low pressure air testing:

1. Clean pipe to be tested by propelling a snug fitting inflated rubber ball through the pipe with water. Remove any debris.
2. Plug all pipe outlets with suitable test plugs. Brace each plug securely.
3. If the pipe to be tested is submerged in ground water, insert a pipe probe, by boring or jetting, into the backfill material adjacent to the center of the pipe, and determine the pressure in the probe when air passes slowly through it. This is the back pressure due to ground water submergence over the end of the probe. All gauge pressures in the test should be increased by this amount.
4. Add air slowly to the portion of the pipe installation under test until the internal pressure is raised to 5.0 p.s.i.g.
5. Check exposed pipe and plugs for abnormal leakage by coating with a soap solution. If any leakage is observed, bleed off air and make necessary repairs.
6. After an internal pressure of 5.0 p.s.i.g. is obtained, allow at least two minutes for air temperature to stabilize, adding only the amount of air required to maintain pressure.
7. After the two minute period, disconnect the air supply and start stopwatch. The pressure of 5.0 p.s.i.g. shall be maintained for 5 minutes.
8. As an alternate, the contractor may request the air testing procedure as presented in Section 306-1.4.4 of the 2012 edition of the "Greenbook" Standard Specifications.

After pipe installation and placement and compaction of backfill, but prior to placement of pavement, all PVC pipe shall be cleaned and then mandrel tested for obstructions, such as, but not limited to, deflections, joint offsets and lateral pipe intrusions. A rigid mandrel, conforming to Standard 518 shall be pulled through the pipe by hand. The minimum length of the circular portion of the mandrel shall be equal to the nominal diameter of the pipe. All obstructions encountered by

the mandrel shall be corrected by the Contractor. Obstructions due to deflection shall be corrected by replacement of the over-deflected pipe. Mechanical re-rounding is not permitted.

If a section of pipe fails to meet the mandrel test and is reinstalled and fails the second time, said section(s) of pipe shall be replaced with an approved rigid pipe material.

The contractor shall furnish mandrel as shown on the City Standards.

The Contractor shall retest PVC pipe using a mandrel conforming to Standard 518 eleven (11) months after recordation of Notice of Completion of a Public Works Sewer Contract or after the acceptance by the City Council of a subdivision. Any pipe which fails to pass the mandrel test shall be replaced at the expense of the Contractor. The City reserves the right to determine the longitudinal limits of any pipe that is required to be replaced. Pipe replacement shall be guaranteed by the project maintenance bond.

130-1.09 Televising Inspection

Prior to scheduling televising inspection work, all sanitary sewer construction, and any other underground work which, in the opinion of the Director of Santa Rosa Water, has the potential to impact sanitary sewer work, shall be installed, their trenches compacted, and all other testing and inspections completed and accepted. Final paving over the work shall not take place until all underground work, including television inspection, is completed and accepted by the Engineer.

The Contractor shall hire an independent television inspection service to perform a closed circuit television inspection of all newly constructed sewers lines, including laterals from the main to the cleanout, and if lateral line is a replacement, from cleanout to connection point of the existing lateral.

The Contractor shall notify the Engineer in writing 2 working days in advance of the date for television inspection. The Engineer or their authorized representative shall be given the opportunity to be present during the inspection. Upon receipt of the completed televising inspection digital video files and written logs, the Engineer shall be allowed 10 working days to review the video records and logs before giving written notice of acceptance and/or deficiencies of the lines to the Contractor.

The Contractor shall supply plans and specifications for this work to the televising subcontractor with manhole and mainline cleanout numbers, street names, addresses and any other information required to facilitate the work.

During this inspection, the Contractor or their authorized representative shall be present to observe the televising inspection. Acceptance of any portion of the sanitary sewer work shall not be given in the field at the time of televising.

The Engineer shall only receive video and written logs for areas not known by the Contractor to need correction. If while conducting the initial television inspection in the field, the General

Contractor or their authorized representative discovers areas that need correction, these corrections shall be made and the area televised again prior to submitting the logs to the Engineer for review. If footage of video that is not required for inspection, such as; areas known to need repair, stationary video footage in sanitary sewer lines other than where required and footage not of sanitary sewer facilities, the submittal will be rejected.

Any damage to facilities or obstruction to service caused by the televising operations shall be corrected immediately by the Contractor at no cost to the City.

The Contractor shall obtain permission from the Engineer prior to the removal of any manmade or natural obstruction needed to complete this work. Any item removed shall be replaced in kind to the satisfaction of the Engineer, and will be done at the Contractor's expense.

All lines shall be flushed clean with a high-pressure commercial sewer flusher unit or by balling prior to televising. If required to televise an existing line it may be necessary to remove roots, grease or other obstructions prior to flushing per these Special Provisions. The equipment shall be appropriate for the type of obstruction being removed and shall not damage the pipe in any way. All debris shall be trapped at the first downstream manhole and removed. Debris will be hauled to an appropriate disposal site at the Contractor's expense.

After flushing and prior to televising, an approved source of water will be discharged into the upstream manhole or mainline cleanout until water flows out of the downstream manhole. This is to be done no more than 24 hours before the video inspection takes place. High pressure flushing of the line is not to be considered as a substitute for this requirement. This shall be done to insure that all dips or sags are filled before televising, if the sanitary sewer has live flow, the Engineer may waive this requirement. Live flows that are greater than the depth of the gauge shall be temporarily plugged upstream and bypass pumped to allow for proper televising.

The televising of all lines shall be recorded in a digital color format that does not require the use of specialized equipment and/or programs not already in use by the City's Engineering Department. Video files shall be on non-rewritable DVD disc(s) or flash drive(s), and shall be delivered to the Engineer along with computer program generated written inspection logs. The video files and written logs shall become the property of the City of Santa Rosa. Every televised run (manhole to manhole, manhole to mainline cleanout, and laterals) shall be recorded as a separate video file, with the name of the file being the manhole and/or mainline cleanout numbers for the main, and the property address for the lateral. A lateral file shall consist of the run from the clean out to the connection at the main and the run from the clean out to the connection of the existing lateral.

A pan and tilt color camera shall be used for all video inspection of main lines and shall be one specifically designed and constructed for such inspections. The camera shall be mounted on adjustable skids, a tractor, or when approved by the Engineer, a raft to keep it in the center of the pipe. Lighting for the camera shall be supplied by a lamp on the camera, capable of being dimmed or brightened remotely from the control panel. The lighting system shall be capable of lighting the entire periphery of the pipe. The camera shall be operative in 100% humidity conditions and

shall have a minimum of 330 lines of resolution. The camera equipment shall produce a continuously monitored color picture, which will have the resolution capability to discern small hairline cracks and other minor and major defects in the sanitary sewer line. The camera equipment shall be capable of producing digital still pictures for permanent record as required. The camera shall be self-propelled or pulled by a cable winch from the downstream manhole, through the line along the axis of the pipe, at a uniform rate of 1/2 foot per second maximum.

Where infiltration in the sanitary sewer line is suspected, the camera shall be stopped for at least 30 seconds in the area of question and the camera shall pan and/or tilt as needed to ascertain that infiltration is occurring and the possible cause. The camera shall stop at all lateral connections, defects, sags, etc for a period of at least 10 seconds and the camera shall pan and/or tilt as needed so that all portions of the connection or defect that is visible from within the main line can be completely inspected.

Each pipe run between manholes being inspected may be required to be isolated from the remainder of the line by the use of a line plug to insure total viewing of the inside periphery of the pipe. The inspection shall be performed in a forward and/or backward direction according to line conditions at the time of the inspection. Every effort shall be made by the Contractor to televise in the same direction as the flow, especially during live flow conditions. The Engineer must approve any video inspection that goes against the flow.

Televising subcontractor personnel shall be in constant communication during the televising operation.

The Contractor shall keep a copy of the written logs on site that clearly show the exact location, in relation to the starting manhole/mainline cleanout or lateral cleanout, of each following item discovered during the television inspection; infiltration points, lateral locations, cracks, open/pulled joints, roots, broken or collapsed sections, grease, debris, location of dips (starting and ending footage plus depth), and any other discernible features. In addition to the items noted, the video and written logs shall also note; name of project, general contractor, date, line size, length of section, manhole condition and live flow. Measurement for location of defects shall be at ground level by means of a metering device. Markings on the cable, or the like, which would require interpolation for depth of manhole or lateral cleanout will not be allowed. Measurement meters will be accurate to plus or minus one foot in a thousand and must show on video. A one-inch depth gauge pulled or pushed in front of the camera is required for all main lines up to and including 12 inch. For any line larger the Contractor shall verify required gauge size with the Engineer prior to scheduling television inspection. Measurement of laterals must be recorded on video and written log from bottom of cleanout to main and bottom of cleanout to connection at existing lateral.

The following conditions shall exist prior to the television inspection:

1. All sewer lines shall be in installed, backfilled and compacted;
2. All structures shall be in place, all channeling complete and all pipelines accessible from structures;
3. All other underground facilities, utility piping and conduit within two feet of the sewer

main, shall be installed, backfilled and compacted;

4. Pipelines to be video inspected shall have been flushed, and all other testing completed and accepted, including the mandrel test;
5. Immediately before the television inspection, run fresh water into the sewer until it passes through the downstream manhole.

All work performed must meet the quality and clarity standards set by the City of Santa Rosa and is subject to City review and rejection.

Deficiencies revealed by the television inspection, in the opinion of the Engineer, shall be repaired by the Contractor to the satisfaction of the Engineer. After all required repairs are completed the areas of repair shall be televised again at the Contractor's expense.

The Contractor shall be notified in writing of any deficiencies revealed by the television inspection that will require repair, following which, the Contractor shall excavate and make the necessary repairs and perform a television re-inspection. Television re-inspection shall be at the Contractor's expense.

Although the final determination for required repairs will be made by the Engineer, the following observations are typical defects found in the construction of the sewer pipelines and will require corrections prior to acceptance whether or not there is a passing air test:

1. Off grade - 0.08 foot, or over, deviation from grade;
2. Separations over 1" in coupled together mainline pipe joints where the pipe is 8-inches in diameter or smaller, and 2-inches or more in coupled together mainline pipe joints where the pipe diameters are 10-inch or larger;
3. Separations over 1/2-inch in coupled together lateral piping;
4. Any open joint or pulled joint that is beyond manufacturers installation recommendations;
5. Offset joints;
6. Chips in pipe ends - none more than 1/4" deep;
7. Cracked or damaged pipe or evidence of the presence of an external object bearing upon the pipe (rocks, roots, etc.);
8. Infiltration;
9. Debris or other foreign objects;
10. Other obvious deficiencies when compared to Approved Plans and Specifications, these Standards and Standard Drawings.

The above list is not a complete list of items that may be considered as deficiencies. The final determination for any required repair shall be made by the Engineer.

130-1.10 Bypass Pumping and/or Diversion System

When bypass pumping and/or flow diversion is required to keep existing services active, the Contractor shall provide a system that furnishes and maintains all personnel, equipment, tools, power, piping and incidentals required to maintain existing sewer flows and services without interruption.

The Contractor shall submit a bypass pumping and/or diversion plan for review by the Engineer at least 10 working days prior to planned commencement of bypass pumping and/or diversion. The Engineer shall approve the bypass pumping plan before commencing any bypass pumping work. The Contractor shall notify the Engineer 2 working days prior to commencing with the bypass pumping operation.

Any proposed flow diversion plan that includes a temporary connection to existing sewer components shall also comply with Section 130-1.05 herein.

The bypass pumping plan shall include design flow, documentation of pump and discharge line capacities, manufacturer, and age. Bypass pumping plan shall also include shop drawings that identify pumping location(s) and methods with sufficient detail to assure that the work can be accomplished without sewage spills. The plans shall include an emergency discharge response plan to be followed in the event of a failure of the bypass pumping system.

All components of the bypass pumping system shall be sound attenuated and produce noise emissions in accordance with City noise ordinances. All pumps shall be set into or surrounded by spill containment devices.

Bypass pumping shall be done in such a manner as not to damage private or public property or create a nuisance or public menace. The pumped sewage shall be in an enclosed hose or pipe system that is adequately protected from traffic and shall be redirected into the sewer system.

The Contractor shall take all necessary precautions including constant monitoring of bypass pumping to ensure that no private residences or properties are subjected to sewage backup or spills. Dumping, leaks or free flow of sewage onto private property, gutters, streets, sidewalks, or into storm sewers or waterways is strictly prohibited.

Except as otherwise specified herein for testing purposes, the Contractor must receive written approval from the Engineer prior to the use of pneumatic test plugs or any other means for blocking sewer flows. The Contractor shall submit a flow blockage plan, for review by the Engineer, identifying at a minimum the following:

1. What devices and/or material will be used,
2. Depth of upstream manhole(s),
3. Location of existing lateral cleanouts and how they will be monitored,
4. Address of all parcels along with name and operating hours of all businesses located

upstream of blockage to the next upstream manhole.

The Contractor shall also provide name and cell phone number of the employee(s) that will have the sole duty of monitoring all active blockages. If multiple lines are simultaneously blocked, the Contractor's submittal must show how each blockage is to be continuously monitored. For multiple blockages, and at no additional cost to the City, the Engineer may also require devices for each blockage to give audible and/or visual alarm of a pending overflow.

The Contractor shall be liable for all cleanup, damages and resultant fines in the event of a spill.

Subsequent to removal of bypass pumping and/or diversion system, the Contractor shall verify existing sewer flows are restored to pre-existing condition.

The Contractor shall allow up to 10 working days for response from the City for any request regarding sewer system flows.

WATER DISTRIBUTION SYSTEM CONSTRUCTION STANDARD SPECIFICATIONS

SECTION 132 WATER DISTRIBUTION SYSTEM CONSTRUCTION

132-1.01 Description

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

The Contractor shall provide a full size set of water distribution system “record plans” for their project to the City within 7 calendar days from the final connection to the City’s water distribution system. All deviations from the improvement plans shall be recorded on the plans in red ink.

Permanent paving shall not take place until all underground work is finished, except as otherwise noted, and the Engineer has given written notice of acceptance to the Contractor.

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.

132-1.01A 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 Engineer;

- 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.

The City reserves the right to reject any material that may be supplied for use, whether on the “Engineer’s List of Approved Items” or not. If the City 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 the City.

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

132-1.01B Material Submittals

The Contractor shall submit to the 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 Water Department.

For material listed on the "Engineer's List of Approved Items" 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 "Engineer's List of Approved Items" 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 Director of Santa Rosa Water.

132-1.02 Pipe

Unless otherwise approved by the Director of Santa Rosa Water, 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 Santa Rosa Water.

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.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.

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

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.

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 12 AWG solid copper wire with a blue type UF 60 mil insulation that is designed for use in the detection of underground utilities. Except where otherwise noted on individual City Standards, fasten the wire to the top of the pipe so as not to be displaced during backfilling operations, (one method of accomplishing this is to affix the wire to the top of the pipe with duct tape at approximately 10 feet intervals). Where splicing is required only watertight connectors shall be used, and shall be either Copperhead Snakebite, 3M DBR, or an approved equivalent.

132-1.03 Copper Water Service Tubing

All copper water service tubing shall be factory coated “blue” with a polyethylene coating that has a minimum coating thickness of 0.025”. The copper tubing shall conform with the latest AWWA Standards as described in AWWA C800 of the latest revision, and with ASTM B88. Type K soft temper tubing shall be used for 1" services, and Type K hard temper tubing for 1-1/2" and 2" services.

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

132-1.03A High Density Polyethylene (HDPE) Water Service Tubing

All 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.

132-1.04 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 Director of Santa Rosa Water all fittings shall be mechanical joint type.

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 Director of Santa Rosa Water.

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.

132-1.04A Restrained Joints and Fittings

In general, and unless otherwise specified or allowed by the Director of Santa Rosa Water, 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 City 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 Santa Rosa Water 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.

132-1.04B 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 per City Standards 854 and 877. 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 City's distribution system. Connection to the existing mains shall be by approved couplings as noted herein unless otherwise approved by the Director of Santa Rosa Water.

132-1.05 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 the Water Department. 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 the Water Department, the installation of a horizontally installed gate valve with manufacturer installed bevel gearing. Bonnet direction of horizontally installed gate valves must be approved by the City 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 City 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 City personnel at all times. Valves that require "valve stem risers" shall not be considered accessible unless the riser is in place and operational.

132-1.06 Butterfly Valves

Butterfly valves shall only be installed where approved by the Director of Santa Rosa Water.

Butterfly valves shall be flanged or mechanical joint type only and shall conform to AWWA C504 of latest revision and shall be of the rubber seat type. Valve discs shall rotate 90 degrees from the full open position to the tight shut position. The valve seat shall provide a tight shutoff at a pressure differential of 150 psi upstream and 0 psi downstream in either direction. The valve operator shall be the traveling nut type. Valve shall open with a counter-clockwise rotation of the operating nut.

132-1.07 Valve Boxes, Vaults and Pits

Each gate valve shall be covered by a precast 8" valve box set flush with street surface with cast iron ring and cover marked "WATER".

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 the Water Department. 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 Standard 877. 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 3" 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.

132-1.08 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 Standard 877. See Section 132-1.10 Asbestos Cement Pipe herein for additional requirements.

132-1.09 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 Director of Santa Rosa Water.

Fire hydrants serving one and two family residential use have one 2-1/2 inch outlet and one 4-1/2 inch outlet. Fire hydrants serving commercial and multi-family residential uses have one 2-1/2 inch outlet and two 4-1/2 inch outlets.

Paint all hydrants in accordance with City Standard 857.

Before a public fire hydrant may be placed in service, a high velocity flushing of the hydrant lateral shall be witnessed and approved by Santa Rosa Water Department 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 Standards and Specifications.

132-1.10 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.

132-1.11 Excavation, Backfill, and Resurfacing

All trenching, backfill and resurfacing required for installation of water distribution system facilities shall be in accordance with all applicable City Standards, specifically Standard 215, or as modified on the plans, and approved by the City of Santa Rosa Materials Engineer.

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 Contractor’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 City 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 public works 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 City 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 streets the excess material shall be removed from the site daily unless it has been preapproved for reuse.

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 City.

All lateral services constructed under curb, gutter and driveway culverts shall be accomplished by use of a trenchless method approved by the 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 Engineer.

Blasting shall not be permitted unless first approved of, in writing, by the Building Department and the Director of Santa Rosa Water.

Controlled density fill (CDF) shall be placed at the locations shown on the plans and where cover is less than 3 feet unless otherwise specified herein, on the plans, or approved by the Director of Santa Rosa Water. CDF shall conform to City Standard 215, 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, by any such damage due to their operations.

Unless otherwise approved by the 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 Engineer.

132-1.11A Trench Bracing and Shoring – Water

All bracing and shoring shall conform to Section 7-1.02K(6) of the 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.

132-1.12 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. The Engineer may reject stockpiled pipe with exposed ends.

Proper implements, tools, and facilities satisfactory to the 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 City Water Distributions System Design Standards, or as shown on the Plans. Where, in the opinion of the Engineer, new mains cannot start on the same lines and grades and 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 City 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, dirt, 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 the Engineer 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 Appendix "A" of the City of Santa Rosa Water Distribution System Design Standards for additional information and direction.

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.

132-1.13 Laying 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 insure 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

132-1.14 Laying 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.

132-1.14A Water Main Lowering/Over-Structure

Attention is directed to Sections 132-1.04 and 132-1.04A 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 City of Santa Rosa Water Distribution System 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 City 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.

132-1.15 Service Laterals

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

132-1.15A Water Services

The Contractor shall install new water service laterals per applicable City Standards 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 City 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 sewer laterals.

HDPE and type "K" soft temper copper 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.

Water service connections to existing building service lines of 3/4" or 1" in size shall be made with type "K" hard or soft temper copper or schedule 80 PVC tubing, and shall match the size of the existing service line.

Water Service connections to existing building service lines of 1-1/2" to 3" in size shall be made with type "K" hard temper copper tubing and shall match the size of the existing service line.

When connecting to any service line under 4" that has a backflow prevention device, threaded brass or type "K" hard temper copper tubing shall be used unless otherwise shown on individual 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 or type "K" hard temper copper.

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 City 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.

When connecting to a 5/8" x 3/4" water meter the street side curb stop shall be a 1" x 3/4" angle meter ball valve (submittal required), and the meter box shall be per Standard 863.

After the new water system is connected to the existing City 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 the field 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.

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 off the "*City of Santa Rosa Approved List of Backflow Testers*". All necessary paperwork shall be completed by the Tester and one copy given to the property owner and one to the City's Water Quality Section 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.

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. The Water Department will attempt to facilitate hot taps within these timeframes; however, extenuating circumstances may result in response times in excess of those mentioned above.

132-1.15B HDPE Water Services

High Density Polyethylene (HDPE) services shall be installed per applicable City Standard and as specified on the Plans.

132-1.15C Copper Water Services

Unless otherwise specified herein or in other contract documents, water service lateral installations of sizes 2" and smaller shall be HDPE.

If directed to install a copper water service it shall be installed per Section 132-1.03 of these specifications, the applicable City Standard, and any modification herein and/or on the Plans. All brass material and sections of copper tubing where the polyethylene coating is removed shall be wrapped with an approved waterproof pipe wrap to a minimum of 4" beyond any exposed brass or copper. All cut ends of copper tubing shall be deburred prior to installation.

132-1.15D 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 City 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 off the City of Santa Rosa "*Approved List of Backflow Contractors*", which upon request will be provided by the Engineer. 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.

132-1.16 Thrust Blocking

Unless other arrangements are made that are acceptable to the Engineer, the Contractor shall coordinate notification, and allow for visual inspection by the City, 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 Design and/or City Engineer.

Concrete thrust blocks and/or harnesses shall also be installed per applicable City Standard, 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 City or the Contractor, it shall be installed per City Standards unless otherwise specified on the plans.

132-1.17 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 City Standard 507. 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 Director of Santa Rosa Water, 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 Director of Santa Rosa Water 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 the Water Department.

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 the 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 City 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 Water Distribution System 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, if left in the ground, shall be capped or plugged in an acceptable manner. The hydrant only shall be delivered to the City's Water Department Field Operations site located at 35 Stony Point Road, unless the Contractor has obtained specific written approval by the Water Department to otherwise dispose of the materials.

Remove all valve boxes and risers on abandoned mains and backfill and resurface per City 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 Standard 507. 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 backfilled per City Standards and surfaced 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 by authorized City personnel.

132-1.18 Hydrostatic Test

Prior to being allowed to connect to the City of Santa Rosa's 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 City for acceptance, shall take only 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 the Engineer, shall be hydrostatically tested to a pressure of not less than 150psi measured at the highest point along the section to be tested. Where the static pressure in the City's distribution system to be connected to is greater than 100psi, the test pressure shall be 1.5 times the static pressure of the City's 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 or joint pressures at the lowest elevation, the Contractor shall request direction from the Director of Santa Rosa Water.

Except where otherwise specified or approved by the Director of Santa Rosa Water, 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 corrected to the satisfaction of the Director of Santa Rosa Water, 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

system. 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. The City of Santa Rosa 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 <i>psi</i>	Nominal Pipe Diameter									
	4"	6"	8"	10"	12"	14"	16"	18"	20"	24"
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.

132-1.19 Cleaning, Flushing and Disinfection of the New Water System

Cleaning, flushing and disinfection of new water system components purposed to be connected to the City of Santa Rosa's Water Distribution System shall conform to AWWA C651, all applicable City 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 Director of Santa Rosa Water cleaning and flushing of all mainline pipes shall be accomplished by propelling the swab down the pipeline to an exit point per Section 132-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. The City 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 862 with a "same size as main" elbow and vertical stand pipe to prevent trench and disspelled 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 City's 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 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 the City.

Except as otherwise specified or permitted by the Director of Santa Rosa Water, 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%, 12.5% or 15% 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 City's existing 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 City's 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 132-1.20 "Discharge of Chlorinated Water", and all new mains and laterals shall be given a final flush and then filled with water from the City's 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 City's 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 City's distribution system and 1 ppm, but no higher. If the residual taken from the City's 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, or their designee, 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 City's 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 bacteria test sampling taking place.

Unless otherwise approved by The City of Santa Rosa Water Quality Supervisor, 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 City's 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 the City. 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.

The City 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 Director of Santa Rosa Water, due to unsanitary or other construction practices, as determined by the Engineer, the Contractor may be required to do additional sampling with satisfactory results prior to connecting to the City's distribution system.

132-1.20 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 North Coast 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 City of Santa Rosa Subregional Reclamation Facility shall be notified by the Engineer in coordination with the Contractor, 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.

132-1.21 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 authorized City personnel.

The Contractor shall make a schedule request, to the Engineer, for any work which requires a City water distribution system shutdown, including, but not limited to, connection to the City's distribution system or a service hot tap. Connections to the City's 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. The Santa Rosa Water Department 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 City personnel only. Authorized City personnel must be present during any operation requiring a shutdown unless otherwise approved by the Director of Santa Rosa Water and provided to the Contractor in writing. Connections to the City's 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. The City 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. Hot tap scheduling shall also be subject to the limitations of Section 6-4.01B, “Water Utility Notification”, of these Special Provisions.

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 Director of Santa Rosa Water. 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 require by the Director of Santa Rosa Water to be removed and replaced with approved pipe and couplings under City 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 City personnel and equipment time used, and the contractor shall bear the costs incurred by the City 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 City will contact commercial customers for service interruption needs and will inform the Contractor accordingly.

City crews work a 9/80 schedule; this schedule may prohibit shutdowns on alternating Fridays.

Contractors requiring work of any kind by City forces shall request such services a minimum of 48 hours in advance of the time such services are desired. Work requests, which will involve City forces for more than 8 hours or an extensive number of City 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 City Standard 215.

All joints of a tie-in connection to the City's 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 City 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 85psi 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

City inspection, and shall provide all other work and materials necessary to complete the installation to City Standards.

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 temporary 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.

132-1.22 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 City’s water system the Contractor shall obtain a Water Use Permit and rent a hydrant or bridge meter, this can be done at 35 Stony Point Rd, Water Department’s Utilities Field Operations front counter, Ph# 707-543-4200. 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 City 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 City of Santa Rosa water 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 Water Department and will result in penalties including payment of fines and estimated water usage fees.

Construction water shall be obtained from the City water system only at the point(s) designated by the Engineer.

Contractors are prohibited from operating gate valves or fire hydrants on the City system.

Use of water obtained from unmetered fire hydrants or other facilities is a violation of City ordinance and State law. Use of construction water from sources other than the City Water System

must be approved by 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 City.

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 City's Water Quality Section.