Section 7 Sanitary Sewer

1.1 General

These standards shall apply to the engineering design and construction of all sanitary sewer system to be maintained by the City, or with those exceptions as noted, within private multiple ownership residential or multi-parcel commercial and industrial developments.

All work shall be installed in accordance with the requirements of these standards, as recommended by the manufacturer, the California Building Code, the California Plumbing Code. These standards and manufacturer's guidelines shall be present at the construction site at all times.

1.2 Connect to Existing Facilities

Connection to existing City sewer facilities shall be made after approval of construction and bypassing plans from the City Engineer, and all permits have been issued.

The City has the option of making any system tap as required on the plans. Should the City elect to perform the tap, the Contractor shall pay for such work on a time and materials reimbursement basis. The Contractor shall be responsible for the following tasks associated with the tap, and as determined by the City.

1. Coordinating the work requested with the City. This shall include discussions on provisions for materials and equipment required to complete the work.
2. Traffic Control per the City's requirements.
3. Excavating the work area, as agreed upon by the City.
4. Sheeting, shoring and bracing as required.
5. Lighting as required if the tap is to be performed at night.
6. Backfilling, compacting and pavement restoration of the excavations upon tap completion.
7. A bypass pumping plan, with a secondary back up pump as required. A bypass pumping plan must be submitted to and approved by the City Engineer. Anticipated Flows rates and pump capacity shall be shown on the plan. Sections of existing surcharge pipe may be encountered in the system.
8. Bypass pumping operations shall be monitored full time at the cost of the Contractor.

A. Existing Sewer Stubs and Sewer System Outfalls

The contractor shall excavate and connect to an existing sewer stub in the presence of the City. Existing stubs shall be air tested by contractor and CCTV'd by the Contractor before connecting. If an existing stub is found damaged or otherwise exceeding tolerances, the contractor shall remove and replace the stub prior to connecting. Contractor shall incur all expenses. A note to this effect shall be placed on the improvement plans.

Sewer system outfalls shall be mechanically plugged and grouted. The plug shall remain in place until final acceptance by the City.

B. Construction Staking

The sewer main shall be staked prior to installation. Such staking shall provide the station and offset to the sewer main, aswell as the cut to the nearest 0.10 foot. Stakes shall be provided at a minimum of every 100 feet in tangent sections and every 25 feet in curved sections, and every 10 feet in approved vertical curve sections, and at all appurtenances or structures.

1.3 Average Flow Determination

The determination of average dry weather flows for design purposes shall be based upon the best available information concerning land use and density as determined by the City. This information may include approved land use and density inaccordance with current zoning in the absence of more specific information pertaining to expected development. Average dry weather flow factors are listed in Table Error***! No text of specified style in document.****-1*.

Table ***Error! No text of specified style in document.****-1 Flow Designation*

Land Use Designation	**Units**	**Flow Factor (gpd/unit)**
Commercial	gpd per acre	850
Industrial	gpd per acre	850
Agricultural	Gpd per acre	600
Neighborhood Center Mixed Use	gpd per acre	2,300
Public/Quasi-Public	gpd per acre	660
Schools	gpd per acre	170
Residential (All)	gpd per DU	250
Open Space	gpd per acre	0
Parks> 10 Acres	gpd per acre	10
Vacant	gpd per acre	0

*Includes allowances for I&I

**Future development shall use the factor that results in the highest flow

***Factor flow assumes a 30% FAR. 50% for senior living

1.4 Design Flow

Design flow sizing of infrastructure 15 inches in diameter andsmaller shall be calculated by using the average dry weather unit flow factor(s) listed in Table Error***! No text of specified style in document.****-1* for the upstream service area. Maximum flows shall be based on the ratio of peak to average flows as determined by using a Peak Factor of:

$$PF = 2.8xQ^{(-0.155)}$$ (Q in MGD)

$$PF = 7.72xQ^{(-0.155)}$$ (Q in GPM)

For sizing trunk sewers 18 inches in diameter and larger, utilize the hydraulic model of the collection and conveyance system and consult with the City.

1.5 Pipe Capacity, Slope, Velocity, Size, Depth and Material

Design criteria for the pipe system are as follows:

A. Main Sizes

The minimum size sewer main within a residential developmentshall be 6 inches in diameter. The minimum size sewer main for commercial and industrial developments shall be 8 inches in diameter.

B. Slope and Velocity

Manning's formula shall be used to determine the relation of slope, design flow, velocity, diameter, and "n" value. The "n" value shall not be less than 0.013 for all pipe materials.

Table Error***! No text of specified style in document.****-2* provides minimum slopes and design flow capacities for various pipe diameters. Pipe slopes less than those listed in this table shall not be used without the approval of the City. The slopes indicated are based on a velocity of two feet per second with the pipeflowing full.

Table ***Error! No text of specified style in document.****-2 Minimum Slopes*

Pipe Diameter (in)	Slope (Ft/ft)	Capacity at 0.7 Depth (MGD)	Capacity Flowing Full (MGD)
6	0.0050	0.22	
8	0.0035	0.38	
10	0.0025	0.58	
12	0.0020	0.85	1.00
15	0.0015	1.32	1.60
18	0.0012	1.95	2.35

The maximum depth of flow at design conditions in any lateral 10 inches in diameter or less shall be 70 percent of pipe diameter. Lines 12 inches in diameter or larger may be designed to flow full unless direct sewer connections are planned, in which case the 70 percent pipe diameter maximum depth of flow shall govern.

All sanitary sewer pipe shall be designed for a minimum scour velocity of 2 feet per second at peak flows. The volume of wastewater within the pipe system as determined above shall be used when designing pipe slopes. Maximum design velocity shall not exceed 10 feet per second.

C. Capacity

Pipe capacity, in all cases, shall be adequate to carry the Peak Wet Weather Flow (PWWF) from the entire tributary shed area even though said area may not be within the project boundaries.

D. Hydraulic Grade Line

The hydraulic grade line shall be determined from the design flows, based upon 100 percent development of the tributary area. Hydraulic grade line calculations must be submitted for the design of all lines 12 inches in diameter or larger.

E. Depth

Sewer mains with service lateral shall not exceed a depth of 15 feet. The system shall be designed to provide a minimum slope for sewer services of ¼ inch per foot with a minimum cover of 12 inches at any buildable location within the properties to be served. Proposed building pad elevations shall be aminimum six inches above the lowest upstream manhole rim. Where thebuilding pad does not meet the elevation requirement, a backwater valve for the building shall be required. The backwater valve shall be noted on the improvement plans and building plans. Installation shall be made duringconstruction of the underground improvements. Deed restrictions shall be putin place which hold the City harmless for failure of the backwater valves on suchlots.

1.6 Manhole Criteria

The design criteria for manholes are as follows. Manholes shall be placed at the intersection of all sanitary sewer lines, at the upstream end of a pipe run, and at the end of any temporary line more than 200 feet in length. No more than three lines may enter a manhole with one line exiting. Pipes shall be aligned so that there is sufficient spacing between each pipe entry on the barrel section.

A. Spacing

Maximum spacing of manholes shall be 500 feet for all straight lines of 10 inches in diameter or less. Manhole spacing for mains 12 inches and larger shall be considered on a case-by-case basis. A line with a radius greater than 400 feet shall be considered as straight for purposes of this section. Manhole spacing on curved lines of 200-feet radius (minimum allowable) shall be 200 feet. Manhole spacing on curved lines of radii between 200 and 400 feet, or where only a portion of the line is curved, shall be adjusted proportionately. Reverse curves require a manhole at the point of tangency of the curves or as determined by the City. A manhole shall be required at any change in vertical alignment, pipe size or change of direction unless approved by the City.

B. Invert Elevations

The invert elevation for pipe of the same diameter entering a manhole shall have a 0.10-foot drop between the entering and exiting pipe. Under special circumstances, the 0.10-foot drop may be waived with the approval of the City. Mains with 10 or fewer services shall enter manholes at an invert to crown match with the exit pipe. Lateral mains entering trunk mains, as defined by the City, shall enter manholes at an invert to crown match with the exit pipe.

C. Manhole Sizing

A standard 48 inch manhole with a 24 inch access opening shall be used for sewer mains 12 inches and smaller, and not exceeding 20 feet depth. A 60 inch manhole with a 36 inch opening shall be used for sewer trunkmains 15 inches to 36 inches in diameter. The design of larger trunk mains shall be approved on a case-by-case basis.

D. Manhole Coatings

Manhole coatings shall be required in areas determined to have a potential of generating excessive sulfide gases. Such manholes shall include, but are not limited to, all manholes on trunk mains 15” in diameter or larger, the first manhole originating from a sewer trunk main

15 inches in diameter or larger, force main transition manholes, manholes designed with inside drops, or as determined by the City.

E. Manhole Access

Provisions must be made to prevent vegetation from overgrowing the manholes. An all-weather 10-ton vehicular access shall be provided to each manhole as required by the City. Turning radii of 30 feet inside and 45 feet outside, and a vertical clearance of 14 feet are required.

F. Connection to City Mains

Improvement plans which require a tap to an existing City sewer main shall specify that such connection be performed by City forces on a time and materials basis.

1.7 Drop Connection Criteria

Drop connections shall be permitted under special conditions and with the approval of the City. There shall be no more than one inside drop connection into a 4-foot diameter manhole. If an elevation difference of at least 3 feet is not available, the slope of the incoming line shall be increased to eliminate the need for the drop.

1.8 Mainline Transitions

Mainline transitions shall be made at a sewer manhole.

1.9 Sewer Service Design

The design criteria for sewer services are as follows.

A. General

Services shall be designed and constructed per the City standard details. The service shall extend from the main to the edge of the public right-of-way or easement. The service shall be stubbed up at the public right of way and the cleanout shall be constructed per the City standard details. The customer is responsible for and owns the lateral from the sewer main to the building which is being serviced. Services shall extend two feet beyond edge of pavement of private roads. Easements of adequate width to accommodate the service shall be obtained. A plan and profile of services shall be supplied to the City on request.

Cleanouts shall be designed and constructed to grade with subdivision improvements or at the time connection is made to the building sewer. Unless otherwise noted on the plans, construction of the cleanout to grade is the responsibility of the contractor for the subdivision improvements. If installation of the cleanout is deferred, the plans shall call for the placementof a 2-inch by 4-inch post at the end of the service sewer extending from the flow line to not less than 12 inches above ground surface. The service shall be plugged at right of way ad an 18” diameter coil of #12 tracer wile shall be buried at the end of the service.

B. Sizing

The minimum size service for single-family developments shall be 4 inches in diameter. Services greater than 100 feet in length shall be 6 inches in diameter. Schools, commercial, industrial, and multiple residential properties shall be served by a minimum 6-inch diameter service.

C. Connection to Sewer Mains

Residential services shall connect to the sewer main by means of a factory fitting. Properties with services located at the end of cul-de-sacs shall enter a manhole. A 6-inch service shall enter a 6-inch main by means of a manhole. A 6-inch service entering an 8-inch or larger main must either be connected with a manhole or by means of a factory fitting with a manhole placed at the property line. Services 8 inches in diameter and larger shall be connected to the main by use of a manhole. In no case shall a service connection be made with the use of a tee.

D. Connection to Existing Sewer Mains

The City reserves the right to make all sewer service taps onto existing mains after approval and payment of the required connection fees. If the City elects to utilize city forces for sewer service taps payment made to the City for such work will be on a time and materials basis. A note to this effect shall be placed on the plan sheet which shows a detail for the area that requires such tapping. The application shall be made to Public Works. Connection fees shall be paid prior to submittal of the application. All excavation, backfill, and the installation of the remainder of the sewer service or stub shall be performed by the Contractor.

E. Connection Limitations

Sewer services shall connect to 12-inch diameter and larger pipe or to lines more than 15-feet in depth at a manhole.Direct connection to trunk mains shall only be with the approval of the City.

F. Location

A sewer service shall be constructed to each lot. In new subdivisions or developed areas, unless specifically requested otherwise in writing, sewer services shall be placed on the low side of a typical subdivision lot or similar parcel with 2 percent or greater slope across the front, or shall be placed in the center of lots of lesser slope. Trees, improvements, etc., are to maintain a minimum of 5’ from the sewer service, including the cleanout and where the sewer service is extended to service the house.

If the property is located such that service is available both to a line located in an easement and in a right-of-way, service shall be at the latter location unless otherwise approved by the City. No sewer service shall be located such that future on-site construction will result in the line being in such proximity to a water well or water main or service that applicable health standards will be violated.

G. Depth

Adequate depth of sewer service at the edge of easement or right-of- way to service the intended parcel shall be verified. A depth of 3 feet to crown of pipe, measured from gutter flow line or edge of adjacent roadway, whichever is lower, shall be considered the standard for service sewerdepth, except where the water main is to be installed at back of sidewalk as partof the subdivision improvements. In such cases, service shall have a minimumdepth of cover of 4-feet 6-inches at the property line and the service shall be extended to a minimum of 7 feet back of sidewalk with the cleanout to grade remaining within 2 feet of back of sidewalk. When greater depth is required, the invert elevation of the service sewer at the edge of the right-of-way or easement shall be noted on the improvement plans. If a joint

trench is being utilized for other utilities, the plans shall indicate that a joint trench will exist and service elevations shall be adjusted accordingly.

Sewer service connection to the main 14 feet or deeper, shall place concrete around the haunch of the "wye". Sewer service connection to the main shall notexceed 15 feet.

H. Special Requirements in Developed Areas

In developed areas, a sewer service shall be provided to each parcel participating in the project which contains a source of sewage less than 200 feet from a lateral. A property owner's request for service location shall be honored whenever practical. Parcels which have two or more sources of sewage must have an independent sewer service provided for each sewage source which can be separated from the rest of the parcel and sold. A service shall be provided to each lot. During the design period, each property owner affected by the proposed work shall be contacted in writing to determine the preferred sewer service location. In the absence of a response, a sewer service shall be provided in accordance with these standards.In addition, upon staking the location of the proposed sewer services prior to construction, each property owner shall be given a final opportunity to approve the proposed sewer service location. A compilation of this information shall be furnished to the City.

I. Warranty Inspection of Sewer Main Stubs

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

J. Grease Interceptor

A grease interceptor shall be required for any business having the potential of producing grease as specified in the Gridley Municipal Code. Minimum size of the interceptor shall be 1000 gallons. Sizing of the interceptor shall be based on the current edition of the California Plumbing Code adopted by the City.

General Commercial/Retail buildings shall require dedicated grease lines for future use. A location for the future grease interceptor shall be identifiedon the improvement plans.

K. Oil/Sand Interceptor

An oil/sand interceptor shall be installed for any business having the potential of producing oil and sand waste resulting from routine maintenance as specified in the Gridley Municipal code. Minimum size shall be 450 gallons. Sizing of the interceptor shall be based on the current edition of the California Plumbing Code adopted by the City.

1.10 Canal Crossing Design

Advance approval of the City Engineer, and other appropriate agencies is necessary to initiate design. The criteria for creek crossings are as follows.

A. General

In all cases, the proposed future creek/irrigation ditch bed elevation shall be used for design purposes. Crossing details of pipe, piers, anchorage, transition couplings, etc., shall be shown on a detail sheet of the plans. The top of pipe shall have a minimum of 3 feet of cover at the shallowest point of the crossing.

B. Gravity Mains

For line sizes 10 inches and smaller, ductile iron pipe shall be used under the full creek width plus 10 feet each side. For line sizes 12 inches and larger, pipe used shall be as determined by the City. The ductile iron pipe shall be supported by steel I-beam piles. The steel I-beam pile shall be installed to a yielding depth as recommended by the soils engineer. Each stick of pipe shall be supported by a least one pile or as approved by the City Engineer. A steel plate shall be welded on top of the I-beam. A ½-inch thick polyethylene pad shall be installed on top of the steel plate for the pipe to rest on. The pipe shall be held by two 2-inch wide galvanized steel straps, with galvanized bolts attached through the steel plate and polyethylene plate. An insulating material shall be used between the pipe and the section of strap coming into contact with the pipe. All exposed surfaces shall be coated with coal tar epoxy. A layer of 4-inch to 8-inch cobbles shall be placed and compacted on the top surface of the trench area for the full width of the creek. A trench plug shall be required at the top of the pipe at the downstream side of the crossing. The plug shall be a minimum of 4 feet in length, and shall extend 24 inches beyond the width and depth of the trench.

C. Design

Calculations shall be submitted which clearly indicate the design of the pipe and supports regarding impact, horizontal and vertical forces, overturning, pier and anchorage reactions, etc.

1.11 Pump Station and Force Main Requirements

Every phase of pump station design, including force main design, shall be closely coordinated under the direction of the City Engineer. The pump station and force main shall be designed and submitted concurrently. The plan sheets will show the general layout and control system required for a typical acceptable sewage pump station. The plans shall call out the testing required for acceptance of the pump station.

A. Location

The pump station and facilities shall maintain a minimum 100- foot separation from existing and proposed residential and commercial structures. Adequate maintenance access shall be provided to the pump station. The access design shall consider requirements for the removal of pumpstation equipment.

B. Capacity

The pump station shall be designed to accommodate ultimate buildout flows as well as initial flows. Allowances for larger or additional pumping equipment must be made for future requirements. If the design capacity is more than anticipated initial flow, the effects of the minimum flow condition must be estimated to prevent excessive retention of sewage in the wetwell, to prevent septic conditions, and to determine whether the pumping

equipment will operate within the manufacturer's guidelines. Table Error***! No text of specified style in document.****-3* provides planning level criteria for sizing and configuration of pump station and forcemain facilities.

*Table **Error! No text of specified style in document.**-3 Pump Station and Force Main Criteria*

Pump Stations	
Capacity	PWWF (hydraulic modeling required for pipes 18 inches and larger)
Storage	4 hours
Operation	Lead/lag for duty pump(s), plus 1 standby pump
Maximum Pump Cycles	6 cycles/hour (3 cycles per pump)
Force Mains	
Headloss	Hazen-Williams roughness coefficient (C-factor) of 120
Maximum Velocity	7-10 feet per second
Minimum Velocity	3.0 feet per second

C. Wet Well

The wet well design and detention time shall be such that the deposition of solids is minimized and the sewage does not become septic. Provisions for 4 hour storage capacity shall be provided. An interior protective coating shall be required for the prevention of hydrogen sulfide corrosion of the structure. Maximum depth of wet well shall not exceed 35'.

D. Pumps

Pumping equipment shall consist of centrifugal pumps. Pump suction and discharge size shall be a minimum of 4 inches in diameter. Pump drive units shall be electric. A sufficient number of pumping units shall be installed such that station capacity can be maintained with any one unit out of service. Provisions for telemetry shall be included in the station control systemas directed by the City.

E. Station Piping

Suction, discharge, and header piping within the station shall be sized to adequately handle flows. Piping less than 4 inches in diameter shall not be used for conveying sewage. Valves shall be located to allow proper equipment maintenance and operation. The design shall provide a bypass configuration back to the wet well.

F. Odor Control

If required, the station shall have equipment and/or space provided for the purpose of introducing odor control chemicals into the wet well, upstream gravity line, and/or force main. Adequate provisions shall be made for the safe handling and storage of chemical containers. The force mainshall be designed to maintain a continuous uphill grade, or, as a minimum be level. All force mains shall have provisions for introduction of either air or odor control chemicals.

G. Force Mains

Force mains shall be designed such that the velocities normally fall within a range from 3 to 5 feet per second. If initial capacity of the station is considerably less than ultimate,

consideration should be given to the prevention of septic conditions due to extensive detention time within the forcemain. The feasibility of installing dual force mains to accommodate initial andultimate flows shall be investigated in such situations. Provisions shall be madeintroducing a “cleaning pig” into all force mains. The design shall also include facilities to eliminate or sufficiently dampen transient forces and/or surging in the event of an immediate station shutdown. Details shall be included in the improvement plans. The maximum angle allowed on force mains is 22.5 degrees.

A corrosion protection study shall be included with the improvement plan submittals. Corrosion protection facilities for the force main shall be identifiedfrom the roadway with a curb stamp labeled “CP – FM”.

H. S.C.A.D.A.

SCADA requirements for pump stations shall be provided by the City. The submittal shall be included along with the improvement plans for such facilities.

I. Valves

Valves on pressurized sewer systems shall be check valves.

1.12 Multi Parcel Commercial and Industrial Developments

“On-site” sewer mains for new commercial and industrial developments containing more than one parcel, shall be designed in accordance with the requirements contained in these standards or as approved by the City. The sewer main shall be installed within a dedicated public sewer easement in accordance with these standards. Each separate parcel within a multi-parcel commercial or industrial development shall have a separate connection to the public sewer line(s).

1.13 Sewer Improvement Plan Requirements

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

A. Sewer Study

A sewer study or sewer master plan as determined by the City may be required prior to review of the sewer design if there is a possibility that upstream or adjacent areas might require service through the subject property. The map shall show the entire areaincluding upstream tributary and adjacent areas, and all other data necessary to determine anticipated sewage flows. The method of providing service to theentire service area, including pipe sizes and slopes, shall be shown to the extentnecessary to determine the requirements within the subject property.

B. General Requirements

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

C. Layout Sheet

Improvement plans shall include an overall map which shows the project boundaries, sewer lines, manholes, backwater valves, and other important items of the work.

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

1.14 Pipe Bedding

Conform to City Standard Detail SS-05 for Sewer Pipe Bedding.

1) Bedding shall provide uniform and continuous support along the barrel of the pipe. The minimum depth of bedding material shall be provided under the bell.Blocking of the pipe is not permitted.
2) Loose material shall be removed from the trench bottom and replaced with imported material.
3) Where rocky, unyielding or unsuitable foundation material is encountered, thesubgrade shall be over-excavated a minimum of 4 inches and replaced with imported bedding material.
4) Where the trench bottom is soft, yielding or unstable, the trench bottom shall be over-excavated by 4 inches and ¾-inch crushed rock shall be placed in the trench to provide a stable foundation, to the satisfaction of the City Inspector. The rock is in addition to the required pipe bedding used in the pipe zone.
5) Where a saturated trench condition is encountered, the trench wall and pipe shall be lined with a geotextile fabric as shown on Standard Detail SS-05, and to the satisfaction of the City Inspector.
6) Bell holes shall be excavated per the manufacturer's recommendations. The minimum depth of bedding material shall be provided under the bell. Care shall be taken to ensure that the bell hole is no larger than necessary to accomplish proper joint assembly.

1.15 Pipe Installation

The sewer system outfall(s) shall be mechanically plugged and grouted, and shall remain plugged until final acceptance. The system shall be constructed to minimize infiltration and inflow. Evidence of groundwater infiltration, excessive wet weather flow contribution, or operational deficiencies may require corrective action at the City's discretion. Sewer pipe (gravity and pressure) shall be installed in accordance with the following provisions:

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

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

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

Improvements installed without proper inspection shall be exposed and inspected as required by the City.

All installations shall follow the manufacturer's recommendations unless otherwise noted on the approved plans. The manufacturer's installation guide shall be on the job site at all times.

A 12 inch wide metallic backfill tape with the warning "SEWER MAIN BURIED BELOW" shall be placed in the trench lines of all mains and services, between the piped bedding and backfill layer.

Mains in unpaved areas shall be marked every 125 lineal feet with a green composite utility marker having a decal stating "CAUTION BURIED SEWER PIPELINE". Appurtenances (such as manholes, valves, ARV's, test stations, etc.) and angle points shall also be marked. Mains in landscaped areas shall be delineated with a brass marker set in an 8 inch diameter concrete cylinder.

A. Polyvinyl Chloride (PVC) Pipe

Pipe-laying shall proceed upgradewith the bell end of the pipe placed upstream, and shall follow manufacturer's guidelines for installation.

B. Ductile Iron Pipe (DIP) Installation

DIP for gravity sewer applications shall have an interior coating with "Permashield 431" (or approved equal) unless otherwise specified on the approved plans. DIP sewer systems shall be constructed per the manufacturer's recommendations.

The force main shall be constructed and tested in accordance with the water pressure pipe standards established in Section 6 - Water of these Standards, with the following deviations:

The force main will not require disinfecting or water quality testing. The main shall be pre-flushed again with a properly sized "pig" after the pressure test. Flushing shall occur in the presence of a City Inspector.

Backfill tape shall be 12 inch wide green metallic tape stating "SEWER FORCE MAIN BURIED BELOW".

Exothermic welds shall be made on the bell of the pipe as near to the edge as possible and on the weld pads provided on the spigot end of the pipe.

When it is necessary to cut a "Permashield 431" treated pipe, the City shall make all repairs prior to installation. Coordinate with the City.

All DIP fittings for wastewater use shall have an interior coating with "Permashield-431" Or approved equal.

Tracing wire shall be installed per Section 6-Water of these Standards. Above ground access to the tracing wire shall not exceed 500 linear feet along the main. Access shall be provided by raising and securing the tracing wire through a conduit into a valve box. This location shall be 2 feet minimum from back of walk and marked per standards

1.16 Manhole Installation

Manholes shall be installed in accordance with the Standard Details and as specified herein:

Manholes shall be set flush with finish grade in improved areas, unless otherwise noted on the approved plans. Manholes placed in off-site, unimproved areas shall be constructed with the top of the casting cover a minimum of 6 inches above the final surrounding grade. A minimum 12 inch wide concrete collar shall be constructed around the casting and centered in collar. Manholes may not be placed in the center of intersections in all new development.

Manholes placed in landscape areas adjacent to City improvements shall be constructed with the top of the casting cover a minimum of 6 inches above the final surrounding grade. A minimum 12 inch wide concrete collar be constructed around the casting and 6 inches below finish grade.

PVC pipe entering a sewer manhole shall have a flex joint at the manhole base. A flex joint consists of a bell and spigot joint at the manhole with only bell ends cast into the manhole base, and a second bell and spigot joint located 12 to 24 inches outside of the manhole. Service "Y's" shall not be installed directly onto a manhole.

Manhole lids and castings for 48 inch diameter barrels shall be 24 inch diameter. Manhole lids and castings for 60 inch barrels shall be 36 inch diameter. Lid shall be bolt-down type with 2 cast-in-place bars and a gas detector probe hole, and have no poke holes. Lids shall be bolted when a manhole is constructed outside a paved area, as specified on the approved plans, or as directed by the City. Manholes constructed outside of paved area shall use a GMI composite lid and frame. All manhole openings 36 inches or larger shall use a GMI composite lid and frame.

Sewer mains or services entering an existing manhole shall be core drilled, without exception. The space between the pipe and the manhole shall be filled with non-shrink grout or a core-n-seal boot or approved equal may be used..

Any work on an existing sewer manhole shall require the manhole to pass a vacuum test as described in the Testing procedures of this Section. The work completed shall remain exposed until the vacuum test has been accepted by the City.

Concrete manhole bases may be either pre-cast or cast-in-place. Pre-cast bases shall conform to these Standards. Cast-in-place manholes shall be constructed in accordance with the details provided in these Standards:

Concrete shall be per the most recent edition of the Caltrans standard specifications.

Vitrified Clay Belled pups set in the manhole base wall shall be set flush with the exterior of the wall. The "speed-seal" on the spigot end shall be cut off prior to setting. Unless specified on the approved plans, there shall be a 0.10-foot drop constructed across the manhole base.

The top of the base shall be formed to accept the first barrel section, wet setting is not permitted. Ram neck shall be installed on this firstjoint after the City inspector has approved the manhole base for stacking.

The concrete on cast-in-place bases plus a 1 foot barrel section shall cure a minimum of 24 hours before stacking the remaining barrel sections.

C. Adjusting Manholes

The manhole neck and frame shall be adjusted to grade and be a maximum of 18 inches. Use of metal grade rings is not permitted.

D. Frame and Lid

The manhole frame and lid shall be sealed with an approved rubber gasket, as required. Manholes constructed in streets shall have the lid bolt holes filled with silicone. Manholes constructed outside of the street or paved area shall be bolted down or closed by other locking mechanism.

E. Manhole Coatings

Approved materials include epoxy or calcium aluminate.

Epoxy Coating - Sewer manholes requiring an epoxy coating shall first pass a vacuum test, per these Standards, and shall then be constructed as follows:

The exterior of the manhole shall be coated with an asphaltic material and wrapped in 8 mil polyethylene sheeting prior to backfilling. Use 10 mil vinyl tape to secure and seal the polyethylene per Section 5 of these Standards.

All voids and imperfections in the interior of the manhole shall be mortared or "sacked" smooth with a cement paste composed of 50 percent Portland cement and 50 percent sand. The mortar mixture shall be manually worked into the dampened surface with sufficient pressure to completely fill voids and imperfections. The surface shallthen be finished smooth.

This process shall be continued until the entire manhole surface(base, barrel, cone, neck and joints) is smooth and free of imperfections. Note that it is not required to cover the entire interior surface area of the manhole, only where voids or imperfections exist.

Upon receiving the City's approval of the sacking, the outlet channel(s) of the manhole to be epoxied and the first upstream manhole shall be mechanically plugged to prevent water flow. The newly sacked manhole shall cure for a period of 28 days.

The epoxy coating and applicator's certification must be submitted to the City for approval. The approved coating may be applied after the 28 day curing period has ended. An accepted method of epoxy application is as follows:

1) Mask off the metal frame.
2) Sandblast the interior concrete surfaces of the sewer manhole.
3) Apply a sealer/primer approved by the City and allow curing per the manufacturer's recommendations. Application may be withheld if, in the opinion of the City, the walls of the manhole exceed the recommended moisture content.A visqueen test may be performed to determine the absence of moisture.
4) Apply an approved epoxy to obtain a minimum thickness of 80 mils and allow curing per the manufacturer's recommendations.
5) Verify the thickness and adherence of the coating by coring samples, to the satisfaction of the City.
6) Repair the sampled areas and allow the repairs to cure.
7) "Spark test" the entire epoxy surface area. The electrode shall provide a minimum of 10,000 volts. Areas failing the spark test shall be removed, repaired and retested.

8) After approval from the City removethe masking from the metal frame and use "Sikaflex" (or approved equal) sealant to caulk to transition joint between the epoxy coating and the metal frame.

9) Use "Sikaflex" (or approved equal) sealant at the concrete PVC interface and for all epoxy transitions.

10) Remove the plugs.

Calcium aluminate - Calcium aluminate may be used in lieu of epoxy coating. The manhole shall pass a vacuum test, per these standards. Calcium aluminate shall be SewperCoat by Kerneos Aluminate Technologies or approved equal and shall be installed per manufacture specifications. Whenever Calcium Aluminate is used, the contractor shall immediately TV the sewer line to ensure no grout entered the line during application. Use "Sikaflex" (or approved equal) sealant at the concrete VCP interface and for all epoxy transitions.

1.17 Service Installation

Sewer services shall be installed in accordance with Standard Details SS-03 and SS-04.

Sewer services originating from sewer mains 14 feet in depth or greater shall have the crotch on the "Y" fitting filled with concrete.

1.18 Testing Procedures

A. Sewer Mains and Services

Public and private sewer mains and services shall be air-tested per ASTM C828 by the Contractor and the Contractor shall provide closed circuit TV inspection, after installation of the joint trench utility crossings and subgrade elevations have been met. Additionally, pipeline segments beneath road bases to be lime- treated shall be tested before and after the lime treatment process.

B. Air Pressure Test

Sewer mains and laterals shall be pressure tested in accordance with the National Clay Pipe Institute recommended guidelines withthe following amendment:

Minimum test time shall be 60 seconds.

For mains installed in an area where the water table is higher than the pipe, the test pressure shall be increased 0.5 PSI per foot of waterover the pipe.

The test gauge shall be liquid-filled, capable of testing up to 15 PSI, and graduated to 1/10 PSI.

C. CCTV Inspection

TV inspection of sewer mains and services shall be performed by the Contractor. Costs for said inspection shall be borne by the Contractor.

The sewer system shall be completely cleaned by an approved method such as hydroflushing with a vactor truck prior to TV inspection. The sewer system shall be rejected if any of the following conditions exist:

1) Standing water or sags based on pipe size at warranty

PIPE SIZE	Inch per 25-feet
21-inch or less	1
24-inch to 36 inch	1.5
42-inch or larger	2

2) Standing water in services.
3) Offset joints.
4) Joint separations greater than ½ inch wide.
5) Damaged pipe.
6)

D. Inspection Criteria for Coated Ductile Iron Pipe

All ductile iron sewer will have the following additional inspection requirements.

The condition of the barrel section of pipe as well as 360◦ at each joint shall be recorded to a DVD or portable drive. Once completed,and the inspection demonstrates the pipe meets the City's standards, the contractor may proceed with the backfill of the trench. The Contractor shall provide the DVD and a map of the section inspected, to the City for review prior to the City's acceptance inspection. Acceptance does not relieve the contractor or developer from responsibility from defect.

Upon finding any deficiency in the pipe which does not meet the standards of the City, it is strongly encouraged that the contractor make the necessary corrections at that time. If deficiencies aren't corrected City forces at time of acceptance CCTV will identify these deficiencies and require the contractor to dig and replace the pipe sections; there will be no exceptions.

The observation data on the DVD provided to the City shall include the following:

1) City wide job number
2) Encroachment Permit number
3) Project Name
4) Location (Street name and cross streets)
5) Manhole numbers (based on approved plan set or City asset numbers)
6) Direction of inspection (upstream or downstream)
7) Date of Inspection
8) The speed of travel shall be slow enough to inspect each pipe joint, wye connection, coating integrity, and potential sags. Camera speedshould travel at a rate of no more than 30 feet per minute. The camera speed shall be steady and slow enough to record features anddefects.

E. Manholes

Sewer manholes shall pass a vacuum test consisting of thefollowing criteria and procedures.

1) The test shall be performed after assembly of the manhole and installation of the pipe entering or exiting the manhole, but prior to backfilling. The Contractor shall perform the test and supply all test equipment. The City Inspector shall witness the test results.
2) Lift holes shall be filled with non-shrink grout prior to testing.
3) Pipe entering and exiting the manhole shall be plugged. The plug shall be places on the flex joint outside of the manhole base. Securely brace the plugs to prevent them from being drawn into the manhole. Unused channels shall be permanently plugged with a plastic or clay stopper.
4) A vacuum of 10 inches of mercury shall be drawn to start the test. The amount of time required for the vacuum to drop to 9 inches shall be measured. The manhole will pass the test if the amount of elapsed time is greater than 60 seconds for a 48 inch manhole, 75 seconds for a 60 inch manhole, 90 seconds for a 72 inch manhole and 120 seconds for an 84 inch manhole. A liquid-filled vacuum gauge shall be used for testing. All detectable leaks shall be repaired with non- shrink grout while the vacuum is drawn. No mortar shall be applied to the inside of the manhole until the vacuum test has passed.
5) If the manhole fails the initial test, necessary repairs shall be made with a non-shrink grout while the vacuum is still being drawn. Retesting shall proceed until elapsed times are satisfactory. After passing the vacuum test, all joints shall then be mortared, inside and out. Outside mortared joints shall be allowed to dry 24 hours or as approved by the City before backfilling.
6) If damage to the manhole is evident any time during the construction the City may require repairs to be made on the manhole which will require a new vacuum test prior to acceptance.

F. Topside Improvements

When all water, recycled water and sewer infrastructures have passed air, vacuum, pressure and continuity test as well as CCTV inspection the City indicating that the project is ready for road bases and top side improvements only. This does not constitute approval for use of the infrastructure.

G. Tying Into the City System

A tie-in procedure shall be submitted and approved by the City prior to the proposed work. The contractor shall allow for up to 7 days for review of the procedures by the City. The sewer system shall be tied into the City system within 10 working days upon completing and passing all the testing procedures. Tie-ins shall be conducted as specified in these Standards.

1.19 Repairing Installed Improvements

Sewer mains, services, manholes and appurtenances shall be repaired per these n Standardsand by the following procedures:

Repairing Pipe: Damaged Pipe shall be exposed and replaced in kind. Sagging or misaligned pipe shall be exposed and corrected in place if possible. If the pipe is defective, then a new pipe shall be installed. After the correction has been completed, the excavation shall be backfilled and compacted to grade as specified. The repairs shall then be retested and reinspected via CCTV per these Standards.

1.20 Abandoning Sewer Stubs and Services

In new construction, sewer stubs and services to be abandoned shall be removed to the main or manhole of origination. The abandonment of existing sewer stubs shall be as directed by the City.

1.21 Materials

A. Manholes

Manholes, frames, and covers are to be in accordance with details SS-01. All materials used in cast-in-place concrete or precast concreteshall conform to ASTM C-150 Specifications with Type V cement for sulfate protection.

B. Manhole Barrels, Cones and Lids

All manhole frames and covers shall be of cast iron or ductile iron and conform to the ASTM designation A 48, C478 or ASTM 536 and shall be the following or approved equal. All lids shall have an “S” embossed in the center or marked “Sanitary Sewer.”

D&L Supply #A-1021

Southbay Foundry #1900.

If short frame and covers are approved:

D&L Supply # A-1022 , 1023

South Bay Foundry #1922

C. Appurtenances

Air Release Valve - APCO Model 450 or approved equal

Trench Dam - controlled density fill.

Cleanout Caps – Threaded ABS or approved equal.

Couplings - For4 inch lines, use Flex Seal Repair Coupling for ABS cap only, or approved equal. For 4 to 12 inch lines, use Mission Rubber Repair Coupling, Calder Coupling or approved equal. Couplings may not be used in new construction.

Flange Gaskets - All flange gaskets to be neoprene rubber or red rubber, USSO Standard B.16.21 insulation flange kits—Calpico TypeE full-faced gasket and two-side insulation.

Joint Sealing Compounds - Ram-Nek, Con Seal Compound or approved equal.

Mortar - Non-shrink grout during manhole vacuum testing and asspecified. Standard mortar mix for all other applications.

Silicone - 100 Percent clear silicone with a 25-year life or approved equal.

MH Coatings - Hydro Pox 204 or approved equal, Calcium aluminate.

Wastewater Marking Tap - Terra Tape Extra Stretch 450 Material, detectable, 12 inch wide or approved equal. Non-Detectablefor sewer force mains.

Oil/Grease Interceptor - Jensen Precast or approved equal.

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

1.22 Illegal Use of Sewer System

If Stormwater enters the sewer system,the Contractor and/or Owner/Developer shall be charged according to Gridley Municipal Code. Stormwater run-off shall be classified as “low-strength metered commercial users.” The sewer unit shall be 1 sewer unit per 1,000 cubic feet discharge. The City shall determine the volume of discharge.