

# CITY OF REDLANDS

MUNICIPAL UTILITIES & ENGINEERING DEPARTMENT



## SANITARY SEWER SYSTEMS STANDARD SPECIFICATIONS

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## SECTION A

### GENERAL REQUIREMENTS

These instructions set forth the standards for the preparation and processing of plans and all documents supplemental thereto for sanitary sewers and related structures intended to connect to or become part of the collection and trunk system of the City of Redlands.

Your cooperation in preparing plans in conformity with these standards will expedite the work of checking the plans and will consequently lessen the time needed to process these plans.

The City requires that plans and profiles be prepared and signed by a Civil Engineer, registered in the State of California. Plans must be submitted for checking and approval before any sewer construction is commenced either in public streets, alleys or easements.

The plans and construction shall comply with all standard specifications and ordinances of the City of Redlands and those of any other governing body or jurisdiction as may apply. Any questions you may have on matters not covered herein will be answered by the City Engineer.

#### 1. **DEFINITIONS:**

The word “City” shall mean the City of Redlands Municipal Utilities & Engineering Department.

The words “Municipal Utilities & Engineering Department” or “Engineer” shall mean the Municipal Utilities & Engineering Department Director/City Engineer acting directly or such individuals acting in his/her behalf as properly authorized agents, assistants, inspectors, and superintendents.

The words “City Engineer” used in this standard shall mean the Municipal Utilities & Engineering Department Director/City Engineer or his/her properly authorized agents, engineers, assistants, inspectors and superintendents acting in his/her behalf.

The words “Engineer” or “Design Engineer” used in this standard shall mean a Civil Engineer registered as such in the State of California and the duly authorized representative of the party or parties requesting an extension of or addition to the City’s sewer system.

The word “Contractor” shall mean the person, persons, partnership, or corporation duly licensed as such in the State of California to enter into a contract for the performance of the work required.

The word “Standard Specifications” shall refer to Standard Specification for Public Works Construction (SSPWC), the “Greenbook”.

The word “Design Standards” shall refer to this standard.

The word "Drawings" shall mean collectively all of the drawings attached to and accompanying this specification and made a part thereof.

**2. CONDITIONS:**

On all matters relating to the acceptability of the materials, machinery or plant equipment, classifications of material or work, the proper execution, progress or sequence of the work, quantities, and the interpretation of the specifications or drawings, the decision of the City Engineer shall be final and binding.

The contractor shall obtain copies of, and comply with, all applicable current statutes, laws, ordinances, rules, regulations, and specifications of the United States Government, State of California, County of San Bernardino, City of Redlands, and any other governmental agencies having jurisdiction and shall make application for all required permits and bear the cost of same.

Any contractor installing a sanitary sewer within public right-of-way, or within a City easement, or a sewer which will be ultimately maintained by the City, shall, prior to starting work, obtain an encroachment permit from the One Stop Permit Center (OSPC). This permit shall be kept on the job site and shall be available for review by any City representative. Failure to present a valid permit when requested by the City will be caused to issue a notice to stop work and all work shall remain stopped until a valid permit is produced.

Any contractor making an excavation over five feet deep shall have a valid Cal-OSHA permit on file with the OSPC. The contractor shall furnish to the City, copies of all required permits and licenses prior to initiation of the work.

**3. SUPERVISION AND INSPECTION:**

The City Engineer shall decide within the provisions of the specifications all questions that may arise concerning the quality or acceptance of materials furnished and work performed, and all questions concerning the acceptable fulfillment of the work by the Contractor.

**4. DEFECTIVE WORK OR MATERIALS:**

No work which is defective in its construction or deficient in any of the requirements of this specification will be considered as accepted even in consequence of the failure of any inspector connected with the work to point out said defects or deficiency during construction. The Contractor shall correct any imperfect work, without compensation from the City before final acceptance of the work by the City.

All materials not conforming to the requirements of this specification shall be considered defective. They shall be rejected whether in place or not and shall be removed immediately from the site of the work by the Contractor at his expense. No

rejected material, the defects of which have been subsequently corrected, shall be used until approval in writing, has been given by the City Engineer.

**5. MAINTENANCE OF EXISTING IMPROVEMENTS:**

Unless otherwise indicated on the plans or in this specification, or unless otherwise cared for by the owner of a public utility or franchise, all water, gas, oil, or irrigation lines; lighting, power, telephone conduits or communication wires; sewer lines, structures or house laterals in place and other surface or sub-surface structures or lines, shall be maintained by the Contractor and shall not be disturbed, disconnected or damaged by the Contractor during the progress of the work. Should the contractor in the performance of the work, disturb, disconnect or damage any of the above, all expenses, of whatever nature arising from such disturbance or in the replacement or repair thereof, shall be borne by the Contractor.

**6. PROXIMITY TO WELLS:**

Where sanitary sewers and house connections are to be constructed within a 100-foot radius of a water well, types of pipe and joints shall be reviewed with the State Health Department for their recommendation and approval. In accordance with the City of Redlands Municipal Code, every well shall be located no closer than fifty feet (50') from sewers, watertight septic tank, or any potential sources of contamination and pollution. Minimum distances from other sources of pollution or contamination shall be determined by Division of Environmental Health Services (DEHS) upon investigation and analyses of the probable risks involved. No impoundment of recycled water shall be located within one hundred feet (100') of any domestic water well, unless it can be demonstrated that special circumstances justify lesser distances to be acceptable.

**7. CONSTRUCTION WATER:**

All water taken from the City fire hydrants shall be by a special permit or through a Redlands fire hydrant meter. Arrangements for a permit or meter may be made through the Municipal Utilities & Engineering Department. City ordinance No. 1441 provides that using hydrants is a privilege, which, if abused, will be revoked.

**8. GENERAL NOTES (SEWER):**

1. SEWER INSTALLATION IS TO BE IN ACCORDANCE WITH THESE PLANS AND THE STANDARD SPECIFICATIONS AND DETAIL DRAWINGS OF THE CITY OF REDLANDS LATEST REVISION THEREOF.
2. ALL SEWER PIPE ELEVATIONS GIVEN REFER TO THE FLOW LINE INVERT ELEVATIONS.
3. THE APPROXIMATE LOCATIONS OF KNOWN EXISTING UNDERGROUND UTILITY LINES ARE SHOWN ON THESE PLANS. THE LINES ARE PLOTTED



FROM A COMBINATION OF RECORD AND FIELD DATA. THE CITY HAS TRIED WITHIN ITS AVAILABLE RESOURCES TO LOCATE ALL SUCH FACILITIES WITH REASONABLE ACCURACY. BY ENTERING INTO A CONTRACT FOR THIS WORK THE CONTRACTOR AGREES, PRIOR TO ANY EXCAVATION TO NOTIFY ALL UTILITY AND IRRIGATION COMPANIES OPERATING IN THE AREA OF THE WORK AND TO DETERMINE WITH AS MUCH ACCURACY AS IS NEEDED TO PERFORM THIS WORK, THE EXACT LOCATIONS OF ALL UNDERGROUND MAIN OR SERVICE UTILITY FACILITIES.

4. SAND BEDDING AND BACKFILL TO A DEPTH OF 12" ABOVE PIPE IS REQUIRED FOR ALL SEWER PIPE MAY BE REQUIRED IF IN THE OPINION OF THE CITY, THE NATIVE BACKFILL MATERIAL IS DEEMED UNSUITABLE.
5. VCP AND PVC SEWER PERMITTED ON HORIZONTAL OR VERTICAL CURVES SUBJECT TO DESIGN.
6. THE CONTRACTOR SHALL AIR TEST THE SEWER SYSTEM IN ACCORDANCE WITH CITY STANDARDS AFTER ALL OTHER UTILITIES HAVE BEEN INSTALLED AND COMPLETED WITHIN THE TRACT OR DEVELOPMENT. IN ADDITION, AFTER FINAL AIR TEST, THE CONTRACTOR SHALL CONNECT THE SEWER LATERALS TO THE HOUSE LATERALS AT THE PROPERTY.
7. SEWER LATERALS SHALL BE CLEARLY MARKED WITH AN "L" CHISELED IN CURB FACE.
8. REQUIRED SEPARATION OF THE WATER AND SEWER MAINS AND LATERALS SHALL BE STRICTLY ADHERED TO. INSTALLATION SHALL COMPLY WITH THE STATE DEPARTMENT OF HEALTH REGULATIONS AND BE A MINIMUM OF 10 FEET SEPARATION.
9. SEWER LATERAL LOCATIONS SHALL NOT BE CHANGED MORE THAN 3 FEET (HORIZONTAL) WITHOUT AUTHORIZATION FROM THE CITY.
10. IF PLASTIC SEWER PIPE IS USED, A MANDREL TEST SHALL BE PERFORMED BY THE CONTRACTOR IN THE PRESENCE OF THE CITY INSPECTOR IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS OF THE MUNICIPAL UTILITIES DEPARTMENT. LATEST REVISIONS EXCEPT THE MANDREL SHALL BE SUPPLIED BY THE PIPE MANUFACTURER APPROVED BY CITY OF REDLANDS AND SHALL BE PULLED THROUGH THE PIPE BY HAND. PVC PIPE-MAXIMUM 15" DIAMETER ALLOWABLE.
11. PRIOR TO PAVING OF STREETS OVER A NEW SEWER MAIN ALL COMPACTION TESTS, AIR TESTS, BALLING AND MANDREL TESTS SHALL BE COMPLETED AND APPROVED BY THE CITY AND A COMPLETE SET OF AS-BUILT DRAWINGS SUBMITTED TO THE MUNICIPAL UTILITIES DEPARTMENT. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PREPARATION OF AS-BUILT DRAWINGS.
12. PRIOR TO ACCEPTANCE BY THE CITY. NEW SEWER LINE SHALL REMAIN PLUGGED AT OR PHYSICALLY SEPARATED FROM THE DOWNSTREAM MANHOLE AND STREETS SHALL BE PAVED.

13. THE CONTRACTOR SHALL REPLACE EXISTING STRIPING AS NECESSARY.
14. THE CONTRACTOR SHALL OBTAIN AN ENCROACHMENT PERMIT FOR SEWER CONSTRUCTION FROM THE CITY OF REDLANDS PUBLIC WORKS DEPARTMENT PRIOR TO COMMENCEMENT OF WORK.
15. PVC SEWER PIPE AND FITTINGS SHALL CONFORM TO AMERICAN SOCIETY FOR TESTING AND MATERIALS (A.S.T.M.) DESIGNATION D-3034, 15" MAXIMUM SIZE, SDR 35 LATEST REVISION.
16. THE JOINTING OF PVC SEWER PIPE SHALL BE BY USING ELASTOMERIC GASKET JOINTS. THE CRITICAL SEALING DIMENSIONS OF THE BELL, SPIGOT, AND GASKET SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S STANDARD DIMENSIONS AND TOLERANCES.
17. MANHOLE RIM ELEVATIONS INDICATED HEREON ARE APPROXIMATE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ADJUSTING ALL RIMS TO FINAL FINISH GRADE, IN COORDINATION WITH STREET IMPROVEMENTS.
18. ALL SEWER STATIONS ARE CENTERLINE SEWER MAIN UNLESS OTHERWISE INDICATED.
19. DURING THE PERIOD OF CONSTRUCTION THE CONTRACTOR SHALL FURNISH, ERECT, AND MAINTAIN ALL WARNINGS, SIGNS, BARRICADES, AND OTHER SAFETY MEASURES IN CONFORMANCE WITH THE STATE MANUAL OF TRAFFIC CONTROLS FOR CONSTRUCTION AND MAINTENANCE WORK ZONES, LATEST EDITION. THE CONTRACTOR SHALL PROVIDE SAFE AND CONTINUOUS PASSAGE FOR PEDESTRIAN AND VEHICULAR TRAFFIC AT ALL TIMES.

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## **SECTION B**

### **MATERIALS**

#### **1. GENERAL:**

Vitrified Clay Pipe (VCP) or Polyvinyl Chloride (PVC) pipe shall be used for sewer mains, except where cast iron pipe is required for special conditions.

Vitrified Clay Pipe (VCP) or Polyvinyl Chloride (PVC) pipe shall be used for house connection laterals from the sewer main to the property line.

Manholes shall be the pre-cast reinforced concrete type described herein.

#### **2. VITRIFIED CLAY PIPE:**

Pipe shall conform to American Society for Testing and Materials (ASTM) Standards C-700, latest revision, entitled "Standard Specifications for Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated". For either plain end or bell and spigot, type extra strength vitrified clay pipe shall be used.

Jointing of vitrified clay pipe shall conform to ASTM Designation C-425, latest revision, entitled "Standard Specifications for Compression Joints for Vitrified Clay Pipe and Fittings", for either plain end or bell and spigot type extra strength vitrified clay pipe.

#### **3. POLYVINYL CHLORIDE (PVC) SEWER PIPE:**

Type PSM Polyvinyl Chloride (PVC) sewer pipe fittings shall conform to ASTM Designation D-3034, 15" maximum size, SDR 35 (latest revision).

PVC plastic pipe and fittings shall be made of PVC plastic having a cell classification of 12454-B or 12454-C as defined in ASTM Designation D-1784 (latest revision).

The jointing of PVC sewer pipe shall be accomplished by using elastomeric gasket joints. The critical sealing dimensions of the bell, spigot and gasket shall be in accordance with the manufacturer's standard dimensions and tolerances. The elastomeric compound shall comply with the physical properties specified in ASTM Designation D-1869 (latest revision). The gasket shall provide an adequate compressive force against the sealing surfaces of the bell and spigot so as to affect a positive seal under all combinations of the joint tolerances. The gasket shall be the only element dependent upon to make the joint flexible and watertight.

Whenever possible, the manufacturer's maximum standard length of pipe shall be used.

Solvent cement joints shall be allowed only when installing saddles and lateral caps. The solvent cement shall be in accordance with ATSM Designation D-2564 (latest revision).

All fittings and accessories shall be as manufactured by the pipe supplier and be of equal material of the pipe suppliers and have bell and spigot configurations identical to that of the pipe. Pipe of the same manufacturer shall be joined together.

**4. CAST IRON PIPE:**

Cast iron pipe shall be “pipe centrifugally cast in metal molds” conforming to the requirements of the American National Standards Institute (ANSI) Specification A21.6 (latest revision), Class 150 Minimum American Water Works Association (AWWA) Standard C-106 (latest revision). Pipe shall be furnished with mechanical bolted joints conforming to ANSI Specification A21.11 (latest revisions) and AWWA Standard C-111 (latest revision).

**5. STEEL CASING FOR BORED CROSSING:**

Steel pipe shall be a minimum one-quarter (1/4) inch thick wall for 12 inch to 20 inch nominal diameter and a minimum three-eighths (3/8) inch thick wall for pipe sizes up to 36 inch nominal diameter or in accordance with the requirements of the governing agency, whichever is greater; and shall be manufactured in accordance with AWWA Standard C202-64, (latest revision), entitled “AWWA Standard for Mill-Type Steel Water Pipes”, Grade “B”. The casing shall be round and straight, free from protruding bolts, rivets or welds and shall have a inside diameter of not less than the maximum outside diameter of the sewer plus six (6) inches. The steel casing pipe shall be jacked or bored into place and shall be designed to withstand stresses created by jacking the pipe into place. The carrier pipe shall be installed on redwood skids banded to the pipe, and the annular space between the casing and carrier pipe shall be filled with sand slurry and approved and seals shall be provided.

**6. CONCRETE:**

All concrete shall be 560-C-3250 as per SSPWC Section 201-1 (latest revision).

Mortar and Grout – Cement Mortar shall be Class “A” per SSPWC Section 201-5 (latest revision). Mortar for plastering shall be composed of one part of cement to one part of sand. Cement mortar shall consist of Portland cement, sand, and water. Cement and sand shall be combined in the proper proportions, and then thoroughly mixed with the required amount of water. The quantity of water to be used in the preparation of mortar shall be only that required to produce a mixtures sufficiently workable for the purpose intended. Mortar shall be used as soon as possible after mixing and shall show no visible signs of setting prior to use. No mortar or grout that has begun to set shall be used and no re-tempering will be permitted.

7. **MANHOLES, FRAMES & COVERS:**

Frames and covers shall be Alhambra Foundry No. A-1170 or equal as approved by the City Engineer.

Precast manholes shall be of reinforced concrete manufactured to meet ASTM Specification C-478 (latest revision) entitled "Standard Specifications for Precast Reinforced Concrete Manhole Sections", and shall be 48 inches in diameter for sewers 15 inches and smaller. Manholes for sewers 18 inches through 24 inches shall be 60 inches in diameter or as shown on the plans (see Standard Drawing No. A-101).

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## SECTION C

### METHODS OF CONSTRUCTION

#### 1. EXCAVATION, TRENCHING AND BACKFILL:

##### a. General

The work covered by this portion of the specifications consists of the furnishing of all plant, labor, equipment, appliances, and materials and the performance of all operations in connection with excavation, trenching, back-filling and testing for sanitary sewers and appurtenant structures, in strict accordance with the specifications and the applicable drawings.

In case of conflict in requirements for excavation, trenching and backfilling between this specification and any statutes, laws, ordinances, rules, regulations and specifications of any political subdivision or agency having jurisdiction, it shall be understood that the more exacting requirement shall govern. In general, this specification will apply in City right-of-ways and easements and the aforementioned statutes, laws, ordinances, rules, regulations and specifications of any political subdivision or agency having jurisdiction will apply within the political boundaries or public right-of-ways to which they apply.

The Contractor shall perform all excavation of every description and of whatever substances encountered, to the depths and alignment indicated on the construction drawings or as otherwise specified. During excavation, material suitable for backfilling shall be piled in an orderly manner, a sufficient distance from the banks of the trench to avoid overloading and to prevent slides or cave-ins. All excavated materials not required or suitable for backfill shall be removed and wasted by the Contractor at the direction of the City Engineer.

Such grading shall be done as may be necessary to prevent surface water from flowing into trenches or other excavation. The Contractor shall remove, by pumping or other means approved by the City, any water accumulated in the trench from any source.

Suitable shoring, timbering or sheeting shall be provided by the Contractor where necessary to support the sides of the trench prior to and during the installation of the pipe. The shoring methods and procedure shall be consistent with safety. The shoring shall be removed as the trench is being backfilled. All such shoring, timbering or sheeting shall meet or exceed the standards of Cal-OSHA.

Unless otherwise indicated, excavation shall be by open cut except that short sections of a trench may be tunneled if, in the opinion of the City Engineer, the pipe can be safely and properly installed and backfill can be properly tamped in such tunnel sections.



All spoil shall be thrown on one side of the trench only to facilitate distribution and installation of pipe in such a manner that it will not endanger the work and will not obstruct roads and driveways. Adequate provisions shall be made for maintaining the flow of water courses, drains, sewers or ditches crossing the trench, and upon completion of the work they shall be restored to their original condition.

When trenching is necessary across street intersections, the work shall be done in such a manner as to maintain two-way traffic on the cross-street without undue interruption. Vehicular access to residences shall be interrupted only when absolutely necessary to expedite construction. Where any crosswalk is cut by the trench, suitable bridging shall be constructed. Such bridging shall be at least four (4) feet in width, shall have suitable hand railing, and shall be adequately guarded and lighted.

The use of trench digging machinery will be permitted except where its operations will cause damage to trees, buildings or existing structures above or below the ground. At such locations, hand methods shall be employed to avoid such damage. Trees, fences, poles and other property shall be protected unless their removal is authorized. Any property damaged shall be satisfactorily restored by the Contractor.

The Contractor shall provide his own access and proper clearances for installation of pipe in easements. Removal and disposal of all trees, stumps, roots, brush and other objectionable material shall be performed by the Contractor, all in accordance with the approval of the City.

b. Trench Excavations

The width of the trench at and below the top of the pipe shall be such that the clear space between the barrel of the pipe and the trench wall shall not be less than 5 inches nor exceed 8 inches on either side of the pipe. No narrow trenches will be permitted (SSPWC 306-1.2.1.2). The width of the trench above that level may be as wide as necessary for sheeting and bracing and the proper performance of the work and the banks shall be as near vertical possible. The bottom of the trench shall be rounded so that at least the bottom quadrant of the pipe shall rest firmly on undisturbed soil for the full length of the barrel except where it is necessary to excavate the bell holes and proper joint operations. This part of the excavation shall be done manually, only a few feet in advance of the pipe laying, by workers skilled in this type of work. Bell holes and depressions for joints shall be dug after the trench bottom has been graded and shall be only of such length, depth and width as necessary for properly aiming the particular type of joint. Except where rock or unsuitable materials are encountered, care shall be taken not to excavate below the depth indicated on the construction drawings.

Where the bottom of the trench is in rock or hard materials, the trench shall be excavated six (6) inches below grade as directed by the City Engineer. Where the trench bottom requires the use of imported material under the pipe because of soft, wet, spongy or unstable condition in the trench, a minimum thickness of twelve (12) inches crushed rock bedding shall be placed below grade of pipe invert of the full width of the trench.

c. Excavation for Appurtenances

Excavation for manholes and similar structures shall be sufficient to leave at least twelve (12) inches clear between their outer surfaces and the embankment of timber which may be used to hold and protect the banks. Excavation for other structures shall be made to the grade shown on the construction drawings and all work shall be done in a workmanlike manner.

d. Backfill

Backfill of the trench around the pipe and around appurtenances shall follow the installation as closely as possible. Backfill shall be accomplished in two stages:  
(1) Initial backfill from proper trench grade to twelve (12) inches over the pipe;  
(2) Final backfill from twelve (12) inches over the pipe to the surface.

i. Initial Backfill - Vitriified Clay Pipe and Cast Iron Pipe

Initial backfill should be accomplished as soon as possible after the pipe has been laid. The backfill material shall be approved by the City Engineer and shall contain no particles larger than one (1) inch or other objectionable material. The material shall be sufficiently damp to permit thorough compaction free of voids on all sides of the pipe. Initial backfill shall consist of placing the backfill from proper trench grade to an elevation of twelve (12) inches over the top of pipe by the following procedure:

The first lift of material shall be uniformly placed on both sides of the pipeline for the full width of the trench and have a maximum loose depth of not more than six (6) inches as measured from the trench bottom. This material shall then be tamped under and around the pipe and joints until all voids underneath and around the pipe and joints have been filled.

After the voids beneath the pipe have been filled, the material between the trench walls and the pipe shall be compacted, with each layer firmly compacted prior to placing the subsequent material. Maximum depth of the horizontal layers shall not exceed eight (8) inches in depth.

Flooding of the initial backfill may be permitted with prior approval of the City Engineer. Flooding of the initial backfill will be permitted when the

material has a sand equivalent value of not less than 30 as determined by California Test No. 217 of the California Divisions of Highways.

ii. Initial Backfill Polyvinyl Chloride (PVC)

The initial backfill procedures for PVC sewer pipe shall be in accordance with ASTM Designation D-2321, (latest revision) entitled "Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications", except as amended herein. Only Class 1 or Class 2 embedment materials shall be used. Class 1 materials are crushed rock bedding, graded stone, or slag. Class 2 materials are coarse sands and gravels containing small percentages of fines, and the fines shall be granular and non-cohesive. No particles greater than 1-1/2 inch in the greatest dimension will be permitted. The same class of bedding material shall be used for the bedding, haunching and initial backfill. The bedding material shall have a minimum thickness of 4 inches. PVC PIPE WILL NOT BE ALLOWED WHEN THERE IS LESS THAN 60 INCHES OF COVER OVER THE PIPE. The bedding, haunching, and initial backfill shall be mechanically compacted to bring the relative compaction of the material up to 90 percent of the maximum dry density as determined by ASTM D-1556.

Care shall be taken to insure that material is properly worked under the pipe and that the pipe is not moved or deflected during the haunching and initial backfill procedure. By the nature of the material being used for the initial backfill, little compactive effort will be required to obtain the specified density. FLOODING THE INITIAL BACKFILL WILL NOT BE PERMITTED.

iii. Final Backfill-General

The balance of backfill shall contain no particles larger than six (6) inches in its greatest dimension or such small dimensions as specified by the governing body having jurisdiction and shall be free from brush or any other perishable or objectionable matter that would prevent proper compaction, consolidation or that might cause subsequent settlement. Relative compaction of 95% minimum shall be required for asphalt pavement, paving base material and backfill material within top two (2) feet from the surface. All of the backfill placed within the bedding zone shall be compacted to a minimum dry density of ninety (90) percent of its maximum dry density as determined by ASTM D-1556, (latest revision). Flooding and/or jetting of the material to accomplish compaction will not be permitted without prior authorization by the City Engineer. For trenches eight (8) feet in depth or less, the final backfill may be placed in compacted lifts of twenty-four (24) inches or one-half (1/2) of the trench depth, whichever is greater. For trenches greater than eight (8) feet in

depth, the material shall be placed in maximum compacted lifts of four (4) feet. The depth of fill lifts for trenches on slopes may be reduced by the City Engineer to facilitate compaction.

The Contractor shall provide the City with compaction test results as determined by an approved and licenses soiled laboratory at intervals of not less than one test per 300 feet or as required by the City Inspector. The Contractor shall pay all costs of compaction tests.

In lieu of the above, the Contractor may elect to backfill completely with sand and jet thoroughly to the satisfaction of the City Inspector.

Any deficiency in the quantity of material for backfilling the trenches or for filling depressions caused by settlement shall be supplied by the Contractor. Surplus soils shall be crowned over the trench, spread or hauled away as directed by the City Engineer.

Backfill within traveled streets or highways existing or proposed shall meet the standards and approval of the City or proper authority having jurisdiction over same.

Trenches improperly backfilled, or where settlement occurs, shall be re-opened to the depth required for proper compaction, then backfilled and compacted, with the surface restored to the required grade.

Where flooding and/or jetting have been approved by the City Engineer, backfill shall be thoroughly consolidated by use of the water jets. The Contactor shall use water jets of adequate diameter and of sufficient length to extend to within one foot of the top of the pipe. A City approved back flow assembly is required when connecting to a fire hydrant meter.

Where water is not readily available in sufficient quantity and pressure, the backfill may be flooded by the following method: The water shall be allowed to flow slowly into the trench from the upper end, and shall be worked down to the bottom of the trench by "poling". Care shall be taken to insure that water does not flow through the trench before it has penetrated down to the pipe line.

iv. Final Backfill PVC Pipe

PVC Pipe shall be backfilled as described in Section g. "Final Backfill" except as amended in this section. Thirty-six (36) inches of cover shall be provided over the pipe before wheel rolling the trench is permitted. Forty-eight (48) inches of cover shall be provided before using a hydrohammer to compact the backfill. Where the Contractor can demonstrate that a four (4) foot lift can be thoroughly compacted without deflecting the pipe, he may

place the first lift four (4) foot thick. When in the opinion of the City Engineer a four (4) foot lift cannot be adequately compacted, he may require a thinner lift and an alternate method of compaction or require that the first four (4) feet of final backfill be filled with clean sand and be jetted or flooded with water to achieve the required compaction.

e. Pavement Replacement

When it is necessary to break pavement in order to lay the pipe lines shown on the construction drawings, the Contractor shall comply with all the requirements of the City Engineer.

The existing pavement shall be saw cut vertically as near as possible to a straight line by a City approved method. The pavement removed shall be hauled away as directed by the City and shall be replaced as herein specified. Base material shall be replaced with materials and methods which will give a sub-base at least equal to that adjacent.

The Contractor shall install a temporary patch of not less than two (2) inches thick of a City approved asphaltic material over the backfilled trench and shall maintain said trench in a smooth readable condition for a period of thirty (30) days. Where the trench has been completely backfilled with sand, the pavement may be replaced initially with a permanent patch as specified below:

Asphaltic surfaces or oiled surfaces shall be replaced with a City approved plant-mix surfacing material to a thickness equal to the original thickness, or to a thickness of two and one-half (2-½) inches, whichever is greater. The paving asphalt to be used in the plant mix shall be steam refined, grad as specified by the City Engineer. At the Contractor's option, where the area to be resurfaced is less than 650 square feet, the City may resurface the area with a permanent patch to be paid for by the Contractor at City resurfacing rates in effect at that time. In any case, the Contractor shall be responsible for replacing all necessary pavements.

**2. PIPE LAYING:**

a. Vitrified Clay Pipe (VCP)

The bottom of the trench shall be shaped to give uniform circumferential support to the lower fourth of each pipe. Pipe laying shall proceed upgrade with the spigot ends of bell-and-spigot pipe pointing in the direction of the flow. Each pipe shall be laid true to line and grade in such a manner as to form a close concentric joint with the adjoining pipe and to prevent sudden offsets of the flow line. As the work progresses, the interior of the sewer line shall be cleared of all dirt and superfluous materials of every description.

Where cleaning after laying is difficult because of small pipe size, suitable swab or drag shall be kept in the pipe and pulled forward past each joint immediately after the jointing has been completed. If the maximum width of the trench at the tip of the pipe, specified in EXCAVATION, TRENCHING AND BACKFILLING is exceeded for any other reason than by order of the City Engineer, the Contractor shall install at his own expense, such concrete, cradling, pipe encasement, or other bedding as may be required by the City Engineer to support the added load of the backfill. Trenches shall be kept free from water until the pipe jointing has been completed. Pipe shall not be laid when the condition of the trench or the weather is unsuitable for such work. At times when work is not in progress, open ends of pipe and fittings shall be securely closed to the satisfaction of the City Engineer so that no trench water, earth, or other substances will enter the pipe or fittings.

b. Polyvinyl Chloride (PVC) Pipe

The pipe shall be laid directly on the grade of the bedding material. Pipe laying shall proceed upgrade with spigot ends of the pipe pointing in the direction of the flow. Each pipe shall be laid true to line and grade in such manner as to form a close concentric joint with the adjoining pipe to prevent sudden offset of the flow line. As the work progresses the interior of the sewer line shall be cleared of all direct and superfluous materials of every description.

Where cleaning after laying is difficult because of the small pipe diameter, a suitable swab or drag shall be kept in the pipe and pulled forward past each joint immediately after the jointing has been completed. If the maximum width of the trench at the top of the pipe, specified in EXCAVATION, TRENCHING AND BACKFILLING is exceeded for any other reasons than by orders of the City Engineer, the Contractor shall install at his own expense, such concrete, cradling, pipe encasement, or other beddings as may be required by the City Engineer to support the added load of the backfill. Trenches shall be kept free from water until the pipe jointing has been completed and pipe shall not be laid when the condition of the trench or the weather is unsuitable for such work. At times when work is not in progress, open ends of the pipe and fittings shall be securely closed to the satisfaction of the City Engineer so that no trench water, earth, or other substances will enter the pipe or fittings.

Whenever pipe is required to be cut, it shall be done in a neat and workmanlike manner and the cut shall be made at a right angle to the longitudinal axis of the pipe. All burrs shall be removed prior to the assembly of the pipe.

Connections to manholes or other rigid structures shall be accomplished by installing a manhole water stop, corresponding to the size of the sewer pipe directly into the rigid structure such as a manhole or manhole base. The coupling shall be placed in the structure whereby the outer side of the coupling is flush with the outside of the structure. (See Standard Drawing No. A-101).

c. Cast Iron Pipe

Defective, damaged or unsound pipe will be rejected. The cutting of pipe, where necessary, shall be done in a neat and workmanlike manner without damage to the pipe. Unless otherwise authorized by the City Engineer, cutting shall be done by means of an approved type of mechanical cutter. In general, cast iron pipe shall be installed as described for vitrified clay pipe.

3. **PIPE JOINTING:**

a. Vitrified Clay Pipe (VCP)

Joints in the bell-and-spigot pipe shall be made by lubricating the resilient material on both the bell-and-spigot ends with a soap solution approved by the manufacturer. Position the spigot inside the bell of the next length and properly align the two sections in the trench. Push the joint home by hand or by means of a bar lever, with wooden blocking to protect the bell end from damage, until the joint is obtained.

Joints in plain-end pipe shall consist of three parts; a circular rubber sleeve, stainless steel compression bands with a bolt and nut mechanism for tensioning bands, and a stainless steel shear ring to insure proper alignment of the pipe joints. The bolt wrench, furnished by and preset to the manufacturer's specifications. Prior to tensioning, a lubricant approved by the manufacturer shall be applied to the rubber under the area of the bands.

b. Polyvinyl Chloride (PVC) Pipe

Joints in PVC Elastomeric joints shall be made as follows: Bell and rubber rings shall be cleared of foreign material that could interfere with the proper assembly of the joint. Wipe the spigot end of the pipe with a clean, dry cloth around the entire circumference from the end of one inch beyond the reference mark. Lubricate the spigot end of the pipe using only lubricant recommended or supplied by the pipe manufacturer. The lubricant shall be applied in a manner in accordance with the pipe manufacturer's recommendation. The spigot end of the pipe is then inserted into the bell so that it is in contact with the rubber ring keeping the pipe lengths in proper alignment. Brace the bell while the spigot end is pushed in under the rubber ring, so that previously completed joints will not be closed up. Push the spigot end in until the reference mark on the spigot end is flush with the end of the bell. This pipe shall be assembled by hand and/or bar and block and shall not be stabbed.

c. Cast-Iron Pipe

Before mechanical jointing, the socket and plain end of the pipe shall be brushed and wiped clean of dirt, oil, grease and scale. The socket and end shall be

washed with soapy water, then after the gland and gasket have been slipped on, the gasket shall be painted with soapy water. The gasket shall then be pushed into position and seated with the fingers after which the gland shall be positioned and all bolts tightened by hand before wrench tightening.

d. Jointing Different Materials

Sewer mains between manholes shall be of the same material, except when a section of cast iron pipe is required for crossing a water main, or when allowed by the City Engineer. When cast iron is joined directly to VCP or PVC pipe, it shall be done with a commercial transition coupling approved by the City Engineer. PVC house laterals may be joined to VCP wyes, provided that an adaptor bushing is installed on the PVC lateral and the wyes have a plain end branch for connecting with a band sleeve. VCP house laterals shall not be connected to PVC wyes.

e. Connecting House Laterals to Existing Main

When the sewer main is VCP at the point of connection and the lateral is half the size of the sewer main or smaller, the connection shall be made by chipping a neat hole in the main and clamping a vitrified clay wye saddle to the main. The main shall then be encased in concrete at the point where the saddle was installed as per Standard Drawing A-103.

When the sewer main is PVC at the point of connection and the lateral is half the size of the main or smaller, the connection shall be made by using a PVC solvent weld saddle. All other connections to an existing sewer main shall be made by installing a standard manhole over the main, and breaking out the main AFTER THE MANHOLE HAS BEEN INSPECTED BY THE CITY INSPECTOR. Under certain conditions, when the lateral is over half the size of the main, the City Engineer may allow the installation of a factory fabricated wye.

4. **SEPARATE WYES:**

Commercially manufactured wyes shall be installed where indicated on the plans and/or at such other locations required by the City Engineer. All wye branches not to be joined to house connections shall be installed with a suitable stopper of size of the wye branch. The wye branches, unless otherwise specified, shall be inclined upward at an angle not greater than 45° from a horizontal line. No wye branch shall be placed closer than five (5) feet to the centerline of any structure. The use of double wyes will not be permitted except as specified or required for chimneys.

5. **CHIMNEY PIPES:**

Chimney pipe shall be constructed as shown on Standard Drawing No. A-104 and at locations designated on the plans. Chimney pipes shall be installed where the depth



of the sewer main is twelve (12) feet or more in depth, or as designated by the City Engineer.

**6. HOUSE CONNECTIONS (SEWER LATHERALS):**

The term “house connections (sewer laterals)” as used in this specification or on the plans is used to designate branch sewers, laid from a main sewer to points at the property lines, or other locations as shown on the plans, from which sewer service can be obtained by proper extension. Where conditions are such that the house connection cannot be adequately supported on undisturbed earth or tamped backfill, the house connection pipe shall be encased in concrete and supported on a concrete cradle as directed by the City Engineer. Concrete shall be installed by the Contractor.

The house connection shall be constructed in accordance with details shown on Standard Drawing No. A-100 on an unyielding foundation, with joints closely and accurately fitted, true to line, and on a straight grade from the bend joining the main sewer to their upper ends, unless otherwise indicated on the plans. House connections shall not be laid on a slope greater than 45° from a horizontal line unless approved by the City Engineer. Wyes for house connections shall be installed as specified in Section 4. The house connection sewer lines shall be joined to the wye branch by eighth bends. All eighth bends are a part of the house connection sewer lines. Where a house connection sewer line is to be connected with a chimney, all bends leading away from the wye branch is a part of said house connection sewer line. House connections (sewer laterals) are not allowed directly into manhole.

a. Size and Depth

The minimum size house connection shall be four inches (4”) in diameter. All house connections shall be laid on a uniform slope from the main line sewer to the property line with a minimum grade of 2% (1/4” per ft.) for a four-inch (4”) house connection and a minimum grade for 1% (1/8” per ft.) for a six-inch (6”) house connection. The minimum cover over a house connection shall be five feet (5’) below the invert of the concrete curb and gutter. For multiple family dwellings, commercial lots, schools or the like, special consideration should be given to determining the correct size and depth of connection to meet the City’s approval.

**7. MANHOLE:**

a. General

Manhole invert channels shall be smooth and semicircular in shape, conforming to the inside of the adjacent sewer section. Changes in direction of flow shall be made with a smooth curve of as large radius as the size of the manhole will permit. Changes in size and grade of the channels shall be made gradually and evenly. The invert channels may be formed directly in the concrete of the manhole base, may be half tile laid in concrete, or may be constructed by laying full section sewer pipe through the manhole and breaking out the top half after the

surrounding concrete has hardened. The floor of the manhole outside the channels shall be smooth and shall slope toward the channels not less than one inch per foot nor more than two (2) inches per foot.

Manhole frames and covers shall be installed in accordance with Standard Drawing No. A-101. Top of manhole frames and covers shall be installed six (6) inches below finish grade in new tract developments. After paving is completed, top of manhole, frame and cover shall be adjusted to top of pavement. Manhole frames and covers in existing street pavement shall be constructed to top of pavement. Manhole diameter shall be 48" for sewers 15" and smaller, 60" for sewers 16" to 24" or as shown on the approved plans.

b. Precast Manholes

Precast manholes shall be installed and assembled in accordance with details shown on Drawing No. A-101 and in accordance with the manufacturer's specifications. Eccentric cones shall be used unless otherwise specified on the plans. Eccentric cones are to be installed with the straight wall downstream. All manholes shall have three (3) inch and six (6) inch, grade rings for a minimum height of twelve (12) inches, and a maximum height of eighteen (18) inches, below the manhole frame. When the manhole depth is less than four (4) feet, a concentric cone shall be used.

c. Drop Manholes

Drop manholes shall be constructed in accordance with Standard Drawing No. A-102.

d. Remodeling Existing Manholes

Pipe connections to existing manholes or existing stubs shall be made in such a manner that the finished work will conform as nearly as practicable to the essential applicable requirements specified for new manholes, including all necessary brick work, concrete work, cutting, and reshaping of inverts to provide proper channels for flow.

e. Spacing

The maximum spacing allowable between manholes on eight-inch (8") through thirty-inch (30") lines shall be 350 feet. For lines over thirty inches (30"), a maximum spacing of 600 feet is allowable. Manholes shall be placed at the end of all sewer mains, unless approved otherwise by the City Engineer.

f. Grades

A minimum drop of 0.10 foot and maximum of 0.60 foot shall be used on a straight-through line. For a bend through the structure, a minimum of 0.20 foot and maximum of 1.00 foot shall be used. Minimums do not apply to sewers

greater than eighteen inches (18"). Pipe connections to existing manholes or existing stubs shall be made in such a manner that the finished work will conform as nearly as practicable to the essential applicable requirements specified for new manholes, including all necessary brick work, concrete work, cutting, and reshaping of inverts to provide proper channels for flow.

**8. DEAD ENDS:**

Manholes shall be constructed at all dead ends unless shown otherwise on the construction plans.

**9 BORED CROSSINGS:**

a. General

The work covered by this paragraph of the specifications includes all pipe, pipe fittings, casing, special appurtenances, and materials between the stations indicated as bored crossings on the construction plans.

b. Installation

Crossings shall be bored with an earth auger to the line and grade shown on the plans. The maximum allowable variation in line or grade will be two-tenths (0.20) of a foot in the distance bored. Should voids be created outside the casing pipe, the voids shall be filled as directed by the City Engineer. After the pipe is in the casing, the lower one-half of the casing for the full length of the bore shall be grouted; the Contractor shall fill the space between the pipe and the casing with sand slurry, and seal the ends with brick rubble masonry and provide a one (1) inch diameter pipe drain in the lower end.

**10. CONCRETE WORK:**

Concrete as specified herein, shall be used for manhole bases, pipe bedding encasements and for other support and backfill as the City Engineer may direct. In general, forms will not be required, provided that concrete may be successfully placed to the minimum dimensions as shown on the drawings using side walls of excavations for support. If side walls of excavations are not suitably stable in the opinion of the City Engineer, the Contractor shall furnish and use forms for concrete placement.

**11. TESTS:**

a. Test for Displacement of Sewer

Sewer mains will be checked by the City Engineer to determine whether any displacement of the pipe has occurred after the trench has been completely backfilled and compacted as specified. If the interior of the pipe line shows poor

alignment, displaced pipe, or any other defects, the defects designated by the City Engineer shall be remedied by the Contractor at his expense.

b. Test for Leakage

- i. Hydrostatic Test Procedure – Manholes – if required by the City Engineer, manholes shall be hydrostatically tested. The inlet and outlet of the manhole shall be plugged and the cylindrical section of the manhole filled with water. The maximum allowable leakage rate per foot of depth tested shall be three (3) gallons per hour. The test shall run a minimum of thirty (30) minutes.
- ii. Air Test Procedure - Sewers – Each section of sanitary sewer constructed between two successive manholes or structures shall be air tested. The City may require that the final air test be conducted after all other utilities have been installed and compaction on trenches completed. Length of line tested at one time shall be limited to the length between adjacent manholes or structures.

Contractor shall pressurize the test section to 4.0 psi and hold at 4.0 psi for not less than two minutes. Add air if necessary, to keep the pressure at 4.0 psi.

Disconnect Air Supply. When pressure decreases to 3.5 psi, start stopwatch. Determine the time in seconds that is required for the internal pressure to reach 2.5 psi. This time interval shall be greater than time given in the following table. The section of sewer shall not have passed if the time is less than shown below:

Sewer Diameter	Minimum Time	
	With Laterals	Without Laterals
8 inches	2 min 25 sec	2 min 36 sec
10 inches	2 min 51 sec	3 min 0 sec
12 inches	3 min 17 sec	3 min 31 sec
15 inches	5 min 0 sec	5 min 0 sec
18 inches	7 min 0 sec	7 min 0 sec
21 inches	10 min 0 sec	10 min 0 sec

If the air test is not passed, the leak shall be found and repaired to the satisfaction of the City Engineer.

House sewers (Laterals) shall be considered part of the main sewer to which they are connected and no adjustment of test time shall be allowed to compensate for the smaller diameter of the house sewers.

The pressure gauge used shall be supplied by the Contractor: shall have minimum divisions of 0.10 psi and shall have an accuracy of 0.04 psi.

Accuracy and calibration of the gauge shall be certified when requested by the City Engineer.

c. Deflection Test for PVC Pipe

Following the placement and compaction of backfill and prior to permanent paving, the Contractor shall clean all PVC sewer mains and pull an approved mandrel through the sewer mains to measure the deflection of pipe of any obstructions caused by joint offsets, lateral pipe intrusions or rough joints. A rigid mandrel, approved by the City Engineer, with a circular cross section having at least 95% of the specified average inside diameter, shall be provided and pulled through the pipe by hand by the Contractor, in the presence of the City Engineer.

Ninety-five percent of the specified average inside diameter for PVC sewer pipe manufactured per the specifications of ASTM D-3034 is as follows:

<b>Pipe Nominal Diameter</b>	<b>95% I.D. SDR 35</b>
6"	5.619"
8"	7.524"
10"	9.405"
12"	11.191"
15"	13.849"

The Contractor shall notify the City Inspector 48 hours in advance of testing the sewer lines.

**12. MAINTENANCE OF SEWER SYSTEM PRIOR TO ACCEPTANCE BY CITY**

a. Cleaning

All new sewer lines shall be cleaned of debris, rocks, sand, or dirt before being accepted by the City. Cleaning the lines by balling and flushing or by using a hydraulic jet machine are acceptable methods. Devices approved by the City Inspector shall be provided and installed by the Contractor to catch all debris, rocks, sand, etc. in order to prevent it from entering the existing sewer system.

b. Connecting to Existing Sewer

No sewer line shall be connected to an existing sewer until the new portion of a line has been cleaned and inspected by the City Inspector. After cleaning the new sewer lines and prior to connecting to the existing sewer, the Contractor shall install an approved sandtrap in the outlet of the first upstream manhole from the point of connection to the existing sewer. The Contractor shall maintain and clean the sandtrap until the sewer is accepted for operation and maintenance.

c. Final Inspection

Prior to final inspection of the sewer, the Contractor shall remove all sandtraps and any other protection devices such as plywood over the manhole channels and shall insure that the sewer lines are clean, and shall raise all manhole covers to final grade.

Arrangements for the final inspection shall be made forty-eight (48) hours in advance by calling the City Engineer or Inspector.

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## SECTION D

### MAIN LINE SEWERS

#### 1. LOCATIONS:

In general, main line sewer should be located on the centerline of existing and proposed streets. The Standard minimum horizontal distance between the main line sewer, sewer laterals, existing and proposed water mains, and water service laterals shall be ten (10) feet. Where this cannot be accomplished, special construction shall govern as shown on page 31 and page 32, of this specification. The sewer mains shall be in a straight line both in plan and profile between manholes. Where approved by the City Engineer, vertical and horizontal curves may be used based on the following criteria:

a. Horizontal Curves (Clay Pipe)

On a sewer 27 inches or less in diameter, one curve, either horizontal or vertical will be permitted between manholes spaced per Section 7(e), on page 19 of this specification.

On a sewer 30 inches or greater in diameter, compound curves or a combination of curves and tangents may be used. Vertical curves shall not be located within the limits of horizontal curves.

Special attention shall be given to the number and location of manholes to ensure normal maintenance operations.

The minimum radius of curvature allowable for vitrified clay pipe using compression joints (“speed sal” or equiv.) joints is given on the above **Table 1 (VCP)**. The minimum allowable radius is governed by the type of joints used by the pipe lengths and by the allowable separations or “pull”, measured in inches, of the abutting pipe ends permitted on the outside surface of the curved sewer. Beveled pipe shall not be used. If pipe lengths less than the standard are required, it shall be noted on the plans.

**TABLE 1 (VCP)**

Pipe Size (inches)	Maximum Pipe Length (feet)	Maximum Pull (inches)	Minimum Radius (feet)	Maximum Deflection
8	3-1/3	3/8	95	2° 00'
8	5	3/8	145	2° 00'
8	6	3/8	175	2° 00'
10	5	7/16	145	1° 58'
10	6	7/16	175	1° 58'
12	5	1/2	145	1° 58'
12	6	1/2	175	1° 58'
15	5	9/16	160	1° 50'
15	6	9/16	190	1° 50'
18	5	5/8	180	1° 38'



18	6	5/8	210	1° 38'
21	5	3/4	180	1° 38'
21	6	3/4	210	1° 38'
24	5	3/4	190	1° 32'
24	6	3/4	230	1° 32'
27	5	3/4	210	1° 23'
27	6	3/4	250	1° 23'
30	5	13/16	225	1° 15'
30	6	13/16	270	1° 15'
33	5	13/16	250	1° 09'
33	6	13/16	300	1° 09'
36	5	7/8	260	1° 07'
36	6	7/8	310	1° 07'
39	5	7/8	285	1° 01'
39	5-1/2	7/8	315	1° 01'
39	6	7/8	340	1° 01'
42	5	7/8	305	0° 57'
42	5-1/2	7/8	335	0° 57'
42	6	7/8	365	0° 57'

b. Horizontal Curves PVC Pipe

The minimum radius of curvature allowable for Polyvinyl Chloride Pipe (PVC) is as shown on **Table 2 (PVC)** below, and bend curvature manufacturer's recommendations. A maximum of one half of manufacturer's bend may be permitted subject to City approval.

**TABLE 2 (PVC)**

Pipe Size (inches)	Maximum Pipe Length (feet)	Minimum Radius (feet)	Maximum Deflection (Degrees)
8	10	380	1.5
8	12.5	475	1.5
8	20	765	1.5

c. Parabolic Vertical Curves

**Vitrified Clay Pipe or Polyvinyl Chloride Pipe**

Parabolic vertical curves shall be so designed that the limitations for horizontal curves are observed. The minimum horizontal length of vertical curve required to conform to the minimum radii permitted shall be computed as follows, but in no case shall the length be less than forty (40) feet.

**Formula**

$$L_{\min} = (S_2 - S_1) R_{\min}$$

Where,  $L_{\min}$  = minimum horizontal length of vertical curve in feet.

$S_1$  and  $S_2$  = Slopes of tangents on the vertical curve expressed in feet per foot.

$R_{\min}$  = Minimum radius of curvature permitted in feet from Table 1, for VCP or Table 2 for PVC.

Elevations on vertical curves shall be computed at intervals determined by the following equation and the results shown on the profile.

**Formula**

$$X_{\max} = 0.283 \sqrt{\frac{L}{S_1 - S_2}}$$

Where,  $X_{\max}$  = maximum horizontal distance between elevation intervals.

$L$  = horizontal length of vertical curve.

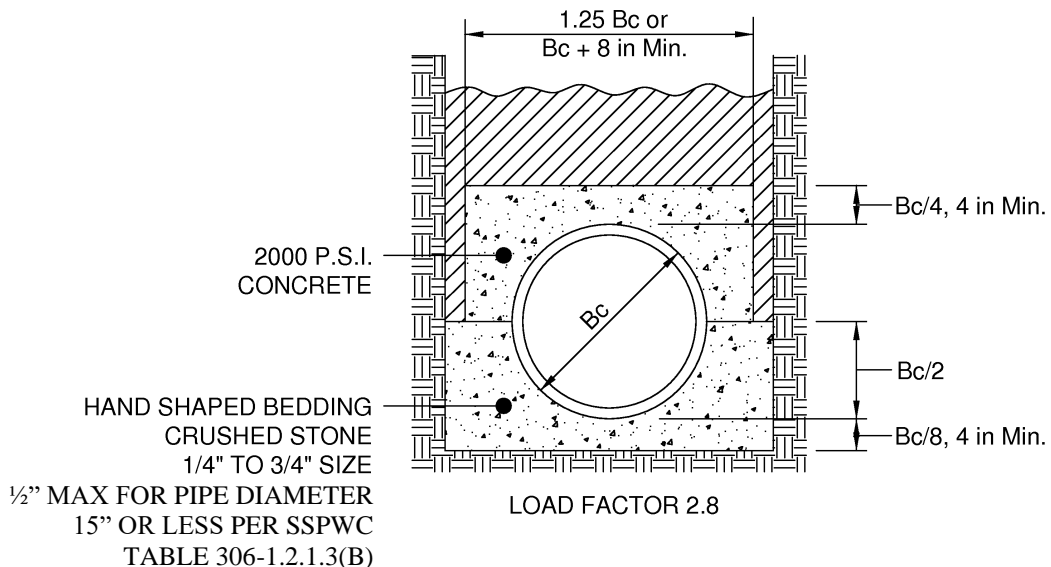
$S_1$  and  $S_2$  = Slopes of tangents on the vertical curve expressed in feet per foot.

The interval used shall be the nearest multiple of 5 feet, that is less than the computed value of "X" but in no case shall it exceed 25 feet.

d. Depths

The normal minimum cover of the pipe shall be seven feet (7') below finished grade. In cases where street and/or lot grading requires sewers to be at a shallower depth, the depth may be approved by the City Engineer subject to the following construction requirements.

Depth of Cover: 7' to 4' – Submit load calculations on pipe  
 4' to 2-1/2' – Sewer main shall be capped with concrete as follows:



Less than 2-1/2' of cover – Sewer main and/or laterals shall be Class 150 cast iron pipe with approved mechanical joints.

e. Size and Grades

The minimum pipe size shall be 8 inches. Pipe twelve inches (12”) and smaller in diameter shall be designed to flow at ½ full at peak dry weather flow using n = 0.013 in the Manning Formula. Pipe 15 inches (15”) and larger in diameter shall be designed to flow at ¾ full at peak dry weather flow using n = 0.013. Minimum slopes for various sizes of pipe are listed below.

- 8” Pipe at s = 0.0040 feet per foot
- 10” Pipe at s = 0.0032 feet per foot
- 12” Pipe at s = 0.0024 feet per foot
- 15” Pipe at s = 0.0016 feet per foot
- 18” Pipe at s = 0.0014 feet per foot
- 21” Pipe at s = 0.0012 feet per foot
- 24” Pipe at s = 0.0010 feet per foot
- 27” Pipe at s = 0.0008 feet per foot
- 30” Pipe at s = 0.0007 feet per foot

All sewers shall be designed for peak flow and using the above design criteria, however the velocity shall be not less than 2.5 feet per second nor greater than 10 feet per second at peak dry weather flow.

For determining the peak rate of flow in a main line sewer, the following tables shall be used with designated land use or persons per acre producing the greater rate of flow as the governing factor. The peak flow shall equal average flow (**Table 3**) x peak factor (**Table 4**).

**TABLE 3**

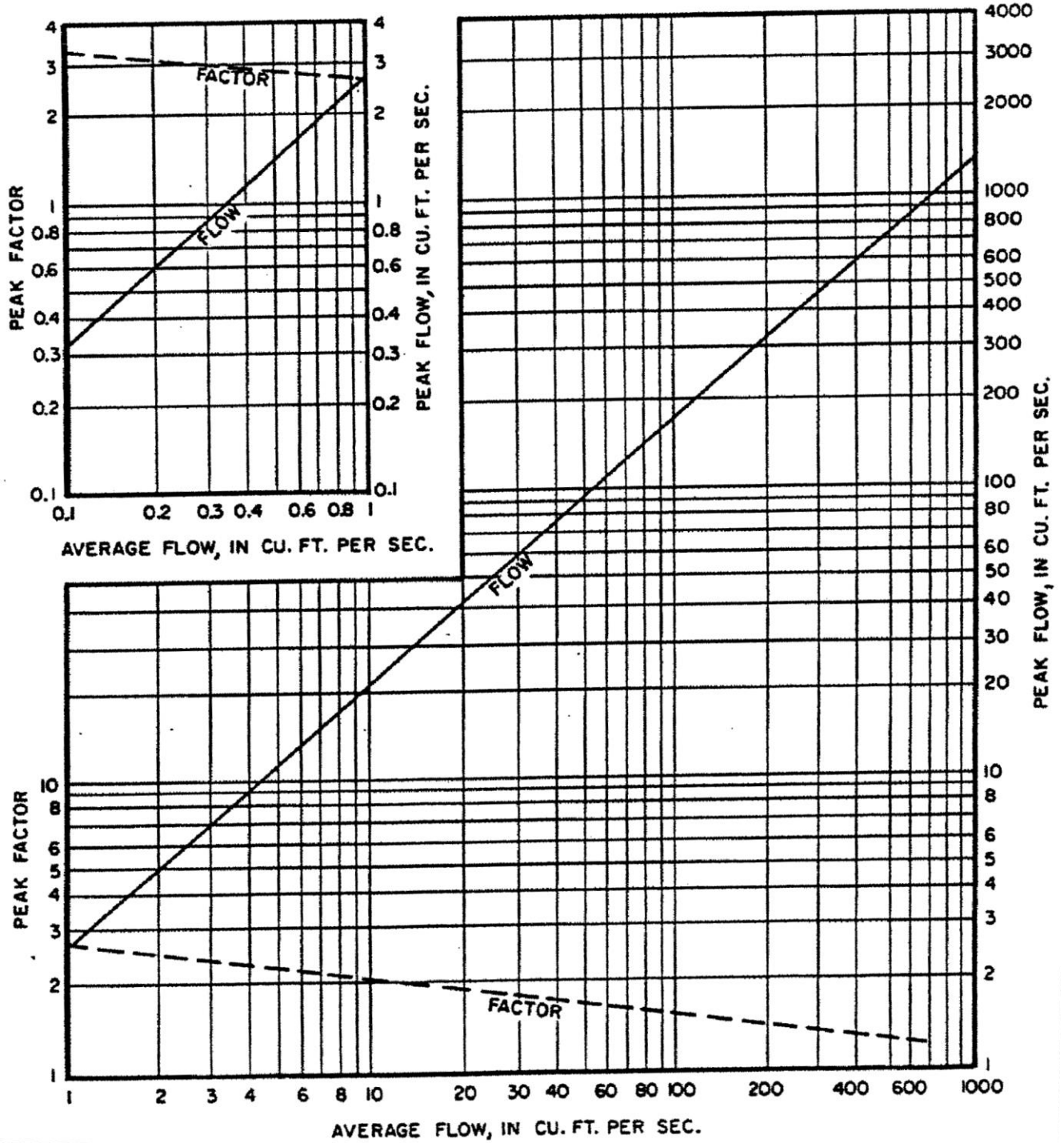
**Wastewater Design Flows (Average Flow)**

Land Use		Dwelling Units Per Acre	Persons per Dwelling Unit	Average Flows (cfs/acre)
Residential	Hillside	2	3.15	0.00083
	Low Density	4	3.15	0.0017
	Medium Density	10	2.50	0.0033
Commercial	Administrative & Professional			0.0022
	Neighborhood			0.0022
	Freeway Related			0.0022
	General			0.0022
Industrial	Urban Services			0.0022
	Light			0.0022
	General			0.0022
Public Use				0.0022

Those conditions not covered by the above table shall require special study.

**TABLE 4**

**RATIO OF PEAK FLOW TO AVERAGE DAILY FLOW**



**(AVERAGE FLOW x PEAK FACTOR = PEAK FLOW - cfs)**

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## SECTION E

### SPECIAL CONDITIONS

#### 1. **JACKING OR MACHINE BORING**

Where it is necessary to construct a sewer beneath railroad tracks, across state or federal highways, or beneath a large obstruction where tunneling is not feasible, jacking or machine boring is required. All jacking or machine boring shall be approved by the governing body having jurisdiction.

#### 2. **WELL PROTECTION**

Whenever a sewer passes within a horizontal radius of one hundred feet (100') of water well, material for the sewer main shall be Class 150 cast iron with mechanical joints. In accordance with the City of Redlands Municipal Code, every well shall be located no closer than fifty feet (50') from sewers, watertight septic tank, or any potential sources of contamination and pollution.

#### 3. **SPECIAL CONSTRUCTION REQUIREMENTS**

The California Waterworks Standards (California Code of Regulations (CCR), Title 22, Division 4, Chapter 16, Section 64572) establish criteria for the separation of new water mains from non-potable pipelines. Public water systems should ensure that these distances are met, whenever feasible, for all new construction.

- (a) New water mains and new supply lines shall not be installed in the same trench as, and shall be at least 10 feet horizontally from and one foot vertically above, any parallel pipeline conveying:
  - (1) Untreated sewage,
  - (2) Primary or secondary treated sewage,
  - (3) Disinfected secondary-2.2 recycled water (defined in section 60301.220),
  - (4) Disinfected secondary-23 recycled water (defined in section 60301.225), and
  - (5) Hazardous fluids such as fuels, industrial wastes, and wastewater sludge.
- (b) New water mains and new supply lines shall be installed at least 4 feet horizontally from, and one foot vertically above, any parallel pipeline conveying:
  - (1) Disinfected tertiary recycled water (defined in section 60301.230), and
  - (2) Storm drainage.
- (c) New supply lines conveying raw water to be treated for drinking purposes shall be installed at least 4 feet horizontally from, and one foot vertically below, any water main.
- (d) If crossing a pipeline conveying a fluid listed in subsection (a) or (b), a new water main shall be constructed no less than 45-degrees to and at least one foot above that pipeline. No connection joints shall be made in the water main within eight horizontal feet of the fluid pipeline.
- (e) The vertical separation specified in subsections (a), (b), and (c) is required only when the horizontal distance between a water main and pipeline is less than ten feet.

- (f) New water mains shall not be installed within 100 horizontal feet of the nearest edge of any sanitary landfill, wastewater disposal pond, or hazardous waste disposal site, or within 25 horizontal feet of the nearest edge of any cesspool, septic tank, sewage leach field, seepage pit, underground hazardous material storage tank, or groundwater recharge project site.
- (g) The minimum separation distances set forth in this section shall be measured from the nearest outside edge of each pipe barrel.
- (h) With State Board approval, newly installed water mains may be exempt from the separation distances in this section, except subsection (f), if the newly installed main is:
  - (1) less than 1320 linear feet,
  - (2) replacing an existing main, installed in the same location, and has a diameter no greater than six inches more than the diameter of the main it is replacing, and
  - (3) installed in a manner that minimizes the potential for contamination, including, but not limited to:
    - (A) sleeving the newly installed main, or
    - (B) utilizing upgraded piping material

**4. EXCEPTIONS:**

If existing conditions prohibit compliance with § 64572, Water Main Separation, use of alternatives may be approved by City of Redlands. The City may implement and/or approve use of alternatives to Waterworks standards for the separation distances of potable water mains from non-potable fluid carrying pipelines per approved Permit Amendment No. 06-13-24PA-002 attached in Appendix A.

## **SECTION F**

### **PLAN PREPARATION AND PRESENTATION**

**1. DRAWINGS**

All drawings shall be ink on mylar. The minimum mylar thickness shall be 7 mil (0.007 inch). All plans shall be standard size sheet, 24 inches by 36 inches. The plans shall have a 1-½ inch border on the left side and a ½ inch border on the remaining three sides. A City of Redlands standard title block and revision block shall be located in the lower right corner. Sewer plans shall be on plan and profile paper at the scale of one inch equal forty feet (40') in plan and one inch equals four feet (4') in profile. The profile shall be on the upper half of the sheet, and the plan on the lower half. In all cases, the mylar shall have a matte finish on the front side of the drawing. Diazo mylars produced by a blueprint process are not acceptable for sewer plans.

**2. CALCULATIONS**

When requested by the City Engineer, the Design Engineer shall submit calculations as may be deemed necessary to evaluate the design. Such calculations may include, but are not limited to; hydraulics of the sewer, ability of the pipe to withstand the anticipated loads, development of the design flows, and alignment of the sewer. All calculations shall be submitted on 8-½ by 11 inch paper and shall be presented in the neat, professional form. Calculations shall bear the Engineer's license number and signature.

**3. MISCELLANEOUS**

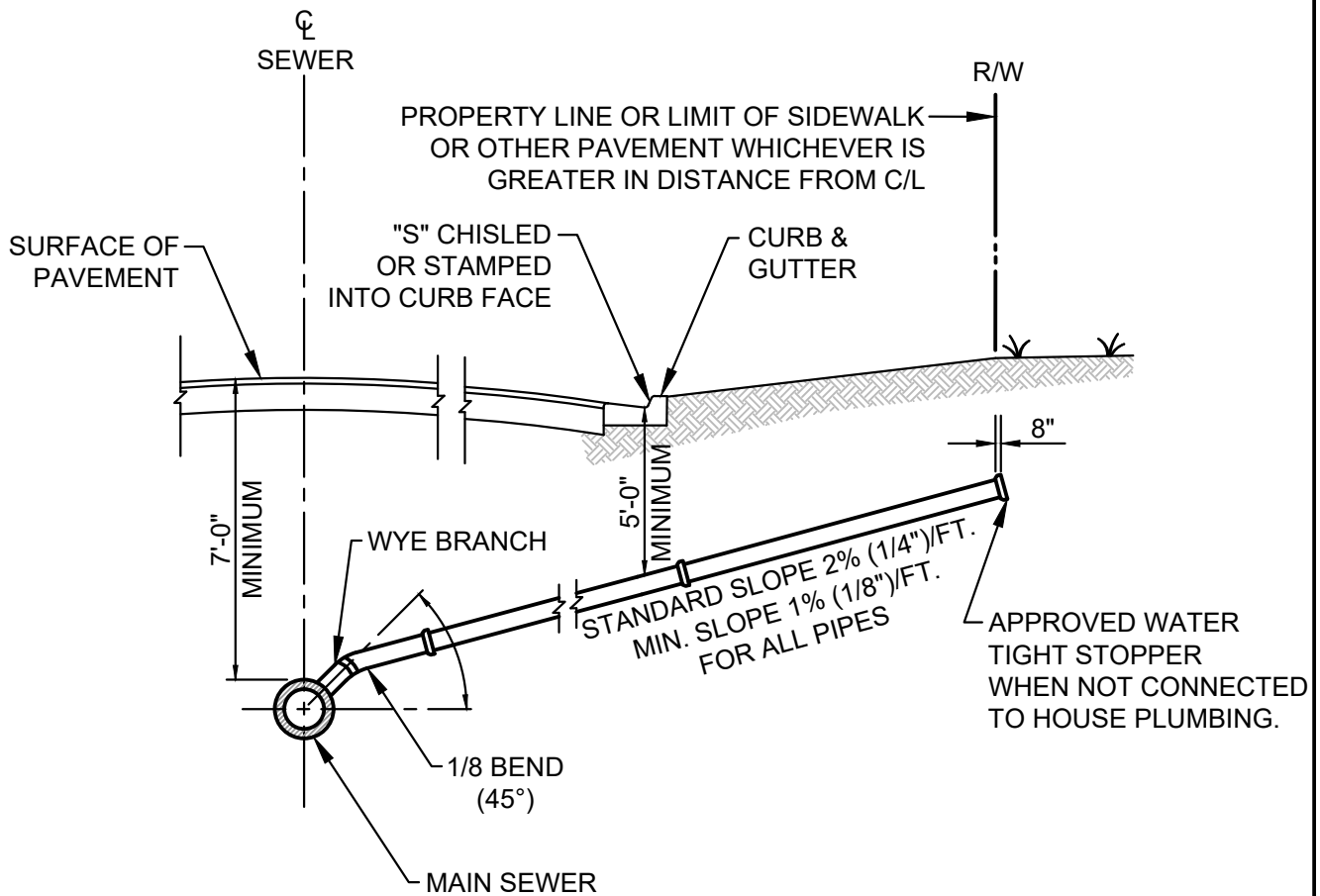
If other design problems occur which are not covered herein, such as pump stations, siphons, industrial waste treatment facilities, or the like, consult the City.



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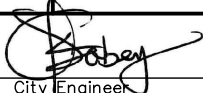
## **STANDARD DRAWINGS**

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**NOTES:**

- 1) WHERE CURB AND GUTTER IS DESIGNED, BUT NOT INSTALLED, SEWER LATERAL SHALL BE POSITIONED SO THE MINIMUM CLEARANCE WILL BE MAINTAINED UNDER PROPOSED CURB INSTALLATION.
- 2) WHERE CURB AND GUTTER DO NOT EXIST AND ARE NOT DESIGNED, THE LATERAL SHALL BE POSITIONED SO THAT THE MINIMUM COVER AT THE PROPERTY LINE WILL BE 6'-0" AS MEASURED FROM THE CROWN OF THE EXISTING STREET.
- 3) THE CITY SHALL APPROVE THE DESIGN OF LATERALS FOR MULTIPLE FAMILY DWELLINGS, COMMERCIAL LOTS, SCHOOLS AND PLACES OF A GREATER THAN NORMAL HOUSEHOLD WATER USE.
- 4) WHERE SEWER LATERAL CROSS OVER AN EXISTING OR PROPOSED WATER MAIN, CONTINUOUS PIPE SHALL BE USED FOR 10' FROM EITHER SIDE OF WATER MAIN AND SHALL HAVE A 4" MIN. CLEARANCE BETWEEN CROSSING.
- 5) HOUSE CONNECTION TO BE AT RIGHT ANGLES TO MAIN LINE SEWER UNLESS LOCATION OF MAIN SEWER DOES NOT PERMIT.
- 6) MINIMUM SLOPE MUST BE APPROVED BY CITY ENGINEER, SEE PAGE 18.
- 7) VCP OR PVC PIPE SHALL BE USED FOR HOUSE CONNECTION: LATERALS FROM SEWER MAIN TO THE PROPERTY LINE.

Date: 01/03/2023	Drawn: GKD
Scale: Not-to-Scale	Revised: GKD
Approved by:	
City Engineer	

**CITY OF REDLANDS**  
Municipal Utilities & Engineering Department

HOUSE CONNECTION  
(SEWER LATERALS)

**A-100**

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DESIGN THE RADIUS OF OUTER CHANNEL WALL AS  $\frac{1}{2}$  OF INSIDE DIAMETER OF THE MANHOLE  
 24" OPENING ON DOWN STREAM SIDE OF M.H.

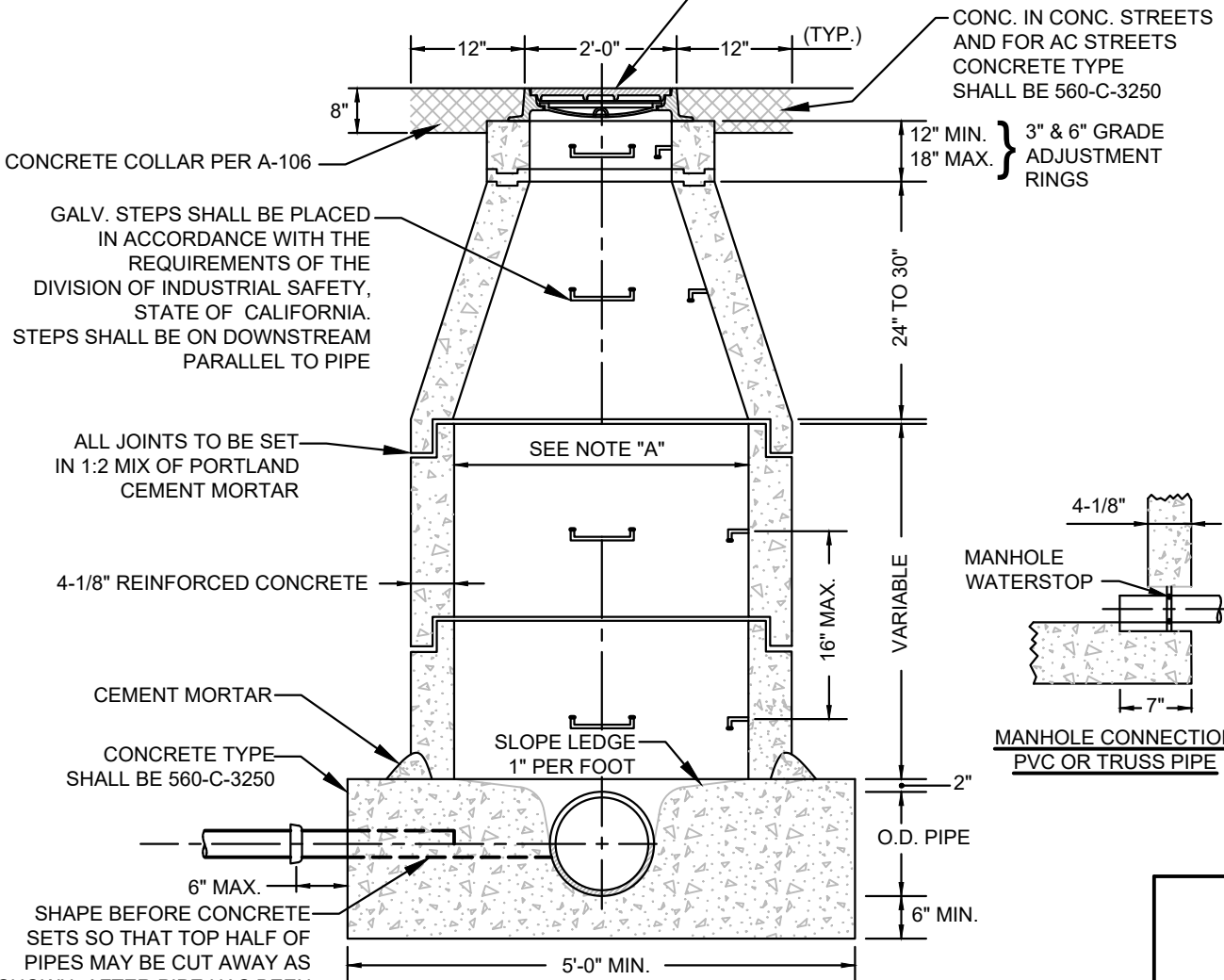
**NOTE "A":**  
 48" DIAMETER FOR SEWERS 15" AND SMALLER, 60" DIAMETER FOR SEWERS 16" THRU 24" OR AS SHOWN ON THE PLANS.

**NOTE:**  
 SEWER LATERALS ARE NOT ALLOWED IN MANHOLES.

MANHOLES LOCATED IN EASEMENTS OR NATIVE SOIL SHALL BE ELEVATED 12" ABOVE NATURAL GRADE AND ENCASED WITHIN A CONCRETE DOME.

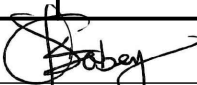
CITY OF REDLANDS STANDARD MANHOLE FRAME AND COVER MANUFACTURED BY ALHAMBRA FOUNDRY CO. TYPE A-1170 OR APPROVED EQUAL.

**PLAN VIEW**



**ELEVATION VIEW**

**A-101**

Date: 01/03/2023	Drawn: GKD
Scale: Not-to-Scale	Revised: GKD
Approved by: 	City Engineer

**CITY OF REDLANDS**  
 Municipal Utilities & Engineering Department  
 STANDARD PRECAST REINFORCED  
 CONCRETE MANHOLE

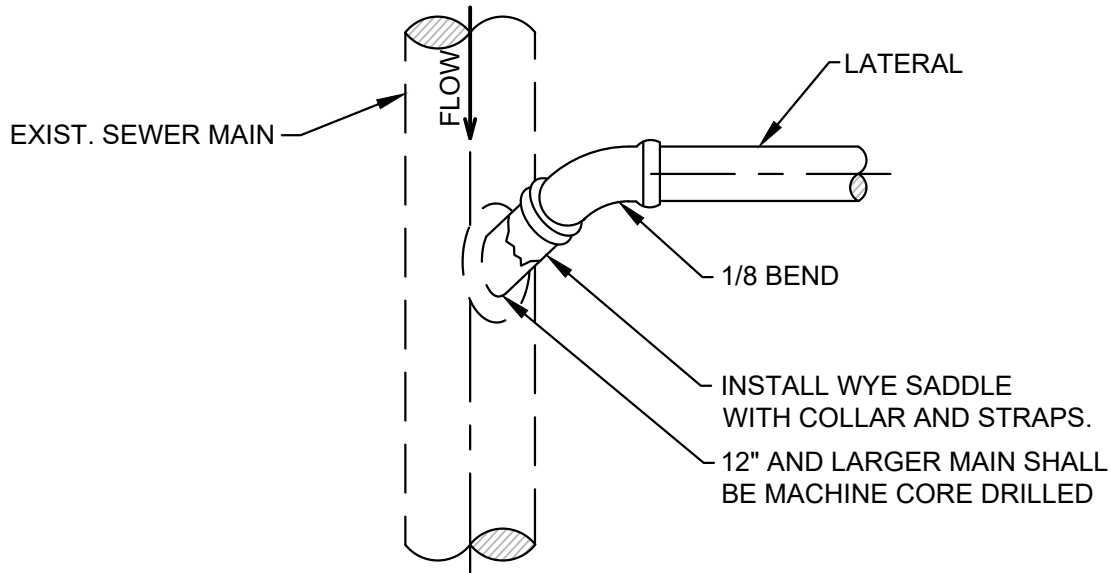
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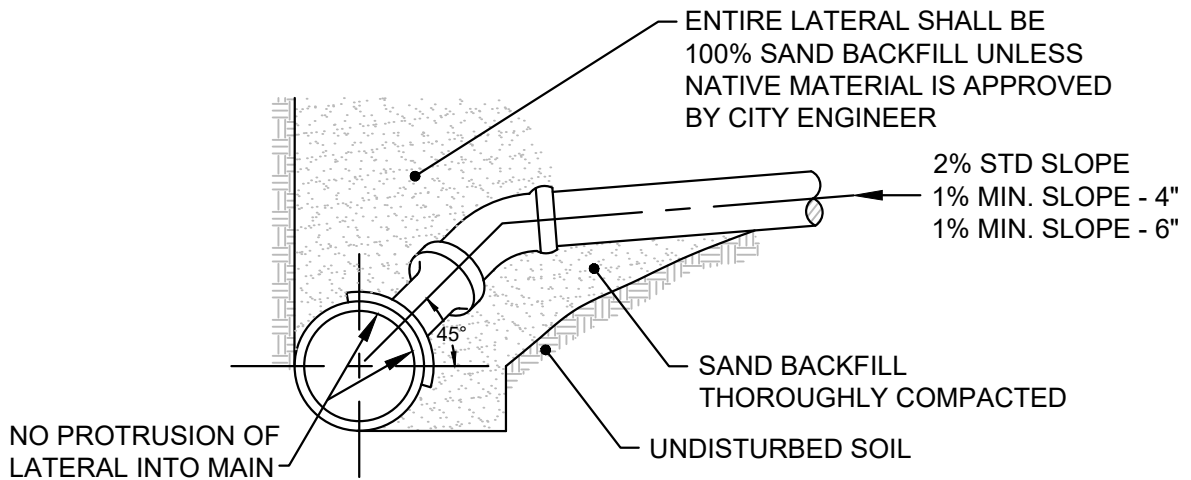


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INSPECTION: THE CONTRACTOR SHALL SCHEDULE INSPECTION WITH THE CITY. THE TAPPING HOLE AND THE WYE SHALL BE INSPECTED BEFORE THE LATERAL IS CONNECTED AND BEFORE BACKFILL BEGINS.



PLAN VIEW

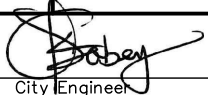


ELEVATION VIEW

**NOTES:**

-WHERE SEWER LATERAL SIZE IS EQUAL OR GRATER THAN THE SIZE OF THE SEWER MAIN, A MANHOLE SHALL BE INSTALLED AT THE POINT OF CONNECTION. A WYE MAY BE INSTALLED IN THE MAIN AT THE POINT OF CONNECTION IF FLOW WILL PERMIT AND SUCH CONNECTION IS APPROVED BY THE CITY ENGINEER.

-TAPPING HOLE FOR VCP SHALL BE A CLEAN CUT OVAL WITHOUT SHARP EDGES.

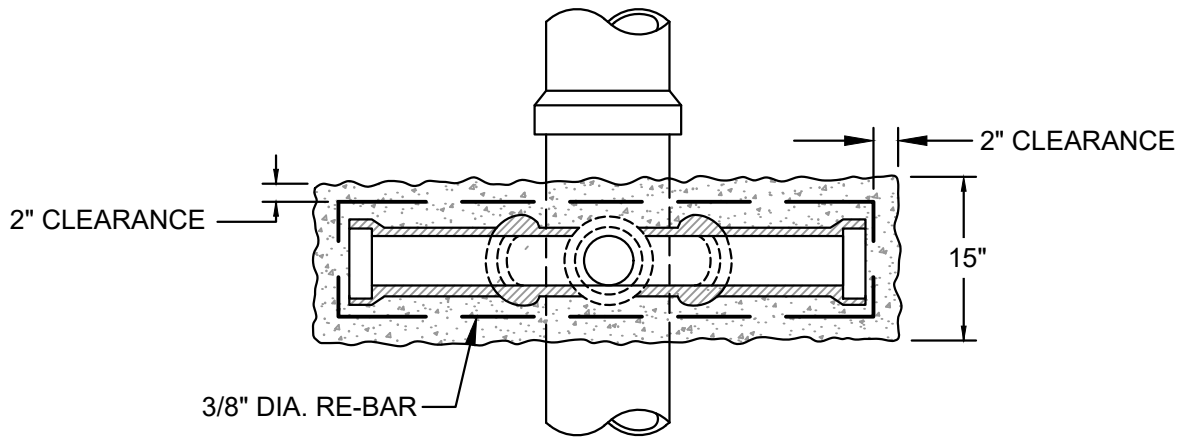
Date: 01/03/2023	Drawn: GKD
Scale: Not-to-Scale	Revised:GKD
Approved by: 	City Engineer

**CITY OF REDLANDS**  
Municipal Utilities & Engineering Department

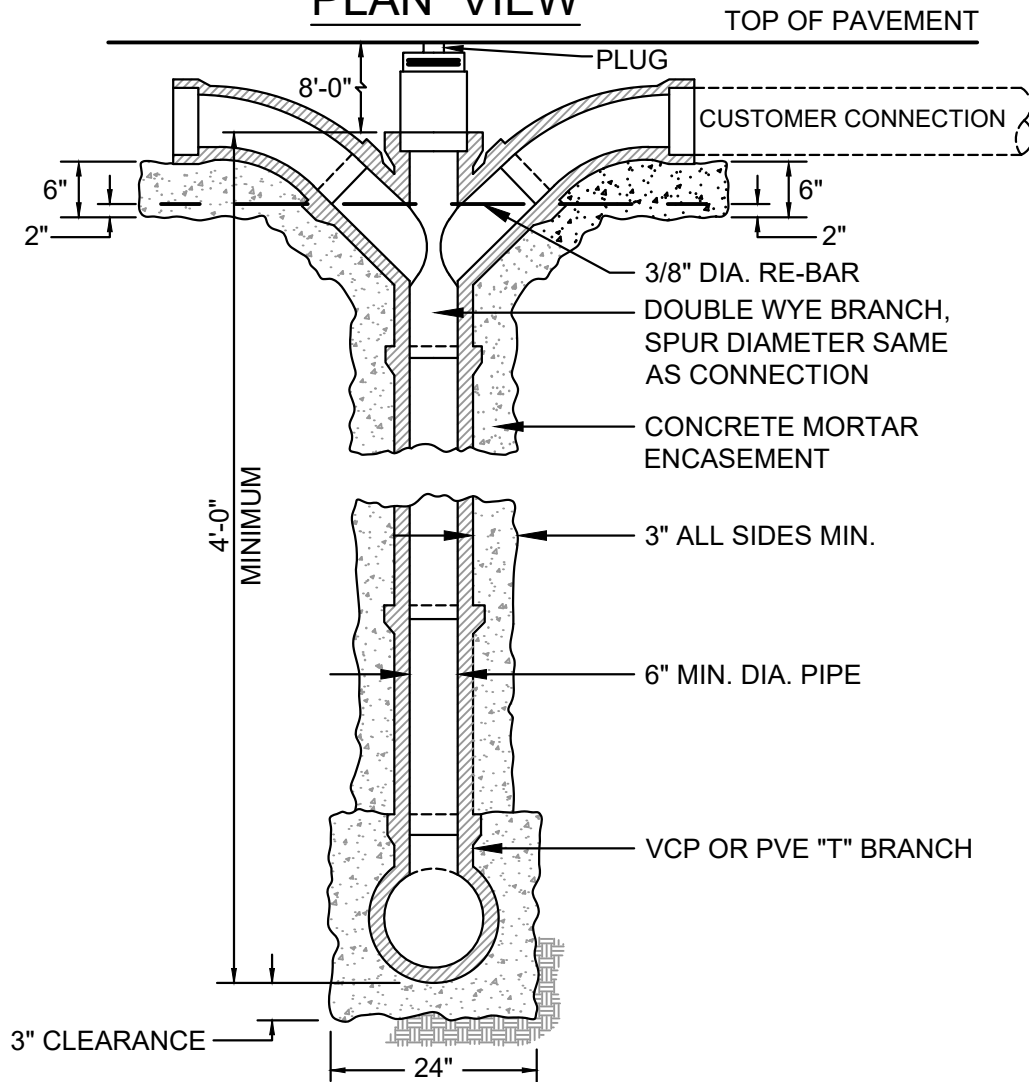
TYPICAL WYE – SADDLE INSTALLATION  
CONNECTION TO EXISTING SEWER MAIN

A-103


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**PLAN VIEW**



**ELEVATION VIEW**

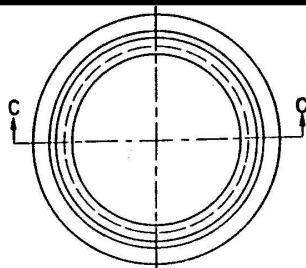
Date: 02/20/2020	Drawn: GKD
Scale: Not-to-Scale	Revised: GKD
Approved by: 	City Engineer

**CITY OF REDLANDS**  
Municipal Utilities & Engineering Department

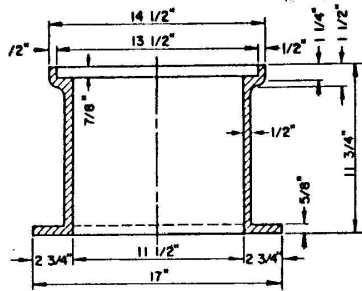
CHIMNEY PIPE

A-104

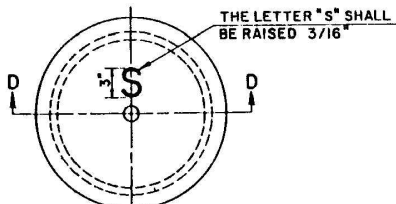
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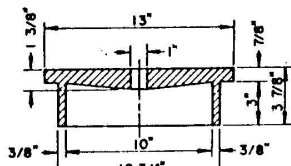
ACCESS FRAME



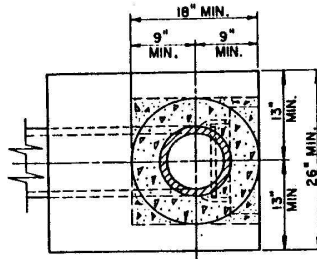
SECTION C-C



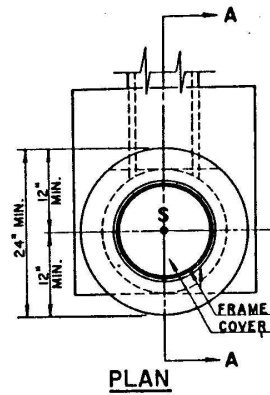
ACCESS COVER



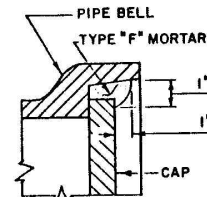
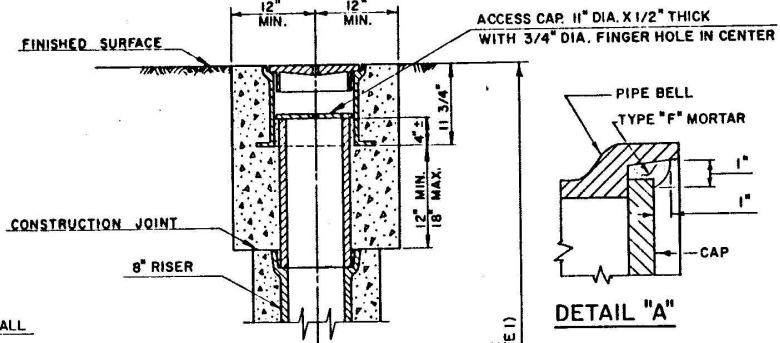
SECTION D-D



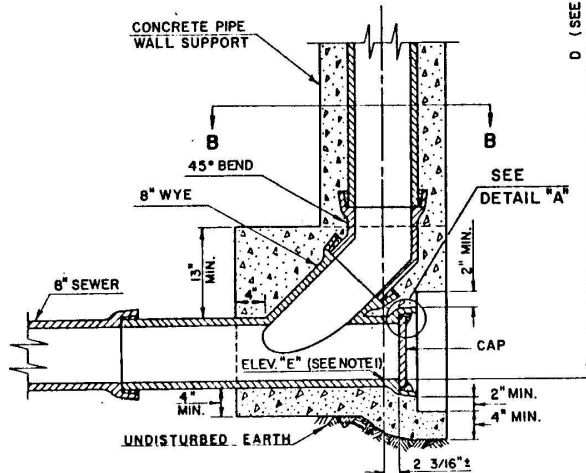
SECTION B-B



PLAN



DETAIL "A"



SECTION A-A

**NOTES:**

- 1) SEE PLANS FOR VALUES OF DIMENSION 'D' AND ELEVATION 'E'.
- 2) PIPE AND FITTINGS, UNLESS OTHERWISE NOTED, SHALL BE OF THE SAME MATERIALS AS THE SEWER, UNLESS APPROVED ADAPTORS ARE USED, AND MAY BE ANY OF THE FOLLOWING:
  - A. VC PIPE
  - B. PE PIPE
  - C. ABS SOLID WALL PIPE
  - D. ABS COMPOSITE PIPE
  - E. PVC PLASTIC PIPE
- 3) PIPE AND FITTINGS SHALL BE BEDDED AND ENCASED IN PCC AS SHOWN. PCC SHALL BE CLASS 450-C-2000(265-C-14). JOIN AND ALIGN PIPE AND FITTINGS BEFORE PLACING CONCRETE. MAINTAIN ALIGNMENT WHILE PLACING AND ALLOWING PCC TO SET.
- 4) THE ACCESS FRAME, COVER AND CAP SHALL BE CAST IRON. THE FINGER HOLES MAY BE DRILLED OR BLOCKED OUT PRIOR TO CASTING. THEY SHALL NOT BE PUNCHED OUT.
- 5) THE CONTRACTOR MAY PLACE EITHER CIRCULAR OR SQUARE CONCRETE PIPE WALL SUPPORTS.

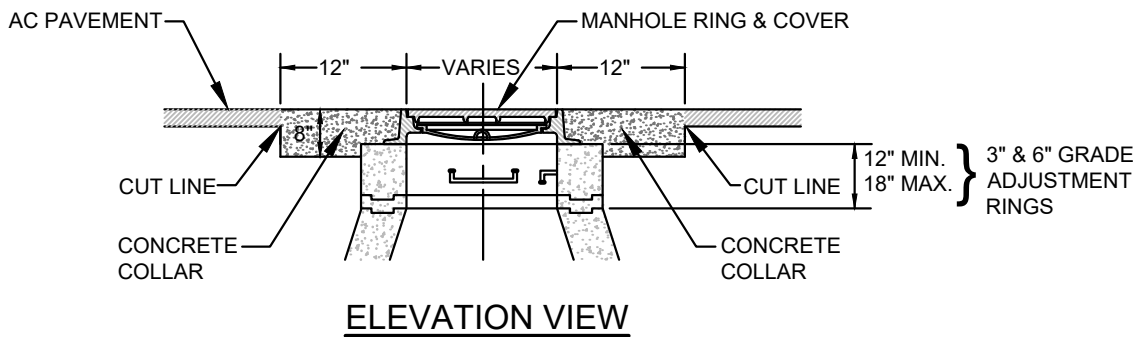
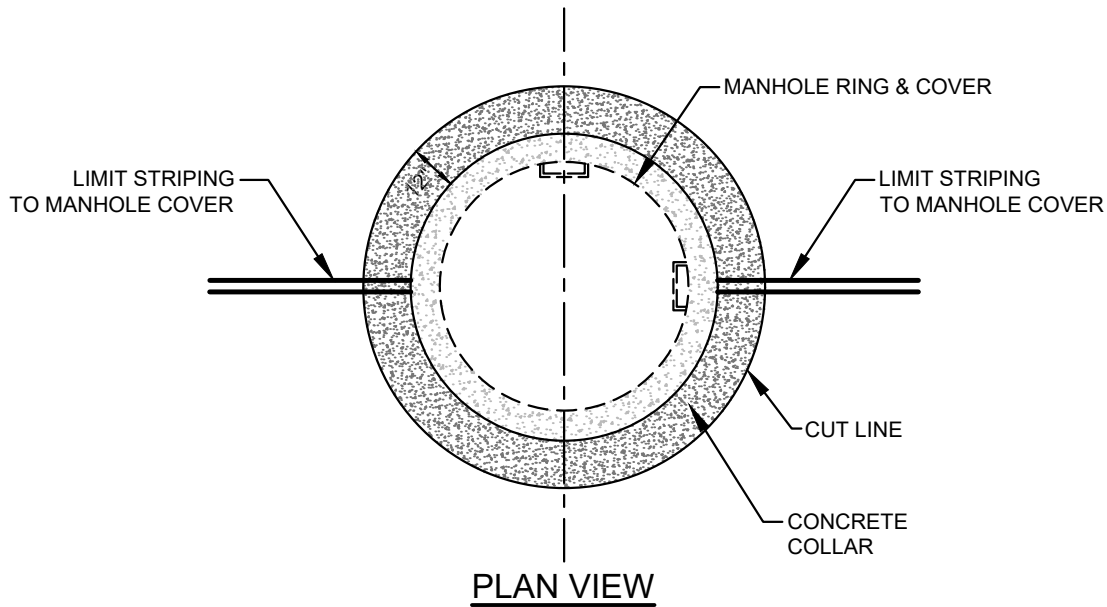
Date: 01/03/2023	Drawn: GKD
Scale: NONE	Revised: GKD
Approved by:	City Engineer

**CITY OF REDLANDS**  
Municipal Utilities & Engineering Department

STANDARD CLEANOUT

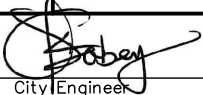
A-105

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**NOTE:**

1. SAW CIRCULAR AROUND MANHOLE 12" FROM MANHOLE FRAME.
2. MANHOLE SHALL BE MARKED PRIOR TO CUT THE PAVEMENT.
3. RAISE MANHOLE FRAME AND COVER TO FINISH GRADE BY INSTALLING CONCRETE RINGS AND LEVELING MORTAR.
4. BACKFILL WITH PCC CONCRETE TO FINISH GRADE.
5. CONCRETE TYPE SHALL BE 560-C-3250.
6. ADD QUIKRETE LIQUID CEMENT COLOR - CHARCOAL BLACK.
7. PROTECT FROM TRAFFIC LOADING UNTIL CONCRETE HAS CURED.
8. APPLY TACK COAT TO EDGES OF EXISTING PAVEMENT BEFORE INSTALLATION PATCH.
9. COLLARS ARE REQUIRED FOR ALL PAVED TRAVEL WAYS.

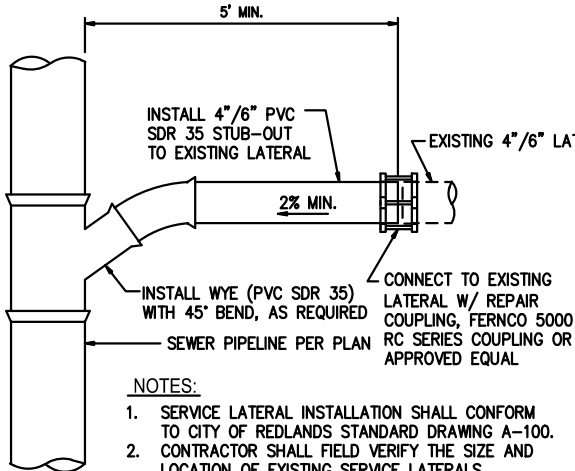
Date: 01/03/2023	Drawn: GKD
Scale: NONE	Revised: GKD
Approved by: 	

<b>CITY OF REDLANDS</b> Municipal Utilities & Engineering Department
CONCRETE COLLAR

A-106



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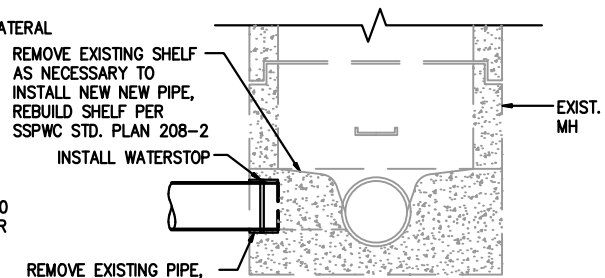


NOTES:

1. SERVICE LATERAL INSTALLATION SHALL CONFORM TO CITY OF REDLANDS STANDARD DRAWING A-100.
2. CONTRACTOR SHALL FIELD VERIFY THE SIZE AND LOCATION OF EXISTING SERVICE LATERALS.
3. THE LOCATION OF SERVICE LATERALS SHOWN ON THE PLAN ARE FOR REFERENCE ONLY.
4. ALL SERVICE LATERALS, SHOWN ON THE PLANS OR NOT, SHALL BE REINSTALLED UNLESS OTHERWISE DIRECTED BY THE CITY.

SERVICE LATERAL CONNECTION DETAIL

NOT TO SCALE



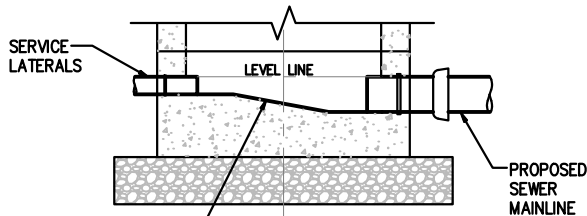
REMOVE EXISTING PIPE, DRILL OUT MH BASE TO ACCOMODATE INSTALLATION OF NEW PIPE PER SSPWC STD. PLAN 208-2

NOTES:

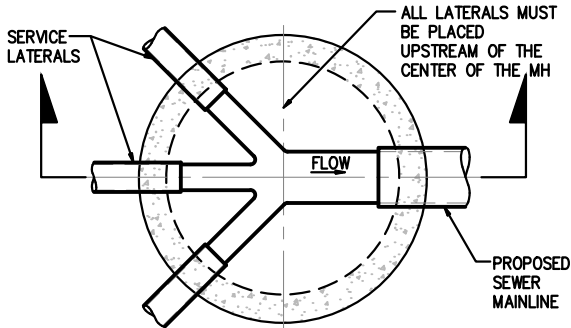
1. ORIENTATION OF INLET/OUTLET MAY VARY FROM WHAT IS SHOWN.
2. CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE TO EXISTING MAHNOLE, PIPES, BASE OR SHELF.

EXISTING MANHOLE CONNECTION DETAIL

NOT TO SCALE



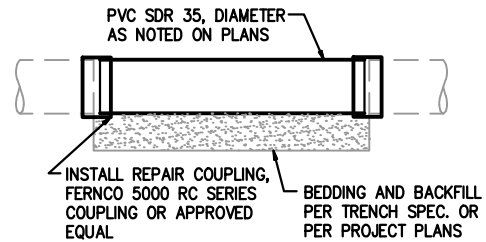
ELEVATION VIEW



PLAN VIEW

TERMINUS MH WITH LATERALS DETAIL

NOT TO SCALE



NOTES:

1. ADJUST CONNECTION TO MINIMIZE OFFSET AT PIPE FLOWLINE CONNECTION.
2. NEOPRENE REDUCER BUSHING MAY BE REQUIRED TO MINIMIZE OFFSET AT CONNECTION POINT.
3. NO CONNECTION WILL BE ALLOWED AT BELL END OF VCP, CUT BELL OFF VCP PRIOR TO MAKING CONNECTION.
4. CONTRACTOR SHALL ENSURE ALL DAMAGED AREAS OF PIPE ARE REMOVED AND REPLACED WITHIN DISTANCE SPECIFIED ON PLANS.
5. IF ADDITIONAL REPAIR DISTANCE IS REQUIRED ABOVE WHAT IS SHOWN ON PLANS, NOTIFY CITY PRIOR TO COMPLETING WORK.

TYPICAL SPOT REPAIR DETAIL

NOT TO SCALE

A-107

Date: 01/03/2023	Drawn: GKD
Scale: NONE	Revised: GKD
Approved by:	City Engineer

**CITY OF REDLANDS**  
Municipal Utilities & Engineering Department

MISCELLANEOUS DETAILS

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**APPENDIX A**

**BLANKET PERMITTANCE OF THE USE OF ALTERNATIVES TO WATERWORKS  
STANDARDS FOR SEPARATION DISTANCES OF WATER MAINS**

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## State Water Resources Control Board Division of Drinking Water

February 2, 2024

John R. Harris  
Director  
Redlands City MUD-Water DIV  
P.O. Box 3005  
Redlands, CA 92373  
[jharris@cityofredlands.org](mailto:jharris@cityofredlands.org)

Dear Mr. Harris,

**PERMIT AMENDMENT NO. 06-13-24PA-002 TO APPROVE BLANKET PERMITTANCE OF THE USE OF ALTERNATIVES TO WATERWORKS STANDARDS FOR SEPARATION DISTANCES OF WATER MAINS**

The State Water Resources Control Board, Division of Drinking Water (Division) is pleased to issue a permit amendment to City of Redlands (City) to allow the use of alternatives to American Waterworks standards for the separation of potable water mains from non-potable fluid carrying pipelines, in accordance with the submitted Standard Operating Procedure.

Attached to this letter is Permit Amendment No. 06-13-24PA-002, which includes specific provisions, appendices, and findings. Findings are detailed in the enclosed engineering report.

Please provide this office with a notice of receipt by March 3, 2024, that certifies the permit amendment was received, reviewed by appropriate managerial staff, and understood to contain legally enforceable conditions for system operation. The Division appreciates your cooperation and patience in the development of this permit amendment.

If you have any questions regarding the information contained in the permit amendment, please contact my staff David Divani at (909) 383-4320, or by email at [David.Divani@Waterboards.ca.gov](mailto:David.Divani@Waterboards.ca.gov).

---

E. JOAQUIN ESQUIVEL, CHAIR | ERIC OPPENHEIMER, EXECUTIVE DIRECTOR

464 W. 4th Street, #437, San Bernardino, CA 92401 | [www.waterboards.ca.gov](http://www.waterboards.ca.gov)

Sincerely,

Wei H. Chang, P.E.  
District Engineer  
San Bernardino District  
Southern California Field Operations Branch

Enclosures:

1. Permit Amendment No. 06-13-24PA-002
2. Supplementary Engineering Report

cc:

1. Goutam K. Dobby, City Engineer, via email at [gdobey@cityofredlands.org](mailto:gdobey@cityofredlands.org)
2. Paul Mariscal, Water Utility Manager via email at [pmariscal@cityofredlands.org](mailto:pmariscal@cityofredlands.org)

STATE OF CALIFORNIA

**AMENDMENT TO THE  
DOMESTIC WATER SUPPLY PERMIT ISSUED TO**

**City of Redlands  
CA3610037**

ORIGINAL PERMIT NO. 69-49      DATE OF ISSUE: October 24, 1969

AMENDMENT NO. 06-13-24PA-002      EFFECTIVE DATE: February 2, 2024

**WHEREAS:**

1. The **City of Redlands** public water system submitted a request letter to the State Water Resources Control Board, Division of Drinking Water (Division) on **March 24, 2023**, for an amendment to the Domestic Water Supply Permit issued to **City of Redlands** on **October 24, 1969**.
2. The purpose of the amendment, is to allow **City of Redlands** to make the following modification to the public water system:  
  

***Allow blanket permission of alternatives to Waterworks standards for separation distance of water mains in lieu of waiver process.***
3. The **City of Redlands** has submitted all of the supporting information required to evaluate the application.
4. The Division has evaluated the application and the supporting material and has determined that the proposed modifications comply with all applicable State drinking water requirements.



## **THEREFORE:**

The Division hereby approves the application submitted by the **City of Redlands** for a permit amendment. The Domestic Water Supply Permit issued to **City of Redlands** on **October 24, 1969**, is hereby amended as follows:

***The City of Redlands may implement alternatives to Waterworks standards for the separation distances of potable water mains from non-potable fluid carrying pipelines as described in the currently approved Standard Operating Procedures (SOP) document.***

This permit amendment is subject to the following conditions:

1. The City must comply with all requirements set forth in the California Safe Drinking Water Act, California Health and Safety Code, and any regulations, standards or orders adopted thereunder.
2. This document amends and adds to the domestic water supply permit issued to the City on October 24, 1969. If any provision of this amendment conflicts with those of the original, the provisions of this amendment must be followed.
3. The City must adhere to the water main separation requirements described in California Waterworks Standards (Title 22, California Code of Regulations (T22 CCR), section 64572), in all possible new pipeline installation projects and will implement alternatives only when meeting said requirements is not feasible.
4. Any and all new construction or replacement projects for which alternatives to waterworks standards for main separation are applicable, and for which alternatives will be implemented, must adhere to the construction, approval, and design practices of the approved Standard Operating Procedure (SOP).
5. For all new pipeline installation/replacement projects which do not comply with California Waterworks Standards (T22 CCR, Section 64572) and which are not addressed in the approved SOP, the City must submit an individual Waterworks Standards Main Separation Alternative Waiver Request, as shown in Appendix A of the approved SOP, for the Division's written approval prior to construction.
6. The City must maintain records and "as-built" diagrams of all pipeline installation and/or replacement projects which implement the alternatives described in the SOP.





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State Water Resources Control Board  
Division of Drinking Water

**Supplementary Engineering Report for Consideration of  
Permit Amendment No. 06-13-24PA-002**

**City of Redlands**

System No. CA3610037  
San Bernardino County

Prepared by: \_\_\_\_\_

A handwritten signature in black ink, appearing to read "David Divani", written over a horizontal line.

David Divani  
Water Resource Control Engineer  
San Bernardino District

Approved by: \_\_\_\_\_

Wei H. Chang, P.E.  
District Engineer  
San Bernardino District

February 2, 2024

## INTRODUCTION

### PURPOSE OF REPORT

The State Water Resources Control Board, Division of Drinking Water (hereinafter “Division”) has received the permit amendment application package submitted by City of Redlands (City) on March 24, 2023. The application package requests that the City be allowed blanket approval to implement alternatives to Waterworks Standards for separation distances of potable water mains required in California Code of Regulations, Title 22 (T22 CCR), Section 64572.

The purpose of this report is to document the Division’s review of the City’s application and supporting documents, and to make recommendations regarding the issuance of the requested permit amendment to City of Redlands.

### BACKGROUND INFORMATION

T22 CCR, Section 64572 describes the minimum distances that new potable water mains should be installed at, relative to existing pipelines carrying any of the following non-potable fluids:

- (1) Untreated sewage
- (2) Primary or secondary treated sewage
- (3) Disinfected secondary recycled water (various types)
- (4) Disinfected tertiary recycled water
- (5) Storm water (storm drainage pipelines)
- (6) Hazardous fluids, including fuels, industrial wastes, and wastewater sludge

Regulations exist for new water main pipelines that are installed parallel to, or cross over/under existing ones. Waterworks standards for separation distances between these pipelines are maintained to protect public health. The primary concern that these standards are developed and maintained to address is that of cross contamination. In the event that water mains rupture, crack, or otherwise become susceptible to infiltration of hazardous pathogens or toxic materials, the minimum separation distances ensure that risk of human exposure is minimal.

Under California T22 CCR, Section 64551.100, public water systems may propose the use of an alternative to the requirements of T22 CCR, Chapter 16, regarding California Waterworks standards. The City may implement this alternative if they demonstrate to the State Board that the proposed alternative would provide at least the same level of protection to public health as the standard, and only if written approval is obtained from the State Board prior to construction.

The City is classified as a community water system, and it is one which continues to expand its service area in order to provide water for customers. As expansion continues,

existing structures such as sanitary sewage pipelines and storm drains, structures subject to the Waterworks standard separation requirements, may be encountered. The placement of these existing structures may be vital to their function, making it infeasible for the City to install essential projects that meet separation distance requirements as described in regulations. In such cases, waiver requests may be made to the Division which permits the one-time use of one or multiple alternatives to Waterworks’ separation requirements. The City is knowledgeable and capable of utilizing measures that provide equal or greater protection to public health when typical separation distances cannot be met.

The City has requested general, blanket approval to implement alternatives to Waterworks standards for the separation of potable water mains and non-potable fluid carrying pipelines, in accordance with the procedures outlined in the Standard Operating Procedures (SOP), as found in Appendix A of this report. The SOP proposes specific alternative measures and describes scenarios in which alternatives will be used. The latest revised SOP, submitted January 23, 2024, has been reviewed by Division staff, and the measures described therein are believed to adequately provide equal or greater protection to public health.

## DESCRIPTION OF SYSTEM

The City operates under the domestic water supply permit No. 69-49 dated October 24, 1969. Issued permit amendments and permit letters are summarized in Table 1.

**Table 1: City of Redlands Permit Amendments**

Amendment	Date Issued	Purpose
69-49_PA1	01-22-1988	To Operate the Horace Hinckley Water Treatment Plant
69-49_PA2	04-22-1991	Construct And Operate Two GAC Treatment Plants to Remove Organic Chemical
PA 69-49_PA3	09-05-2001	To Operate the Texas Street GAC Facility
PA 69-49-PA4	05-31-2002	To Operate and Maintain as A Potable Municipal Water Source the Existing San Bernardino Ave Well
PA69-49_PA5	08-19-2002	To Operate and Maintain as A Potable Municipal Water Source the Blending of The Water from The Existing Well 10 And Well 13 With the Water from Pressure Zone 1750 In the Highland Reservoir
PA 69-49_PA6	12-05-2002	To Allow the Use of SWP Water and SAR Water as Acceptable Water Sources at the Henry Tate WTP
PA 69-49-PA7	08-04-2003	To Operate North Orange Well 2 as a Potable Municipal Water Source

PA 69-49_PA9	12-04-2003	To Allow Redlands to Use Additional Water Sources by Means of Placing North Orange Well 1 in Service
PA 69-49_PA8	12-04-2003	Allow Redlands to Treat 100 % State Water Project Water Up to A Maximum Capacity Of 8 Million Gallons Per Day at the Henry Tate SWTP
PA69-49_PA_10	08-05-2004	Perchlorate Treatment at Rees Well
PA69-49_PA11	08-19-2004	Blending of Water Produced from Well 38 & Well 39 Per Approved Blending Plan & Church Street Well and Orange St Well Per Approved Blending Plan
05-13-05PA-019	08-05-2005	Upgrades To the Tate Water Treatment Plant and Use of Mill Creek at the Hinckley Water Treatment Plant
05-13-09PA-015	04-10-2009	Revise The Highland Ave Reservoir Blending Operations to Include Blending Perchlorate, Church St Well/ Orange St Well Blending Well 38 & 39 and the Rees Ion Exchange
05-13-10PA-040	08-05-2010	To Convert the Existing Rees Well GAC Facility to Ion Exchange for the Treatment of Perchlorate from Reese Well
05-13-11PA-023	05-16-2011	Add The Refurbished Country Club 1 As an Approved Potable Water Storage Facility
05-13-11PA-039	08-17-2011	Add as an Approved Treatment the Blending of Agate Well 2 with Diluent Water from HWTP for the Reduction of Perchlorate
05-13-13PA-029	07-10-2013	Revised Condition for Permit for Redlands Horace P. Hinckley Water Treatment Plant
05-13-14PA-030	08-11-2014	For Use of Crafton Well to Supply Water to the Distribution System
2017PA-SCHOOLS	01-17-2017	To Establish Requirements for Lead Monitoring and Lead Sample Result Interpretation at Kindergarten To 12 Grade (K-12)
05-13-21PA-004	04-27-2021	To Allow Henry Tate SWTP to Treat 100% Santa Ana River Water and Approval of February 2021 Operations Plan
05-13-23PA-006	05-12-2023	To Remove the Perchlorate Treatment Plant at Rees Well

This permit amendment will allow the City to implement alternatives to standards, as described in the approved SOP, without the Division’s additional approval when the water main separation criteria fall into one of the scenarios described in the approved SOP.

The City has a total of 23,872 active service connections and a population of 78,025 as reported in the 2022 annual report. The City owns a total of 51 production wells including 33 active production wells, out of which 21 produce potable water and the other 12 supply

non-potable water for irrigation purposes. The potable wells have a total production capacity of 34 million gallons per day.

In addition, City has two surface water treatment plants, Hinckley and Tate, both which treat surface water from the Santa Ana River, Mill Creek, and State Project Water. The City's distribution system includes six pressure zones and 18 storage tanks. All tanks have been reported as inspected in the last five years and cleanings are maintained.

## **SOURCES OF INFORMATION**

Information for the preparation of this report was obtained from material submitted by the City with the blank waiver approval request letter. Additional information was obtained from records of the State Water Resources Control Board, Division of Drinking Water, San Bernardino District Office. At the time of writing this report, the approved SOP was submitted for division review on January 23, 2024.

Investigation, analyses, and preparation of this report were completed by David Divani, Water Resources Control Engineer with the San Bernardino District. The report was reviewed and approved by Wei H. Chang, P.E., District Engineer of the San Bernardino District.

## **INVESTIGATION AND FINDINGS**

### **STANDARD OPERATING PROCEDURES**

On March 24, 2023, the Division received the first draft of the City's proposed SOP, and the blanket waiver approval request letter. Upon Division review, revisions and clarifications to the SOP were requested to ensure equal or greater protection is provided. On January 23, 2024, the City submitted the final revisions of the revised SOP which is hereby approved as the basis for alternative construction procedures.

The City's SOP discusses the need for waivers from Waterworks standards, regulations outlining those standards, and the authority by which the Division may waive those requirements in order to use alternatives. In addition, it describes the criteria that a new project must meet for alternatives to be approved by City management, and the specific alternative materials, practices, and construction methods which will be used to provide at least equal protection for public health.

The City may implement alternatives to water main separation standards as described in the approved SOP if and only if the necessary pipeline construction project cannot reasonably be built in accordance with the requirements of Title 22, CCR, Section 64572. If the project falls within one of the scenarios described in the approved SOP, the City can implement the alternatives per the SOP without Division's approval. Any projects outside of the scenarios described in the approved SOP will require approval from the

Division using the typical one-time Water Main Separation waiver request form which is enclosed in Appendix A of the approved SOP.

Division staff have reviewed the SOP and found that the alternative measures proposed therein as alternatives to Waterworks separation distance standards will provide equal or greater protection to public health by reducing the risk of cross contamination in potable water mains. The approved SOP, as submitted January 23, 2024, by the City will serve as an adequate basis for the approval, and construction of supply and pipeline projects which cannot meet typical water main separation requirements. Should the City wish to revise the approved SOP, those revisions must be submitted to the Division for approval prior to implementation.

## CONCLUSIONS AND RECCOMENDATIONS

The State Water Resources Control Board, Division of Drinking Water finds that the City has proposed adequate measures to be implemented in cases that invoke this permit and that the Standard Operating Procedures document sufficiently addresses all concerns associated with waiving water main separation distance requirements. It is anticipated, based on available information, that the quality of water delivered will meet all applicable State Drinking Water Standards. Issuance of a permit amendment by the Division to the City of Redlands (City) is recommended subject to the following provisions.

1. The City must comply with all requirements set forth in the California Safe Drinking Water Act, California Health and Safety Code, and any regulations, standards or orders adopted thereunder.
2. This document amends and adds to the domestic water supply permit issued to the City on October 24, 1969. If any provision of this amendment conflicts with those of the original, the provisions of this amendment must be followed.
3. The City must adhere to the water main separation requirements described in California Waterworks Standards (Title 22, California Code of Regulations (T22 CCR), section 64572), in all possible new pipeline installation projects and will implement alternatives only when meeting said requirements is not feasible.
4. Any and all new construction or replacement projects for which alternatives to waterworks standards for main separation are applicable, and for which alternatives will be implemented, must adhere to the construction, approval, and design practices of the approved Standard Operating Procedure (SOP).
5. For all new pipeline installation/replacement projects which do not comply with California Waterworks Standards (T22 CCR, Section 64572) and which are not addressed in the approved SOP, the City must submit an individual Waterworks Standards Main Separation Alternative Waiver Request, as shown



- in Appendix A of the approved SOP, for the Division’s written approval prior to construction.
6. The City must maintain records and “as-built” diagrams of all pipeline installation and/or replacement projects which implement the alternatives described in the SOP.
  7. The City must maintain a directory that may be used to readily identify completed projects which implement alternatives, and must submit this directory to the Division annually. An example directory has been included in Appendix B of this permit amendment.
  8. “As-built” diagrams must contain all same information as would be included in a Waterworks Standards Main Separation Alternative Request (Appendix A of the approved SOP), which includes but is not limited to the new and old pipeline location, the waterworks standard that is unable to be met, and the additional measures implemented to protect public health.
  9. Upon Division’s request, the City must provide as-built diagrams for all new pipeline installation/replacement projects which make use of alternatives described in the approved SOP to the Division.
  10. Any modifications, alterations, or additions to the approved SOP dated January 23, 2024, must be submitted to the Division for review and written approval prior to implementation.

## **APPENDIX**

**Appendix A:** Approved Standard Operating Procedure (SOP) for Alternatives to Waterworks Standards

**Appendix B:** Example for Directory of Alternatives to Waterwork’s Standards for Main Separation

## CRITERIA FOR ALTERNATIVE WATER MAIN SEPARATION BLANKET WAIVERS

THIS STANDARD OPERATING PROCEDURE (SOP) IS WRITTEN TO SPECIFY REQUIREMENTS AND RECOMMENDATIONS REGARDING THE SEPARATION OF WATER MAINS WITH EXISTING UNDERGROUND UTILITIES IN ORDER TO MINIMIZE THE RISK OF CONTAMINATING DRINKING WATER.

### 1.0 INTRODUCTION, PURPOSE, OR SCOPE:

THE STATE WATER RESOURCES CONTROL BOARD (STATE BOARD), DIVISION OF DRINKING WATER (DIVISION) HAS RECEIVED SEVERAL WATERWORKS STANDARDS WAIVER REQUESTS FOR WATER MAIN SEPARATIONS FROM THE CITY OF REDLANDS (CITY). THE DIVISION HAS BEEN IN CORRESPONDENCE WITH STAFF AT THE CITY REGARDING CREATION OF AN ALTERNATIVE (BLANKET WAIVERS) IN LIEU OF THE CURRENT WATER MAIN SEPARATION WAIVER PROCESS WHICH IS REQUIRED BY THE WATERWORKS STANDARDS. THIS ALTERNATIVE WILL BE ACCOMPLISHED BY USING A PERMIT AMENDMENT AND SOP. THIS SOP COVERS THE PHYSICAL SEPARATION OF PIPES AND STRUCTURES CONTAINING DRINKING WATER AND THE ALTERNATIVE BLANKET WAIVERS SHALL ONLY BE USED FOR DESIGN AND/OR CONSTRUCTION WHERE THE CONDITIONS DO NOT ALLOW THE CITY TO ACHIEVE THE WATER MAIN SEPARATION CRITERIA IN ACCORDANCE WITH THE WATERWORKS STANDARDS.

### 2.0 DEFINITIONS

**WATER MAIN** – ANY PIPELINE, EXCEPT FOR USER SERVICE LINES, WITHIN THE DISTRIBUTION SYSTEM.

**SANITARY SEWER MAIN** – A GRAVITY SEWER CONVEYING UNTREATED MUNICIPAL WASTEWATER.

**SEWER FORCE MAIN** – A PRESSURIZED SEWER CONVEYING UNTREATED MUNICIPAL WASTEWATER.

**SEWER LATERAL** – A SEWER LINE CONNECTION THE BUILDING DRAIN AND THE SANITARY SEWER MAIN.

**STORM DRAIN** – PIPING AND COLLECTION EQUIPMENT USED FOR COLLECTING AND DISPOSING OF STORM WATER.

**COMPRESSION JOINTS** – A PUSH-ON JOINT THAT SEALS BY MEANS OF THE COMPRESSION OF A RUBBERING OR GASKET BETWEEN THE PIPE AND A BELL OR COUPLING.

**CONTINUOUS SLEEVE** – A PROTECTIVE TUBE OF HIGH-DENSITY-POLYETHYLENE (HDPE) PIPE WITH HEAT FUSION JOINTS OR OTHER NON-POTABLE METALLIC CASING JOINTS INTO WHICH A PIPE IS INSERTED.

**WRAPPED JOINT** – A PIPE WRAP TAPE THAT SEALS SEWER FORCE MAIN AT JOINTS.

### 3.0 GENERAL

WHEN BURIED WATER MAINS ARE IN CLOSE PROXIMITY TO NON-POTABLE PIPELINES, THE WATER MAINS ARE VULNERABLE TO CONTAMINATION THAT CAN POSE A RISK OF WATERBORNE DISEASE OUTBREAKS. FOR EXAMPLE, SEWERS (SANITARY SEWER MAINS AND SEWAGE FORCE MAINS) FREQUENTLY LEAK AND SATURATE THE SURROUNDING SOIL WITH SEWAGE DUE TO STRUCTURAL FAILURE, IMPROPERLY CONSTRUCTED JOINTS, AND/OR SUBSIDENCE OR UPHEAVAL OF THE SOIL ENCASING THE SEWER. IF A NEARBY WATER MAIN IS DEPRESSURIZED AND NO PRESSURE OR NEGATIVE PRESSURE OCCURS, THAT SITUATION IS A PUBLIC HEALTH HAZARD THAT IS COMPOUNDED IF AN EXISTING SEWER IS BROKEN DURING THE INSTALLATION OR REPAIR OF THE WATER MAIN. FURTHER, FAILURE OF A WATER MAIN IN CLOSE PROXIMITY TO OTHER PIPELINES MAY DISTURB THEIR BEDDING AND CAUSE THEM TO FAIL. IN THE EVENT OF AN EARTHQUAKE OR OTHER DISASTER, SIMULTANEOUS FAILURE OF ALL PIPELINES COULD OCCUR.

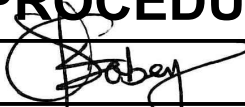
THE MOST EFFECTIVE PROTECTION AGAINST THIS TYPE OF DRINKING WATER CONTAMINATION IS ADEQUATE CONSTRUCTION AND SEPARATION OF NON-POTABLE PIPELINES AND WATER MAINS. THE WATERWORKS STANDARDS (CALIFORNIA CODE OF REGULATIONS (CCR), TITLE 22, CHAPTER 16, SECTION 64572) PROVIDE SEPARATION CRITERIA FOR NEW CONSTRUCTION. HOWEVER, WHEN THESE CRITERIA CANNOT BE MET, THE RISK OF CONTAMINATION CAN BE REDUCED BY INCREASING THE STRUCTURAL INTEGRITY OF PIPE MATERIALS AND JOINTS, AND ENSURING MINIMUM SEPARATION REQUIREMENTS ARE MET. THEREFORE, THE FOLLOWING GUIDANCE DETAILS CONSTRUCTION CRITERIA FOR THE INSULATION OF WATER MAINS AND NON-POTABLE PIPELINES TO MINIMIZE THE RISK OF CONTAMINATION OF DRINKING WATER.

## CITY OF REDLANDS MUNICIPAL UTILITIES AND ENGINEERING DEPARTMENT

# STANDARD OPERATING PROCEDURE (SOP)

SOP

APPROVED:



DATE: JAN. 2024

**1 OF 2**

REV.	BY	DATE

Goutam K. Dobey, City Engineer RCE 75646

#### 4.0 AUTHORITY

THE CALIFORNIA WATERWORKS STANDARDS ESTABLISHED CRITERIA FOR THE SEPARATION OF NEW WATER MAINS FROM NON-POTABLE PIPELINES. THE CITY WILL ENSURE THAT THE DISTANCE ARE MET, WHENEVER FEASIBLE, FOR ALL NEW CONSTRUCTION. THE DIVISION RECOGNIZES THAT CERTAIN CONDITIONS MAY CALL FOR THE INSTALLATION OF PIPELINES WITH LESS SEPARATION DISTANCE THAN WHAT IS REQUIRED BY THE REGULATIONS. IN THESE SITUATIONS, THE CITY PROPOSES AN ALTERNATIVE BLANKET WAIVERS PURSUANT TO CCR, TITLE 22, SECTION 64551.100.

#### 5.0 APPLICABILITY

- A. THE ALTERNATIVE CONSTRUCTION CRITERIA PRESENTED IN THIS DOCUMENT ALSO APPLIES TO SEWER LATERALS OR STORM DRAIN THAT CROSS ABOVE A WATER MAIN, BUT NOT TO THE SEWER LATERALS OR STORM DRAINS THAT CROSS BELOW A WATER MAIN.
- B. IN NO CASE, SHOULD WATER MAINS AND NON-POTABLE PIPELINES CONVEYING SEWAGE OR OTHER LIQUIDS BE INSTALLED IN THE SAME TRENCH.

#### 6.0 POLICY

CCR, TITLE 22, CHAPTER 16 WATERWORKS STANDARDS

- (1) SECTION 64572 WATER MAIN SEPARATION
- (2) SECTION 64551.100 WAIVERS AND ALTERNATIVES

THE CCR, TITLE 22, CHAPTER 16, WATERWORKS STANDARDS, SECTION 64572 WATER MAIN SEPARATION, AND SECTION 64551.100 WAIVERS AND ALTERNATIVES IS OUTLINED IN APPENDIX A.

#### 7.0 ALTERNATIVE CONSTRUCTION CRITERIA

WHEN NEW WATER MAINS AND NEW SANITARY SEWER MAINS ARE BEING INSTALLED IN EXISTING DEVELOPMENT AREAS, LOCAL CONDITIONS (E.G., AVAILABLE SPACE, LIMITED SLOPE, EXISTING STRUCTURES) MAY CREATE A SITUATION IN WHICH THERE IS NO ALTERNATIVE BUT TO INSTALL WATER MAINS AT A DISTANCE LESS THAN BASIC REQUIREMENTS SPECIFIED ABOVE. IN SUCH CASES, THE DIVISION MAY APPROVE ALTERNATIVE CONSTRUCTION CRITERIA.

ANY APPLICATION THAT PROPOSED TO USE THE ALTERNATIVE CONSTRUCTION CRITERIA SHALL DEMONSTRATE TO THE DIVISION HOW IT WILL INSTITUTE ADDITIONAL MITIGATION MEASURES TO ENSURE THAT THE PROPOSED ALTERNATIVE WOULD NOT RESULT IN AN INCREASED RISK TO THE PUBLIC HEALTH. A COPY OF THE STATE WATER RESOURCES CONTROL BOARD, DIVISION OF DRINKING WATER, EXAMPLES FOR WATERWORKS STANDARDS MAIN SEPARATION ALTERNATIVES APPLICATION IS OUTLINED IN APPENDIX A.

APPROPRIATE ALTERNATIVES CONDITION CRITERIA FOR TYPICAL SCENARIO(S) THE CITY EXPERIENCES IN WHICH THE BASIC REQUIREMENTS FOR WATER MAIN SEPARATION CANNOT BE MET SHALL BE DEMONSTRATED TO THE DIVISION. A COPY OF THE DIVISION OF DRINKING WATER (DDW) APPROVED WATERWORKS STANDARDS MAIN SEPARATION ALTERNATIVES (BLANKET WAIVERS) FOR THE USE OF THE CITY IS OUTLINED IN APPENDIX A.

#### 8.0 CITY DDW BLANKET WAIVERS TRACKING

FOR EACH INSTANCE THAT THE WATER MAIN IS NOT MEETING SEPARATION STANDARDS, THE REQUEST FOR AN ALTERNATIVE BLANKET WAIVERS SHALL BE TRACKED. THE CITY SHALL MAINTAIN A RECORD AVAILABLE FOR REVIEW BY THE DDW. CITY RECORD DRAWINGS TO BE KEPT AS A PERMANENT RECORD.

#### 9.0 REFERENCES

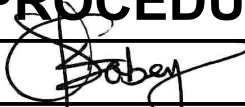
CALIFORNIA STATE WATER RESOURCES CONTROL BOARD (2017, APRIL 10). CALIFORNIA REGULATIONS RELATED TO DRINKING WATER.  
[HTTPS://WWW.WATERBOARDS.CA.GOV/DRINKING\\_WATER/CERTLIC/DRINKINGWATER/DOCUMENTS/LAWBOOK/DWREGULATIONS-2017-04-10.PDF](https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/lawbook/dwregulations-2017-04-10.pdf)

### CITY OF REDLANDS MUNICIPAL UTILITIES AND ENGINEERING DEPARTMENT

## STANDARD OPERATING PROCEDURE (SOP)

SOP

APPROVED:



DATE: JAN. 2024

2 OF 2

REV.	BY	DATE
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Goutam K. Dobey, City Engineer RCE 75646

# **APPENDIX "A"**

## **CRITERIA FOR THE SEPARATION OF WATER MAINS AND NON-POTABLE PIPELINES**

- I. California Code of Regulation Title 22, Chapter 16 "Waterworks Standards"
  1. Section 64572 Water Main Separation
  2. Section 64551.100 Waivers and Alternatives
  
- II. State Water Resources Control Board, Division of Drinking Water: Examples Request for Alternative Water Main Installation
  
- III. Division of Drinking Water Approved Alternative Installation "Blanket Waivers" for use in the City of Redlands

# I. California Code of Regulation Title 22, Chapter 16 "Waterworks Standards"

## 1. Section 64572 Water Main Separation

- (a) New water mains and new supply lines shall not be installed in the same trench as, and shall be at least 10 feet horizontally from and one foot vertically above, any parallel pipeline conveying:
  - (1) Untreated sewage,
  - (2) Primary or secondary treated sewage,
  - (3) Disinfected secondary-2.2 recycled water (defined in section 60301.220),
  - (4) Disinfected secondary-23 recycled water (defined in section 60301.225), and
  - (5) Hazardous fluids such as fuels, industrial wastes, and wastewater sludge.
- (b) New water mains and new supply lines shall be installed at least 4 feet horizontally from, and one foot vertically above, any parallel pipeline conveying:
  - (1) Disinfected tertiary recycled water (defined in section 60301.230), and
  - (2) Storm drainage.
- (c) New supply lines conveying raw water to be treated for drinking purposes shall be installed at least 4 feet horizontally from, and one foot vertically below, any water main.
- (d) If crossing a pipeline conveying a fluid listed in subsection (a) or (b), a new water main shall be constructed no less than 45-degrees to and at least one foot above that pipeline. No connection joints shall be made in the water main within eight horizontal feet of the fluid pipeline.
- (e) The vertical separation specified in subsections (a), (b), and (c) is required only when the horizontal distance between a water main and pipeline is less than ten feet.
- (f) New water mains shall not be installed within 100 horizontal feet of the nearest edge of any sanitary landfill, wastewater disposal pond, or hazardous waste disposal site, or within 25 horizontal feet of the nearest edge of any cesspool, septic tank, sewage leach field, seepage pit, underground hazardous material storage tank, or groundwater recharge project site.
- (g) The minimum separation distances set forth in this section shall be measured from the nearest outside edge of each pipe barrel.
- (h) With State Board approval, newly installed water mains may be exempt from the separation distances in this section, except subsection (f), if the newly installed main is:
  - (1) less than 1320 linear feet,
  - (2) replacing an existing main, installed in the same location, and has a diameter no greater than six inches more than the diameter of the main it is replacing, and
  - (3) installed in a manner that minimizes the potential for contamination, including, but not limited to:
    - (A) sleeving the newly installed main, or
    - (B) utilizing upgraded piping material.

## 2. Section 64551.100 Waivers and Alternatives

- (a) A water system that proposes to use an alternative to a requirement in this chapter shall:
  - (1) Demonstrate to the State Board that the proposed alternative would provide at least the same level of protection to public health; and
  - (1) Obtain written approval from the State Board prior to implementation of the alternative.

II. State Water Resources Control Board, Division of Drinking Water: Examples  
Request for Alternative Water Main Installation

**STATE WATER RESOURCES CONTROL BOARD**  
**Division of Drinking Water**  
**Waterworks Standards Main Separation Alternative**  
**Request Checklist**

**Water System Name/Number:** [Click here to enter text.](#)

**Name of Applicant:** [Click here to enter text.](#)

**Phone Number and Email Address:** [Click here to enter text.](#)

**Project Name and Location:** [Click here to enter text.](#)

**Attach Plans or field drawings to show the standard installation and the proposed installation for which the alternative is being requested. (e.g. vertical profile and horizontal alignment, specifications, and other exhibits, as possible)**

The Waterworks Standards in the California Code of Regulations (CCR) Title 22, Chapter 16, Section 64572 provide separation criteria for new construction. When buried water mains are in close proximity to non-potable pipelines, the water mains are vulnerable to contamination that can pose a risk of waterborne disease outbreaks.

Per CCR Title 22, Chapter 16, Section 64551.100, a water system that proposes to use an alternative to a requirement in Chapter 16 shall: 1) demonstrate to the State Board that the proposed alternative would provide at least the same level of protection to public health; and 2) obtain written approval from the State Board prior to implementation of the alternative. Requests for alternatives to the Waterworks Standards must consist of information outlined in at least four of the attachments below. Information contained in Attachments A, B and E will be required for all alternative requests. Information contained in Attachments C and/or D will also be needed depending on your particular situation. Please review all the attachments and submit the information for your specific project. The information must be submitted to your local Division of Drinking Water District Office for review and approval prior to construction.

**Attachment A** represents the standard pipe material and construction that would be used if the standard separation criteria can be met by the utility.

**Attachment B** represents information on the current pipe in the ground that is being crossed by a new pipeline or being paralleled by a new pipeline.

**Attachments C and D** represent information on the new pipeline being installed. Attachment C is for parallel construction and Attachment D is for crossings.

**Attachment E** is certification language that is needed to consider the Waterworks Standard alternative application.

Please Note: The information may be submitted using this checklist or another format, but all relevant information must be provided to the Division of Drinking Water District Office for consideration. If multiple crossings or parallel pipelines in multiple locations are part of the application, please indicate in the comments field of the applicable attachment or submittal. Alternatively, the applicant can provide an attachment or separate submittal for each location.

## Attachment A (All Cases)

### Water System's Standard Pipe Material and Construction Details

Attach the water system's standard pipe specification and construction details to this as Exhibit 1 and describe below.

Liquid Conveyed By New Pipeline:

- Domestic Water    Raw Water    Recycled Water  
 Sewer    Force Sewer    Storm Drain  
 Other (describe) [Click here to enter text.](#)

Nominal Size: [Click here to enter text.](#) inches

Operating Pressure: [Click here to enter text.](#) psi or  Gravity flow/atmospheric

Pipe Material:    Ductile Iron    Cast Iron    Welded Steel  
 HDPE    PVC    Concrete    Clay  
 Other describe   [Click here to enter text.](#)

AWWA Material Designation Code: [Click here to enter text.](#)

Pressure Class/Thickness/Coating [Click here to enter text.](#)

Joint Type Construction:    Push On    Restrained    Welded Joints    Fused  
 Other describe   [Click here to enter text.](#)

Depth of Cover: [Click here to enter text.](#)

**Comments:**  
[Click here to enter text.](#)

## Attachment B (All Cases)

### Existing Pipeline Material – Paralleling or Crossing the Proposed Pipe

List the condition of the existing pipeline being paralleled or crossed.

Liquid Conveyed By Existing Pipeline:

- Domestic Water    Raw Water    Recycled Water  
 Sewer    Force Sewer    Storm Drain  
 Other (describe) [Click here to enter text.](#)

Nominal Size: [Click here to enter text.](#) inches

Operating Pressure: [Click here to enter text.](#) psi or  Gravity flow/atmospheric

Pipe Material:    Ductile Iron    Cast Iron    Welded Steel  
 HDPE    PVC    Concrete    Clay  
 Other (describe) [Click here to enter text.](#)

AWWA Material Designation Code: [Click here to enter text.](#)

Pressure Class/Thickness/Coating [Click here to enter text.](#)

Joint Type Construction:    Push On    Restrained    Welded Joints    Fused  
 Other (describe) [Click here to enter text.](#)

Length of Project: [Click here to enter text.](#)

Age/Condition: [Click here to enter text.](#)

Depth of Cover: [Click here to enter text.](#)

Separation from proposed pipeline

Note: all distances are measured from the outside walls of both pipelines.

Vertical: [Click here to enter text.](#)

Horizontal: [Click here to enter text.](#)

Have there been many repairs on the existing pipeline in this area?    Yes    No

If yes, explain: [Click here to enter text.](#)

#### COMMENTS:

[Click here to enter text.](#)



## Attachment C

### Proposed Parallel Pipeline Material and Construction Information

Where the Waterworks Standards cannot be met, it is the responsibility of the water system proposing an alternative to demonstrate that its proposed construction will have at least the “same level of protection to public health” as the minimum separation distances prescribed in the regulations.

Intended Use of New Pipeline:     Distribution    Transmission    Storage  
 Other (describe)\_[Click here to enter text.](#)

Liquid Conveyed:

Domestic Water    Raw Water             Recycled Water  
 Sewer                     Force Sewer             Storm Drain  
 Other (describe) [Click here to enter text.](#)

Nominal Size: [Click here to enter text.](#) inches    Flow rate: [Click here to enter text.](#) gpm  
Operating Pressure: [Click here to enter text.](#) psi or  Gravity flow/atmospheric

Pipe Material:             Ductile Iron             Cast Iron    Welded Steel  
 HDPE                     PVC             Concrete             Clay  
 Other describe    [Click here to enter text.](#)

AWWA Material Designation Code: [Click here to enter text.](#)

Pressure Class/Thickness/Coating [Click here to enter text.](#)

Joint Type Construction:     Push On    Restrained    Welded Joints    Fused  
 Other describe    [Click here to enter text.](#)

Length of Project: [Click here to enter text.](#)

Depth of Cover: [Click here to enter text.](#)

Separation From Existing Non- Potable Pipeline

Note: all distances are measured from the outside walls of both pipelines.

Vertical: [Click here to enter text.](#)

Horizontal: [Click here to enter text.](#)

Is this a temporary installation?    Yes    No

If yes, how long will it be in place? [Click here to enter text.](#)

**Can the new pipeline be installed in accordance with the Waterworks Standards? If not explain below:**

[Click here to enter text.](#)

**Proposed additional protective measures (*material construction methods, operational considerations, etc.*):**

## Attachment C

[Click here to enter text.](#)

Attach additional exhibits as necessary

## Attachment D

### Proposed Pipeline Crossing Material and Construction Information

Where the Waterworks Standards cannot be met, it is the responsibility of the water system proposing an alternative to demonstrate that its proposed construction will have at least the “same level of protection to public health” as the minimum separation distances prescribed in the regulations.

Intended Use of New Pipeline:     Distribution    Transmission    Storage  
 Other (describe)\_[Click here to enter text.](#)

Liquid Conveyed:

Domestic Water    Raw Water             Recycled Water  
 Sewer                     Force Sewer             Storm Drain  
 Other (describe) [Click here to enter text.](#)

Nominal Size: [Click here to enter text.](#) inches  
Operating Pressure: [Click here to enter text.](#) psi or  Gravity flow/atmospheric

Pipe Material:             Ductile Iron             Cast Iron    Welded Steel  
 HDPE                     PVC             Concrete             Clay  
 Other describe    [Click here to enter text.](#)

AWWA Material Designation Code: [Click here to enter text.](#)

Pressure Class/Thickness/Coating [Click here to enter text.](#)

Joint Type Construction:     Push On    Restrained    Welded Joints    Fused  
 Other describe    [Click here to enter text.](#)

Length of Project: [Click here to enter text.](#)

Depth of Cover: [Click here to enter text.](#)

Number of Crossings: [Click here to enter text.](#)

Angle of Crossings: [Click here to enter text.](#)

**Description of crossing pipelines:**  
[Click here to enter text.](#)

## Attachment D

**Can the new pipeline be installed in accordance with the Waterworks Standards? If not explain below:**

[Click here to enter text.](#)

**Proposed additional protective measures (*material construction methods, operational considerations, etc.*):**

[Click here to enter text.](#)

Attach additional exhibits as necessary

## Attachment E Certification

### CERTIFYING SIGNATURE:

*For consultants, contractors, and developers: attach written concurrence from the governing water system and pipeline owners stating that the selected project alternative is the preferred alternative.*

Attached concurrence?:  YES  NO  N/A

I certify that the forgoing information is true and correct to the best of my ability, and that I believe this alternative would provide at least the same level of protection to public health as the minimum separation distances prescribed in the California Waterworks Standards (CCR, Title 22, Section 64572)..

---

Signature

Name and Title [Click here to enter text.](#)

Date [Click here to enter a date.](#)

## LIST OF MATERIALS

### STANDARD MATERIALS

#### Water

DIP (Ductile Iron Pipe) CL150

Push-on Joints

CML&C Steel Pipe (10 ga)

3" and larger fittings  
250 psi AWWA C110 C104

#### Sewer

Vitrified Clay Pipe (VCP)  
Extra Strength SSPWC

SDR35 PVC (Polyvinyl Chloride) pipe

#### Storm Drain

Non-continuous RCP  
(Reinforced Concrete Pipe) D-1500

### UPGRADED MATERIALS

#### Water

DIP (Ductile Iron Pipe) CL350

Restrained Joints

CML&C Steel Pipe (10 ga)

3" and larger fittings  
250 psi AWWA C110 C104

#### Sewer

Vitrified Clay Pipe (VCP)  
High Strength SSPWC

SDR27 PVC (Polyvinyl Chloride) pipe

#### Storm Drain

Continuous HDPE  
(High Density Polyethylene) Pipe

Reinforced Concrete beam with RCP  
(Reinforced Concrete Pipe) D-1500

## LIST OF CONSTRUCTION METHODS

### STANDARD CONSTRUCTION METHODS

#### Water

Thrust blocks at directional changes

Push-on joints

No reinforced concrete blanket protection of existing water main when SD is built under water main.

#### Sewer

VCP Push on compression Joints

#### Storm Drain (SD)

No protection of existing SD at new Water main at crossing.

### UPGRADED CONSTRUCTION METHODS

#### Water

Restrained Joints at directional changes

Restrained Joints at crossings

Reinforced concrete blanket protection of existing water main when SD is built under water main.

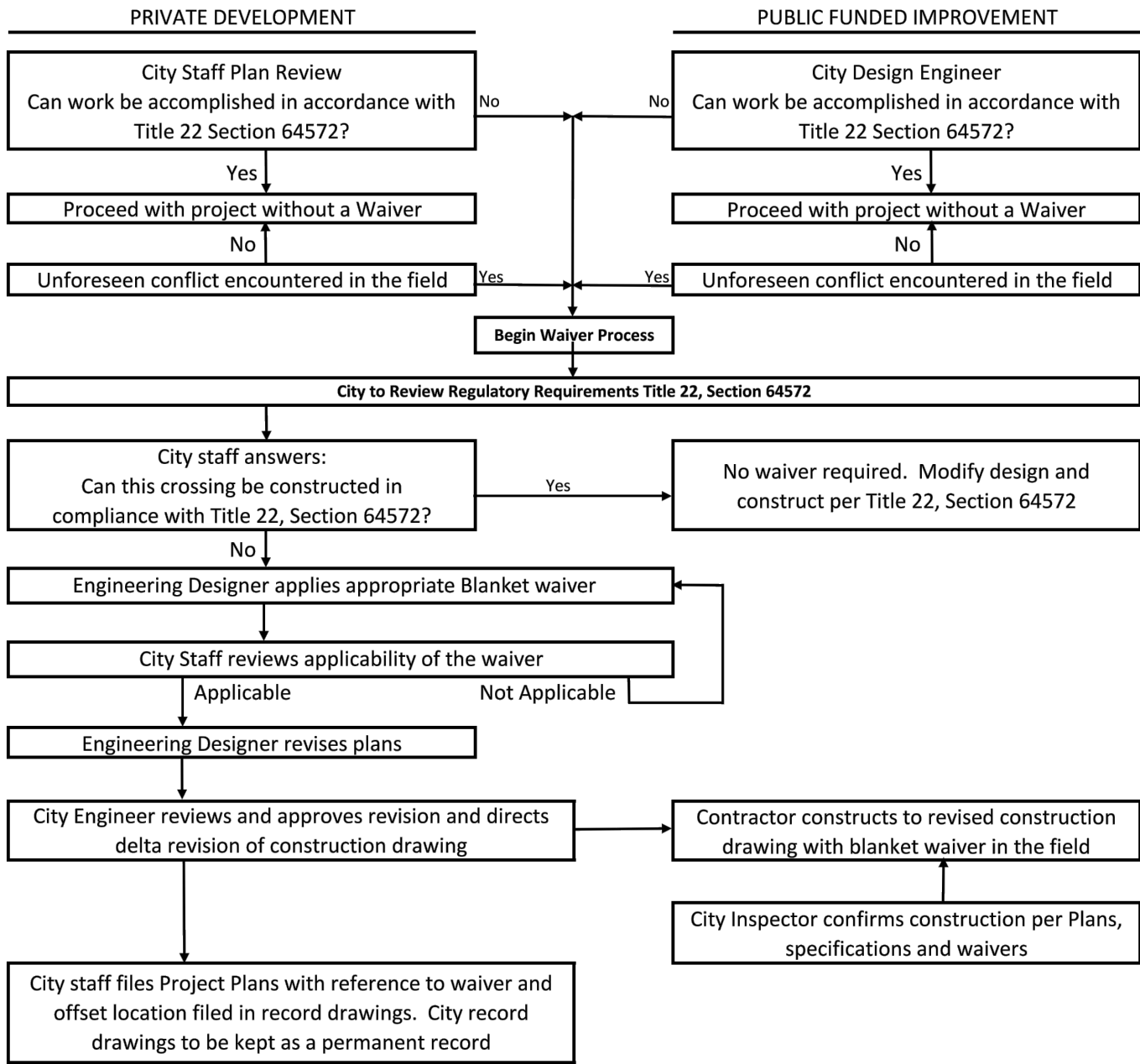
#### Sewer

PVC solvent weld pipe

#### Storm Drain

Reinforced concrete blanket protection of existing RCP at new watermain at crossing under SD.

**FLOW CHART FOR WAIVER**



**Definitions**

**City Staff** – Plan review Engineer under the supervision of the City Engineer

**City Design Engineer** – City Staff Engineer or Consultant who prepares City’s capital improvement project plans.

**Engineering Designer** – Private consultant or City Staff Engineer.

**Permanent records** – include final record drawings, encroachment permit, and inspection records.

**Record Drawings** – Project plans kept in mylar and digital format. These include original plans plus any delta revisions if applicable. These are permanent records.

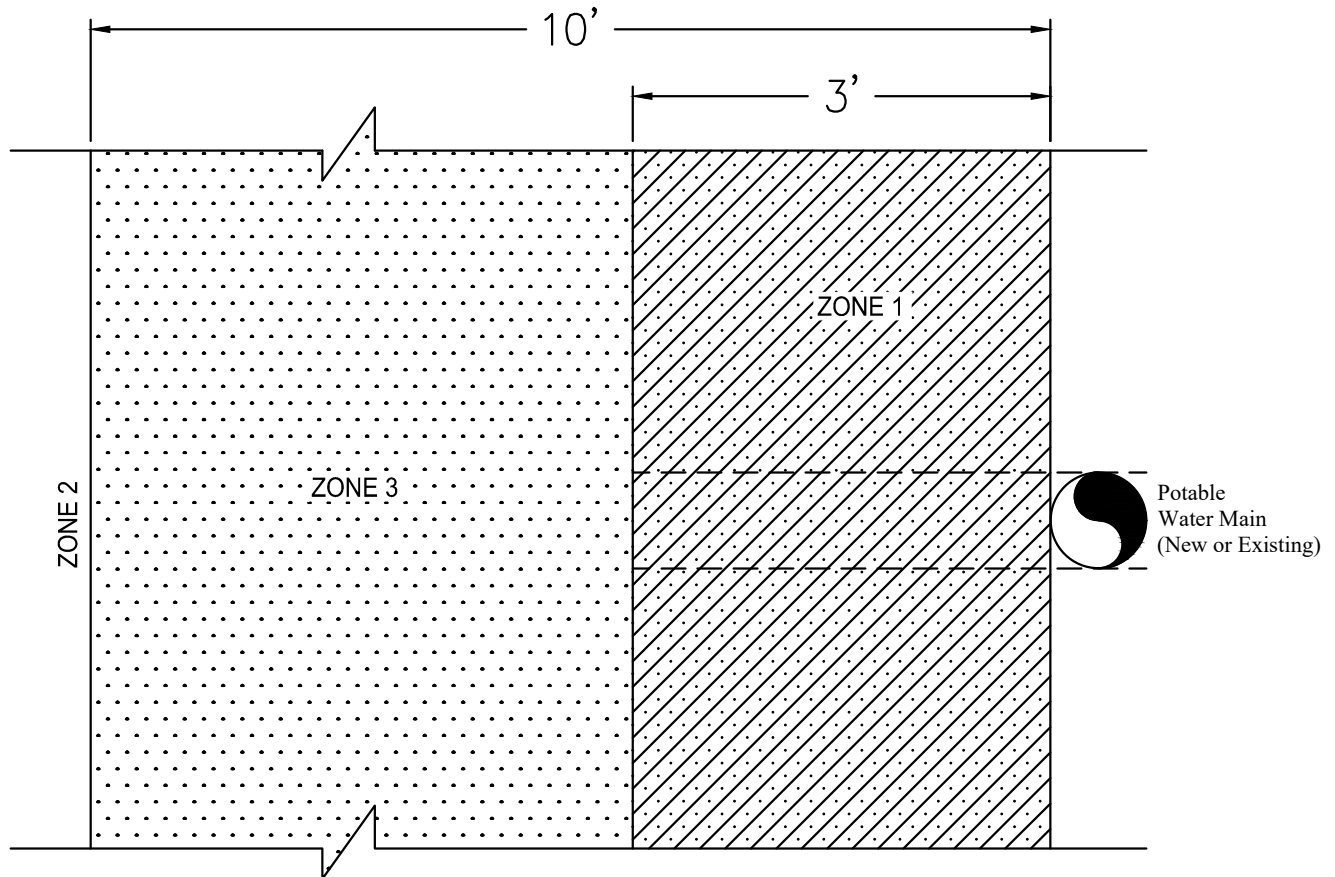


### III. Division of Drinking Water Approved Alternative Installation "Blanket Waivers' for use in the City of Redlands

Note: Design and/or installations per one or more of the approved Blanket Waivers attached to this appendix may only be used when the standard Water Main Separations per Section 64572 of the Waterworks Standards cannot be met. Section 64572 of the California Waterworks Standards can be found in the California Code of Regulations (CCR), Title 22, under Chapter 16, current language is herein. Minimum separations shown on individual Blanket Waivers are to be adhered to, but when practical and field conditions allow, greater separations between water mains and non-potable pipelines shall be utilized.

#### **List of Blanket Waivers:**

1. New Sanitary Sewer Installation Parallel to Water Main
2. New Storm Drain or Recycled Water Installation Parallel to Water Main
3. New Water Main Installation Parallel to Sanitary Sewer Pipe
4. New Water Main Installation Parallel to Storm Drain Line
5. New Sanitary Sewer Line Over or Under New or Existing Water Main
6. New Water Main Crossing Over or Under Sanitary Sewer Pipe
7. New Storm Drain Line Over or Under New or Existing Water Main
8. New Water Main Crossing Over or Under Existing Storm Drain Pipe
9. Non Typical Installation - Sewer Lateral Over Water Main
10. Water Main Lowering
11. Water Main Over Structure
12. Separation Details for Sewer Force Main Conditions



**New Sanitary Sewer Alternate Installation Zones**

- ZONE 1: PROHIBITED ZONE, NO INSTALLATION ALLOWED. SPECIAL APPROVAL REQUIRED BY STATE WATER BOARD AND CITY.
- ZONE 2: NO SPECIAL REQUIREMENTS FOR INSTALLATION.
- ZONE 3: SANITARY SEWER LINES ALLOWED PER THE FOLLOWING UPGRADED MATERIAL REQUIREMENTS: SANITARY SEWER PIPE SHALL BE BELL AND SPIGOT; ASTM 3034 COMPLIANT SDR27 PVC. MATERIAL USES SHALL ALSO COMPLY WITH ALL APPLICABLE CITY STANDARD.

**NOTES:**

1. THIS BLANKET WAIVER SHALL ONLY BE USED UPON APPROVAL BY THE CITY, AND WHERE CONDITIONS DO NOT ALLOW FOR THE MINIMUM 1-FT VERTICAL SEPARATION AS SPECIFIED IN THE CALIFORNIA WATERWORKS STANDARDS, ARTICLE 4, SECTION 64572 "WATER MAIN SEPARATION". SEE THE CITY OF REDLANDS WATER SYSTEMS STANDARDS SPECIFICATIONS FOR ADDITIONAL INFORMATION.
2. DIMENSIONS SHOWN ARE MINIMUMS, PIPES SHALL BE INSTALLED WITH AS MUCH SEPARATION AS FIELD CONDITIONS ALLOW.
3. ALL FITTINGS AND/OR CONNECTIONS TO PIPES SHALL COMPLY WITH CITY DESIGN AND CONSTRUCTION STANDARDS AND THIS ALTERNATE CONSTRUCTION BLANKET WAIVER.
4. 1,320 FEET MAXIMUM FOR ZONE 3.
- \*5. WHEN A SEWER FORCE MAIN MUST CROSS A WATER MAIN, THE CROSSING SHOULD BE AS CLOSE AS PRACTICAL TO THE PERPENDICULAR AND NO LESS THAN 45°. THE SEWER FORCE MAIN SHOULD BE AT LEAST ONE FOOT BELOW THE WATER MAIN AND HAVE NO JOINTS WITHIN EIGHT FEET FROM EITHER SIDE OF THE WATER MAIN PER 64572(D).
- \*6. WHEN A NEW SEWER FORCE MAIN CROSSES AN EXISTING WATER MAIN, AND A ONE-FOOT VERTICAL SEPARATION CANNOT BE PROVIDED, ALL PORTIONS OF THE SEWER FORCE MAIN WITHIN EIGHT FEET (HORIZONTALLY) OF THE OUTSIDE WALLS OF THE WATER MAIN SHOULD BE ENCLOSED IN A CONTINUOUS SLEEVE. IN THESE CASES, A MINIMUM VERTICAL SEPARATION DISTANCE OF 6 INCHES MUST BE MAINTAINED BETWEEN THE OUTSIDE EDGE OF THE BOTTOM OF THE WATER MAIN AND THE TOP OF THE CONTINUOUS SLEEVE (SEE DETAIL 12). PIPE CASING PER STD. A-20522.
- \* APPLIED TO SEWER FORCE MAIN CONDITIONS ONLY.

**CITY OF REDLANDS MUNICIPAL UTILITIES AND ENGINEERING DEPARTMENT**

**NEW SANITARY SEWER INSTALLATION  
PARALLEL TO WATER MAIN**

BLANKET  
WAIVER

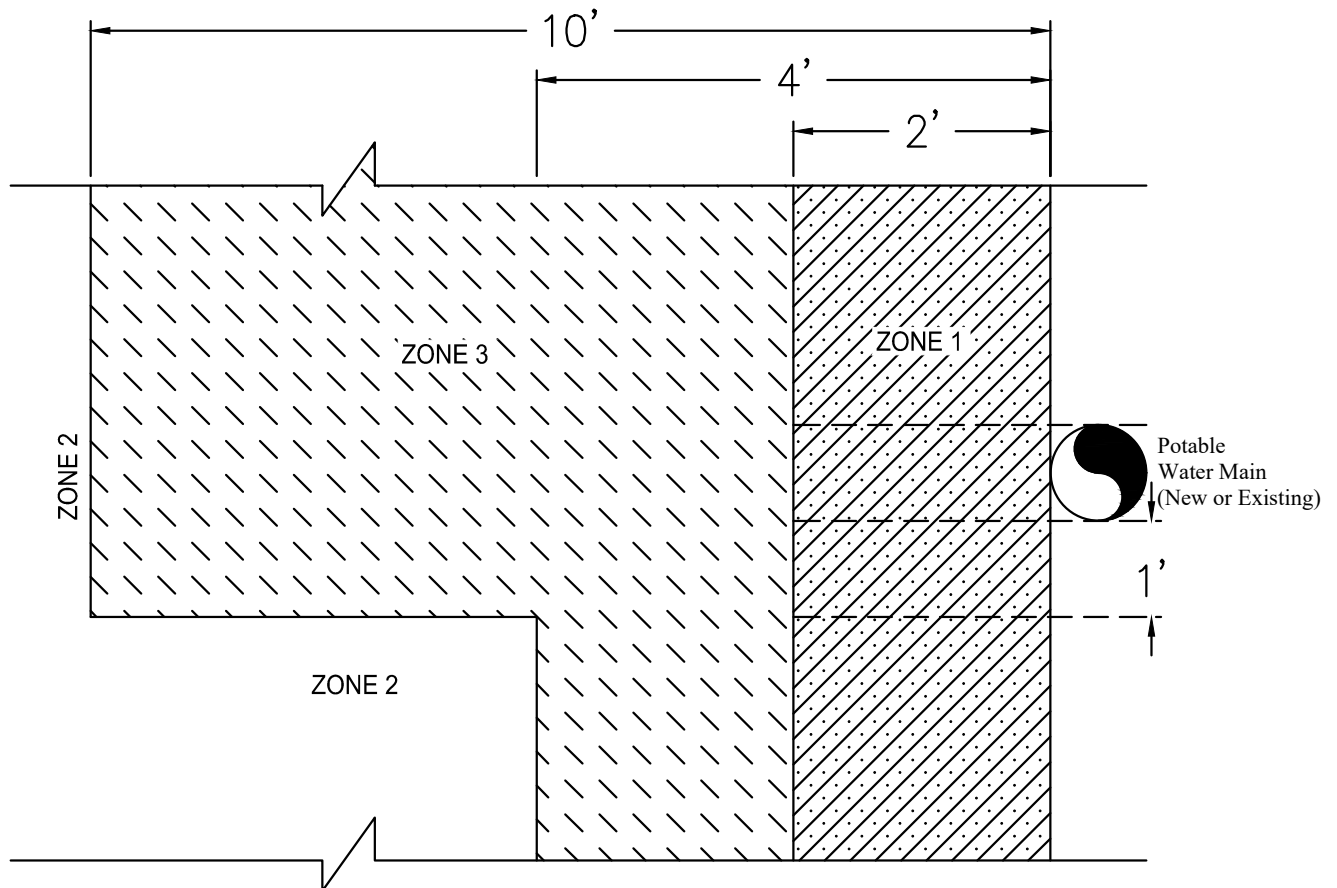
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DATE: DEC. 2023

**1**

Goutam K. Dobby, City Engineer RCE 75646

REV.	BY	DATE



**New Storm Drain Alternate Installation Zones**

ZONE 1: PROHIBITED ZONE, NO INSTALLATION ALLOWED.

ZONE 2: NO SPECIAL REQUIREMENTS FOR INSTALLATION.

ZONE 3: STORM DRAIN LINES ALLOWED PER THE FOLLOWING UPGRADED MATERIAL REQUIREMENTS: PIPE SHALL BE BELL AND SPIGOT; CLASS III, IV OR V REINFORCED CONCRETE (RCP). ALL JOINTS SHALL BE WELDED OR RETRAINED JOINTS. RCP CLASS SHALL BE DETERMINED BY CITY FOR EACH SPECIFIC INSTALLATION. TERTIARY RECYCLED WATER OR NON-POTABLE WATER LINES ALLOWED CLASS 350 RESTRAINED DUCTILE IRON PIPE (DIP).

**NOTES:**

1. THIS BLANKET WAIVER SHALL ONLY BE USED UPON APPROVAL BY THE CITY, AND WHERE CONDITIONS DO NOT ALLOW FOR THE MINIMUM 1-FT VERTICAL SEPARATION AS SPECIFIED IN THE CALIFORNIA WATERWORKS STANDARDS, ARTICLE 4, SECTION 64572 "WATER MAIN SEPARATION". SEE THE CITY OF REDLANDS WATER SYSTEMS STANDARDS SPECIFICATIONS FOR ADDITIONAL INFORMATION.
2. DIMENSIONS SHOWN ARE MINIMUMS, PIPES SHALL BE INSTALLED WITH AS MUCH SEPARATION AS FIELD CONDITIONS ALLOW.
3. ALL FITTINGS AND/OR CONNECTIONS TO PIPES SHALL COMPLY WITH CITY DESIGN AND CONSTRUCTION STANDARDS AND THIS ALTERNATE CONSTRUCTION BLANKET WAIVER.
4. 1,320 FEET MAXIMUM FOR ZONE 3.

**CITY OF REDLANDS MUNICIPAL UTILITIES AND ENGINEERING DEPARTMENT**

**NEW STORM DRAIN OR RECYCLED WATER  
INSTALLATION PARALLEL TO WATER MAIN**

BLANKET  
WAIVER

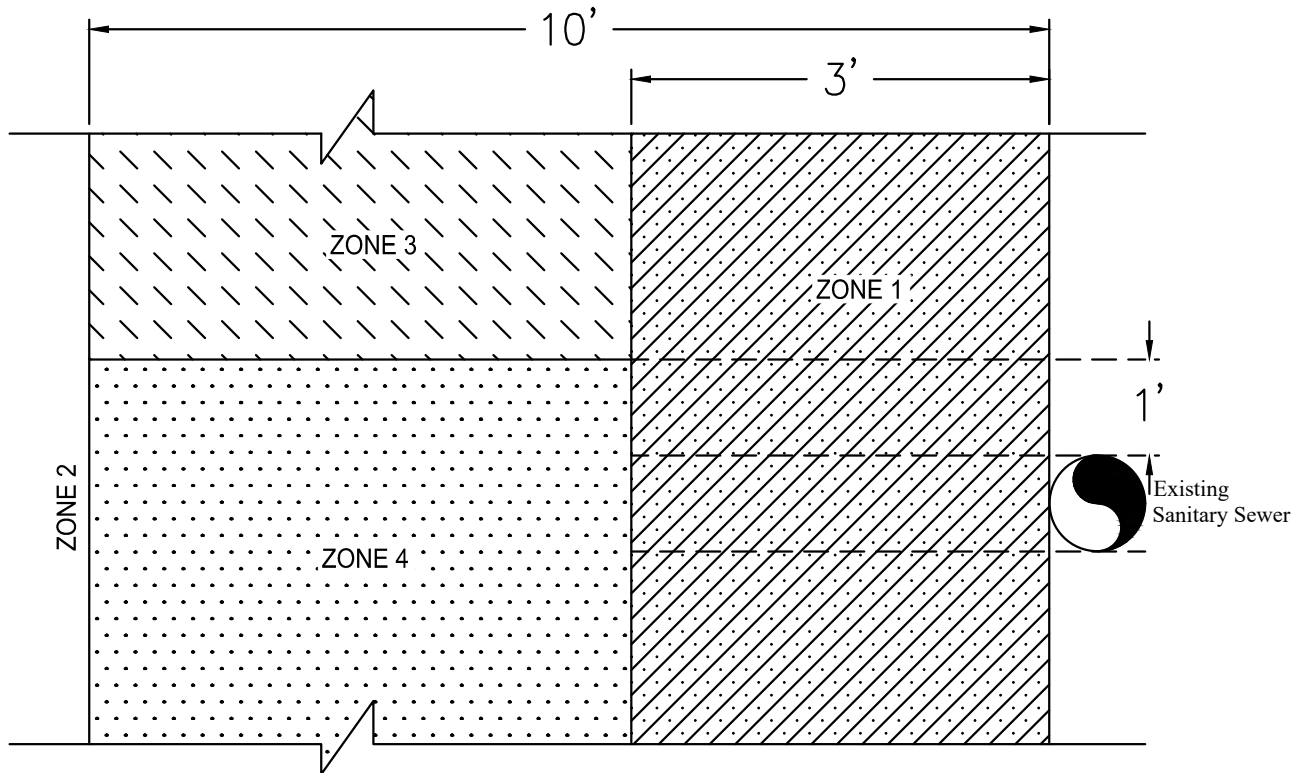
APPROVED:

DATE: DEC. 2023

**2**

Goutam K. Dobby, City Engineer RCE 75646

REV.	BY	DATE



**New Potable Water Main Alternate Installation Zones**

- ZONE 1: PROHIBITED ZONE, NO INSTALLATION ALLOWED.
- ZONE 2: NO SPECIAL REQUIREMENTS FOR INSTALLATION.
- ZONE 3: NEW WATER MAIN ONLY ALLOWED FOR EXISTING STORM DRAIN OR DISINFECTED TERTIARY RECYCLED WATER. NEW WATER MAIN SHALL BE INSTALLED PER CITY STANDARDS.
- ZONE 4: NEW WATER MAIN SHALL BE INSTALLED WITH UPGRADED MATERIALS: CLASS 350 DUCTILE IRON PIPE (DIP) WITH RESTRAINED JOINTS; CML&C WELDED STEEL PIPE, OR WITH SPECIAL APPROVAL BY THE CITY, HIGH DENSITY POLYETHYLENE PIPE WITH FUSION WELDED JOINTS.

**NOTES:**

1. ONLY TO BE USED UPON APPROVED BY THE CITY, AND WHERE CONDITIONS DO NOT ALLOW FOR THE MINIMUM 1-FT VERTICAL SEPARATION AS SPECIFIED IN THE CALIFORNIA WATERWORKS STANDARDS, ARTICLE 4, SECTION 64572 "WATER MAIN SEPARATION". SEE THE CITY OF REDLANDS WATER SYSTEMS STANDARDS SPECIFICATIONS FOR ADDITIONAL INFORMATION.
  2. DIMENSIONS SHOWN ARE MINIMUMS, PIPES SHALL BE INSTALLED WITH AS MUCH SEPARATION AS FIELD CONDITIONS ALLOW.
  3. ALL FITTINGS AND/OR CONNECTIONS TO WATER MAIN SHALL BE WATERTIGHT RUBBER GASKETED TYPE WITH A MINIMUM PRESSURE RATING OF 250PSI, AND SHALL OTHERWISE COMPLY WITH CITY DESIGN AND CONSTRUCTION STANDARDS AND THIS ALTERNATE CONSTRUCTION BLANKET WAIVER.
  - \*4. WHEN A SEWER FORCE MAIN MUST CROSS A WATER MAIN, THE CROSSING SHOULD BE AS CLOSE AS PRACTICAL TO THE PERPENDICULAR AND NO LESS THAN 45°. THE SEWER FORCE MAIN SHOULD BE AT LEAST ONE FOOT BELOW THE WATER MAIN AND HAVE NO JOINTS WITHIN EIGHT FEET FROM EITHER SIDE OF THE WATER MAIN PER 64572(D).
  - \*5. WHEN A NEW SEWER FORCE MAIN CROSSES AN EXISTING WATER MAIN, AND A ONE-FOOT VERTICAL SEPARATION CANNOT BE PROVIDED, ALL PORTIONS OF THE SEWER FORCE MAIN WITHIN EIGHT FEET (HORIZONTALLY) OF THE OUTSIDE WALLS OF THE WATER MAIN SHOULD BE ENCLOSED IN A CONTINUOUS SLEEVE. IN THESE CASES, A MINIMUM VERTICAL SEPARATION DISTANCE OF 6 INCHES MUST BE MAINTAINED BETWEEN THE OUTSIDE EDGE OF THE BOTTOM OF THE WATER MAIN AND THE TOP OF THE CONTINUOUS SLEEVE (SEE DETAIL 12). PIPE CASING PER STD. A-20522.
- \* APPLIED TO SEWER FORCE MAIN CONDITIONS ONLY.

**CITY OF REDLANDS MUNICIPAL UTILITIES AND ENGINEERING DEPARTMENT**

**NEW WATER MAIN INSTALLATION  
PARALLEL TO SANITARY SEWER LINE**

BLANKET  
WAIVER

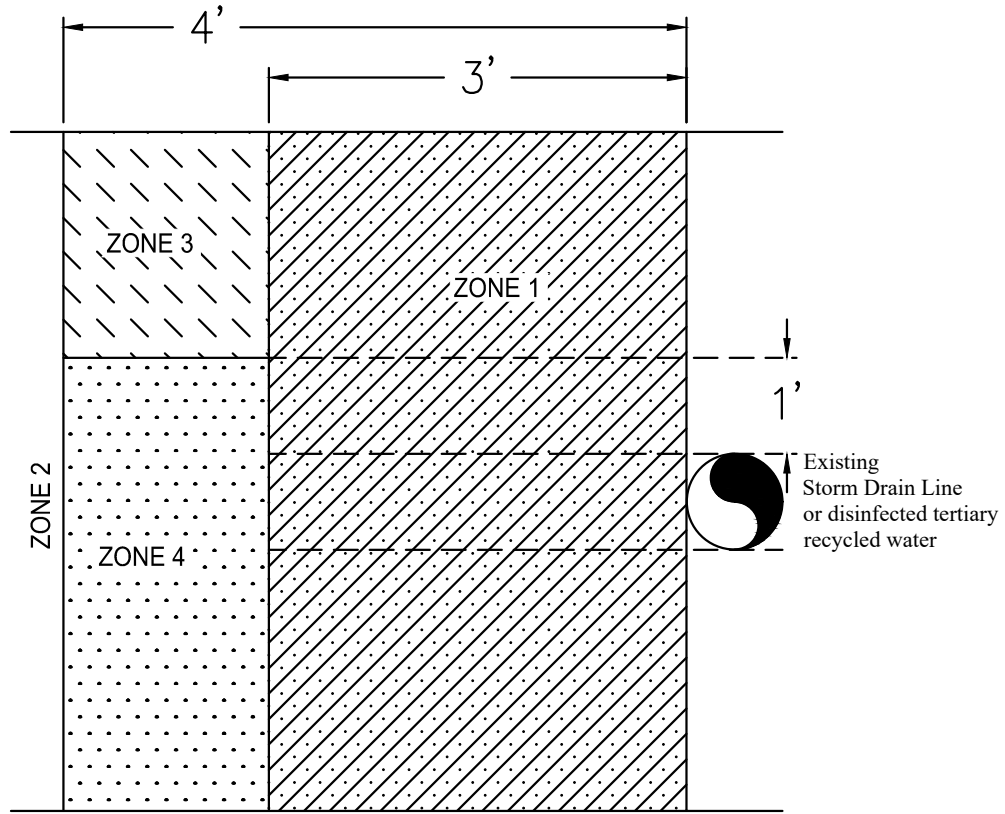
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DATE: DEC. 2023

**3**

Goutam K. Dobby, City Engineer RCE 75646

REV.	BY	DATE



New Potable Water Main Alternate Installation Zones

- ZONE 1: PROHIBITED ZONE, NO INSTALLATION ALLOWED.
- ZONE 2: NO SPECIAL REQUIREMENTS FOR INSTALLATION.
- ZONE 3: NEW WATER MAIN ONLY ALLOWED FOR EXISTING STORM DRAIN OR DISINFECTED TERTIARY RECYCLED WATER. NEW WATER MAIN SHALL BE INSTALLED PER CITY STANDARDS.
- ZONE 4: NEW WATER MAIN SHALL BE INSTALLED WITH UPGRADED MATERIALS: CLASS 350 DUCTILE IRON PIPE (DIP) WITH RESTRAINED JOINTS; CML&C WELDED STEEL PIPE, OR WITH SPECIAL APPROVAL BY THE CITY, HIGH DENSITY POLYETHYLENE PIPE WITH FUSION WELDED JOINTS.

NOTES:

1. ONLY TO BE USED UPON APPROVED BY THE CITY, AND WHERE CONDITIONS DO NOT ALLOW FOR THE MINIMUM 1-FT VERTICAL SEPARATION AS SPECIFIED IN THE CALIFORNIA WATERWORKS STANDARDS, ARTICLE 4, SECTION 64572 "WATER MAIN SEPARATION". SEE THE CITY OF REDLANDS WATER SYSTEMS STANDARDS SPECIFICATIONS FOR ADDITIONAL INFORMATION.
2. DIMENSIONS SHOWN ARE MINIMUMS, PIPES SHALL BE INSTALLED WITH AS MUCH SEPARATION AS FIELD CONDITIONS ALLOW.
3. ALL FITTINGS AND/OR CONNECTIONS TO WATER MAIN SHALL BE WATERTIGHT RUBBER GASKETED TYPE WITH A MINIMUM PRESSURE RATING OF 250PSI, AND SHALL OTHERWISE COMPLY WITH CITY DESIGN AND CONSTRUCTION STANDARDS AND THIS ALTERNATE CONSTRUCTION BLANKET WAIVER.

CITY OF REDLANDS MUNICIPAL UTILITIES AND ENGINEERING DEPARTMENT

**NEW WATER MAIN INSTALLATION  
PARALLEL TO STORM DRAIN LINE**

BLANKET  
WAIVER

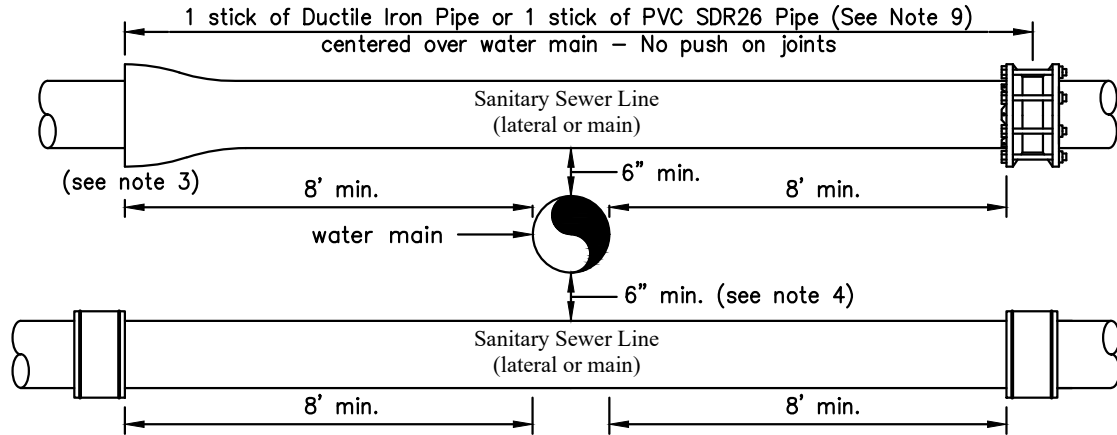
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DATE: DEC. 2023

**4**

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REV.	BY	DATE



**New Sanitary Sewer Line Over or Under New or Existing Water Main**

**NOTES:**

1. THIS BLANKET WAIVER SHALL ONLY BE USED UPON APPROVAL BY THE CITY, AND WHERE CONDITIONS DO NOT ALLOW FOR THE MINIMUM 1-FT VERTICAL SEPARATION AS SPECIFIED IN THE CALIFORNIA WATERWORKS STANDARDS, ARTICLE 4, SECTION 64572 "WATER MAIN SEPARATION". SEE THE CITY OF REDLANDS WATER SYSTEMS STANDARDS SPECIFICATIONS FOR ADDITIONAL INFORMATION.
2. THIS ALTERNATE INSTALLATION APPLIES ONLY TO WATER MAINS LESS THAN 24" DIAMETER. ALL CROSSINGS OF 24" DIAMETER AND LARGER WATER MAINS MUST BE APPROVED BY THE STATE WATER BOARD AND THE CITY.
3. DO NOT REMOVE BELL. WHERE REQUIRED FOR CONNECTION TO ADJACENT PIPING, ADD ADDITIONAL (2' MIN.) SECTION OF PIPE AND CONNECT WITH APPROVED COUPLING OR SOLVENT WELD.
4. WHERE THE SANITARY SEWER LINE CROSSES BELOW THE WATER AND THERE IS 1' OR MORE VERTICAL CLEARANCE NO SPECIAL INSTALLATION IS REQUIRED.
5. ALL BELL & SPIGOT, DRESSER TYPE COUPLING OR TRANSITION ADAPTER JOINTS SHALL HAVE WATERTIGHT RUBBER GASKETED SEALS. MATERIAL SUBMITTAL REQUIRED.
6. NO JOINTS PERMITTED WITHIN 8' ON EITHER SIDE OF THE CROSSING PIPE.
7. STATE WATER BOARD APPROVAL REQUIRED FOR ANY CROSSING OF LESS THAN 6".
8. SOLVENT WELD PVC CONNECTION PERMITTED FROM 8' TO 10' ON EITHER SIDE OF THE PIPE CROSSING.
- \*9. WHEN A SEWER FORCE MAIN MUST CROSS A WATER MAIN, THE CROSSING SHOULD BE AS CLOSE AS PRACTICAL TO THE PERPENDICULAR AND NO LESS THAN 45°. THE SEWER FORCE MAIN SHOULD BE AT LEAST ONE FOOT BELOW THE WATER MAIN AND HAVE NO JOINTS WITHIN EIGHT FEET FROM EITHER SIDE OF THE WATER MAIN PER 64572(D).
- \*10. WHEN A NEW SEWER FORCE MAIN CROSSES AN EXISTING WATER MAIN, AND A ONE-FOOT VERTICAL SEPARATION CANNOT BE PROVIDED, ALL PORTIONS OF THE SEWER FORCE MAIN WITHIN EIGHT FEET (HORIZONTALLY) OF THE OUTSIDE WALLS OF THE WATER MAIN SHOULD BE ENCLOSED IN A CONTINUOUS SLEEVE. IN THESE CASES, A MINIMUM VERTICAL SEPARATION DISTANCE OF 6 INCHES MUST BE MAINTAINED BETWEEN THE OUTSIDE EDGE OF THE BOTTOM OF THE WATER MAIN AND THE TOP OF THE CONTINUOUS SLEEVE (SEE DETAIL 12). PIPE CASING PER STD. A-20522.
- \* APPLIED TO SEWER FORCE MAIN CONDITIONS ONLY.

**CITY OF REDLANDS MUNICIPAL UTILITIES AND ENGINEERING DEPARTMENT**

**NEW SANITARY SEWER LINE OVER OR UNDER  
NEW OR EXISTING WATER MAIN**

BLANKET  
WAIVER

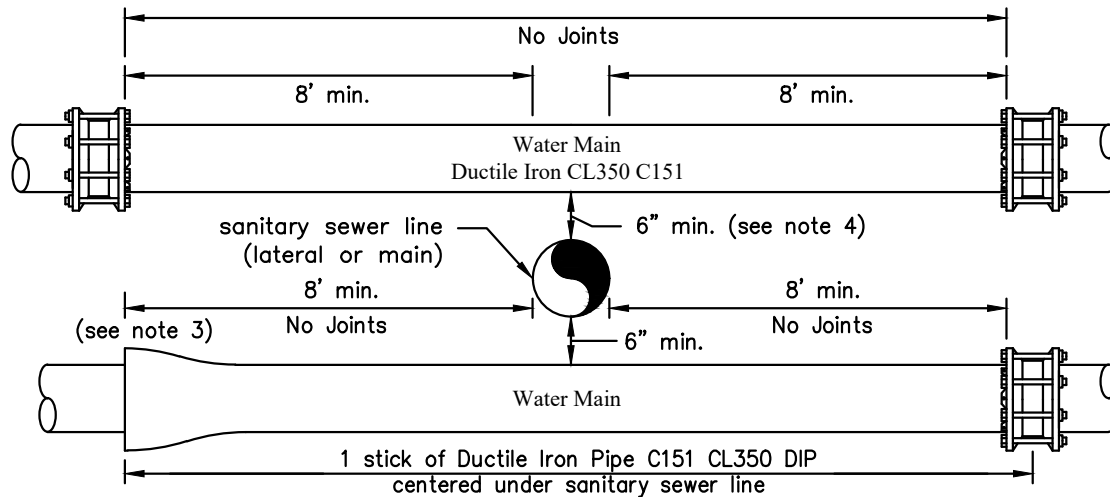
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**5**

Goutam K. Dobey, City Engineer RCE 75646

REV.	BY	DATE



## New Water Main Over or Under Existing Sanitary Sewer Line

**NOTES:**

1. THIS BLANKET WAIVER SHALL ONLY BE USED UPON APPROVAL BY THE CITY, AND WHERE CONDITIONS DO NOT ALLOW FOR THE MINIMUM 1-FT VERTICAL SEPARATION AS SPECIFIED IN THE CALIFORNIA WATERWORKS STANDARDS, ARTICLE 4, SECTION 64572 "WATER MAIN SEPARATION". SEE THE CITY OF REDLANDS WATER SYSTEMS STANDARDS SPECIFICATIONS FOR ADDITIONAL INFORMATION.
  2. THIS ALTERNATE INSTALLATION APPLIES ONLY TO WATER MAINS LESS THAN 24" DIAMETER. ALL CROSSINGS OF 24" DIAMETER AND LARGER WATER MAINS MUST BE APPROVED BY THE STATE WATER BOARD AND THE CITY.
  3. DO NOT REMOVE BELL. WHERE REQUIRED FOR CONNECTION TO ADJACENT PIPING, ADD ADDITIONAL (2' MIN.) SECTION OF PIPE AND CONNECT WITH APPROVED COUPLING OR SOLVENT WELD.
  4. WHERE THE SANITARY SEWER LINE CROSSES BELOW THE WATER AND THERE IS 1' OR MORE VERTICAL CLEARANCE NO SPECIAL INSTALLATION IS REQUIRED.
  5. ALL BELL & SPIGOT, DRESSER TYPE COUPLING OR TRANSITION ADAPTER JOINTS SHALL HAVE WATERTIGHT RUBBER GASKETED SEALS. MATERIAL SUBMITTAL REQUIRED.
  6. NO JOINTS PERMITTED WITHIN 8' ON EITHER SIDE OF THE CROSSING PIPE.
  7. STATE WATER BOARD APPROVAL REQUIRED FOR ANY CROSSING OF LESS THAN 6".
  8. SOLVENT WELD PVC CONNECTION PERMITTED FROM 8' TO 10' ON EITHER SIDE OF THE PIPE CROSSING.
  - \*9. WHEN A SEWER FORCE MAIN MUST CROSS A WATER MAIN, THE CROSSING SHOULD BE AS CLOSE AS PRACTICAL TO THE PERPENDICULAR AND NO LESS THAN 45°. THE SEWER FORCE MAIN SHOULD BE AT LEAST ONE FOOT BELOW THE WATER MAIN AND HAVE NO JOINTS WITHIN EIGHT FEET FROM EITHER SIDE OF THE WATER MAIN PER 64572(D).
  - \*10. WHEN A NEW SEWER FORCE MAIN CROSSES AN EXISTING WATER MAIN, AND A ONE-FOOT VERTICAL SEPARATION CANNOT BE PROVIDED, ALL PORTIONS OF THE SEWER FORCE MAIN WITHIN EIGHT FEET (HORIZONTALLY) OF THE OUTSIDE WALLS OF THE WATER MAIN SHOULD BE ENCLOSED IN A CONTINUOUS SLEEVE. IN THESE CASES, A MINIMUM VERTICAL SEPARATION DISTANCE OF 6 INCHES MUST BE MAINTAINED BETWEEN THE OUTSIDE EDGE OF THE BOTTOM OF THE WATER MAIN AND THE TOP OF THE CONTINUOUS SLEEVE (SEE DETAIL 12). PIPE CASING PER STD. A-20522.
- \* APPLIED TO SEWER FORCE MAIN CONDITIONS ONLY.

**CITY OF REDLANDS MUNICIPAL UTILITIES AND ENGINEERING DEPARTMENT**

**NEW WATER MAIN OVER OR UNDER  
EXISTING SANITARY SEWER LINE**

BLANKET  
WAIVER

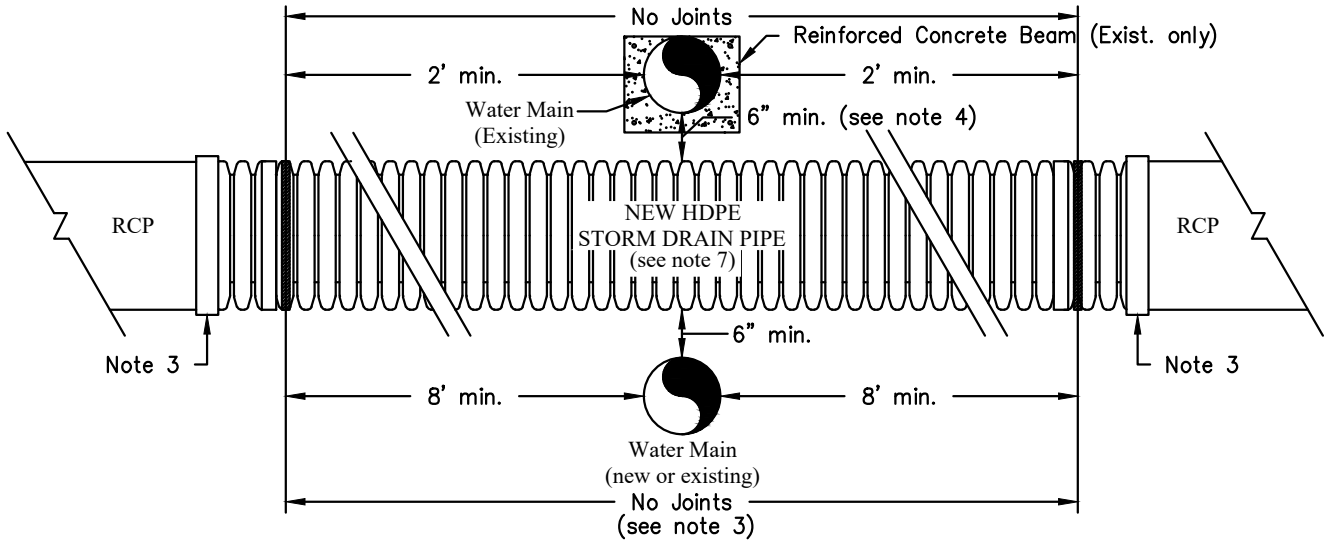
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DATE: DEC. 2023

**6**

Goutam K. Dobey, City Engineer RCE 75646

REV.	BY	DATE



New Storm Drain Line Over or Under New or Existing Water Main

**NOTES:**

1. THIS BLANKET WAIVER SHALL ONLY BE USED UPON APPROVAL BY THE CITY, WHERE CONDITIONS DO NOT ALLOW FOR THE MINIMUM 1-FT ABOVE WATER MAIN VERTICAL SEPARATION AS SPECIFIED IN THE CALIFORNIA WATERWORKS STANDARDS, ARTICLE 4, SECTION 64572 "WATER MAIN SEPARATION". SEE THE CITY OF REDLANDS WATER SYSTEMS STANDARDS SPECIFICATIONS FOR ADDITIONAL INFORMATION.
2. THIS ALTERNATE INSTALLATION APPLIES ONLY TO WATER MAINS LESS THAN 24" DIAMETER. ALL CROSSINGS OF 24" DIAMETER AND LARGER WATER MAINS MUST BE APPROVED BY THE STATE WATER BOARD AND THE CITY.
3. TRANSITION FROM OTHER MATERIAL TO HDPE MAY BE REQUIRED TO MEET JOINT SEPARATION AS SHOWN.
4. WHERE THE STORM DRAIN LINE CROSSES BELOW THE WATER AND THERE IS 1' OR MORE VERTICAL CLEARANCE NO SPECIAL INSTALLATION IS REQUIRED.
5. STATE WATER BOARD APPROVAL REQUIRED FOR ANY CROSSING OF LESS THAN 6".
6. ALL BELL & SPIGOT, DRESSER TYPE COUPLING OR TRANSITION JOINTS SHALL HAVE WATERTIGHT RUBBER GASKETED SEALS. MATERIAL SUBMITTAL REQUIRED.
7. WHERE, DUE TO FIELD CONDITIONS, NEW STORM DRAIN PIPE IS REQUIRED TO BE REINFORCED CONCRETE PIPE (RCP) AND MUST BE INSTALLED OVER THE WATER MAIN, STORM DRAIN RCP PIPE SHALL BE CENTERED OVER WATER MAIN AND ANY JOINTS WITHIN LIMITS SPECIFIED ABOVE A REINFORCED CONCRETE BEAM SHALL BE BUILT, OR SLEEVED TO BEYOND THE LIMITS SPECIFIED. METHOD USED SHALL BE DIRECTED BY A CITY.

**CITY OF REDLANDS MUNICIPAL UTILITIES AND ENGINEERING DEPARTMENT**

**NEW STORM DRAIN LINE OVER OR UNDER  
NEW OR EXISTING WATER MAIN**

BLANKET  
WAIVER

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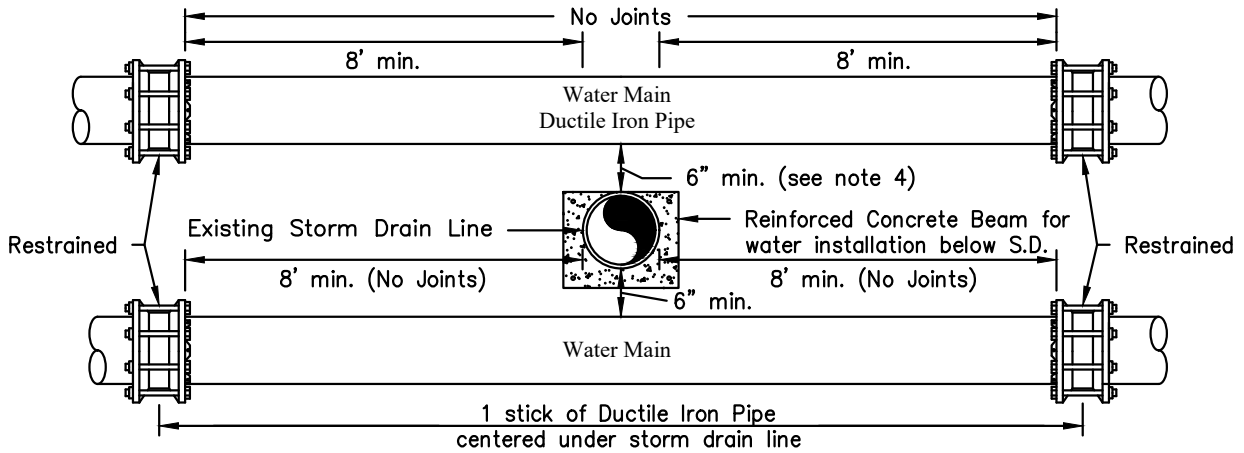
DATE: DEC. 2023

**7**

Goutam K. Dobey, City Engineer RCE 75646

REV.	BY	DATE





### New Water Main Over or Under Existing Storm Drain Line

**NOTES:**

1. THIS BLANKET WAIVER SHALL ONLY BE USED UPON APPROVAL BY THE CITY, WHERE CONDITIONS DO NOT ALLOW FOR THE MINIMUM 1-FT ABOVE WATER MAIN VERTICAL SEPARATION AS SPECIFIED IN THE CALIFORNIA WATERWORKS STANDARDS, ARTICLE 4, SECTION 64572 "WATER MAIN SEPARATION". SEE THE CITY OF REDLANDS WATER SYSTEMS STANDARDS SPECIFICATIONS FOR ADDITIONAL INFORMATION.
2. THIS ALTERNATE INSTALLATION APPLIES ONLY TO WATER MAINS LESS THAN 24" DIAMETER. ALL CROSSINGS OF 24" DIAMETER AND LARGER WATER MAINS MUST BE APPROVED BY THE STATE WATER BOARD AND THE CITY.
3. TRANSITION FROM OTHER MATERIAL TO HDPE MAY BE REQUIRED TO MEET JOINT SEPARATION AS SHOWN.
4. WHERE THE STORM DRAIN LINE CROSSES BELOW THE WATER AND THERE IS 1' OR MORE VERTICAL CLEARANCE NO SPECIAL INSTALLATION IS REQUIRED.
5. STATE WATER BOARD APPROVAL REQUIRED FOR ANY CROSSING OF LESS THAN 6".
6. ALL BELL & SPIGOT, DRESSER TYPE COUPLING OR TRANSITION JOINTS SHALL HAVE WATERTIGHT RUBBER GASKETED SEALS. MATERIAL SUBMITTAL REQUIRED.
7. WHERE, DUE TO FIELD CONDITIONS, NEW STORM DRAIN PIPE IS REQUIRED TO BE REINFORCED CONCRETE PIPE (RCP) AND MUST BE INSTALLED OVER THE WATER MAIN, STORM DRAIN RCP PIPE SHALL BE CENTERED OVER WATER MAIN AND ANY JOINTS WITHIN LIMITS SPECIFIED ABOVE A REINFORCED CONCRETE BEAM SHALL BE BUILT, OR SLEEVED TO BEYOND THE LIMITS SPECIFIED. METHOD USED SHALL BE DIRECTED BY A CITY.

**CITY OF REDLANDS MUNICIPAL UTILITIES AND ENGINEERING DEPARTMENT**

## NEW WATER MAIN OVER OR UNDER EXISTING STORM DRAIN LINE

BLANKET  
WAIVER

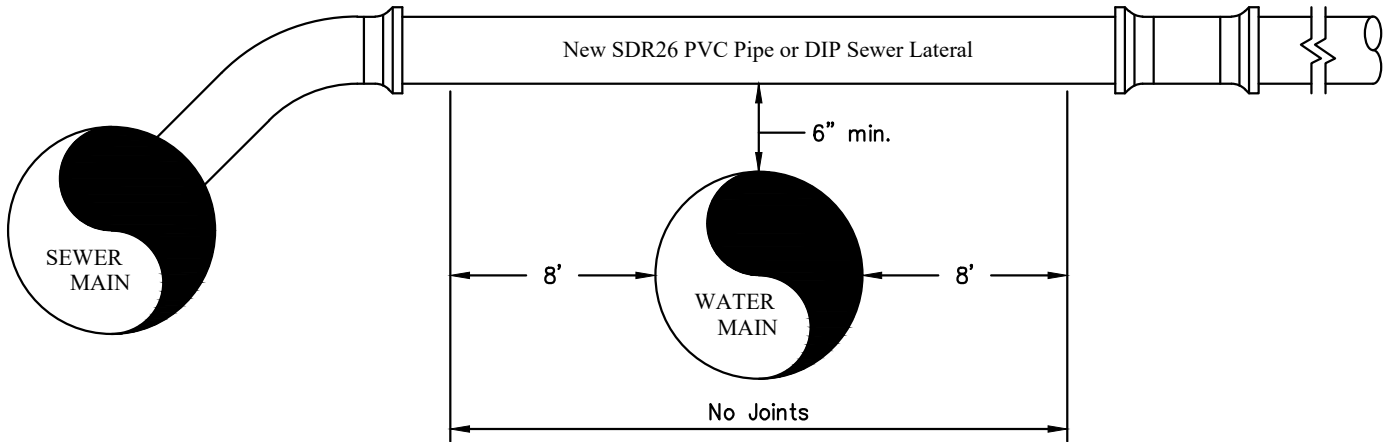
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**8**

Goutam K. Dobey, City Engineer RCE 75646

REV.	BY	DATE



**NON TYPICAL INSTALLATION**  
**SEWER LATERAL OVER WATER MAIN**

**NOTES:**

1. THIS BLANKET WAIVER SHALL ONLY BE USED UPON APPROVAL BY THE CITY, AND WHERE CONDITIONS DO NOT ALLOW FOR THE MINIMUM 1-FT VERTICAL SEPARATION ABOVE WATER MAIN AS SPECIFIED IN THE CALIFORNIA WATERWORKS STANDARDS, ARTICLE 4, SECTION 64572 "WATER MAIN SEPARATION". SEE THE CITY OF REDLANDS WATER SYSTEMS STANDARDS SPECIFICATIONS FOR ADDITIONAL INFORMATION.
2. DIP = DUCTILE IRON PIPE  
PVC = POLYVINYL CHLORIDE
- \*3. WHEN A SEWER FORCE MAIN MUST CROSS A WATER MAIN, THE CROSSING SHOULD BE AS CLOSE AS PRACTICAL TO THE PERPENDICULAR AND NO LESS THAN 45°. THE SEWER FORCE MAIN SHOULD BE AT LEAST ONE FOOT BELOW THE WATER MAIN AND HAVE NO JOINTS WITHIN EIGHT FEET FROM EITHER SIDE OF THE WATER MAIN PER 64572(D).
- \*4. WHEN A NEW SEWER FORCE MAIN CROSSES AN EXISTING WATER MAIN, AND A ONE-FOOT VERTICAL SEPARATION CANNOT BE PROVIDED, ALL PORTIONS OF THE SEWER FORCE MAIN WITHIN EIGHT FEET (HORIZONTALLY) OF THE OUTSIDE WALLS OF THE WATER MAIN SHOULD BE ENCLOSED IN A CONTINUOUS SLEEVE. IN THESE CASES, A MINIMUM VERTICAL SEPARATION DISTANCE OF 6 INCHES MUST BE MAINTAINED BETWEEN THE OUTSIDE EDGE OF THE BOTTOM OF THE WATER MAIN AND THE TOP OF THE CONTINUOUS SLEEVE (SEE DETAIL 12). PIPE CASING PER STD. A-20522.
- \* APPLIED TO SEWER FORCE MAIN CONDITIONS ONLY.

**CITY OF REDLANDS MUNICIPAL UTILITIES AND ENGINEERING DEPARTMENT**

**NON TYPICAL INSTALLATION**  
**SEWER LATERAL OVER WATER MAIN**

BLANKET  
WAIVER

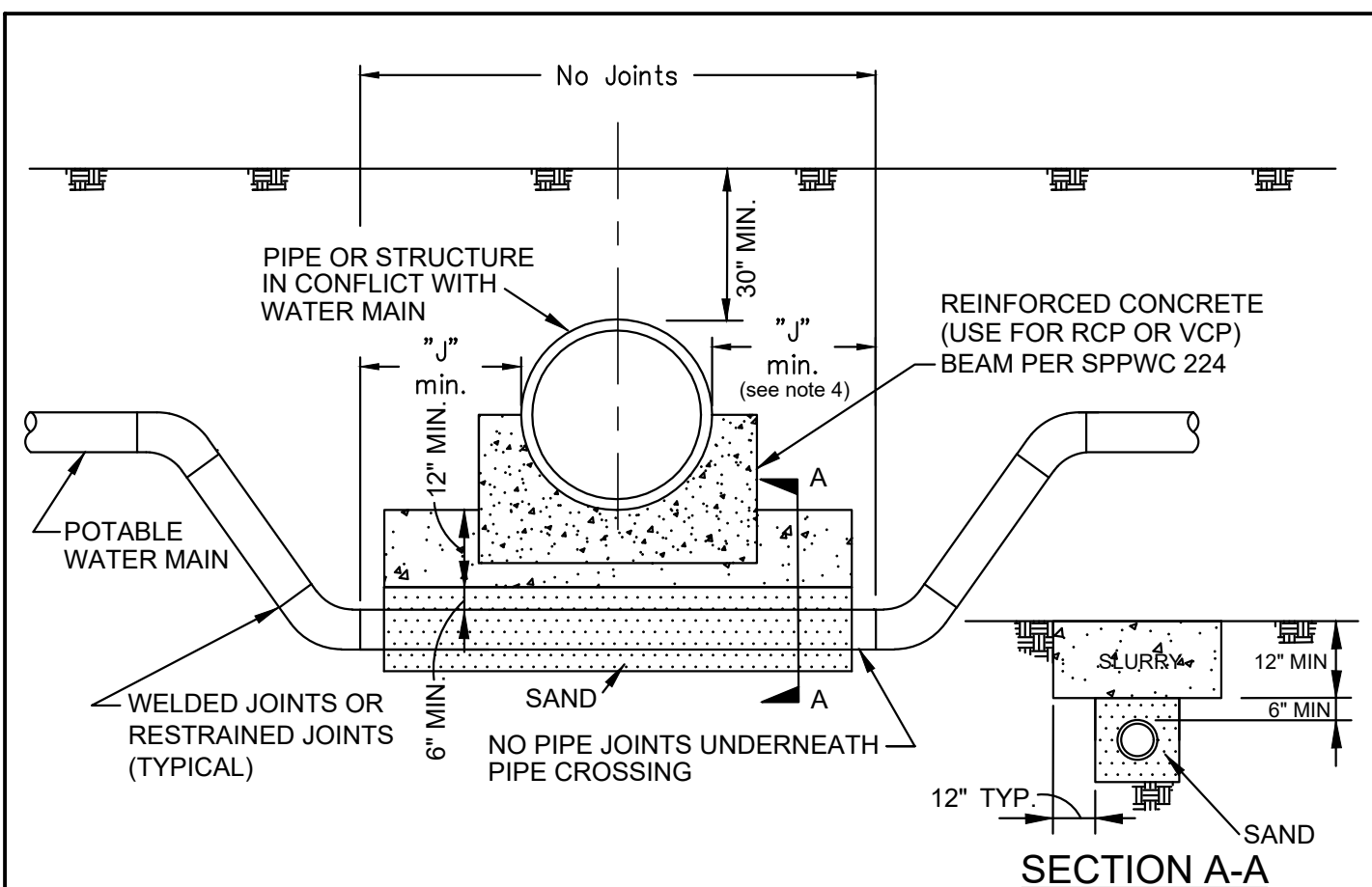
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DATE: DEC. 2023

Goutam K. Dobby, City Engineer RCE 75646

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REV.	BY	DATE



**NOTES:**

1. THIS BLANKET WAIVER SHALL ONLY BE USED UPON APPROVAL OF CITY WHERE CONDITIONS DO NOT ALLOW THE WATER MAIN TO CROSS "OVER" A PIPE OR STRUCTURE. THIS INSTALLATION SHALL ALSO ONLY BE INSTALLED WHERE FIELD CONDITIONS DO NOT ALLOW FOR PROPER 1-FT SEPARATIONS ABOVE WATER MAIN AS SPECIFIED IN ARTICLE 4, SECTION 64572 "WATER MAIN SEPARATIONS" OF THE CALIFORNIA WATERWORKS STANDARDS. SEE THE CITY OF REDLANDS WATER SYSTEMS STANDARDS SPECIFICATIONS FOR ADDITIONAL INFORMATION.
2. THIS INSTALLATION APPLIES ONLY TO WATER MAINS LESS THAN 24" DIAMETER. ALL WATER MAIN INSTALLATION OF 24" DIAMETER AND LARGER MUST BE APPROVED BY THE STATE WATER BOARD AND THE CITY ON A CASE BY CASE BASIS.
3. WHERE WATER MAIN LOWERING IS PART OF A LARGER INSTALLATION, AND WHEN OTHERWISE PRACTICAL, THE NEW SYSTEM SHALL BE DESIGNED AS A "RESTRAINED JOINT SYSTEM", AND PER CITY STANDARDS. SEE THE CITY OF REDLANDS WATER SYSTEMS STANDARDS SPECIFICATIONS FOR ADDITIONAL INFORMATION AND REQUIREMENTS ON RESTRAINED JOINT SYSTEMS.
4. MINIMUM "J" DISTANCES SHOWN ARE; 4' FOR STORM DRAIN OR DISINFECTED TERTIARY RECYCLED WATER; 8' FOR SANITARY SEWER PIPES AND SEWER FORCE MAIN. SEE CITY OF REDLANDS WATER SYSTEMS STANDARDS SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
5. ALL PIPE AND FITTINGS TO CREATE DROP SHALL BE DUCTILE IRON OR CML&C STEEL (WELDED), AND ALL BEND FITTINGS SHALL BE EITHER 45 DEGREE OR 22-1/2 DEGREE RESTRAINED MECHANICAL JOINT, OR WELDED CML&C STEEL OR ROPED UNDER WITHOUT FITTINGS.
6. WHEN CONNECTING TO AN EXISTING MAIN, CONNECTIONS TO CAST IRON, DUCTILE IRON OR PVC PIPE SHALL BE MADE WITH MECHANICAL JOINT SOLID SLEEVES WITH RESTRAINING GLANDS. APPROVED "WIDE RANGE" COUPLINGS SHALL BE USED WHEN CONNECTING TO OVERSIZED CAST IRON OR ASBESTOS CEMENT PIPE. WHEN NOT CONNECTING TO AN EXISTING MAIN COUPLINGS ARE NOT REQUIRED.
- \*7. WHEN A SEWER FORCE MAIN MUST CROSS A WATER MAIN, THE CROSSING SHOULD BE AS CLOSE AS PRACTICAL TO THE PERPENDICULAR AND NO LESS THAN 45°. THE SEWER FORCE MAIN SHOULD BE AT LEAST ONE FOOT BELOW THE WATER MAIN AND HAVE NO JOINTS WITHIN EIGHT FEET FROM EITHER SIDE OF THE WATER MAIN PER 64572(D).
- \*8. WHEN A NEW SEWER FORCE MAIN CROSSES AN EXISTING WATER MAIN, AND A ONE-FOOT VERTICAL SEPARATION CANNOT BE PROVIDED, ALL PORTIONS OF THE SEWER FORCE MAIN WITHIN EIGHT FEET (HORIZONTALLY) OF THE OUTSIDE WALLS OF THE WATER MAIN SHOULD BE ENCLOSED IN A CONTINUOUS SLEEVE. IN THESE CASES, A MINIMUM VERTICAL SEPARATION DISTANCE OF 6 INCHES MUST BE MAINTAINED BETWEEN THE OUTSIDE EDGE OF THE BOTTOM OF THE WATER MAIN AND THE TOP OF THE CONTINUOUS SLEEVE (SEE DETAIL 12). PIPE CASING PER STD. A-20522.
- \* APPLIED TO SEWER FORCE MAIN CONDITIONS ONLY.

**CITY OF REDLANDS MUNICIPAL UTILITIES AND ENGINEERING DEPARTMENT**

**WATER MAIN LOWERING**

BLANKET WAIVER

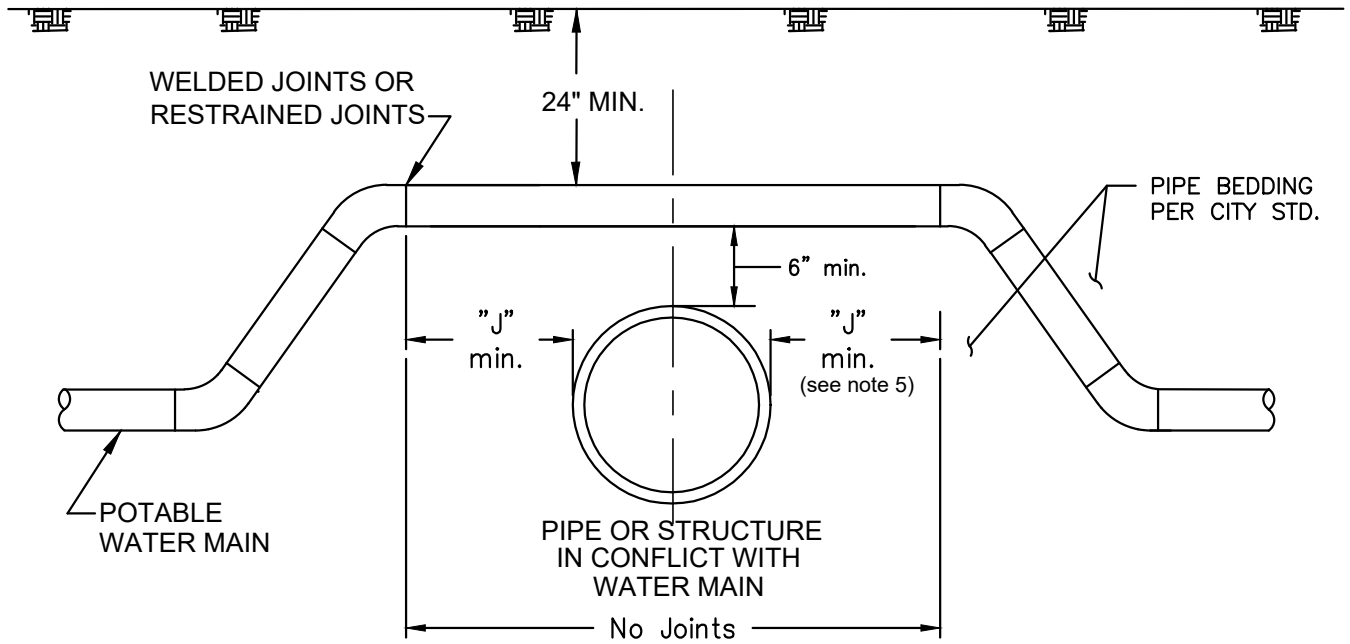
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DATE: DEC. 2023

Goutam K. Dobby, City Engineer RCE 75646

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REV.	BY	DATE



**NOTES:**

1. THIS BLANKET WAIVER SHALL ONLY BE USED UPON APPROVAL OF THE CITY WHERE FIELD CONDITIONS DO NOT ALLOW FOR THE 1-FT STANDARD SEPARATION ABOVE WATER MAIN REQUIREMENTS AS SPECIFIED IN ARTICLE 4, SECTION 64572 "WATER MAIN SEPARATIONS" OF THE CALIFORNIA WATERWORKS STANDARDS. SEE THE CITY OF REDLANDS WATER SYSTEMS STANDARDS SPECIFICATIONS FOR ADDITIONAL INFORMATION.
2. WATER MAIN OVER STRUCTURE MAY ONLY BE INSTALLED WHEN SPECIFICALLY APPROVED ON A CASE BY CASE BASIS BY THE CITY. WHERE PRACTICAL WATER MAIN ALIGNMENT SHALL BE RAISED BY DEFLECTING, (ROPING) WITHOUT EXCEEDING MANUFACTURER'S TOLERANCES. WHERE INSTALLATION IS ROPED, SPACING REQUIREMENTS SHOWN STILL APPLY.
3. THIS INSTALLATION APPLIES ONLY TO WATER MAINS LESS THAN 24" DIAMETER. ALL WATER MAIN INSTALLATION OF 24" DIAMETER AND LARGER MUST BE APPROVED BY THE STATE WATER BOARD AND THE CITY ON A CASE BY CASE BASIS.
4. WHERE WATER MAIN OVER-STRUCTURE IS PART OF A LARGER INSTALLATION, AND WHEN OTHERWISE PRACTICAL, THE NEW SYSTEM SHALL BE DESIGNED AS A "RESTRAINED JOINT SYSTEM", AND PER CITY STANDARDS. SEE THE CITY OF REDLANDS WATER SYSTEMS STANDARDS SPECIFICATIONS FOR ADDITIONAL INFORMATION AND REQUIREMENTS ON RESTRAINED JOINT SYSTEMS.
5. MINIMUM "J" DISTANCES SHOWN ARE; 8' FOR SANITARY SEWER LINES UP TO 18" DIAMETER, 4' FOR ANY SIZE STORM DRAIN LINE, AND 4' FOR OTHER PIPE OR STRUCTURE THAT IS NOT CONVEYING NON-POTABLE FLUID; 4' FOR TERTIARY RECYCLED WATER; 8' FOR SANITARY SEWER FORCE MAIN, DISINFECTED 2.2, 23 RECYCLED WATER, OR HAZARDOUS FLUIDS. SEE THE CITY OF REDLANDS WATER SYSTEMS STANDARDS SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
6. ALL PIPE AND FITTINGS TO CREATE OFFSET SHALL BE DUCTILE IRON OR CML&C, AND ALL BEND FITTINGS SHALL BE EITHER 45 DEGREE OR 22-1/2 DEGREE RESTRAINED MECHANICAL JOINT TYPE OR ROPED OVER WITH RESTRAINED JOINTS OR CML&C STEEL (WELDED).
7. WHEN CONNECTING TO AN EXISTING MAIN, CONNECTIONS TO CAST IRON, DUCTILE IRON OR PVC PIPE SHALL BE MADE WITH MECHANICAL JOINT SOLID SLEEVES WITH RESTRAINING GLANDS. APPROVED "WIDE RANGE" COUPLINGS SHALL BE USED WHEN CONNECTING TO OVERSIZED CAST IRON OR ASBESTOS CEMENT PIPE. WHEN NOT CONNECTING TO AN EXISTING MAIN COUPLINGS ARE NOT REQUIRED.
- \*8. WHEN A SEWER FORCE MAIN MUST CROSS A WATER MAIN, THE CROSSING SHOULD BE AS CLOSE AS PRACTICAL TO THE PERPENDICULAR AND NO LESS THAN 45°. THE SEWER FORCE MAIN SHOULD BE AT LEAST ONE FOOT BELOW THE WATER MAIN AND HAVE NO JOINTS WITHIN EIGHT FEET FROM EITHER SIDE OF THE WATER MAIN PER 64572(D).
- \*9. WHEN A NEW SEWER FORCE MAIN CROSSES AN EXISTING WATER MAIN, AND A ONE-FOOT VERTICAL SEPARATION CANNOT BE PROVIDED, ALL PORTIONS OF THE SEWER FORCE MAIN WITHIN EIGHT FEET (HORIZONTALLY) OF THE OUTSIDE WALLS OF THE WATER MAIN SHOULD BE ENCLOSED IN A CONTINUOUS SLEEVE. IN THESE CASES, A MINIMUM VERTICAL SEPARATION DISTANCE OF 6 INCHES MUST BE MAINTAINED BETWEEN THE OUTSIDE EDGE OF THE BOTTOM OF THE WATER MAIN AND THE TOP OF THE CONTINUOUS SLEEVE (SEE DETAIL 12). PIPE CASING PER STD. A-20522.
- \* APPLIED TO SEWER FORCE MAIN CONDITIONS ONLY.

**CITY OF REDLANDS MUNICIPAL UTILITIES AND ENGINEERING DEPARTMENT**

**WATER MAIN OVER STRUCTURE**

BLANKET WAIVER

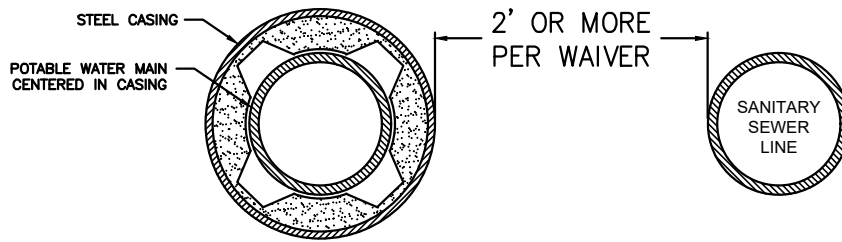
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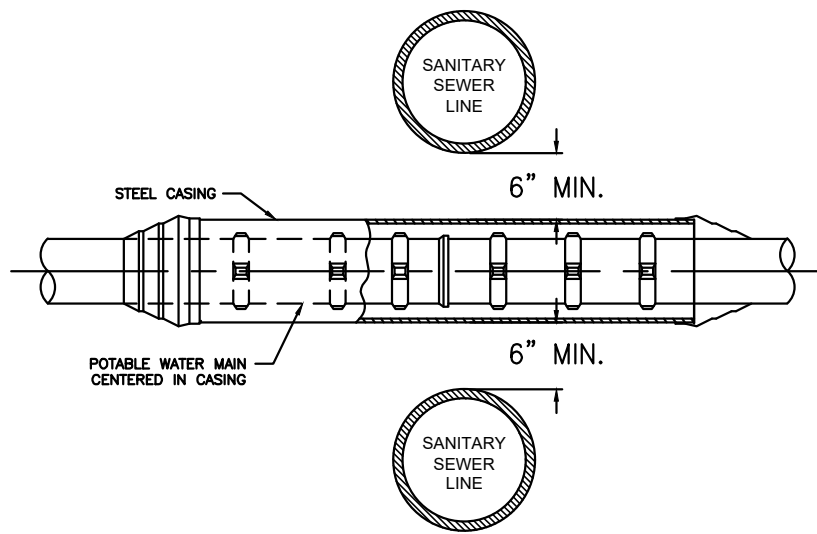
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PARALLEL CONDITIONS  
SEPARATION MEASUREMENTS



CROSSING CONDITIONS  
SEPARATION MEASUREMENTS (OVER/UNDER)

NOTES:

- \*1. WHEN A SEWER FORCE MAIN MUST CROSS A WATER MAIN, THE CROSSING SHOULD BE AS CLOSE AS PRACTICAL TO THE PERPENDICULAR AND NO LESS THAN 45°. THE SEWER FORCE MAIN SHOULD BE AT LEAST ONE FOOT BELOW THE WATER MAIN AND HAVE NO JOINTS WITHIN EIGHT FEET FROM EITHER SIDE OF THE WATER MAIN PER 64572(D).
- \*2. WHEN A NEW SEWER FORCE MAIN CROSSES AN EXISTING WATER MAIN, AND A ONE-FOOT VERTICAL SEPARATION CANNOT BE PROVIDED, ALL PORTIONS OF THE SEWER FORCE MAIN WITHIN EIGHT FEET (HORIZONTALLY) OF THE OUTSIDE WALLS OF THE WATER MAIN SHOULD BE ENCLOSED IN A CONTINUOUS SLEEVE. IN THESE CASES, A MINIMUM VERTICAL SEPARATION DISTANCE OF 6 INCHES MUST BE MAINTAINED BETWEEN THE OUTSIDE EDGE OF THE BOTTOM OF THE WATER MAIN AND THE TOP OF THE CONTINUOUS SLEEVE (SEE DETAIL 12). PIPE CASING PER STD. A-20522.
- \* APPLIED TO SEWER FORCE MAIN CONDITIONS ONLY.

**CITY OF REDLANDS MUNICIPAL UTILITIES AND ENGINEERING DEPARTMENT**

**SEWER FORCE MAIN CONDITIONS  
PARALLEL OR CROSSING MEASUREMENTS**

DETAIL

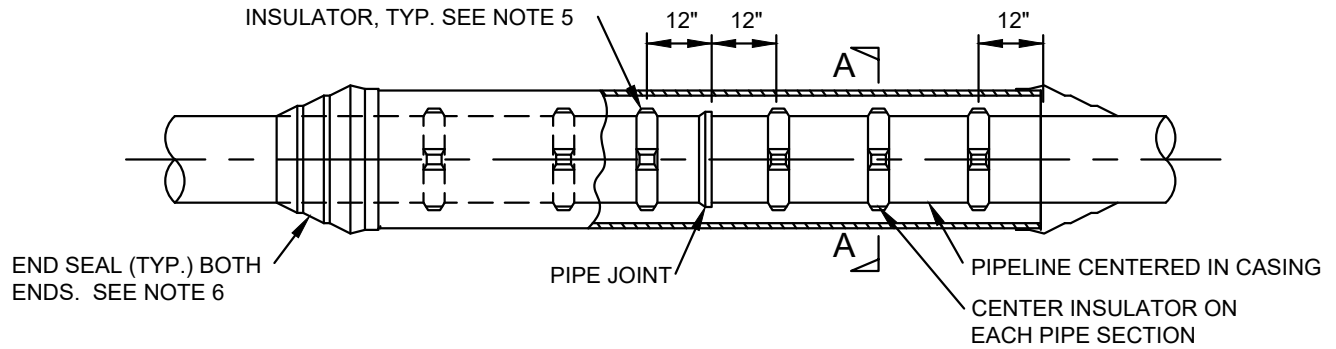
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DATE: DEC. 2023

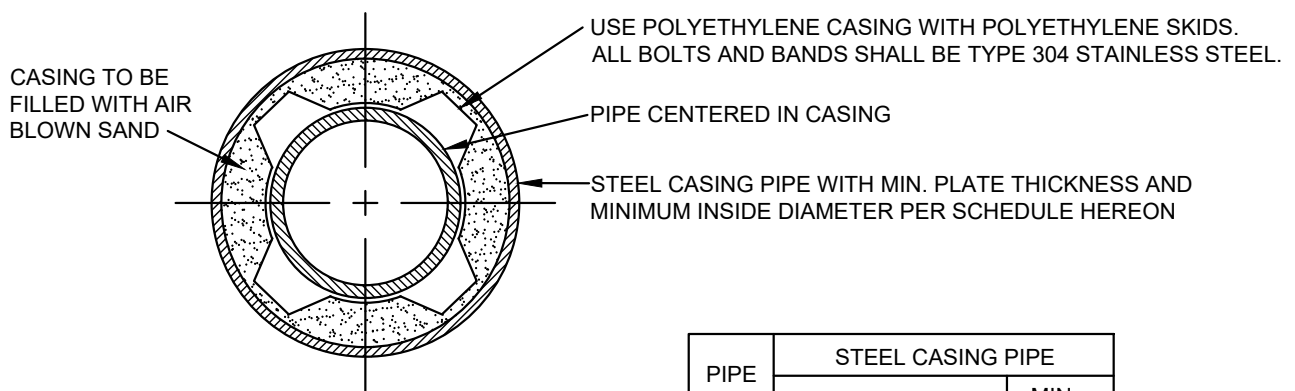
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**CASING DETAIL**



**SECTION A - A**

PIPE SIZE (I.D.)	STEEL CASING PIPE		
	MIN. SIZE (I.D.)		MIN. WALL THK.
	DIP & PVC	CML&C	
6"	16"	14"	1/4"
8"	18"	14"	1/4"
10"	21"	18"	5/16"
12"	24"	18"	5/16"

**NOTES:**

1. ALL STEEL CASING PIPE JOINTS SHALL BE WELDED FULL CIRCUMFERENCE.
2. PERIPHERY OF CASING TO BE PRESSURE GROUTED.
3. CARRIER PIPE SHALL BE AIR TESTED PRIOR TO FILLING WITH BLOWN SAND.
4. UPSTREAM AND DOWNSTREAM ELEVATIONS TO BE VERIFIED PRIOR TO FILLING CASING.
5. SPACING BETWEEN THE CASING INSULATORS SHALL BE PER THE MANUFACTURERS RECOMMENDATIONS EXCEPT THAT THERE SHALL BE AT LEAST 3 CASING INSULATORS PER PIPE SECTION, ONE 12" FROM EACH JOINT AND ONE CENTERED. ADDITIONALLY, ONE INSULATOR SHALL BE INSTALLED 12" FROM EACH END OF THE CASING.
6. BOTH ENDS OF THE CASING BETWEEN THE CASING AND CARRIER PIPE SHALL BE SEALED WATERTIGHT USING AN END SEAL. BANDS SHALL BE TYPE 304 STAINLESS STEEL.
7. DRILL 3/4 INCH HOLE AT THE LOWEST END OF THE CARRIER PIPE TO ALLOW FOR DRAINING OF CONDENSATION.

CITY OF REDLANDS MUNICIPAL UTILITIES AND ENGINEERING DEPARTMENT

**PIPE CASING**

STD. DWG. NUMBER

**A-20522**

APPROVED:

DATE: 01/03/2023

Goutam K. Dobey, City Engineer RCE 75646

SHEET 1 OF 1

REV.	BY	DATE

# **APPENDIX "B"**

**EXAMPLE FOR DIRECTORY OF ALTERNATIVES TO  
WATERWORK'S STANDARDS FOR MAIN SEPARATION**

STATE WATER RESOURCES CONTROL BOARD DIVISION OF DRINKING WATER  
CITY OF REDLANDS BLANKET WAIVERS TRACKING LOG

Item No.	Blanket Waiver No.	Blanket Waiver Type	Project Type	Project Number	Project Name	Exhibit Page No.	Existing Pipeline Size (in) & Utility Pipeline Material	Proposed Pipeline Size (in) & Utility Pipeline Material	Reviewed By	Approved By	Approved Date

EXAMPLE



Directory of Alternatives to Waterwork's Standards for Main Separation

Operating Year: 2024

City of Redlands

Approved SOP at Time of Installation	Date of Installation	Installation Type	Location of Installation
5-Dec-23	3-Mar-23	New Water Main	Cross Street, Grand and 32nd St.

EXAMPLE



*City of*

**REDLANDS "A CITY THAT WORKS"**