

DIVISION THREE

STANDARDS FOR SANITARY SEWERS

CHAPTER I. GENERAL

Sec. 301-1 Scope

This division establishes the minimum acceptable standards of design, materials and methods to be used in providing sanitary sewer systems for developments in the County of Kern. Where the sewer system being designed is to be installed within a district which has adopted standards for sewers, the more restrictive of that district's standards and the standards contained herein shall apply. Minor deviations from these standards may be permitted where warranted in the opinion of the Director, with the concurrence of the district Engineer for the district or entity.

Sec. 301-2 General

- 301-2.01** The design data and calculations, and the construction plans for proposed development sewers are to be submitted by the developer's engineer to the Director, for review and approval prior to construction. This is in addition to the approval of any applicable district.
- 301-2.02** The requirement for review by, and approval of, the Director for sewer plans may be waived when all of the following conditions exist:
- a. The facilities are to be accepted and maintained by an established Public Utility District, Mutual Water Company, Home-Owner Association or other approved entity.
 - b. The company or district has adopted standards which the Director has found to be equivalent to, or more restrictive than, the County's adopted Development Standards.
 - c. The plans are prepared by the developer's engineer and approved by the company's or district's engineer or prepared by the company's or district's engineer and approved by the developer's engineer.
 - d. The company's or district's engineer is independent of the developer and the developer's engineer.
 - e. The company's or district's engineer, by certificate, shall state that the plans meet or exceed the minimum Kern County Development Standards.

- f. The district or company has received written approval from the Director for waiver of the requirement of County review and approval of the plans.

CHAPTER II. DESIGN STANDARDS

Sec. 302-1 Sanitary Sewers Design Criteria

The following guidelines shall be used to compute contributing sewage:

302-1.01 The average family unit shall be two and eight tenths (2.8) persons per residential dwelling unit or its equivalent, and two and twenty-four hundredths (2.24) persons per multi-family residential unit.

302-1.02 The average discharge of domestic sewage shall be one hundred (100) gallons per day per person. In the absence of any specific information to the contrary, the design peak discharge shall be estimated as follows:

$$\text{Peak Factor} = 1.8 \times (\text{Average Discharge})$$

302-1.03 Infiltration allowances will be in addition to the above.

302-1.04 In the absence of any specific information to the contrary, the peak design discharge for commercial and industrial sewage shall be:

<u>Land Use</u>	<u>Peak Discharge Rate</u>	<u>Peak Factor</u>
Commercial	0.010 CFS/GA (6,460 GPD/GA)	1.8
Industrial	0.015 CFS/GA (9,695 GPD/GA)	2.0

Flow rates may be obtained from approved references or other acceptable source.

302-1.05 Depth of flow in main and trunk sewers: Main sewers up to fifteen (15) inches inside diameter shall be designed to flow not more than seven-tenths (0.7) full; Trunk or main sewers over fifteen (15) inches inside diameter may be designed to flow full.

Note: Under no condition is a gravity sewer ever to be designed to flow under a head.

Sec. 302-2 Sewer Velocity and Quantities

302-2.01 Minimum design velocity for any sanitary sewer shall be two (2) feet per second, for pipes flowing full or half full, or with the approval of the Director, one and six tenths (1.6) feet per second. Acceptable criteria

for allowing 1.6 feet per second would be as follows: Pipes designed for 1.6 feet per second velocity at peak shall flow at least 40% full for computed average flows. Without considering the above, the following pipe slopes may be used:

<u>Pipe Diameter</u>	<u>Minimum Slope - (ft/100 ft)</u>	
	n=0.011	n=0.013
4" Laterals	1.00	1.00
6"	0.38	0.50
8"	0.25	0.35
10"	0.20	0.25
12"	0.15	0.20
15"	0.13	
18"	0.11	
21"	0.09	
24" greater	0.08	

- 302-2.02** Unless special provisions approved by the Director have been provided, design velocities for sanitary sewers shall not exceed 10 feet per second. Velocities are to be computed using Manning's formula with a constant "n" value for pipes half full or full as follows:

PVC Pipe	"n" = 0.011
Other Pipe	"n" = 0.013

Sec. 302-3 Maximum Discharge

The maximum design discharge shall not exceed the flow at critical slope and velocity. Sanitary sewers shall not be designed for flow conditions at critical slope and velocity.

Sec. 302-4 Manholes

- 302-4.01** Manholes shall be placed at the intersections of all six (6) inch and larger sewer lines.
- 302-4.02** Manholes shall be placed at all changes of alignment, either vertical or horizontal.
- 302-4.03** The maximum distance between manholes shall be 400 feet, except for mains 15 inches in diameter or larger, the maximum distance may be increased to 600 feet. Minor exceptions may be approved by the Director. In areas where the slope of the sewer line exceeds 1%, the maximum distance between manholes shall be reduced to 350 feet.
- 302-4.04** A one tenth (0.1) foot energy drop shall be allowed for flow through manholes with a deflection of 45° or more.

- 302-4.05** Invert elevations of varying size pipes leading into and out of manholes shall be set by matching elevations of the pipe soffits.
- 302-4.06** Building drains or house laterals which terminate in a manhole shall be elevated a minimum of six (6) inches and a maximum of 12 inches above the flowline of the manhole.
- 302-4.07** Manholes shall be placed only in locations that provide ready access to the sewer for maintenance and emergency service.
- 302-4.08** All manholes shall be as shown on standard drawing STANDARD PRECAST MANHOLE, Plate S-5. Manholes shall be constructed to grade. Precast reinforced concrete manhole risers and tops shall conform to ASTM Designations C478 with openings over outgoing sewer. Precast tops shall be eccentric cone type. All cement used in the construction of concrete manholes shall be minor concrete and conform to ASTM Designation C150. All manholes shall have a concrete pad, unless an exception is given by the sewer service agency. Manholes outside of paved areas shall be constructed to prevent drainage water from entering manhole. Approved water stops are required for all PVC sewer lines entering and exiting any manholes.
- 302-4.09** Frame and cover shall be as shown on standard drawing CAST IRON MANHOLE FRAME AND COVER, Plate S-6. They shall be interchangeable with Alhambra Foundry Model A-1270 and conform to ASTM A48-83 Class 35B gray cast iron with minimum strength 35,000 psi for H20-44 highway loading.
- 302-4.10** Manholes in open fields shall conform to Plate No. R-89.

Sec. 302-5 Joints

All joints in the precast concrete sections, except adjusting rings, shall be set in an elastomeric sealant.

Sec. 302-6 Drop Manholes

Whenever the vertical distance between the inverts of sewer line connection and a manhole exceeds 18 inches, a Standard Drop Manhole, Plate Nos. S-3 or S-4 shall be constructed. Drop Manholes shall be permitted only for compelling reasons.

Sec. 302-7 Rodding and Flushing Inlets

Standard rodding and flushing inlets, also known as cleanouts, may be allowed at the terminal end of sewer segments constructed for later extension, such as at the edge of a subdivision, except where the sewer segment exceeds 200 feet in length, in which case a standard manhole shall be constructed. See Plate Nos. S-7 and S-8.

Sec. 302-8 Polypropylene Coated Manhole Steps

Manhole Steps shall be constructed with grade 60 steel reinforcement and in accordance with ASTM C478. Manhole step shall be of the type with a No-Slip tread surface on one side of step. Manhole step shall be installed into the full depth of tapered preformed holes of at least 3 inches minimum depth.

Sec. 302-9 Sewer Main Location, Alignment, Cover and Size

302-9.01 Location

All sanitary sewers and appurtenant structures shall be a minimum of five (5) feet from the roadway center line. In no case shall a sanitary sewer line be located closer than five (5) feet from an existing or proposed gutter lip. Sanitary sewers shall be centered on travel lanes to the greatest extent possible. In unstable soil, the minimum distances may be increased by the Engineer. Minor exceptions may be approved by the Director.

The entire sanitary system shall be located as mentioned above and shall be designed to clear all other existing or proposed utilities by a minimum of six (6) inches. Clearances with water lines shall conform to Chapter V of this Division.

Location of sewer mains in easements shall be subject to the approval of the Director. Sewer mains in easements shall be kept to a minimum.

Where sewer mains are located within easements, the easements shall be:

- a. Granted with final map, or
- b. Be granted to the entity accepting and maintaining the sewers, or
- c. Be dedicated to and accepted by Kern County.

- d. The minimum width of any easement for sanitary sewer purpose shall be ten (10) feet. In special cases of terrain, depth of sewer line, access, etc. the required easement width shall be increased based on 1:1 cut slope plus three (3) feet for pipe zone. Width of easement to be approved by Director.
- e. All easements shall include right of ingress and egress over adjoining property for maintenance, replacement and operation. No permanent structures shall be constructed in such easements, except fences, and except utilities which are the subject of an overlapping easement. Vehicular access shall be provided to all manholes except as specifically exempted by the Director.
- f. Length of curved sewer lines shall not exceed three hundred (300) feet, unless approved by the Director.

302-9.02 Alignment

Whenever possible, sewer lines shall be laid out in a straight line between structures. Curved sewer lines will be allowed under the following conditions:

- a. All curve data shall be shown on the plans.
- b. Minimum radius of curvature and joint deflections shall be as recommended by the pipe manufacturer and approved by the Director. Alignment shall be concentric to street or easement centerline.
- c. All deflections shall be at the pipe joints or by specially mitered pipe sections. Actual bending of the pipe itself will not be allowed.
- d. Manholes shall be constructed at the B.C. and E.C. of all curves.
- e. Any non-metallic sewer line constructed on a horizontal curve shall have a No. 10 bare soft copper detector wire placed over the pipeline prior to backfilling. The detector wire shall be brought up to the manhole frames at each end of the curved pipeline.

- f. Identification tape, designed for use on sewers, shall be placed one foot above on top of the sewer main along its entire length. Identification tape shall also be placed on the top of sewer laterals extending from one (1) foot above the sewer main to the right of way line.

302-9.03 Cover

Minimum cover for any sewer main shall be four (4) feet within the street section, and three (3) feet in sewer easements, and over sewer laterals within the street section. Any deviation from this cover shall require special design and approval by the Director.

302-9.04 Size

Minimum line size for any sewer main shall be eight (8) inches in diameter. For sewer mains of 150 feet or less which cannot be extended, (e.g. cul-de-sacs) sewers shall not be less than eight (8) inches in diameter or as approved by Director.

Sec. 302-10 **Building Sewers**

302-10.01 Minimum size of any sanitary building sewer within road right of way and/or dedicated easement to serve individual residences, commercial structures, etc. shall be four (4) inches. Actual size of building sewers larger than four (4) inches shall be determined by fixture unit requirements as per the current edition of the California Plumbing Code.

302-10.02 Quantity: A separate building sewer lateral shall be provided to each lot, parcel or building. Subdivision of land into large parcels subject to potential future re-subdivision or multiple building sites may require additional laterals or increased lateral size.

Sec. 302-11 **Special Equipment and Structures**

302-11.01 All special equipment such as package treatment plants, their appurtenances, and their effluent disposal areas and methods shall be designed, located, and constructed so as to preclude contamination, pollution, nuisance, and structural and mechanical instability. Proposals and plans for package treatment systems and disposal facilities shall be subject to the review and approval of: (1) the Regional Water Quality Control Board (RWQCB) for design, contamination elements of pollution and nuisance aspects. Upon approval, waste discharge requirements will be issued by said RWQCB, (2) the Public Works Department for structural and mechanical integrity. Special structures, such as pump stations,

pressure lines and sags, etc. shall be subject to the approval of the Public Works Department and the maintaining District.

302-11.02 Plans for individual septic tank systems shall be subject to the review and approval of the County Environmental Health Services Department and by the County Building Inspection Division. Reclaimed water usage shall be subject to the review and approval of the State Department of Health Services.

302-11.03 Sewer Pumping Stations: Sewer lift stations shall be designed to lift the design peak flow as determined using the criteria in Section 302-1 of this manual. The lift station shall be equipped with two pumps, each capable of discharging the peak flow. Multiple pump stations may be considered where dual pump stations are infeasible, subject to the approval of the Director and/or the maintaining District. Said facilities shall be capable of passing the peak flow with any one pump out of service. Final design is subject to the approval of the Director and/or maintaining District.

CHAPTER III. FINAL ACCEPTANCE

Sec. 303-1 Cleaning

Prior to the acceptance of any sewer line by the County, the contractor shall clean all lines with a Wayne-type sewer cleaning ball under hydrostatic pressure. Any stoppage, dirt or foreign matter shall be removed from the lines and not be washed into the public sewer system. All cleaning and testing of sewer lines shall take place after all construction work is completed, up to, but not including, the final paving. The system will be inspected after final paving is completed and any damage to the system during final paving and cleanup will be corrected before approval.

Sec. 303-2 Air Testing

Prior to final approval, all sewer lines shall be tested for leakage by low pressure air test. The method of test shall follow the procedures and methods as recommended by Uni-bell PVC Pipe Association's publication UNI-B-06, "Recommended Practice for Low Pressure Air Testing of Installed Sewer Pipe." Building drains which are not within the right of way shall be tested in accordance with the low-pressure air testing procedures specified within the California Plumbing Code.

Sec. 303-3 Mandrell Testing PVC, ABS, and PVC Truss

The sewer mains shall be mandrelled to test for excessive deflection.

Deflections in the installed sewer pipe shall not reduce the base inside diameter, as listed by the manufacturer, by more than 5% no less than thirty (30) days after back-fill and

compaction. After the time period, the Contractor, at his expense, shall hand-pull a mandrell, approved by the Engineer, through the installed pipe to demonstrate that deflections have not reduced the inside diameter below tolerance. If the mandrell fails to pass freely, the pipe shall be deemed to be over-deflected. Over-deflected pipe shall be uncovered, any damaged pipe shall be replaced, and the pipe again backfilled, compacted and tested at the Contractor's expense.

The Engineer may waive the thirty (30) daytime period if the initial deflection, after back-fill and compaction, reduces the manufacturer's listed base inside diameter less than 3.5%. Testing procedures for this requirement are the same as previously described. In the case of a non-passing test the Contractor, at his option, may replace over-deflected pipe as described in this section or revert to the requirements previously described for maximum 5% deflection.

The mandrell used to test for excessive defection shall be rigid and non-adjustable, have an odd number of vanes (nine minimum) and have an effective length of not less than its nominal diameter. Before use, the mandrell shall be passed through a go/nogo ring provided by the Contractor and approved for use by the Engineer. At the option of the County, the Engineer may choose to provide the mandrell and go/nogo ring for use by the Contractor.

CHAPTER IV. MATERIALS AND INSTALLATION

Sec. 304-1 General

All material that is to become a permanent part of any sanitary sewer or appurtenant structure, shall conform to the requirements for the particular material as set forth in these specifications. The contractor shall supply any and all certificates of compliance, certified tests results or shall perform tests as required to assure the Engineer that the material being incorporated into the work has met the requirements as specified. Requests to use materials not listed in these standards shall require special consideration and approval of the Director.

Sec. 304-2 Pipe and Conduits

All pipe or conduits shall be of the size, material and strength as shown on the plans. All pipe and fittings shall be marked or stamped with the trade brand name of the manufacturer, and strength or class of pipe. All pipe shall be designed to withstand all internal or external loads applied. Supporting strength of conduits as installed to safely carry imposed gravity loads and superimposed loads (including a suitable factor of safety) shall be determined by use of Marston formula as per Chapter 9 (Structural Requirements) ASCE Manual of Engineering Practices No. 60 (Copy on file with Director). All pipe or conduits shall be of the same material between structures.

Sec. 304-3 Vitrified Clay Pipe (VCP)

Vitrified Clay Pipe (VCP) and fittings shall be new, first quality pipe and shall comply with the specifications for Extra Strength Unglazed Clay Pipe ASTM Designation C700. Joints for bell and spigot VCP shall conform to ASTM Designation C425. Installation of VCP shall comply with ATSM Designation C12. The only allowable variations from the above recommended practices will be as definitely specified in other sections of these standards.

- a. Materials: The pipe and fittings shall be extra strength vitrified clay conforming to current ASTM designation C700 and shall be installed in conformance with the provisions of section 71 of the standard specifications of the State of California, Department of Transportation, current edition and the current ASTM designation C12.
- b. Joints:
 - (1) Joints for bell and spigot VCP shall conform to ASTM Designation C425. The pipe and fittings shall have a socket end and a spigot end with compression joints conforming with the current ASTM designation C425.
 - (2) The pipe and fitting for 6", 8", 10" and 12" sanitary sewer mains may be plain-end with compression couplings conforming with the current ASTM designation C425, excepting that a stainless steel shear ring as manufactured by Mission Clay Products Corporation for their "Mainline" band seal compression coupling, or approved equal, shall be required.
 - (3) The pipe and fittings for private sanitary house sewer or building laterals may be plain end with compression or coupling conforming with the current ASTM designation C425, (stainless steel shear rings are not required).

The only allowable variations from the above recommended practices will be as definitely specified in other sections of these standards.

The use of VCP shall be at the discretion of the District.

Sec. 304-4 Intentionally left blank

Sec. 304-5 PVC, ABS, and PVC Truss Pipes

P.W. Pipe Twin Seal or J-M Ring Tite PVC or Armco ABS or PVC Truss pipe sewer installations. Except for procedures involving the use of the above pipes as detailed herein, the requirements of Section 71 of the Standard Specifications and the required Mandrell Test and Air Pressure Test upon completion of compaction of the trench backfill and subgrade grading plane are applicable. ASTM specifications referred to herein shall be the latest edition thereof.

304-5.01 P.V.C. Sewer Pipe shall conform to the following:

- a. Pipe shall conform to ASTM D3034 in accordance with SDR-35 (1.4.2.3 D2680 and D2751) requirements.
 - 1. Pipe and fittings shall be homogeneous throughout and free from cracks, holes, foreign inclusions or other defects. Fitting shall be injection molded and shall be installed in line on new pipelines; cut-in fittings are not permitted.
 - 2. Joints: Use only elastomeric gasket joints. The assembly of joints shall be in accordance with the manufacturer's recommendation. Where PVC pipe connects to VCP, use couplings approved by the County and District.
 - 3. Joints: Use only solvent welded joints. The assembly of Joints shall be in accordance with the manufacturer's recommendations. Where ABS pipe connects to VCP, use couplings approved by the County and District.
- b. Pipe and fittings shall be made from PVC having a minimum cell classification of 12454-B, 12454-C or 13364-B, as defined by ASTM D1784.
- c. Pipe stiffness shall be 46 psi minimum when measured in accordance with ASTM D2412.
- d. P.V.C. compound used shall not contain filler material in excess of 10 pph.

304-5.02 Parallel Rib Sewer Pipe shall conform to the following:
(Only approved for use by limited districts in the County)

- a. Pipe shall conform to ASTM-F-949 for 4", 6", or 8" diameter pipe.
- b. Pipe and fittings shall be made from PVC having a minimum-cell classifications of 12454B or 12454C as defined by ASTM D1784.
- c. Pipe stiffness shall be 50 psi minimum when measured in accordance with ASTM D2412.

- d. The PVC compound used for ASTM F949 pipe manufacture shall not contain filler material in excess of 5 pph.

304-5.03

ABS or PVC Truss Pipe shall conform to the following:
(Only approved for use by limited districts in the County)

- a. Pipe shall conform to ASTM D2680 in accordance with SDR-23.5 requirements.
- b. Pipe shall be made from ABS or PVC having a minimum cell classification of 12454-B or 12454-C, as defined by ASTM D1784 or classification of 2-2-3 as defined by ASTM D1788.
- c. Pipe, glue and fittings shall conform to ASTM designations D1084, D1788, D2234, D3189, and F402.
- d. Fittings shall be made from PVC having a minimum cell classification of 12454B, 12454C or 13343C as defined by ASTM D1784.
- e. Each length of pipe shall be marked with the applicable ASTM, SDR (if applicable), cell classification, nominal pipe size and manufacturers name or trademark.
- f. A certificate of compliance from the pipe manufacturer shall be provided for each type of material used.

304-5.04

PVC Pipe and Fittings

All PVC pipe and fittings shall conform to the following:

- a. Each length of pipe shall be marked with the applicable ASTM, SDR (if applicable), cell classification, nominal pipe size and manufacturers name or trademark.
- b. A certificate of compliance from the pipe manufacturer shall be provided for each type of material used.
- c. PVC pipe shall not deviate from straight by more than 1/16th inch per foot (camber) when the maximum offset is measured from the concave side of the pipe. ABS or PVC pipe shall be of the bell and spigot type. Bells shall be factory attached to the pipe. Wyes or tees for house service connections shall be complete fittings. Saddle type fittings shall not be allowed. Field solvent welded joints shall not be allowed.

304-5.05 Storage and Handling of PVC, ABS, and PVC Truss Pipes.
Pipes shall be stored on a smooth bed. The pipe shall not be dropped or dragged. Stored pipe shall be covered to protect it from ultraviolet light (sun's rays). Pipe with noticeable color changes resulting from exposure to ultraviolet light shall be rejected by the Engineer.

304-5.06 Bedding for PVC ABS, and PVC Truss Pipes

Embedment materials (Class I, II and III) shall conform to Section 5 of ASTM D2321, and the following:

- a. Class I - Angular, 1/4 to 1-1/2 in. graded stone, including a number of fill materials that have regional significance such as coral, slag, cinders, crushed stone, crushed gravel, and crushed shells.
- b. Class II - Coarse sands and gravels with maximum particle size of 1-1/2 in., including variously graded sands and gravels containing small percentages of fines, generally granular and non-cohesive, either wet or dry. Soil types GW, GP, SW, and SP are included in this class.
- c. Class III - Fine sand and clayey gravels, including fine sands, sand-clay mixtures, and gravel-clay mixtures. Soil types GM, GC, SM and SC are included in this class.
- d. Soil classification is in conformance with Unified Soil Classification System ASTM Designation D2487 and D2488. Native soils meeting the requirements for Class II and Class III materials may be accepted by the Engineer.
- e. Bedding procedure shall conform to Section 7 of ASTM D2321 and the following:
 1. Bedding shall be placed and compacted for all main lines and building sewer laterals as shown on plate S-1.
 2. After placement and compaction of bedding and prior to installation of sewer main and laterals the Engineer shall inspect the bedding placement and compaction.

3. Flooding or jetting of bedding will not be allowed.

304-5.07 Installation of Pipe, Fittings and Haunching PVC, ABS, and PVC Truss Pipes

- a. Pipe exposed to the sun during summer months shall be allowed to cool prior to connection to manholes or placement of haunching. Allowance shall be made for the movement of pipe along the main line and at the building sewer laterals. Fittings shall be sized to receive type of pipe used. Installation of fittings shall be in accordance with manufacturer's instruction manuals. Plugs shall be placed at the termination of the building sewer laterals and main line (if required).
- b. A flexible coupling or a flexible joint, shall be installed within three feet of each sewer manhole. Where bands are tied to secure flexible couplings, the bands, housing, and screw shall be stainless steel. Flexible couplings shall comply with ASTM C1173 and ASTM D5926.
- c. Pipe installation and haunching shall conform to ASTM D2321 and the following:
 1. The pipe shall be laid true to grade with 0.03' maximum tolerance, per joint.
 2. After cooling of the pipe, haunching shall be placed and compacted for all main lines and building sewer laterals as shown on Plate S-1.
 3. Materials used for haunching shall be the same class as that used for bedding.
 4. Prior to placement and compaction of initial backfill, the Engineer shall inspect the placement of sewer main and house building sewers, haunching and compaction.
 5. Care shall be exercised in placing haunching material to prevent damage to or displacement of the sewer pipe.
 6. Flooding or jetting the haunching will not be allowed.

304-5.08 Initial Backfill PVC, ABS and PVC Truss Pipes

Initial backfill shall conform to ASTM D2321 and the following:

- a. After cooling of the pipe and placement and inspection of haunching, initial backfill shall be placed and compacted for all main lines and building sewer laterals as shown on Plate S-1.
- b. Materials used for initial backfill shall be the same class as that used for haunching.
- c. Prior to placement and compaction of backfill, the Engineer shall inspect the initial backfill and compaction.
- d. Care shall be exercised in placing initial backfill material to prevent damage to or displacement of the sewer pipe.
- e. Flooding or jetting the initial backfill will not be allowed.

304-5.09 Backfill PVC, ABS and PVC Truss Pipes

PIPE ZONE MATERIAL

Rigid Pipe	All material passing 1" sieve
Flexible Pipe	ASTM D2321 Class I, II or III (Classes I and II allow up to 1-1/2" rock)
Compaction	90% (ASTM D2321 only requires 85% for Class II material)

TRENCH WIDTH

Pipe Size (in.)	O.D. (in.)*	Min. (O.D.+10")	Max. (O.D.+16")
4	4.215	14.2	20.2
6	6.275	16.3	22.3
8	8.400	18.4	24.4
10	10.500	20.5	26.5
12	12.500	22.5	28.5
15	15.300	25.3	31.3
18	18.701	28.7	34.7
21	22.047	32.0	38.0
24	24.800	34.8	40.8
27	27.950	38.0	44.0

* O.D. may vary from type and/or manufacturer of pipe.

The remainder of the trench backfill shall conform with Section 19-3 of the Standard Specifications and as follows:

- a. Section 19-3.03F, "Slurry Cement Backfill", of the Standard Specifications is deleted.
- b. Backfill material shall be free of all rock or lumps, exceeding six (6) inches maximum dimension.
- c. Compaction of backfill material shall be required for all main lines and building sewer laterals as shown on the attached Plate S-1.
- d. Flooding or jetting of the backfill will not be allowed.

304-5.10 Sewer Pipes

After pipeline cleaning, backfill and compaction of trench and subgrade grading plane compaction, the completed sewer main shall be air tested in conformance with Section 303-2 of the Kern County Development Standards.

- a. Lateral and Stubs
 - 1. All laterals shall extend to the property line and shall be 4" in diameter except as noted on plans. Surface markers for sewer laterals shall be installed at property line.
 - 2. Wye fittings shall be in-line type and shall be used for all lateral connections and shall be rotated a minimum of 23 degrees above the horizontal plane running through the centerline of the main.
 - 3. All sewer stubs shall be closed with a standard plastic plug solvent welded.
- b. Existing Facilities: All existing improvements, (curbs, gutter, sidewalk, cross gutter, fencing, etc.), that are removed, damaged or undercut shall be repaired or replaced as directed by the County.

CHAPTER V. STANDARDS FOR SEPARATION OF WATER AND SEWER LINES

Sec. 305-1 General

This document sets forth the construction criteria for the installation of water mains and sewer lines to prevent contamination of the public water supplies from nearby sanitary sewers.

305-1.01 The "California Waterworks Standards" sets forth the minimum separation requirements for water mains and sewer lines. These Standards, contained in Section 64572, Title 22, California Administrative Code, specify:

- (a) Parallel Construction: The horizontal distance between pressure water mains and sewer lines shall be at least 10 feet.
- (b) Perpendicular Construction (Crossing): Pressure water mains shall be at least one foot above sanitary sewer lines where these lines must cross.
- (c) Separation distances specified in (a) above shall be measured from the nearest edges of the facilities.
- (d) Common Trench: Water mains and sewer lines must not be installed in the same trench.
- (e) Where steel casings or tunnels are used for the passage of water and sewer lines under railroad tracks, highways or other structures, the same shall be specially designed to eliminate any hazard of contamination to the water system.

Sec. 305-2 Exceptions to Basic Separation Standards

Local conditions, such as available space, limited slope, existing structures, etc., may create a situation where there is NO ALTERNATIVE but to install water mains or sewer lines at a distance less than that required by the Basic Separation Standards. In such cases, alternative construction criteria as specified in Section 305-4 should be followed, subject to the special provisions in Section 305-3.

Water mains and sewers of 24 inches in diameter or greater may create special hazards because of the large volumes of flow. Therefore, installations of water mains and sewer lines 24 inches in diameter or larger should be reviewed and approved by the health agency prior to construction.

Sec. 305-3 Special Provisions

- 305-3.01** The Basic Separation Standards are applicable under normal conditions for sewage collection lines and water distribution mains. More stringent requirements may be necessary if conditions, such as, high groundwater exist.
- 305-3.02** Sewer lines shall not be installed within 25 feet horizontally of a low head (5 psi or less pressure) water main.
- 305-3.03** New water mains and sewers shall be pressure tested where the conduits are located ten feet apart or less.
- 305-3.04** In the installation of water mains or sewer lines, measures should be taken to prevent or minimize disturbances of the existing line. Disturbance of the supporting base of this line could eventually result in failure of this existing pipeline.
- 305-3.05** Special consideration shall be given to the selection of pipe materials if corrosive conditions are likely to exist. These conditions may be due to soil type and/or the nature of the fluid conveyed in the conduit, such as a septic sewage which produces corrosive hydrogen sulfide.
- 305-3.06** Sewer Force Mains
- a. Sewer force mains shall not be installed within ten feet (horizontally) of a water main.
 - b. When a sewer force main must cross a water line, the crossing should be as close as practical to the perpendicular. The sewer force main should be at least one (1) foot below the water line.
 - c. When a new sewer force main crosses under an existing water main, all portions of the sewer force main within ten feet (horizontally) of the water main shall be enclosed in a continuous sleeve.
 - d. When a new water main crosses over an existing sewer force main, the water main shall be constructed of pipe materials with a minimum rated working pressure of 200 psi or equivalent pressure rating.
 - e. Force mains greater than 1000 feet shall have pressure clean-outs every 600 feet.

Sec. 305-4 Alternate Criteria for Construction

The construction criteria for sewer lines or water mains where the Basic Separation Standards cannot be attained are shown on Plate Nos. S-9 and S-10. There are two situations encountered:

- Case 1: New sewer line -- new or existing water main.
- Case 2: New water main -- existing sewer line.

For Case 1, the alternate construction criteria apply to the sewer line.

For Case 2, the alternate construction criteria may apply to either or both the water main and sewer line.

The construction criteria should apply to the house laterals that cross ABOVE a pressure water main but not to those house laterals that cross BELOW a pressure water main.

305-4.01 Case 1: New Sewer Being Installed (Plate Nos. S-9 and S-10)

Special Construction Required for Sewer

- Zone A. Sewer lines parallel to water mains shall not be permitted in this zone without approval from the responsible health agency and water supplier.
- Zone B. A sewer line placed parallel to a water line shall be constructed of:
 - 1. Extra strength vitrified clay pipe with compression joints.
 - 2. Plastic sewer pipe with rubber ring joints (per ASTM D3034) or equivalent.
 - 3. Cast or ductile iron pipe with compression joints.
- Zone C. A sewer line crossing a water main shall be constructed of:
 - 1. Ductile iron pipe with hot dip bituminous coating and mechanical joints.
 - 2. A continuous section of Class 200 (DR 14 per AWWA C900) plastic pipe or equivalent, centered over the pipe being crossed.

		3. Any sewer pipe within a continuous sleeve.
	Zone D.	A sewer line crossing a water main shall be constructed of:
		1. A continuous section of ductile iron pipe with hot dip bituminous coating.
		2. A continuous section of Class 200 (DR 14 PER AWWA C900) plastic pipe or equivalent centered on the pipe being crossed.
		3. Any sewer pipe within a continuous sleeve.
		4. Any sewer pipe separated by a ten-foot by ten-foot, four (4) inch-thick reinforced concrete slab.
305-4.02	Case 2:	New Water Mains Being Installed (Plate Nos. S-9 and S-10)
	Zone A.	No water mains parallel to sewers shall be constructed without approval from the health agency.
	Zone B.	If the sewer paralleling the water main does not meet the Case 1, Zone B, requirements, the water main shall be constructed of:
		1. Ductile iron pipe with hot dip bituminous coating.
		2. Dipped and wrapped one-fourth (1/4) inch thick welded steel pipe.
		3. Class 200 pressure rated plastic water pipe (DR 14 per AWWA C900) or equivalent.
		4. Reinforced concrete pressure pipe, steel cylinder type, per AWWA (C300 or C301 or C303).
	Zone C.	If the sewer crossing the water main does not meet the Case 1, Zone C, requirements, the water main shall have no joints in Zone C and be constructed of:
		1. Ductile iron pipe with hot dip bituminous coating.
		2. Dipped and wrapped one-fourth (1/4) inch thick welded steel pipe.

3. Class 200 pressure rated plastic water pipe (DR 14 per AWWA C900) or equivalent.
4. Reinforced concrete pressure pipe, steel cylinder type, per AWWA (C300 or C301 or C303).

Zone D. If the sewer crossing the water main does not meet the requirements for Zone D, Case 1, the water main shall have no joints within four (4) feet from either side of the sewer and shall be constructed of:

1. Ductile iron pipe with hot dip bituminous coating.
2. Dipped and wrapped one-fourth (1/4) inch thick welded steel pipe.
3. Class 200 pressure rated plastic water pipe (Dr 14 per AWWA C900) or equivalent.
4. Reinforced concrete pressure pipe, steel cylinder type, per AWWA (C300 or C301 or C303).

Sec. 305-5

Notes and Definitions

- 305-5.01 HEALTH AGENCY** - The Department of Health Services. For those water systems supplying fewer than 15 service connections, the local health officer may act for the Department of Health Services.
- 305-5.02 WATER SUPPLIER** - "Person operating a public water system" or "supplier of water" means any person who owns or operates a public water system
- 305-5.03 LOW HEAD WATER MAIN** - Any water main which has a pressure of five (5) psi or less at any time at any point in the main.
- 305-5.04 DIMENSIONS** are from outside of water main to outside of sewer line or manhole.
- 305-5.05 COMPRESSION JOINT** - A push-on joint that seals by means of the compression of a rubber ring or gasket between the pipe and a bell or coupling.
- 305-5.06 MECHANICAL JOINTS** - Bolted joints.

- 305-5.07 RATED WORKING WATER PRESSURE OR PRESSURE CLASS -**
A pipe classification system based upon internal working pressure of the fluid in the pipe, type of pipe material, and the thickness of the pipe wall.
- 305-5.08 FUSED JOINT -** The jointing of sections of pipe using thermal or chemical bonding processes.
- 305-5.09 SLEEVE -** A protective type of steel with a wall thickness of not less than one-fourth inch into which a pipe is inserted.
- 305-5.10 GROUNDWATER -** Subsurface water found in the saturation zone.
- 305-5.11 HOUSE LATERAL -** A sewer connecting the building drain and the main sewer line.

CHAPTER VI STANDARDS FOR SEWER LIFT STATION

Sec. 306-1 General

Sewer Lift stations shall conform to the following minimum features and specifications:

- 306-1.01** Pumps shall be installed in a single wet well and shall be submersible as approved by the manufacture.
- 306-1.02** Pumps shall be removable from ground level through use of a guide rail and cable system attached to the wet well.
- 306-1.03** Sewer lift stations shall be located outside street right of way in an easement dedicated for a lift station.
- 306-1.04** Site shall be enclosed by fence and interior surface shall be graveled with three-tenths (0.30) foot of three-fourths ($\frac{3}{4}$) inch gravel. Site shall have approved access.
- 306-1.05** Wet well shall be equipped with access frame and cover which will allow removal of pump and motor assembly.
- 306-1.06** Wet well shall be mechanically vented to prevent odors from reaching adjacent properties.
- 306-1.07** Minimum pump horsepower shall be five (5) hp.
- 306-1.08** Wet well surfaces shall be treated with a protective lining, acceptable to County, and shall be integral to all interior surfaces.

- 306-1.09** A portable supply shall be provided for wash down.
- 306-1.10** Bottom of wet well shall be sloped toward pumps to direct sludge. Pumps shall be supported on smooth and level bottom area.
- 306-1.11** All pipes shall be neoprene sealed at walls of wet well.
- 306-1.12** A wash down assembly to facilitate break-up of scum layer shall be connected to each discharge as near the top as possible. It shall consist of a one (1) inch NPT Bronze strap service saddle with stainless steel nuts and bolts, a one (1) inch NPT cast iron threaded nipple eight (8) inch long, and a one (1) inch cast iron threaded 90° ell.
- 306-1.13** Discharge shall feed into a valve box equipped with check and gate valves for each discharge line. The box shall have a three-fourths ($\frac{3}{4}$) inch gravel bedding with a two (2) inch bleed off pipe connected to the wet well. (see Plate No. S-13)
- 306-1.14** The pump number shall be painted contrasting colors on each discharge pipe in a manner clearly visible from above.
- 306-1.15** The motor control center shall be pedestal mounted on a concrete base in a metal or fiberglass weatherproof, rainproof and lockable enclosure.

Sec. 306-2 Lift Station Specifications

306-2.01 General

All work involved in constructing sewer pump stations shall conform to the applicable provisions of the California Department of Transportation Standard Specifications, current edition, hereinafter referred to as Standard Specifications, County Standards, the improvement plans and these specifications.

The following specifications represent the minimum specification allowable for a duplex sewer pump station. Additional features or specifications may be needed as required by the engineer.

306-2.02 Concrete

The work included herein shall conform to Section 51 "Concrete Structures" and Section 90 "Portland Cement Concrete" of the Standard Specifications. This work shall consist of furnishing all labor, tools, equipment and materials necessary for the installation of all structural concrete, minor concrete and mortar as shown on the plans

and specified herein.

Structural Concrete:

Strength:

The minimum ultimate (28 days) compressive strength of all structural concrete shall be 3250 psi.

Concrete Mix:

Structural concrete must contain at least 675 pounds of cementitious material per cubic yard of concrete. The maximum size of aggregate shall be one and one-half (1 ½) inches.

Slump:

The amount of water used for mixing (including free moisture carried by the aggregate) shall not exceed the maximum necessary to produce a four (4) inch slump as determined by ASTM test method C143.

Placing:

Concrete shall be placed in accordance with Section 51-1.03C(2)(c) (ii): "Placing Concrete" of the Standard Specifications.

Forms:

All form work shall conform to Section 51-1.03C(2) "Forms" of the Standard Specifications.

Defective Concrete:

Concrete not meeting the minimum strength requirement, not formed as indicated, not true to intended alignment, which has large voids or rock pockets, which has wood or other debris embedded which has a surface deviation greater than one-eighth (1/8) inch in 10'-0", or does not fully conform to the specifications shall be deemed defective, and if so directed by the Engineer, shall be removed and replaced with concrete complying with the drawings and specifications.

Minor Concrete:

Concrete Mix:

Minor concrete must contain at least 505 pounds of cementitious material per cubic yard of concrete. The maximum size of aggregate shall be one (1) inch.

Form work:

Earthen forms for exterior concrete surfaces shall be allowed only upon approval by the Engineer. The acceptability of the earthen forms shall be solely decided upon by the Engineer.

Mortar:

All mortar shall conform for Section 51-1.02F "Mortar" of the Standard Specifications.

Non-Shrink Grout and Dry-pack:

Non-shrink grout shall conform to Section 50-1.03B(2)(d), "Bonding and Grouting" of the Standard Specifications with a required admixture using the following proportions:

Portland Cement. 1 Part by Wt.

Sand (100% Passing #8 Sieve) 1 Part by Wt.

Water.. ... 4 ½ -5 ½ gal./sack cement

Sika "intraplast" N Admixture 1 % by Wt. Of cement

Dry-pack shall be composed as for grout except that only enough water shall be added to wet the mixture (no free water and no slump).

Dry-pack shall be tamped into place and cured as specified for concrete in this section. Contractor shall not use non-shrink grout or dry-pack that has been mixed longer than 30 minutes. No re-tamping shall be allowed.

Finishes on Walking Surfaces:

The contractor shall give a monolithic finish to the walking surfaces at all concrete floors and slabs within and adjacent to the structures. All concrete surfaces to be so finished shall be thoroughly worked, brought to a uniform smooth finish and given a final brush finish.

Curing:

All newly placed concrete shall be kept moist for the first seven (7) days after the concrete has been placed. This shall be achieved by one of the following methods:

1. Ponding
2. Cotton mats rugs or carpets kept continuously wet.
3. Kraft paper or plastic film with joints sealed or tapered. The perimeter of the paper shall be sprinkled once daily.
4. Curing compound method: All exposed cast in place concrete shall be cured with curing compound in accordance with Section 90-1.03B "Curing Concrete", of the Standard Specifications.

Forms may be used to cure formed portions in accordance with Section 90-1.03B(5) "Forms In-Place Methods" of the Standard Specifications. If the forms are removed prior to seven (7) days after the pour, the newly exposed areas shall be cured for the remainder of the seven (7) days by one of the above methods.

Metal Work

The work included herein shall conform to Sections 52- "Reinforcement", 55- "Steel Structures" and 75 -" Miscellaneous Metal" of the Standard Specifications. This work shall consist of furnishing all labor, tools, equipment, and materials necessary for the installation of all reinforcing steel, structural steel and miscellaneous metal as shown on the plans and specified herein and as directed by the Engineer.

Reinforcing Steel:**Materials:**

1. Bars shall be deformed bars conforming to ASTM A615, as follows: Bar Size Grade #4 and smaller Grade 40, #5 and larger Grade 60
2. All reinforcing steel shall be new, clean, free from oil, dirt, loose mill scale, excessive rust, mortar, or other coatings that would destroy or reduce the bond.

Placing Reinforcement:

The bending and placing of all reinforcement shall conform to the "Manual of Standard Practice" of the American Concrete Institute. Bends shall be made around a pin having a diameter of not less than four (4) times the bar diameter for stirrups and ties, six (6) times the bar diameter for other bars except for bars larger than 1" which shall be eight (8) times the bar diameter. Bars shall be bent cold. Reinforcing shall be accurately placed in accordance with the drawings and shall be securely tied in position with at least No. 16 gauge annealed wire at all bar intersections. Metal chairs and bolsters shall be used to hold all steel above the form bottoms at the proper distance. Metal spacers shall be used to secure the proper spacing of the steel. Pre-cast concrete blocks shall be used to support reinforcing steel off the ground in footings and off the soffit of concrete exposed to weather. The clear distance between parallel bars shall not be less than one and one-half ($1 \frac{1}{2}$) times the bar diameter, but in no case less than one and one-half ($1 \frac{1}{2}$) inches nor less than one and one-third ($1 \frac{1}{3}$) times the maximum size of coarse aggregate.

Splices shall be made with a lap of at least 30 bar diameters unless noted otherwise. The bars shall be placed in contact and wired together in such a manner as to maintain a clearance of not less than the minimum clear distance to the other bars and to the surface of the concrete. Minimum clear distance to all concrete surfaces shall be two (2) inches unless otherwise noted on the plans.

Pump Access Covers:

The wet well shall be equipped with a pump access cover for each pump as shown on the plans. Access covers shall be stainless steel-fitted aluminum construction, designed for access to submersible pumps. Covers shall be equipped with a guide bar bracket, safety chain hook, electric cable support, and a hasp for a padlock. Covers shall be of a size compatible with the pumps.

Valve Box Access Cover:

Cover shall be double leaf, channel frame aluminum construction with stainless steel hardware and a hasp for a padlock. Cover shall be of a size compatible with valve box opening, minimum size shall be five (5) feet x six (6) feet with each leaf being three (3) feet x five (5) feet. The cover shall withstand a live-load of at least 300 pounds per square foot and be equipped with spring door operators and automatic hold-open arms. The cover construction shall have a mill finish with Bituminous Coating applied to exterior of the frame.

Anchor Bolts and Concrete Anchors:

Concrete anchorage devices shall be installed in the concrete as shown on the plans so that the attached equipment will bear firmly against the concrete. The concrete anchors for the pump discharge mount shall be wedge anchors and must be Type 316 stainless steel, three-fourths (3/4) inch Diameter, or approved equal.

Bolted Connections:

All bolts, nuts and washers within the wet well shall be 316 stainless steel.

306-2.04

Painting

Furnish and apply to the satisfaction of the Engineer, protective paint in colors as approved by the engineer. All exposed interior and exterior metal surfaces, except aluminum, galvanized steel, stainless steel and chrome plated metal, shall be coated. All paint shall be delivered in original containers and shall be applied in strict accordance with the recommendations of the manufacturer.

Preparation of surfaces:

Concrete Surfaces:

Before painting, all concrete surfaces to be painted shall be thoroughly cleaned. Surfaces to be painted shall be completely wire brushed to remove any loose concrete or paint, and cracks shall be patched. Concrete surfaces to be painted shall have all air pockets or other imperfections filled, so that a smooth surface results. All surfaces shall be completely dry prior to painting. Concrete surfaces

which shall be coated with a protective coating for the purpose of protecting the concrete surface, shall have all air pockets or other imperfections in the concrete filled, so that a smooth concrete surface results, after the surface has been opened, it shall be sacked to fill the voids with mortar. Sacking shall be accomplished soon after the removal of the forms to promote adequate adhesion. Covering over the surface with a thin layer of mortar shall not be acceptable.

Metal Surfaces:

All metal work to be painted shall be absolutely clean and free of all rust and grease. All exposed cast iron or steel piping to be painted, which has a previously applied coal tar derivative, shall be primed, prior to finish coating, with two (2) coats of a heavy duty, coal tar based epoxy or approved equal.

Completion of Surface Preparation:

After completion of preparing all surfaces to be painted, the surfaces shall be inspected and approved by the County prior to the application of any protective coatings.

Materials:

Under these specifications, all paint products to be furnished for application as specified in this section.

Coating System:

- A. One (1) coat of a self-priming, coal-tar, with a continuous dry temperature resistance of at least 325 degrees F. The completed surfaces shall have a dry thickness of at least 16 mil.
- B. Two (2) coats of a coal-tar epoxy polyamide with a solids content by volume of at least 72% and has a continuous dry temperature resistance of at least 325 degrees F, the first (1st) coat to be red, second (2nd) coat to be black application of second (2nd) coat to be applied within 24 hours of the first. The completed surfaces shall have a dry thickness of at least 16 mil.
- C. One (1) coat of a polymeric epoxy amine that is a universal primer and tie-coat, self-priming, with a dry temperature resistance of at least 175 degrees F, followed by two (2) coats of a medium oil/alkyd all-purpose enamel, color: OSHA Safety Blue.

The completed surfaces shall have a dry thickness of at least three (3) mil.

Exterior Concrete Painting:

Coating System A shall be used to paint the wet well and valve box exterior surfaces in contact with the soil.

Interior Concrete Painting:

After surface preparation, the Contractor shall paint all submerged concrete surfaces, surfaces exposed to sewage fumes, all valve box interior, with coating System B.

Wet Well Metalwork Painting:

All exposed metalwork surfaces which are submerged or subjected to sewage fumes shall be painted with coating System B. Metal located within water containing compartments shall be considered submerged. The pumps, pump discharge, pump power cables and lifting cables are not to be coated. Also, the access covers are not to be coated.

Valve Box Metalwork Painting:

All exposed metalwork surfaces in the valve box shall be painted with coating System C. The access cover is not to be coated.

306-2.05

Pipe work

All labor and materials shall be furnished for the complete installation and testing of all pipe work and appurtenances related to lift stations. Shop drawings are required to be submitted by the Contractor/Developer to the Engineer for all fabricated pipe work, valves and special fittings for approval prior to construction.

Materials:

PVC Gravity Sewer Pipe:

PVC sewer pipe shall conform to these standards and the requirements of ASTM D3034. SDR 35 and shall have gasketed joints.

PVC Force Main:

PVC force main shall conform to AWWA C900 and shall be Class 150.

Ductile Iron Pipe (D.I.):

Ductile iron pipe and fittings shall be cement mortar lined. Pipe joints shall be flanged or as shown on the plans. Applicable sections of the following standards apply.

Standard	Item
AWWA C151	Ductile Iron Pipe
AWWA CI04	Cement Mortar Lining

Cast Iron Fittings (C.I.):

Cast iron fittings shall be in accordance with the American Water Works Association Standard A21.10 (C110), "Gray Iron and Ductile Iron fittings, three (3) inch through 48-inch, for Water and Other Liquids."

Couplings and Flanges:

In the locations shown on the plans, flanged coupling adaptors shall have a body and end rings composed of ductile iron in accordance with ASTM A536, cross bolts, T-Bolts and nuts of High Strength Low Alloy Steel per AWWA C111 or ductile iron in accordance with ASTM A536 with an SBR coupling gasket per ASTM D2000, nitrile butadiene rubber (NBR) / Buna-N flange O-rings, flange drilled in accordance with ANSI/AWWA C110/A21.10, AWWA C207 and shop coat finish. Flexible couplings shall be comprised of a ductile iron center sleeve and end rings in accordance with ASTM A536, Grade 65-42-12, gaskets comprised of SBR rubber in accordance with ASTM D2000, bolts and heavy hex nuts comprised of high strength low alloy in accordance with ASTM A242 and AWWA C111 and a shop coat finish. End rings shall be color coded for easy identification. Gaskets shall have size and end ring color code embossed. NBR or Buna-N gaskets may be permitted upon approval of Engineer. Flanges shall be of a size and pattern to fit valves and other piping to which they are to be connected.

Small Piping and Fittings:

These specifications shall apply to all metal pipe four (4) inches in diameter and smaller, other than cast iron piping, and shall also apply to all valves and cocks, unions, fittings, and connecting devices, and to pipe lines furnished as a part of the several piping and equipment items within the pump station. Small pipe shall include all nuts, bolts, gaskets, hangers, supports, the drilling of holes and flanges, and all materials and labor that may be necessary to the best installation of this class of work.

Fittings:

All screwed fittings shall be "American Standard Malleable Iron Screwed Fittings", 300 lb. W.O.G. of standard form and dimensions. Malleable iron shall conform to current standard specifications for malleable iron. Castings, as adopted by the "American Society for Testing Materials." All fittings shall be galvanized to correspond with pipe on which they are installed. All fittings necessary for the satisfactory alignment and arrangement of piping and all necessary

unions and clean-outs shall be furnished by the Contractor.

Gate Valve:

All gate valves shall have standard flanged ends. Each valve shall have a two (2) inch square operating nut. Valves shall correspond in size with the run of pipe on which it is installed, except as otherwise noted. Gate valves shall be four (4) inch resilient wedge gate valves with flanged ends in accordance with AWWA C515 or approved equal.

Swing Check Valve:

Check valves shall be flanged, iron body, bronze-mounted check valves. Hinge pins shall be stainless steel or other noncorrodible metal, and the stuffing box assembly shall be made of bronze, securely screwed to the valve body. Swing check valves shall have a spring type lever and check valve with a rubber disc facing in accordance with AWWA C508. Check valve shall have flanged ends in accordance with ANSI B16.1, class 125 and be epoxy coated on exterior and interior. Check valve shall have 200 PSI maximum working pressure and 400 PSI test pressure. Spring shall have option to be installed on either side of valve.

Pipe work in Concrete:

Where formed holes are left in the concrete, the Contractor shall be responsible for the accuracy of their location and for sealing around pipes to produce water tightness where necessary. All necessary pipeline openings through the concrete which may have been omitted shall also be provided.

Christy Box and Force Main Access:

For lift stations without a back-up generator, a Camlock wye connection to the force main shall be installed and placed in a utility box of at least 24 inches by 24 inches, comprised of concrete, to allow portable surface pump access to the force main in the event of a sewer lift station electrical failure, if required by the District. Lid of box shall be comprised of concrete or polymer that can withstand at least 22,500 pounds of force.

Domestic Water Service:

The Contractor shall provide and install all items as shown on the plans and as needed to supply one (1) inch water service to the valve box. The Contractor shall also coordinate installation of the service meter with the utility company providing water service to the site.

Meter and Valve Box:

The meter and valve box shall be a utility box with a minimum size of 15 inches by 22 inches and 12 inches deep. Box performance shall be in accordance with ASTM C857 with a cover that shall be comprised

of concrete or polymer that can withstand at least 22,500 pounds of force.

Reduced Pressure Back-flow Preventer:

The backflow preventer shall be a reduced pressure principle type and shall be suitable for supply pressure up to 175 psi. The backflow preventer shall be designated for inline servicing. The device shall be rated for 175 PSI working pressure and temperature range of at least 32 - 140 degrees F. The reduced pressure zone assembly shall consist of two independently operating, spring loaded, "Y" pattern check valves and one hydraulically dependent differential relief valve.

Mainline valve body and caps including relief valve body and cover shall be lead free cast copper silicon alloy. Diaphragm to seat area ratio shall be 10:1 minimum. Relief valve shall have a removable seat ring. Check valve and relief valve components shall be constructed to allow service without removing the valve body from the line. All seat discs shall be reversible. The assembly shall be in accordance with AWWA C511 for a one (1) inch service or approved equal.

Domestic Water Spigots:

Contractor shall supply one (1) spigot as shown on the plans.

Wet Well Water Stops:

All cored openings in the wet well wall shall be sealed with water stops secured by stainless steel bands and non-shrink grout as specified in Section 306-2.02. Water stops shall be comprised of elastomeric PVC and in accordance with ASTM C923.

Discharge Wash-Down Assembly:

Wash-down assemblies as shown on the plans shall use eight (8) inched x one (1) inch bronze saddles with a brass body, rolled strap threads, O-ring sealed outlet and in accordance with AWWA C800.

Wet Well construction:

Wet well shall be constructed using 96-inch diameter minor concrete reinforced concrete pipe sections manufactured to meet ASTM Standards C76, C443, and C655. The wet well shall be constructed with no more than three pipe sections. The lower wet well section shall be a minimum of six (6) feet in length. Interior surfaces shall be painted prior to the installation of pumps. The discharge connection mating surface shall be kept clean and free of all paint.

Sewer Manholes:

The Contractor shall construct the sewer manholes as shown on the plans per these Standards (Plate Nos. S-5 and S-6).

MECHANICAL EQUIPMENT

The Contractor shall provide and install all necessary items and appurtenances required for the proper placement and functioning of the project components as intended, whether such items and appurtenances are directly specified or not. All equipment shall be designed, manufactured and assembled in such a manner so as to perform satisfactorily within housings, enclosures and the environment into which it is to be installed and operated. All items shall be tested in place. Required supervision for installing, testing and starting shall be furnished by factory-trained personnel at no charge. The Contractor shall verify all actual dimensions of existing and new construction equipment areas, bases and mountings; and he shall be responsible for ensuring proper fit of the equipment selected for installation. The Contractor shall be fully responsible for the compatibility of furnished mechanical, electrical, pipework and structural items and appurtenances.

Pump Warranty:

The pump manufacturer shall warrant the pumps and motors being supplied to the owner against defects in workmanship and materials for a period of one (1) year under normal use, operation and service. The warranty shall be in printed form and shall apply to all similar units.

Submersible Pumps, Motor and Slide-Away Coupling:

The Contractor shall furnish and install a totally submersible pumps as shown on the plans and as described hereinafter. The pumping unit shall conform to the following: Under this section the Contractor shall furnish and install all mechanical equipment and appurtenances for this project as shown on the plans and hereinafter specified. All such equipment shall be placed by the Contractor in satisfactory operating condition as an integral part of the construction of the project.

Characteristics:

Two (2) (brand) size (size) Model Torque-flow vortex submersible pumps with HP, phase, volt, hertz.

Submersible motors and slide-away casings:

Pump casing shall be constructed of ASTM A48 Class 30 gray iron and shall be completely open from suction to discharge with no wearing rings or impeller faceplates required. All internal case clearances shall be equal to the discharge diameter so that all material which will pass through the discharge can pass through the pump. The impeller shall be of the recessed design, constructed of ASTM A48 Class 30 gray iron and shall be mounted completely out of the flow path between the pump inlet and discharge connection, so

that the solids pumped are not required to flow through the impeller. The impeller shall be keyed to the motor shaft and secured by an impeller bolt.

The motor shall be provided with thrust and radial bearings to carry the entire load which may be imposed upon it under all operating conditions. Motor shall be approved by Underwriters Laboratory for operation in a Class I, Group D, Division I, hazardous location.

The motor shall have two (2) mechanical seals, the lower one (1) outside the motor and protecting the upper one (1) which is an oil-filled chamber. Moisture detector probes in the oil-filled seal chamber shall be connected to a customer-supplied alarm to indicate the presence of moisture in the seal chamber. Thermal overload protectors shall be imbedded in the motor windings and connected to the starter to disconnect the motor in the event of overload. The slide-away coupling shall consist of a foot-mounted discharge elbow and adaptor steel baseplate, upper and lower rail supports, lifting yoke and cable. All metal-to-metal interfaces where movement might occur shall be non-sparking. The foot-mounted discharge elbow and adaptor shall conform to ASTM A48 Class 30 grey iron. Lifting cable and hardware shall be stainless steel. Cable shall have a minimum working load of 2,400 lbs. and shall be supplied by the pump manufacturer.

Performance:

The developer's engineer shall provide and complete the following performance data on sewer plans. Each pump shall be capable of operating at the following conditions:

First design point GPM @ _____ ' TDH.

Second design point = GPM @ _____ ' TDH.

(Minimum) (Maximum) shut off= _____ feet.

Impeller selected shall be capable of operating at all three (3) design points without exceeding BHP.

Minimum clearance through case = _____ "

Pump Test:

The pump manufacturer shall perform the following inspections and tests on each pump before shipment from factory:

1. Impeller, motor rating and electrical connections shall first be checked for compliance to the customer's purchase order.
2. A motor and cable insulation test for moisture content or insulation defects.
3. Prior to submergence, the pump shall be run dry to establish correct rotation and mechanical integrity.
4. The pump shall be run for 30 minutes submerged, a minimum of six (6) feet under the water.

5. After operational test No.4, the insulation test (No.2) is to be performed again.

A written report stating the foregoing have been done shall be supplied with each pump at the time of shipment. The pump cable end will then be fitted with a shrink fit rubber boot to protect it prior to electrical installation.

Documentation:

Standard drawings supplied shall include pump outlines, controls, access frames and typical installation guides. Electrical control wiring diagrams shall be supplied. Instruction and maintenance manuals and pump parts lists for the pumps installed shall also be supplied.

Acceptance Tests:

After installation, each pumping unit shall be given a running test, during which it shall demonstrate its ability to operate without vibration, overheating or excessive current draw, and to pump the capacity and head specified. These tests are to be conducted by the Contractor in the presence of the Engineer. The Engineer shall be given at least 24 hours notice in advance of each test.

During the tests, observations shall be made of motor input, vibration, noise and overheating to detect any defects in the equipment. Written results of each test shall be submitted by the Contractor to the Engineer prior to approval of the tested pumps. The Contractor shall provide at his expense the necessary water, gauges, meters, piping and labor necessary for conducting the tests. All adjustments needed to place the equipment in satisfactory working order shall be made at the time of the tests. All defects or defective equipment revealed by or noted during a test shall be corrected or replaced promptly at the expense of the Contractor, and if necessary, tests shall be repeated until satisfactory results are obtained. In case the Contractor is unable to demonstrate to the satisfaction of the Engineer that the units will satisfactorily perform the service required, and that they will operate free from vibration and over heating, the units may be rejected. The Contractor shall then remove and replace the equipment at his own expense.

306-2.07

ELECTRICAL WORK

The Contractor shall provide all the required labor, project equipment and materials, tools, construction equipment, safety equipment, transportation, test equipment, and satisfactorily complete all the electrical work shown on the drawings and included in these specifications. The electrical work for this project includes providing all electrical materials and equipment required for a complete and full

operating facility. The Contractor shall provide temporary power for system testing. Included in this work is the providing of all required conduits, conductors, and cables including those specified; shown on the drawing; and neither specified nor shown on the drawings but nonetheless required for satisfactory interconnection and operations of all electrical, mechanical and instrumentation equipment either shown on the respective drawings, specified in the respective portions of the specifications, or otherwise required.

Codes:

All the electrical equipment and materials, including their installations, shall conform to the following applicable codes:

1. National Electrical Code, Latest Edition
2. State Electrical Code, Latest Edition, Title 24 Part 3
3. Occupational Safety and Health Act Standards
4. County of Kern Codes and Ordinances

Variances:

In instances where two (2) codes are at variance, the more restrictive requirements shall apply.

Standards:

Equipment shall conform to the applicable EIA, IEEE, and NEMA Standards

Drawings:

The electrical drawings shall govern the general layout of the completed construction. Except where special details are used to illustrate the method of installation of a particular piece or type of equipment or materials, the requirements or descriptions in these specifications shall take precedence in the event of conflict.

Securing Equipment:

1. Locations of equipment, inserts, anchors, motors panels, conduits, stub-ups, fittings, power and convenience outlets and ground wells are approximate unless dimensioned, and the Contractor shall be responsible for field verifications of scaled dimensions on drawings.
2. The contractor shall review the drawings and specifications of other trades and shall perform the electrical work that will be required for the installations.
3. Should there be a need to deviate from the electrical drawings and specifications, the Contractors shall submit written details and reasons for all changes to the Engineer for approval.

The Contractor shall provide the required inserts, bolts and anchors, and shall securely attach all equipment and materials to their supports.

Cutting, Drilling and Welding:

The Contractor shall provide the required cutting, drilling and welding that is necessary for the electrical construction work. Cutting and drilling structural members shall not be permitted, except when approved by the Engineer. A core drill shall be used wherever it is necessary to drill through concrete. The Contractor shall provide the required welding for equipment supports. Patchwork shall be completed with the same materials and finished to match the surrounding area.

Conduit:

All electrical conduits shall be PVC Schedule 80 unless otherwise specified.

Ground Rods:

Ground rods shall be Copper weld, not less than one-half (1/2) inch x eight (8) feet.

Control Panel:

Contractor shall furnish and install one duplex air bubbler control panel (conforming to NEMA 3R and 12 standard) with a hinged inner door (dead front) fabricated from 5052- H32 0.080 thick marine alloy aluminum. The inner door shall be held closed by two (2) hand operated, one-fourth (1/4) turn fasteners and shall contain the control instruments and indicators. The tamperproof outer door shall be lockable using a hasp. Ventilation shall be provided by louvers on one (1) side of the enclosure. Enclosure shall be double compartment _ size _ and contain space for service entrance equipment of the left side. The entire control panel shall be UNDERWRITERS LABORATORY LISTED and furnished with a UL LABEL, or listed by one of the other Nationally Recognized Testing Laboratory Program (NRTL) participants and furnished with an appropriate label certifying their acceptance or the item meeting stated requirements. Each component shall be factory mounted, wired, inspected and tested. A wiring diagram and heater chart shall be enclosed in the panel. A red "High Voltage Inside" nameplate shall be fastened to door covering the high voltage compartment. All components including indicating lights, switches, buttons, relays, accessories, and permanently identified as to their function with the components. The identifications shall be in the form of photo etching, silk screening or engraving. All terminal blocks shall be identified by both number and graphic symbols which clearly indicate the purpose of each terminal block. All control wiring shall be numbered at each termination. The panel

enclosure shall be free standing and mounted on a reinforced concrete pad. The lower compartment shall have a lockable access door and be flush with the concrete pad. The enclosure shall be constructed of 14-gauge steel. The entire unit shall be degreased, cleaned and treated with a phosphatizing process, then primed and painted inside and out with corrosion-resistant, industrial-grade baked enamel. The finish coat shall be ASA-61 Gray.

Control System Operation:

The control system shall provide total automatic control for two (2) motor driven pumps operating on 480 volts, 3 phase service. The wet well level shall be monitored and controlled as follows:

- Level 5- High Level
- Level 4- Start Lag Pump
- Level 3- Start Lead Pump
- Level 2- Stop Lag Pump
- Level 1- Stop Lead Pump

Contingent upon the wet well level, the bubbler system shall cause the liquid level indicator/controller to energize the appropriate control contacts. Upon wet well level rise, the lead pump start contact (Level 3) shall be energized causing a relay in the pump logic controller to start the lead pump. If the level continues to rise to the lag pump start control. (Level 4), the controller shall energize a relay to start the lag pump, and both pumps shall run simultaneously. The liquid level shall be lowered until the lag pump stop contact (Level 2) is reached, stopping the lag pump. The lead pump shall continue to run lowering the wet well level until the lead pump stop contact (Level 1) is reached. Upon the next wet well level rise, the lead pump selection shall be alternated. If the wet well level rises to high level contact (Level 5), it shall energize a relay in the pump logic controller to operate the alarm system and indicate a high-water condition. The control system shall be built in such a manner that the owner will have the ability to select high level alarm activation at a separate specific level or have it activated when start lag pump level is reached. The owner shall have the ability to select independent start and stop for the lead and lag pumps, or a common stop for both pumps.

Liquid Level Indicator/Controller:

The wet well level shall be monitored and maintained by a well-type manometer with mercury media that makes and breaks a series of electrical contacts as the mercury rises and falls in direct proportion to the change of the liquid level in the wet well. Digital read out or horizontal needle deflection instruments are not acceptable. The manometer shall have one common 24 V AC electrical contact and a vertical row of contact points, which when coming in contact with the

column of mercury shall signal a relay in the pump logic control to perform the pump operation and alarm functions. The liquid level indicator/controller shall have a viewing window which shall display the mercury column and be calibrated in both feet and inches of water indicating the liquid level in the wet well. The unit shall be mounted on the dead front door. The unit shall be an electro-mechanical device with no moving parts. The unit shall be factory calibrated and not require field calibration. Accuracy shall be plus minus $\frac{1}{2}$ percent of full scale with 100 percent repeat accuracy and zero dead band when making and breaking electrical contacts. Indicated full scale range shall be zero to ten feet with front scale graduated in feet (0 to 10 feet) and inches (0 to 120 inches) the vertical, linear, mercury column shall have a total of 40 control points providing an electrical output for every three inches of water pressure, and shall be individually labeled as to the level at which they are activated. The liquid level indicator/controller shall be manufactured from corrosion resistant material. The liquid level indicator/controller shall be equipped with manual testing capability located on the inner door. The testing system shall consist of a two-position normal test/blowdown manually operated toggle valve and test-port. Test position shall seal off and prevent liquid from rising in the submersed bubbler tube. Simultaneously, it shall divert the bubbler air output to the test port and relieve any air pressure on the indicator/controller. The operator shall be able to simulate rising and falling liquid level by restricting the air flow exiting the test port. The control panel shall be equipped with $\frac{1}{2}$ " NPT female bulkhead fitting located on the inner door for the purpose of applying high pressure air to purge any obstruction in the bubbler tube should it become clogged. Protection shall be provided to prevent high pressure air for blowdown from damaging the liquid level indicator/controller. Blowdown must be possible without having to disconnect any tubing or fittings. All fittings shall be brass or stainless steel and assembled with an adhesive that has a range of application between 40 - 140 degrees F. Adhesive shall be intended for use on both porous and non-porous materials. Cured adhesive shall meet ASTM D 3498 requirements. All tubing fittings shall be barbed with a minimum of three barbs. Tubing shall be clear urethane. The control system shall be equipped with an external $\frac{1}{4}$ " NPT female bulkhead fitting for connection to the bubbler tube in the wet well. The air bubbler tubing from the panel to the wet well shall be size $\frac{3}{8}$ polyethylene. The tubing shall be fastened to the wet well wall using stainless steel rubber backed brackets and stainless-steel fasteners. The tubing shall terminate into an air cell constructed of size 1" PVC pipe with brass adapter. The standard air supply for the bubbler system shall be two continuous running, oil-less, diaphragm-type air pumps. The air pumps shall each deliver .6 SCFH@ 5.5 PSIG. A fixed orifice shall be installed in line with the air pumps output to insure a ripple free air flow. The air pump designated as "lead" shall provide

the air flow to operate the bubbler systems. The designated "lag" air pump shall be automatically energized if the "lead" air pump fails. Indication of failure shall be monitored by measuring the AIR FLOW RATE of the lead air pump. The air flow controlled automatic transfer/alarm chassis shall consist of an automatic electro-mechanical circuit which transfers to the lag air pump whenever air flow from the lead air pump drops to less than 0.15 SCFH for a period of 15 seconds. If the lag air pump fails to produce flow for a period of 120 seconds, an isolated contact shall close relaying a signal, which will activate the high-water alarm. A push button shall be provided to manually reset the circuit to the "lead" air pump. Components to make-up this circuit shall include a flow meter, four (4) LED status indicators and a reset push button; plus a push button flow switch with hermetically sealed contacts, a duplex receptacle for the air pumps, transfer relay, transfer timer and alarm timer all mounted on a single chassis.

Logic Controls:

The duplex logic control system shall consist of the logic chassis mounted on the subpanel and the logic panel mounted on the dead front door. The logic chassis shall be a pre-wired assembly constructed of anodized aluminum containing logic and alarm circuits. The logic chassis shall interface with the wet well level liquid indicator/controller. The logic chassis shall contain a three point terminal block for 120 V AC supply power, a power on-off switch for 120 V AC power, a 15 amp circuit breaker to protect 120 VAC power; a 120/24 V AC control transformer, a 3 position lead pump selector switch that can operate in either "automatic alternation"; "lead pump #1- Lag pump #2; or "lead pump #2- lag pump #1" positions Relays shall be square base, plug-in type, 3 pole double throw rated at 10 amp, 240 V AC with epoxy encapsulated coil and clear dust cover and shall be directly interchangeable. Five LED status indicator lights shall be mounted adjacent to the relay sockets and wired in parallel with the relay coils to indicate that the power is applied to the coils. All relays shall have mechanical hold-down bases. All terminals on the logic chassis shall be of the barrier clamp plate type rated at 15 amp at 300 V AC and accept two (2) AWG#14 wires. Terminal blocks shall be provided for interfacing output from the liquid level indicator/controller to the logic chassis via a multi-conductor cable shall be identified with yellow heat shrink tubing with black nomenclature. Labels shall read as follows: High level alarm, start lag pump, start lead pump, stop lag pump, stop lead pump, and common. The logic panel shall be constructed of corrosion resistant anodized aluminum and connected to the logic chassis via a multi-conductor cable. The logic panel shall be mounted on the inner door. The logic panel shall have the following components: Two (2) "hand-off automatic" selector switches for pumps, two (2) "pump run" green LED Indicators, one (1) 24 V AC

"power on" yellow LED indicator, one (1) "start lag pump" yellow LED indicator, (1) one red pushbutton for audible alarm silence, one (1) "high level alarm" red LED indicator and one (1) red pushbutton for visible alarm reset. Provide two (2) six (6) -digit non-resettable, dust tight, oil tight and moisture resistant running time meters.

Power Handling:

Main lugs of the appropriate size shall be furnished for connecting the incoming supply power. The lugs shall be suitable for use with aluminum or copper conductors. Ground lugs of appropriate size shall be bolted to the subpanel. Motor circuit protection shall be either thermal magnetic circuit breakers or magnetic motor circuit protectors. Either type shall contain a self test "Trip Selector" permitting a mechanical simulation of the over current tripping device. The protector operating mechanisms shall be quick-make, quick-break and trip-free type. Thermal magnetic breakers shall comply with Federal SPB.W-C 357a as Class Two breakers. Symmetrical amperes interrupting ratings shall be 10,000 amps minimum for 250 volt rated breakers and 15,000 amps minimum for 480 volt rated breakers. Magnetic motor circuit protectors shall provide instantaneous clearing of faults to a minimum of 10,000 amperes. RMS, symmetrical and shall have an adjustable instantaneous trip setting. Q-Frame type circuit breakers are not acceptable. Circuit breaker toggles shall be operable through external extension handles that will interlock with the dead front door. Each motor starter shall be NEMA rated, FVNR, with three (3) overload relays and reset button. The contractor shall feature double break, silver cadmium oxide contacts, pressure type terminals, and barriers, free floating armature-magnet frame, molded continuous duty coils and stainless-steel springs sized for the specific pumps supplied under this contract. Definite purpose contractors, horsepower rated motor starters, and fractional NEMA sizes are not acceptable. Motor starter overload reset operators shall be installed on the dead front door allowing motor starter overload relays to be reset without opening the dead front door. A 100-watt strip heater and separate thermostat set at the appropriate temperature to prevent corrosion-causing condensation and freezing shall be supplied. A control transformer, adequately sized for the connected load shall be provided on 3 phase, 3 wire systems. The transformer shall be protected by fuses or circuit breaker. The control transformer may be eliminated on 4-wire and single-phase systems providing that the control voltage is protected by a circuit breaker and is wired per N.B. C. Standards. The unit shall be equipped with the capability to connect a portable generator which will be activated by 60A, 6000V, 3 phase transfer-switch.

For CSA maintained facility, the Development shall install back-up generator which complies with the appropriate Air Pollution Control District requirements. The back-up generator shall have a minimum of 2-day fuel capacity and adequate power generation to operate all pumps.

Optional Equipment: (As required)

1. Provide a NEMA 4X, red lexan, break resistant globe and 75-watt lamp which shall be mounted on top of the enclosure. The globe shall be mounted with stainless steel screws and closed cell neoprene gasket to insure water-tight integrity.
2. Provide a flasher which shall be installed and connected to the logic chassis to provide a flashing alarm light.
3. Provide dim glow terminals on the logic chassis so that the alarm light glows dim during normal condition to verify circuit integrity. When alarm condition occurs, the alarm light shall be switched to full brilliance.
4. Provide a NEMA 4 X encapsulated high intensity electronic horn mounted on the side of the enclosure. Audible rating of the horn shall be a minimum of 85 decibels at 10 feet.
5. A power monitor relay system shall be installed and connected to the logic chassis. When the power monitor relay is activated, it shall disconnect control power from the motor starters and illuminate red LED indicator on the logic chassis. The control power shall automatically reset if the fault conditions correct itself. The power monitor relay shall be activated in the event that any of the following conditions occur:
 - a. Phase loss (single phasing) when anyone of the three-line voltages drop to 83 percent or less of nominal.
 - b. Phase reversal (sequence) when improper phase sequence is applied to equipment.
 - c. Low voltage (brown out) when all three-line voltages drop to 90 percent or less of nominal.
6. Moisture sensing relays for each motor shall be installed and connected to the logic chassis. In the event that moisture enters the motor housing, the relay shall illuminate the red LED indicator on the logic chassis. Provide a back up control consisting of two mercury tilt switches with intrinsically safe relay circuits. The tilt switches shall be UL approved. The upper tilt switch shall engage both pumps and activate the high-water alarm circuit. The lower switch shall disengage both pumps and

de-activate the alarm circuit.

7. Provide a 750-watt duplex convenience receptacle with ground fault interrupter installed on the dead front door.
8. Wiring from the thermal sensor located in the pump motor shall be connected to the pump monitor provision on the logic chassis. In the event the sensor is activated, it shall disconnect control power from the appropriate pump motor starter and illuminate the red LED Indicator on the logic chassis. The circuit shall automatically reset on reclosure of the temperature sensor.
9. Provide an automatic two (2) channel telephone dialer. The Dialer shall upon alarm condition call up to five (5) predetermined numbers and deliver a voice message.

The message shall identify the location of the alarm, and the required action to be taken, and instructions for acknowledging the Dialer. The Dialer must be capable of calling at least five (5) different telephone numbers for each channel. If the called telephone number is busy, or does not answer, or answers but is not acknowledged the Telephone Dialer proceeds to call the same number and/or proceeds to call different "backup" numbers. Each called party has the option to cancel all remaining calls or to allow the Dialer to continue the dialing sequence. The Dialer shall retain the programmed telephone numbers should there be a loss of power.

The called party shall be able to communicate with the Telephone Dialer by means of a tone signal. The signal is generated through a touch tone telephone set. To prevent nuisance alarms the Phone Dialer shall have a time delay adjustment which will delay the starting of the calling cycle from 10 to 90 seconds. If during this delay time, or at any time that the Dialer is placing calls, the activating contact is restored to normal, the Telephone dialer automatically hangs up and resets itself to the beginning number of the dialing sequence. The tripping circuits shall be desensitized with filters so that the time response shall be the same as a telephone type relay (approximately 10 milliseconds). Input pulses of less than ten milliseconds shall be filtered out to eliminate false tripping due to lightning or voltage surges.

When any channel is tripped the Dialer shall continue the calling cycle until acknowledged, or the alarm condition is corrected. Independent memory circuits shall be provided for each channel. The system shall have an indicator light defining which channel

is tripped. When the condition corrects itself, or it is reset, this light shall automatically reset.

The Telephone Dialer shall utilize a regular private line telephone circuit provided by the owner. Connection into the telephone circuit shall be through an industry standard eight (8) pin modular jack. The Phone Dialer shall have the proper cable for connecting into the telephone system modular terminal XRJ-31-X. The Phone Dialer shall provide all the necessary power and control switching for the built-in coupler with no auxiliary equipment, coupler, or power source required. All dial pulses and voice message inputs to the telephone system shall meet the requirements as published by the telephone companies and shall be FCC approved for use on the telephone network.

A low voltage recharging circuit shall be provided to maintain the lead acid batteries in peak condition. An externally mounted pilot light shall indicate when the charging circuit is operational. The stand-by capacity of the Dialer shall be sufficient to sustain one (1) hour of continuous calling or up to eight (8) hours with the system in standby after complete power failure.

The Dialer shall have a built-in AC line monitor. This will allow the Dialer to monitor AC power or another function if desired. The Dialer shall have the option of being called from any of the programmed telephone numbers and being remotely tested. This test shall confirm proper operations of the Dialer and the telephone network. An off/on/abort switch must be accessible to facility testing and installation.

The Dialer shall be provided with one (1) year warranty after acceptance by the Engineer, or a minimum of up to two (2) years after shipment date. The representative shall supply installation and operation data to the Engineer and shall furnish factory authorized start up service and training at no additional cost to the County.

10. Provide a spray system for breaking up the wet well floating scum blanket. Pump system shall recirculate a portion of the pumpage in the form of a spray.

Submittals:

Shop Drawings:

Shop drawings shall be submitted for approval prior to start of construction and shall include the following:

A wiring diagram and an elementary control diagram for each unit

An overall connection diagram for each control panel

A dimensioned outline drawing to scale showing space for conduits, etc.

A complete identification of all electrical components in each control panel and their interconnections within the control panel

All connections to external equipment and control

Wire marking scheme.

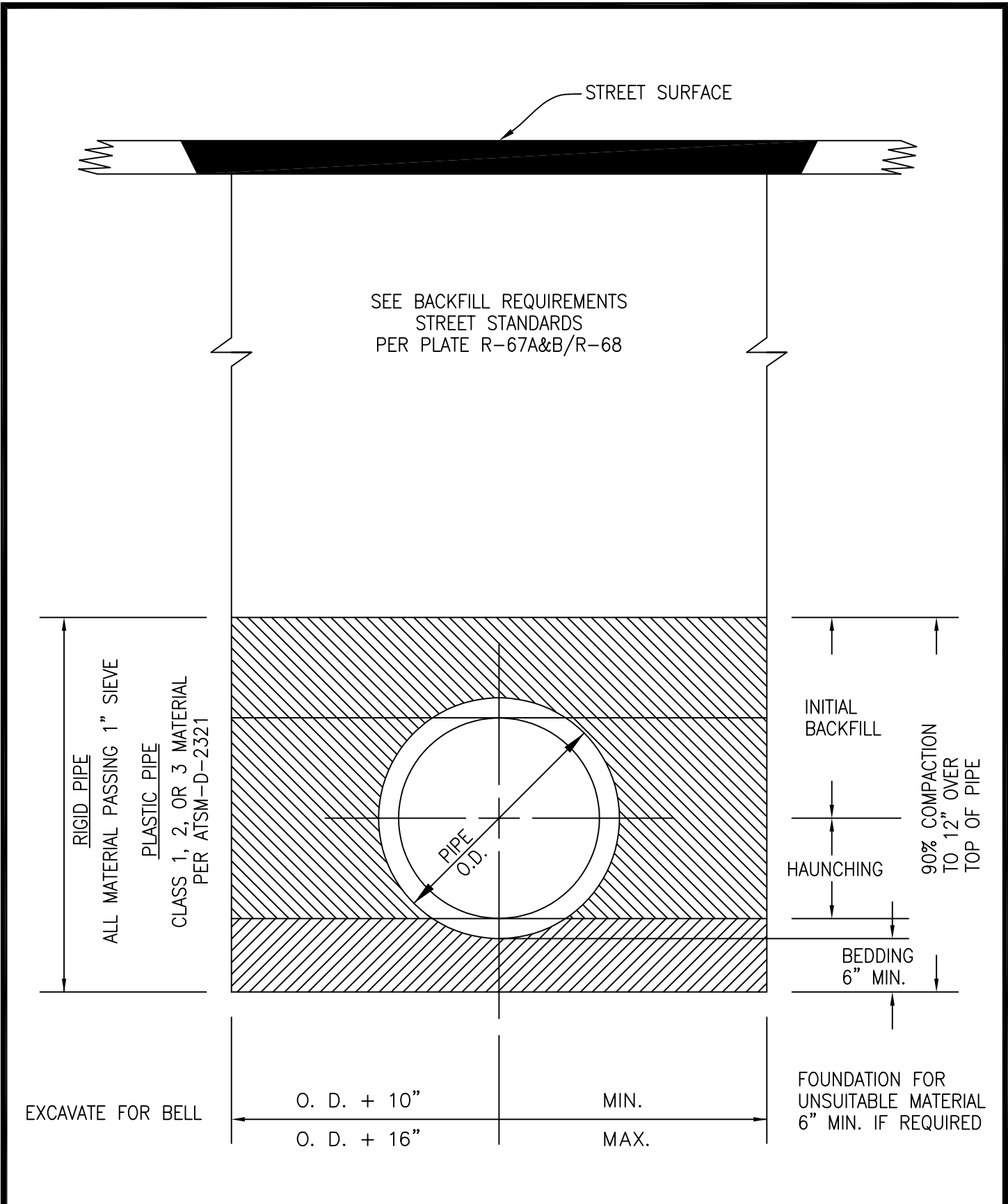
Spare Parts List:

A spare parts list shall be included showing recommended parts and quantities, as well as complete ordering information for replacement components. Instruction books shall be provided for special control devices and special equipment installed in the control panels. These shall be submitted to the Engineer prior to installation of the equipment.

Manuals:

The Contractor shall obtain manuals from the manufacturer of the installed control panels and shall submit same to the Engineer as specified under "Submittals" of this specification section.

The complete system shall be the product of one (1) manufacturer who shall have maintenance personnel that are factory trained to service and repair all components supplied. The guarantee period shall be for two (2) years from the date of successful start-up. Guarantee shall include on-the-job repair and maintenance that cannot be performed by plant personnel.



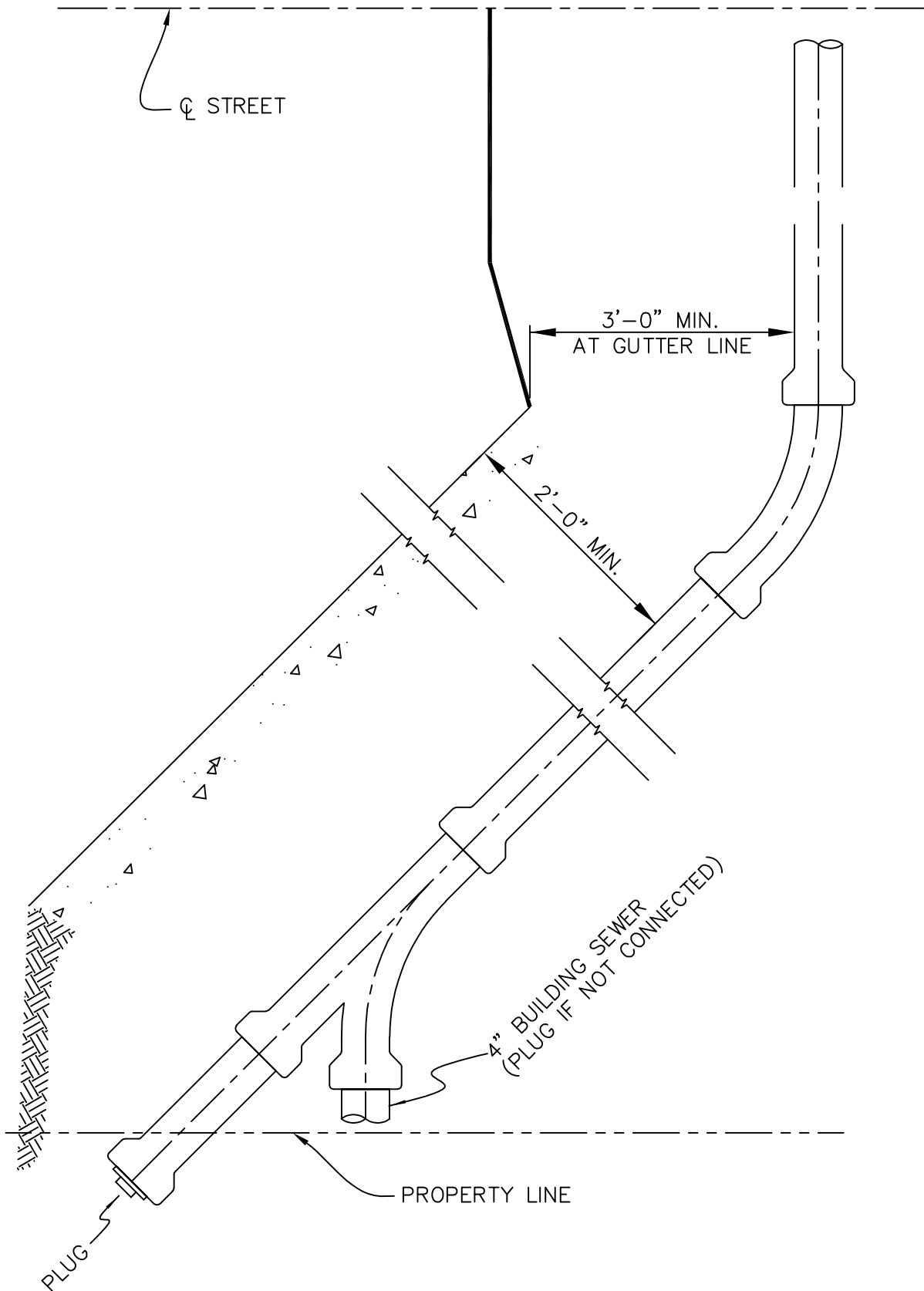
TYPICAL TRENCH SECTION IN PAVED AREAS

COUNTY OF KERN
STATE OF CALIFORNIA
DEVELOPMENT STANDARD

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DRAFTED BY:	R.R.P.
DESIGNED BY:	J.R.C.
DATE DRAFTED:	09/30/23
APPROVED BY:	J.R.C.

PLATE NO.
S-1



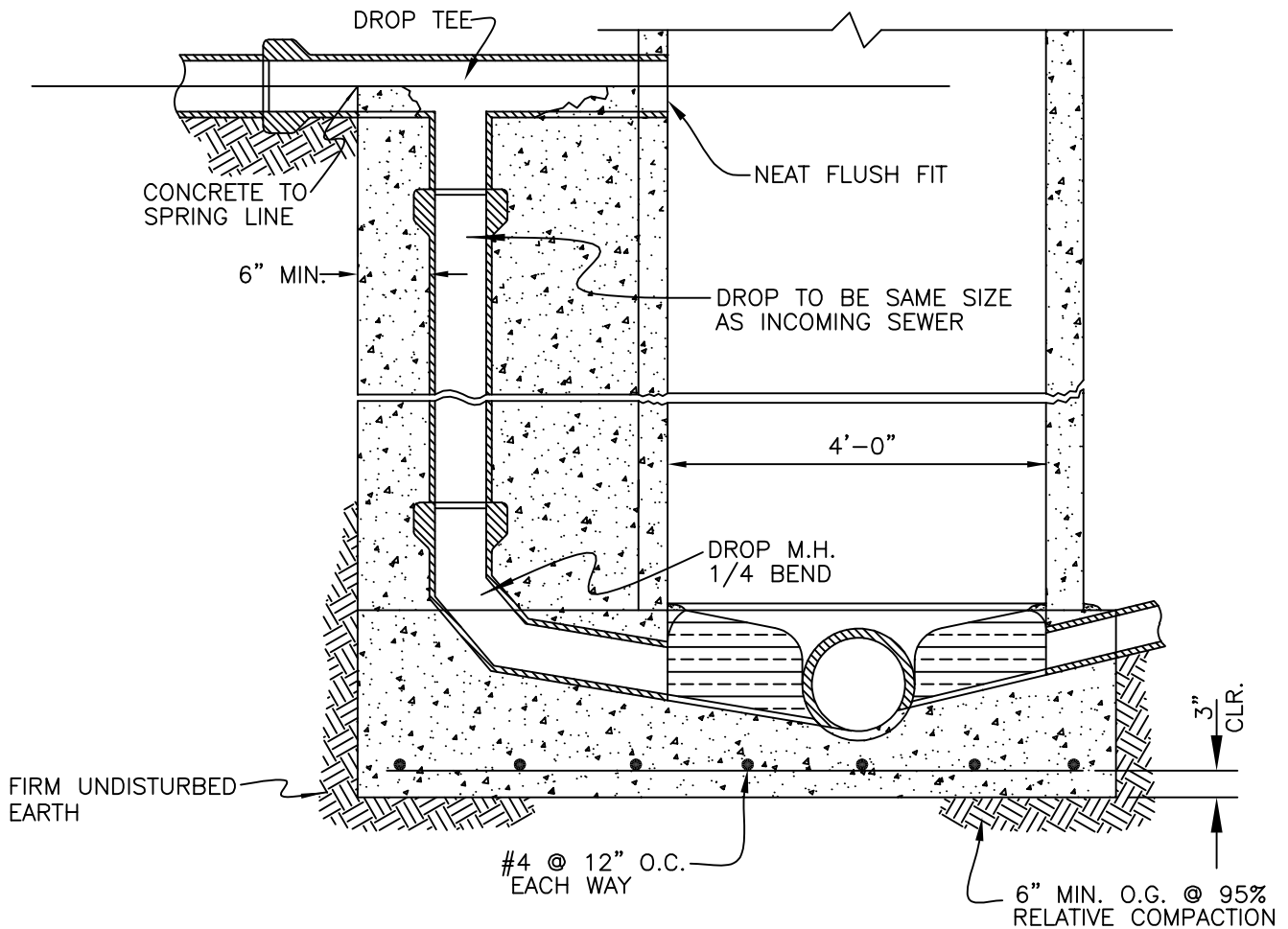
TYPICAL BUILDING SEWER INSTALLATION IN CUT AREA

COUNTY OF KERN
STATE OF CALIFORNIA
DEVELOPMENT STANDARD

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DRAFTED BY: R.R.P.
DESIGNED BY: J.R.C.
DATE DRAFTED: 09/30/23
APPROVED BY: J.R.C.

PLATE NO.
S-2



GENERAL NOTES:

1. STOP ALL PIPES INSIDE WALL.
2. CONCRETE SHALL CONFORM TO THE REQUIREMENTS OF THE STANDARD SPECIFICATIONS FOR MINOR CONCRETE (MIN. CEMENT CONTENT 505 LB/CU.YD.) CONCRETE SHALL CONTAIN NO ADDITIVES UNLESS APPROVED PRIOR APPROVAL IS OBTAINED FROM THE COUNTY ENGINEER.
3. DROP TYPE CONNECTION SHALL BE USED IF DIFFERENCE IN ELEVATION BETWEEN THE MAIN & INTERSECTING PIPES IS GREATER THAN 1.5 FT.
4. THE DROP TYPE MANHOLE IS THE SAME AS THE STANDARD MANHOLE EXCEPT FOR DROP TYPE CONNECTION.
5. THE DROP SECTION OF THE PIPE MAY BE INSTALLED INSIDE THE MANHOLE WHERE PERMITTED BY THE DISTRICT OR THE COUNTY.



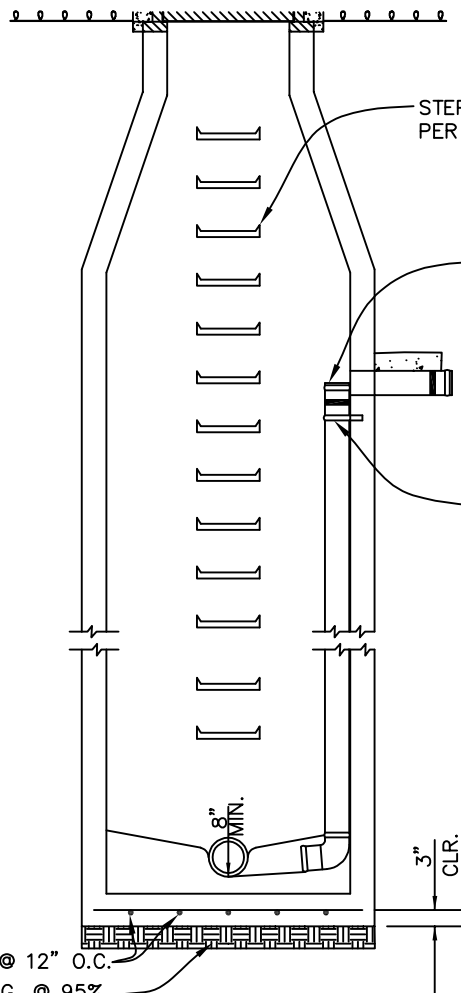
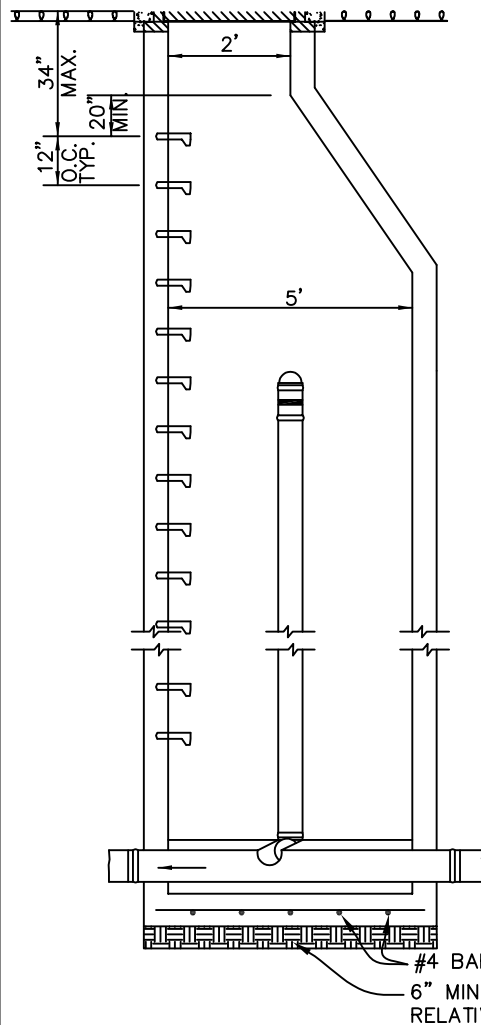
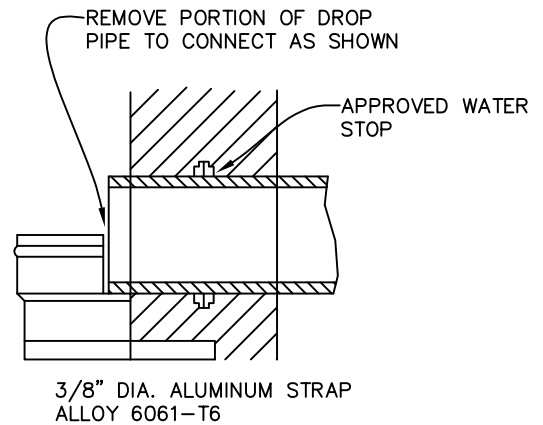
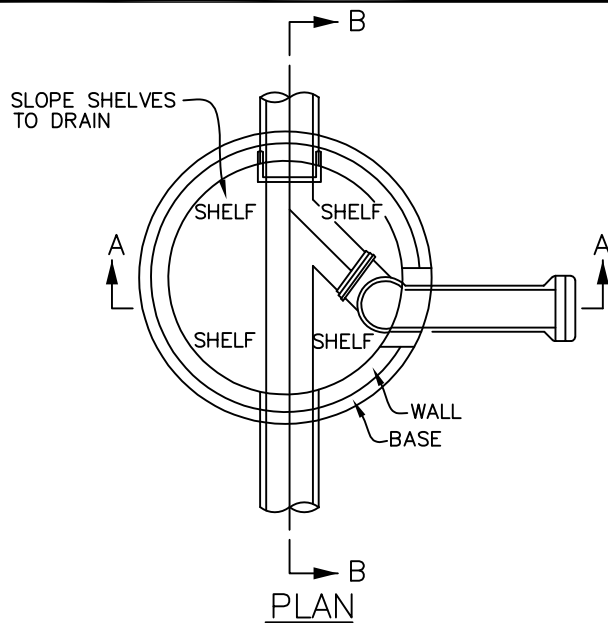
STANDARD OUTSIDE DROP TYPE MANHOLE

COUNTY OF KERN
STATE OF CALIFORNIA
DEVELOPMENT STANDARD

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DESIGNED BY: J.R.C.
DATE DRAFTED: 09/30/23
APPROVED BY: J.R.C.

PLATE NO.
S-3



STEPS WHEN PERMITTED
PER SECTION 302-8

SET TOP OF PIPE BELL
TO SERVE AS WEIR
SEE DETAIL THIS SHEET.

3/8" DIA. ALUMINUM PIPE STRAP
(TYPICAL, NOT TO EXCEED 4' ON
CENTER SPACING)

DROP TO BE ONE SIZE LARGER
THAN INCOMING SEWER, SHALL BE
CONSTRUCTED OF P.V.C. SEWER
PIPE AND SHALL BE CONSTRUCTED
SO AS TO BE REMOVABLE BY
MAINTENANCE CREWS FOR CLEANING
WHEN THE DROP SECTION BECOMES
PLUGGED. THE BOTTOM ELBOW OF
THE DROP SECTION SHALL BE IN
AN OPEN TROUGH SLOPED TO
THE OUT-GOING SEWER.

SECTION B-B

SECTION A-A



STANDARD INSIDE DROP MANHOLE

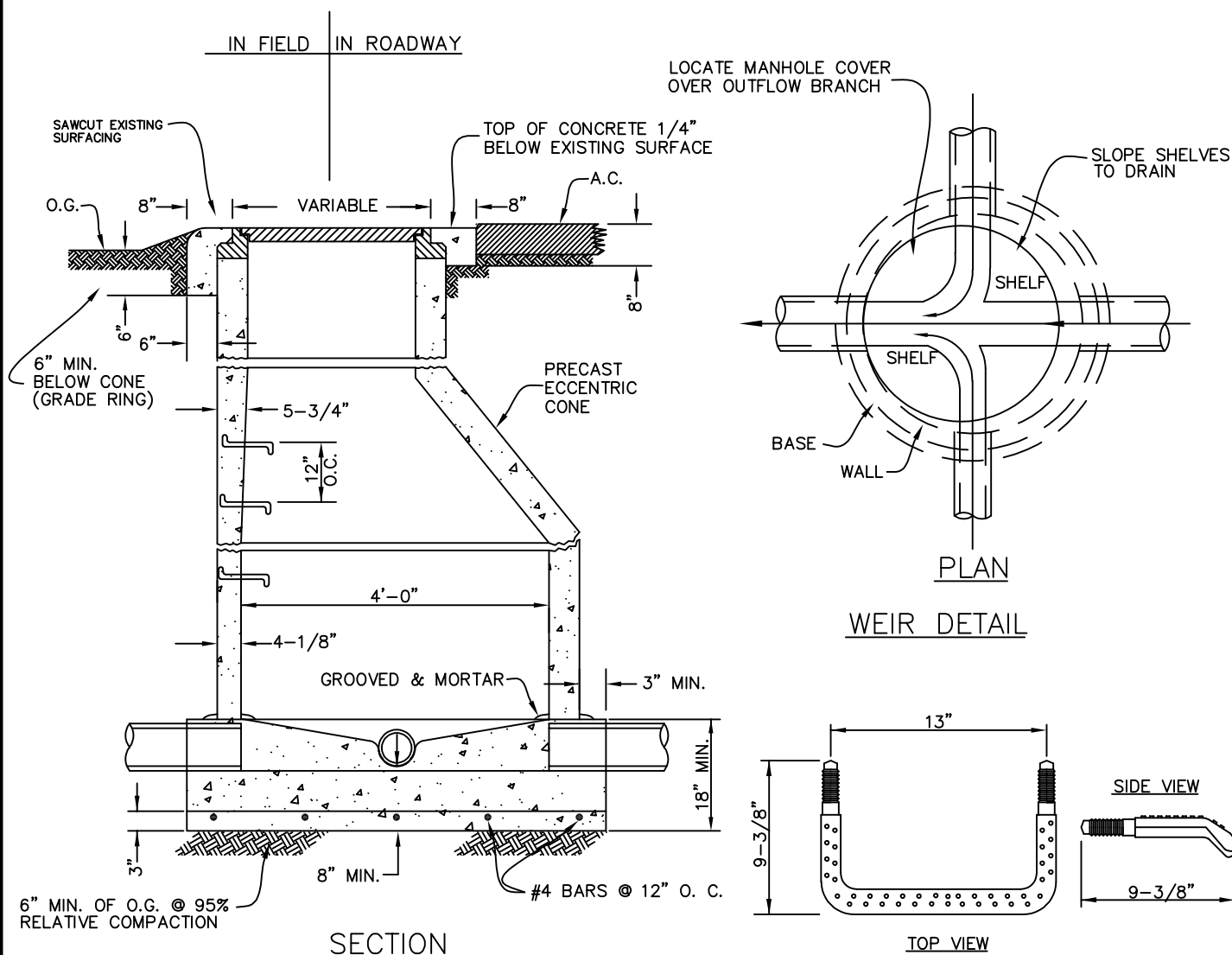
COUNTY OF KERN
STATE OF CALIFORNIA
DEVELOPMENT STANDARD

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DRAFTED BY: R.R.P.
DESIGNED BY: J.R.C.
DATE DRAFTED: 09/30/23
APPROVED BY: J.R.C.

PLATE NO.

S-4

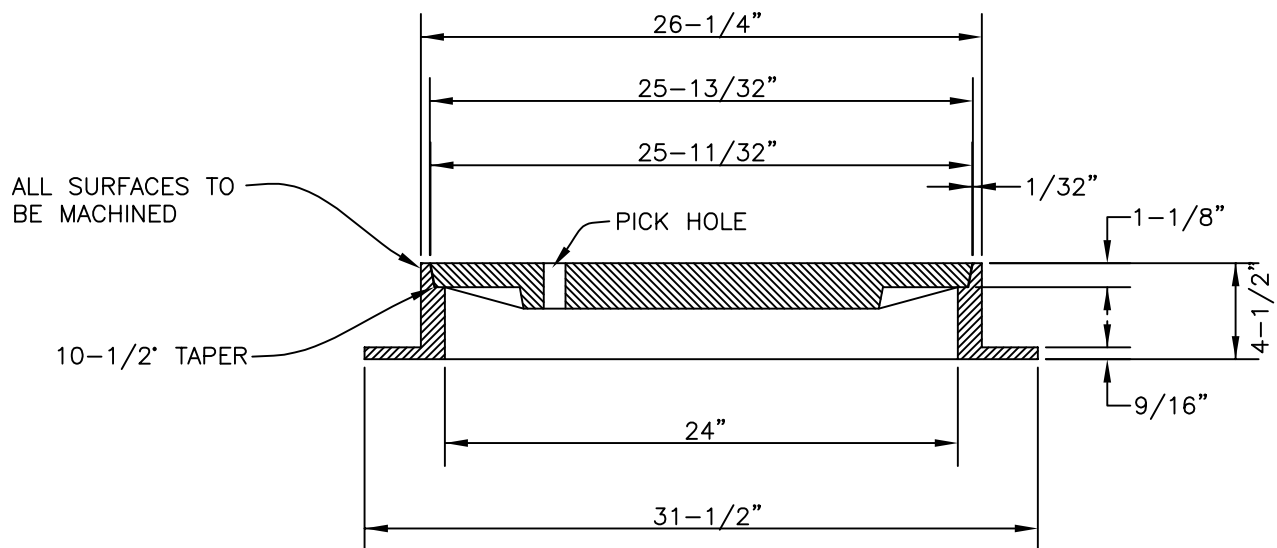
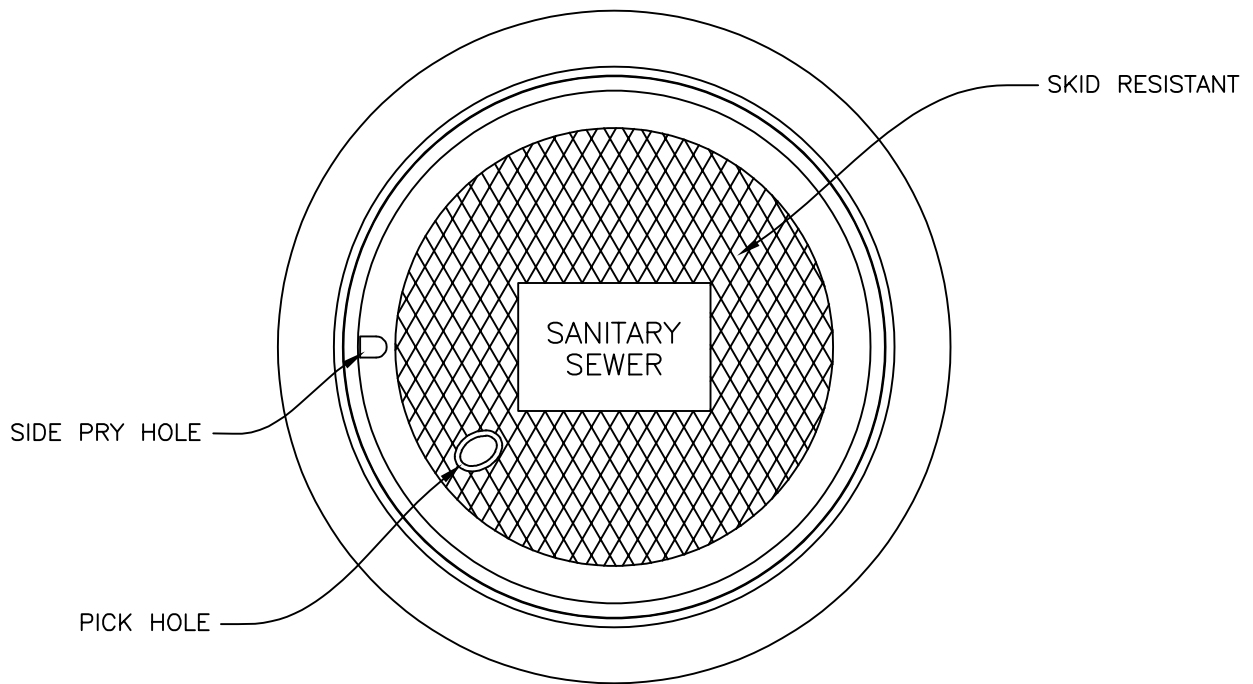


GENERAL NOTES:

1. MANHOLE STEPS WHEN REQUIRED PER SECTION 302-8 SHALL BE STANDARD POLYPROPYLENE STEPS. THE TOP STEP SHALL BE NO MORE THAN 34" BELOW FINISH STREET GRADE AND NO LESS THAN 20" BELOW THE TOP OF THE ECCENTRIC MANHOLE CONE. THE BOTTOM STEP SHALL BE 10" TO 20" ABOVE THE MANHOLE FLOOR. STEPS SHALL BE 12" ON CENTER AND SHALL BE IN VERTICAL ALIGNMENT OVER OUTGOING SEWER.
2. STRUCTURAL BACKFILL IMPERVIOUS MATERIAL @ 95% RELATIVE COMPACTION. LIMITS ARE AS DIRECTED BY THE ENGINEER.
3. CONCRETE SHALL CONFORM TO THE REQUIREMENTS OF THE STANDARD SPECIFICATIONS FOR MINOR CONCRETE (MIN. CEMENT CONTENT 590 LB/CU.YD.) CONCRETE SHALL CONTAIN NO ADDITIVES UNLESS APPROVED PRIOR APPROVAL IS OBTAINED FROM THE COUNTY ENGINEER.
4. MANHOLE HEIGHT SHALL BE FIELD VERIFIED PRIOR TO CONSTRUCTION.
5. JOINTS SHALL BE SET IN AN ELASTOMETRIC SEALANT PER SECTION 302-5.

MANHOLE STEP DETAIL

	STANDARD PRECAST MANHOLE		REVISIONS		DRAFTED BY: R.R.P.		PLATE NO. S-5
			DATE	DESC			
			-	-	DESIGNED BY: J.R.C.		
			-	-	DATE DRAFTED: 09/30/23		
			-	-	APPROVED BY: J.R.C.		
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COUNTY OF KERN STATE OF CALIFORNIA DEVELOPMENT STANDARD							



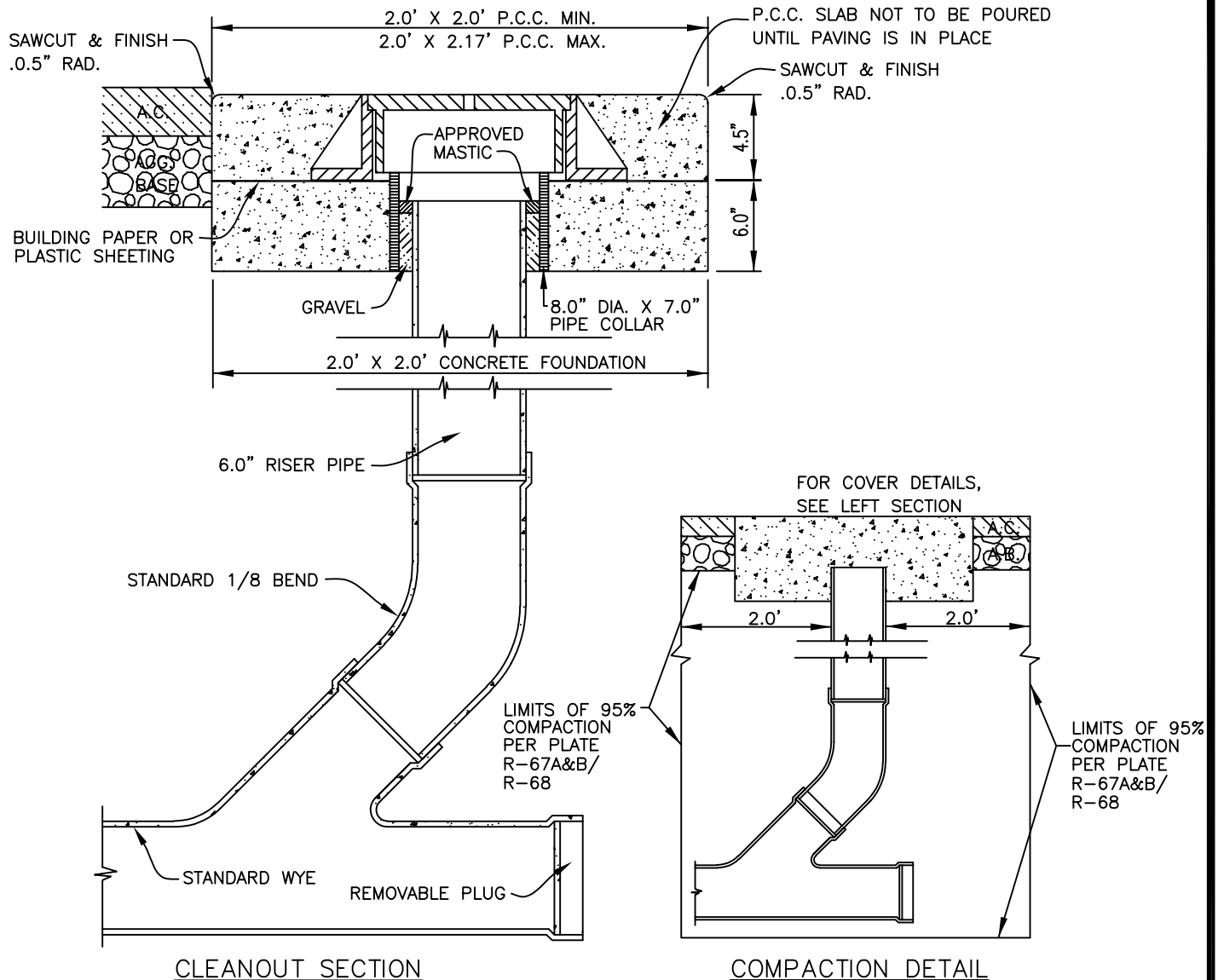
CAST IRON MANHOLE FRAME AND COVER

COUNTY OF KERN
STATE OF CALIFORNIA
DEVELOPMENT STANDARD

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DESIGNED BY:	J.R.C.
DATE DRAFTED:	09/30/23
APPROVED BY:	J.R.C.

PLATE NO.
S-6



NOTES:

- ALL WORK SHALL CONFORM TO THE APPLICABLE SECTIONS OF THE SPECIFICATIONS ENTITLED "STANDARD SPECIFICATIONS, STATE OF CALIFORNIA, BUSINESS AND TRANSPORTATION AGENCY, DEPARTMENT OF TRANSPORTATION", APPROVED CURRENT EDITION.
- PIPE MATERIAL SHALL MEET 302-7.
- ALL CONCRETE SHALL BE MINOR CONCRETE WITH 590 LBS/CY OF CEMENT CONTENT.
- CLEANOUT FRAME AND COVER SHALL CONFORM TO THE KERN COUNTY DEVELOPMENT STANDARDS PLATE NO. S-8.
- CONCRETE SHALL HAVE NO ADDITIVES UNLESS PRIOR WRITTEN APPROVAL IS OBTAINED FROM THE DIRECTOR.
- CONCRETE SHALL BE CURED WITH CURING COMPOUND PER SEC. 90-1.03B OF THE STANDARD SPECS.
- TOP OF SLAB SHALL BE TROWELED SMOOTH AND GIVEN A LIGHT BROOM FINISH.
- 95% RELATIVE COMPACTION IS REQUIRED PER KERN COUNTY DEVELOPMENT STANDARDS PLATE NOS. R67A, R67B, AND R68.
- BUILDING PAPER OR PLASTIC SHALL BE PLACED BETWEEN THE 0.5' CONCRETE FOUNDATION AND 4.5" SLAB.
- FILL CAVITY BETWEEN PIPE AND COLLAR WITH GRAVEL TO WITHIN 0.5" OF TOP OF PIPE. CAULK REMAINING 0.5" WITH APPROVED MASTIC TO TOP OF PIPE FOR WATER TIGHT SEAL.
- COLLAR SHALL BE VCP, ABS, OR PVC PIPE.
- FINISHED PCC SLAB TO BE 0.125' MIN. AND 0.25" MAX. BELOW FINISHED PAVING SURFACE.



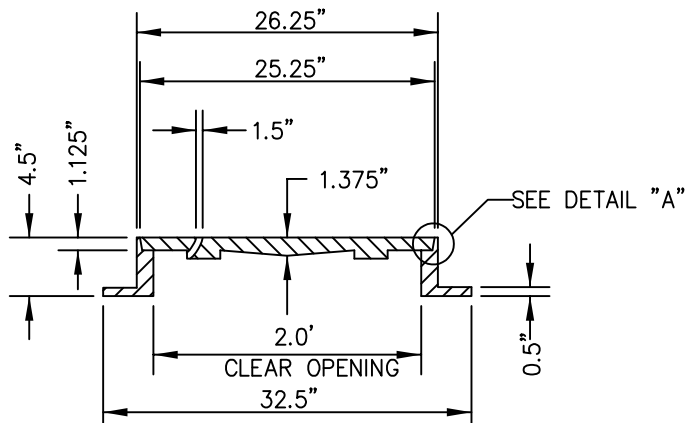
STANDARD EIGHT INCH CLEANOUT

COUNTY OF KERN
STATE OF CALIFORNIA
DEVELOPMENT STANDARD

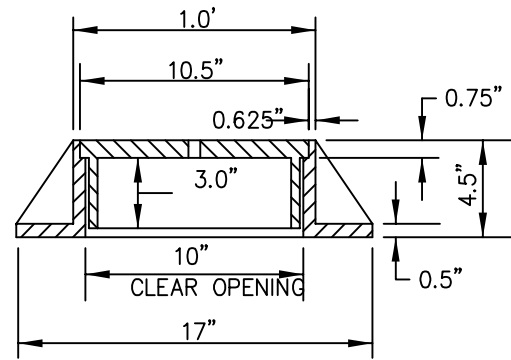
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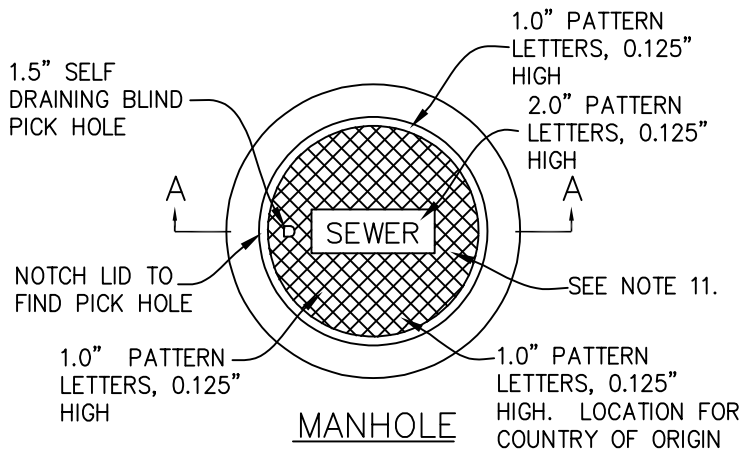
PLATE NO.
S-7



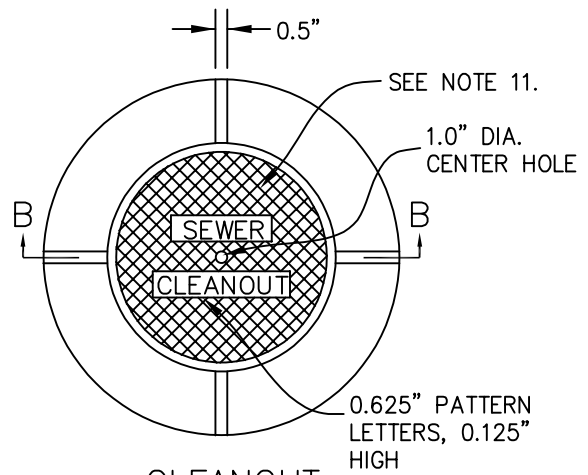
SECTION A-A



SECTION B-B



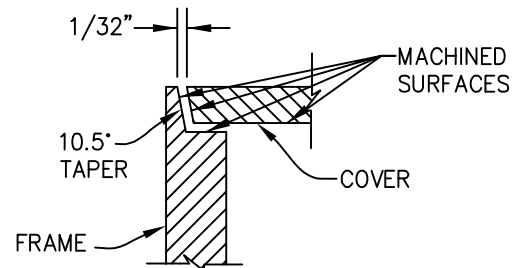
MANHOLE



CLEANOUT

NOTES:

1. ALL FRAMES AND COVERS SHALL BE TESTED FOR ACCURACY OF FIT AND SHALL BE MARKED IN SETS PRIOR TO DELIVERY.
2. THE SEATS OF FRAMES AND BEARING FACES OF THE COVERS SHALL BE MACHINED FOR A SMOOTH NON-ROCKING FIT BETWEEN THE TWO CASTINGS.
3. CASTINGS SHALL BE THOROUGHLY CLEANED AND DIPPED TWICE IN A QUICK-DRYING, JET-BLACK ASPHALTIC COMPOUND TO PROVIDE A PROTECTIVE COATING.
4. ALL FRAMES AND COVERS SHALL BE GRAY CAST IRON, FREE FROM WARPS, CRACKS, HOLES, SWELLS AND COLD-SHOT, AND SHALL HAVE A WORKMANLIKE FINISH.
5. CASTING SHALL CONFORM TO THE PROVISIONS OF THE SPECIFICATIONS FOR GRAY-IRON CASTINGS, SERIAL DESIGNATION ASTM: A-48 (LATEST REVISION), CLASS NO. 30B.
6. THE NAME OF THE MANUFACTURING COMPANY SHALL BE ON THE UNDERSIDE OF THE COVER.
7. MANHOLE FRAME SHALL WEIGH NOT LESS THAN 120 LBS. NOR MORE THAN 250 LBS. THE COVER SHALL WEIGH NOT LESS THAN 120 LBS. NOR MORE THAN 200 LBS.



DETAIL "A"

8. MANHOLE COVERS SHALL HAVE A SELF DRAINING BLIND PICK HOLE UNLESS OTHERWISE APPROVED BY THE DIRECTOR.
9. THE 2.0" PATTERN LETTERS ON THE MANHOLE COVERS SHALL HAVE ONE OF THE FOLLOWING DESIGNATIONS: DRAIN OR SEWER
10. ASSEMBLY SHALL BE DESIGNED FOR HIGHWAY LOADING OF HS 20-44.
11. 2.0" X 1.0" DIAMOND MAT 0.125" DEEP.



**STANDARD FRAMES AND COVERS FOR
MANHOLES & CLEANOUTS**

COUNTY OF KERN
STATE OF CALIFORNIA
DEVELOPMENT STANDARD

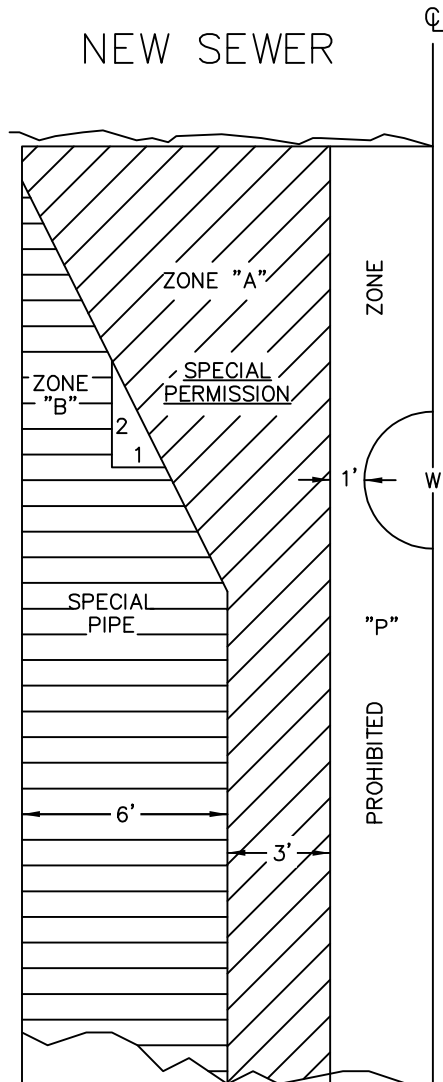
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PLATE NO.
S-8

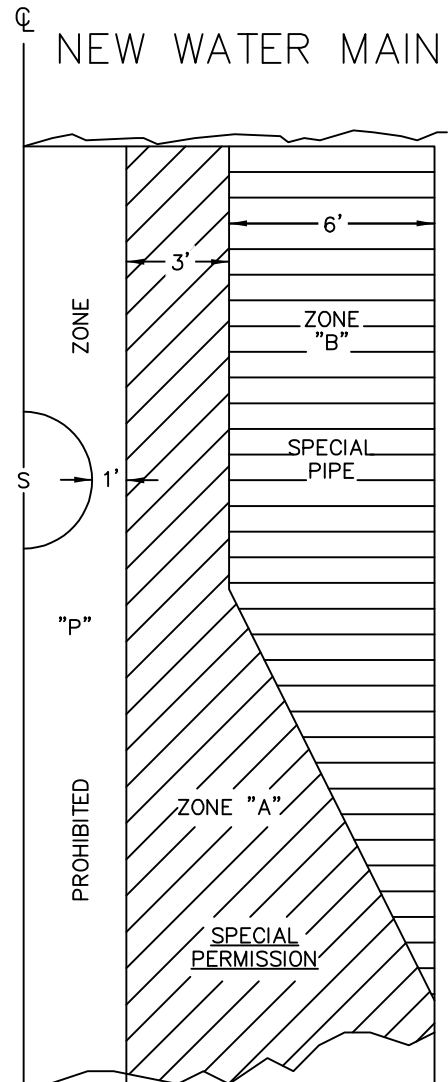
CASE 1

NEW SEWER



CASE 2

NEW WATER MAIN



PARALLEL CONSTRUCTION

NOT TO SCALE

NOTE:

ZONES IDENTICAL ON EITHER SIDE OF CENTER LINES.
 ZONE "P" IS A PROHIBITED ZONE, SECTION 64572 (E) (2) CALIFORNIA ADMINISTRATIVE CODE, TITLE 22.



STANDARD FOR SEPARATION OF WATER AND SEWER LINES

COUNTY OF KERN
 STATE OF CALIFORNIA
 DEVELOPMENT STANDARD

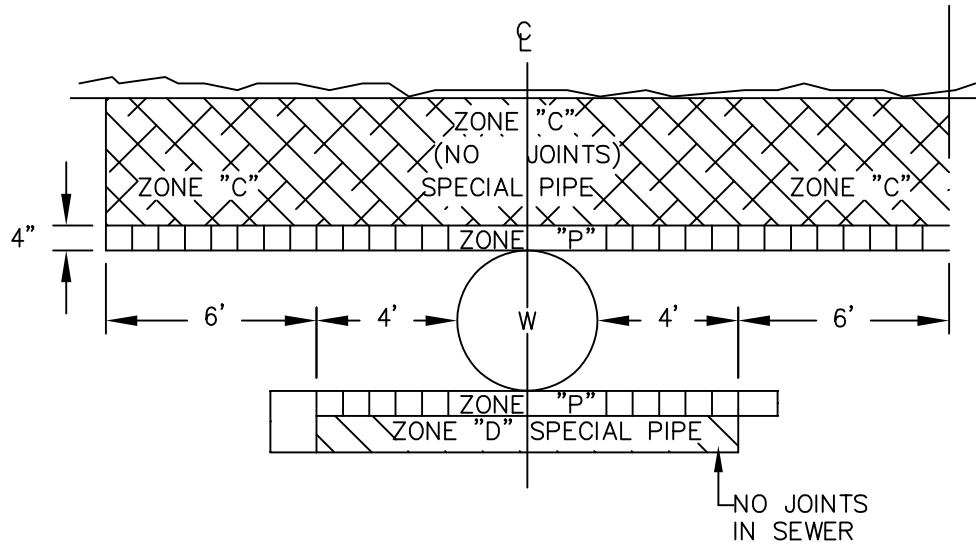
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PLATE NO.
S-9

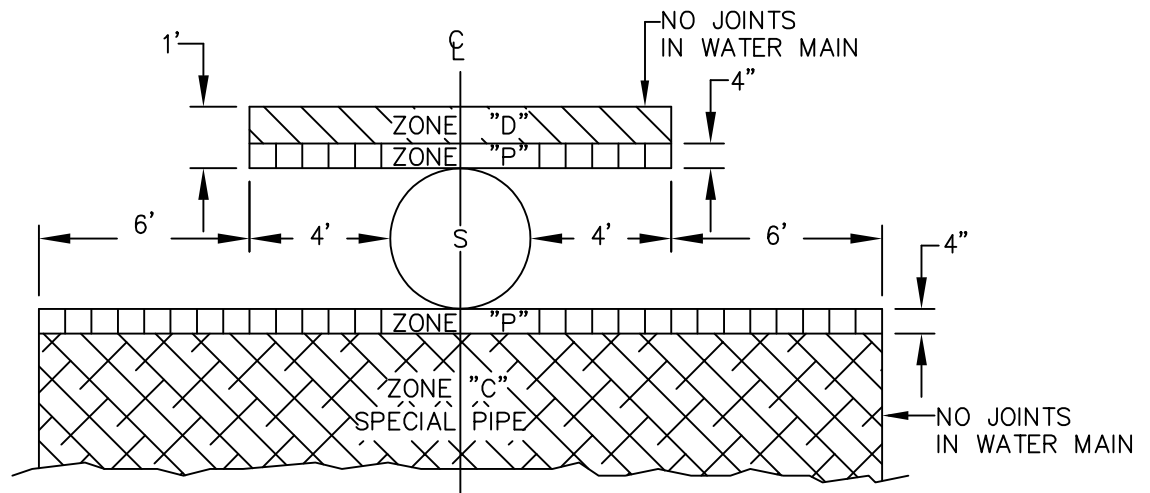
CASE 1 NEW SEWER

APRONS ARE NOT PROPORTIONAL WITH DIMENSIONS.



CASE 2 NEW WATER MAIN

APRONS ARE NOT PROPORTIONAL WITH DIMENSIONS.



CROSSINGS NOT TO SCALE

NOTE:

"P" IS A PROHIBITED CONSTRUCTION ZONE.



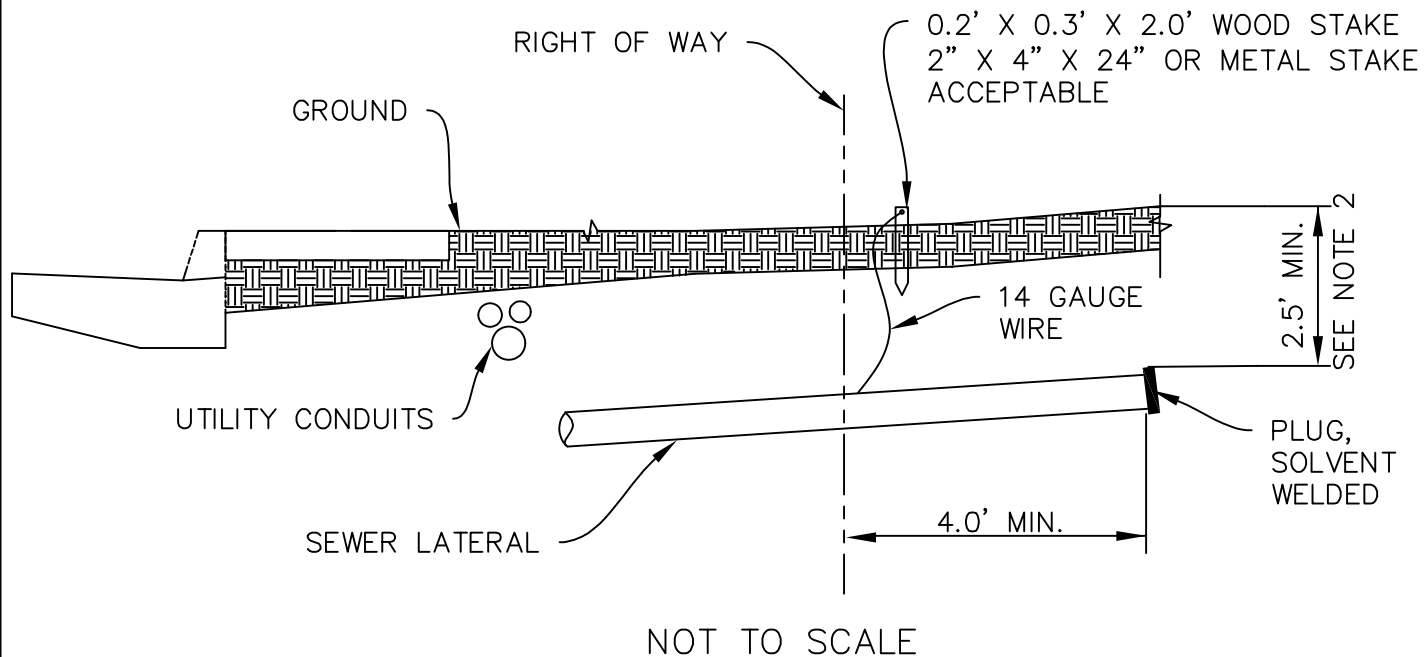
STANDARD FOR SEPARATION OF WATER AND SEWER LINES

COUNTY OF KERN
STATE OF CALIFORNIA
DEVELOPMENT STANDARD

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PLATE NO.
S-10



NOTES:

1. STAMP "S" INTO CURB FACE OVER SEWER LATERAL.
2. MINIMUM COVER WITHIN RIGHT-OF-WAY SHALL BE IN ACCORDANCE WITH SECTION 302-9.03.
3. LATERALS LOCATED SO NOT TO CONFLICT WITH UTILITIES.
4. SEE SECTION 304-5.10 FOR MORE DETAILS.



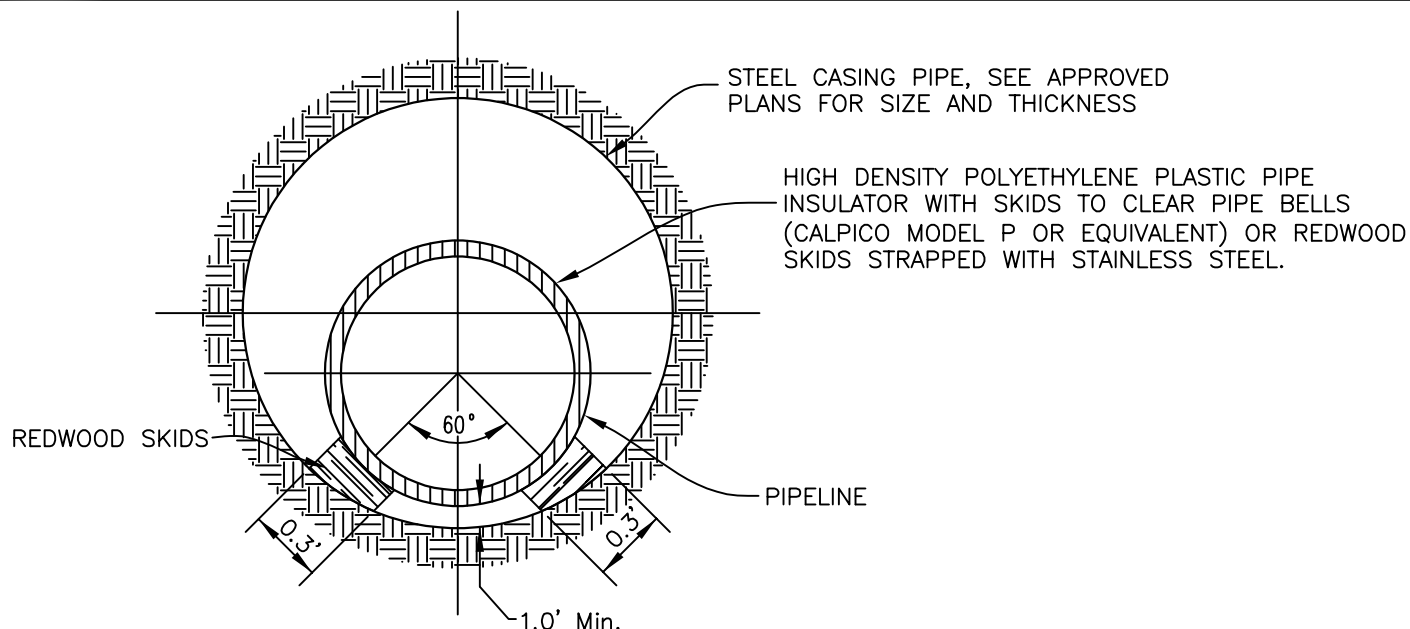
STANDARD SEWER LATERAL MAKER

COUNTY OF KERN
STATE OF CALIFORNIA
DEVELOPMENT STANDARD

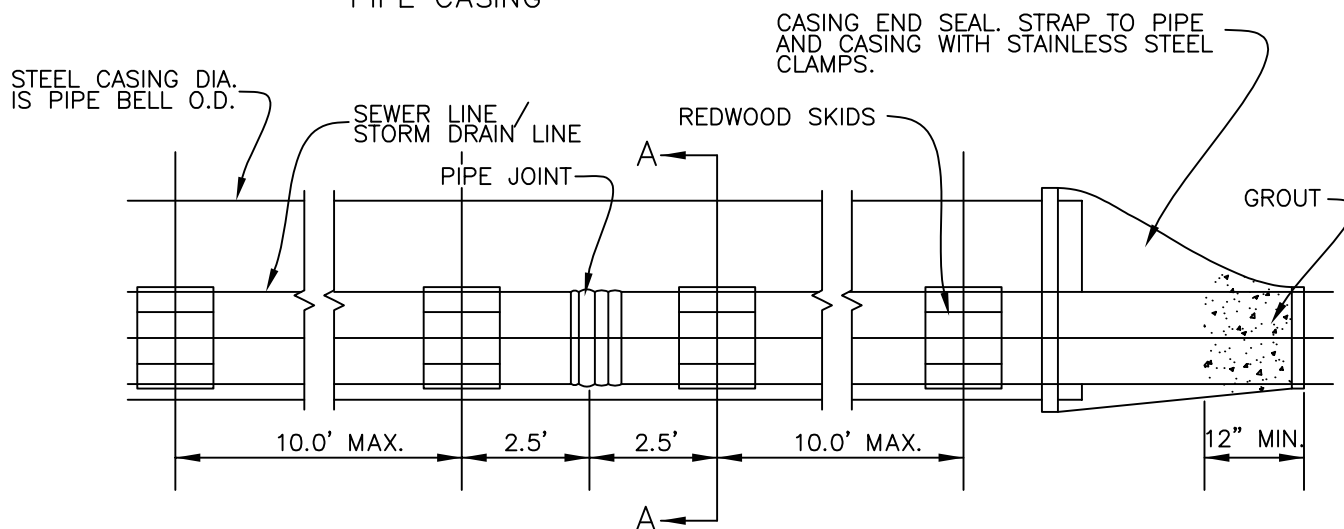
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PLATE NO.
S-11



SECTION A-A
PIPE CASING



SECTION DETAIL
PIPE BORING

NOTES:

1. CASING SHALL BE INSTALLED BY THE BORE, JACK, AND/OR TUNNEL METHOD.
2. INSTALLATION SHALL BE AS RECOMMENDED BY THE PIPE MANUFACTURER.
3. ALL CASING SECTIONS SHALL BE JOINED BY CONTINUOUS PROCESS.
4. FILL VOID BETWEEN CARRIER PIPE AND CASING WITH SAND SLURRY. IF SAND IS USED, COMPACT BY USE OF AIR BLOWING SAND EQUIPMENT OR AS DIRECTED BY THE DIRECTOR.
5. REDWOOD SKIDS SHALL BE CONSTRUCTION GRADE.
6. REDWOOD SKIDS SHALL BE VEED TO FIT CONTOUR OF PIPE.
7. REDWOOD SKIDS SHALL BE STRAPPED TO THE PIPE WITH STRAPPING OR APPROVED WIRE BANDS.



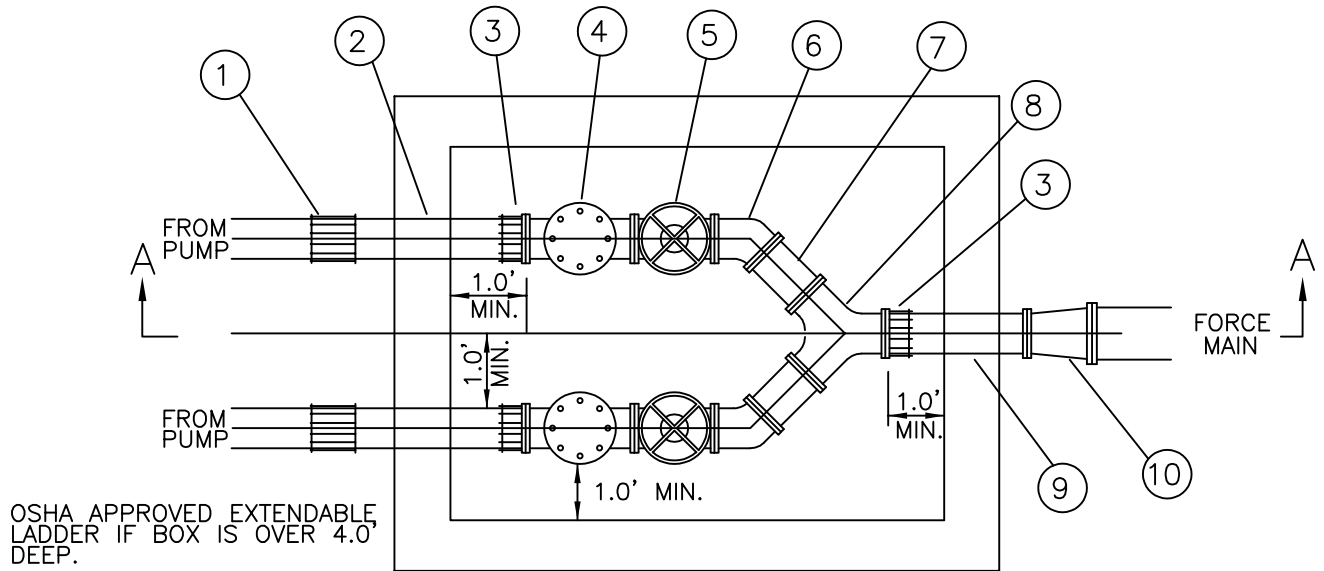
**STANDARD SEWER LINE IN PIPE
CASING**

COUNTY OF KERN
STATE OF CALIFORNIA
DEVELOPMENT STANDARD

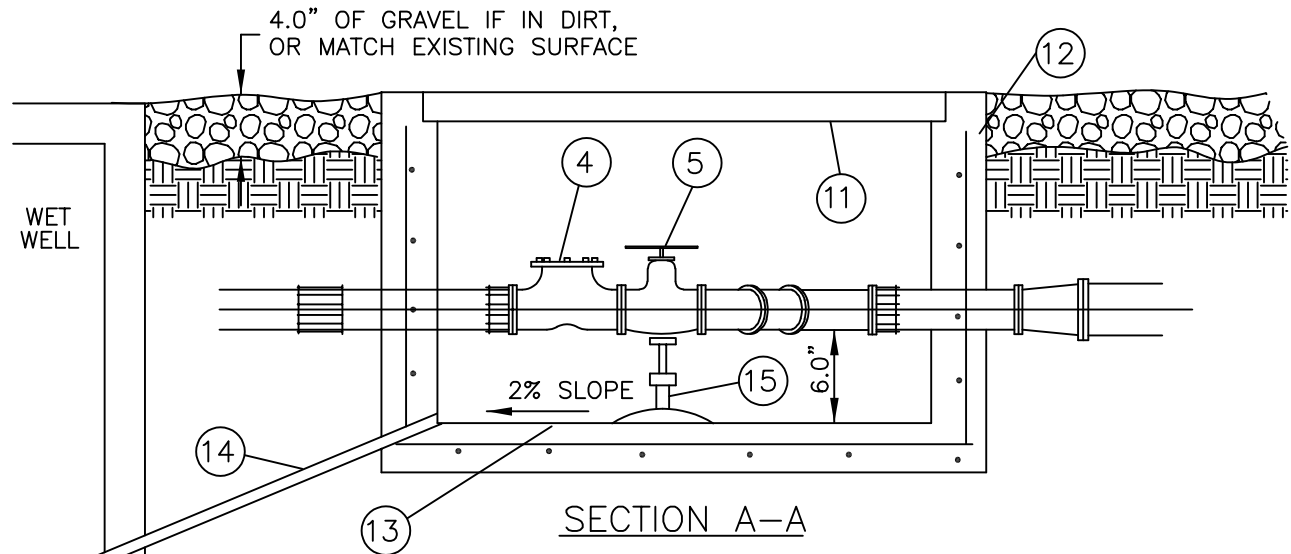
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PLATE NO.
S-12



PLAN VIEW



SECTION A-A

KEY TO CIRCLED REFERENCES

- | | |
|--|---|
| 1. FLEXIBLE COUPLING ADAPTOR | 11. ACCESS COVER WITH FRAME & HINGES. SEE APPROVED SPECIFICATIONS. |
| 2. DUCTILE IRON PIPE WITH EPOXY COATING - PLAIN ENDS | 12. REINFORCED CONCRETE VALVE BOX, PRE-CAST OR CAST-IN-PLACE. DESIGN TO BE APPROVED BY THE DIRECTOR. |
| 3. FLANGED COUPLING ADAPTOR | 13. 2 COATS PER SECTION 306-2.04 OF THE KERN COUNTY DEVELOPMENT STANDARDS. SEE APPROVED SPECIFICATIONS. |
| 4. SWING CHECK VALVE, FLANGED ENDS | 14. 2.0" SCHEDULE 80 PVC DRAIN PIPE EXTENDED TO BOTTOM OF WET WELL. |
| 5. PLUG VALVE, FLANGED ENDS | 15. ADJUSTABLE PIPE SUPPORT STAND. |
| 6. 45° ELBOW, FLANGED ENDS | |
| 7. PIPE - FLANGED ENDS | |
| 8. FLANGED WYE | |
| 9. PIPE - FLANGED END & PLAIN END | |
| 10. CONCENTRIC REDUCER | |

SEE STANDARD SPECIAL PROVISIONS FOR SPECIFICATIONS.



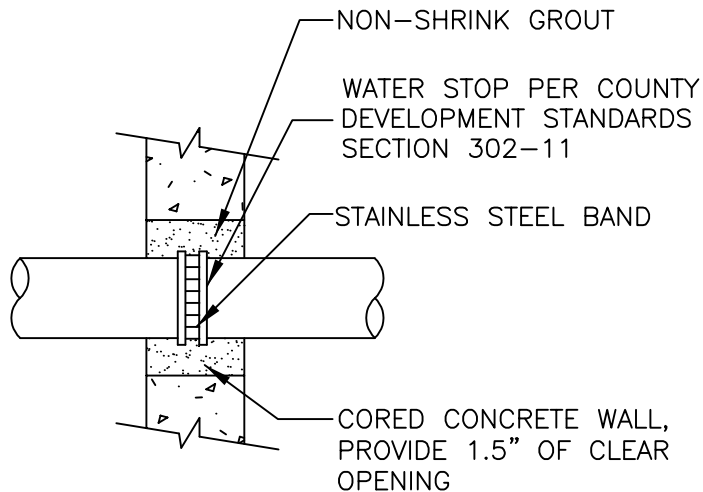
STANDARD TYPICAL SEWER PUMPING
STATION VALVE BOX

COUNTY OF KERN
STATE OF CALIFORNIA
DEVELOPMENT STANDARD

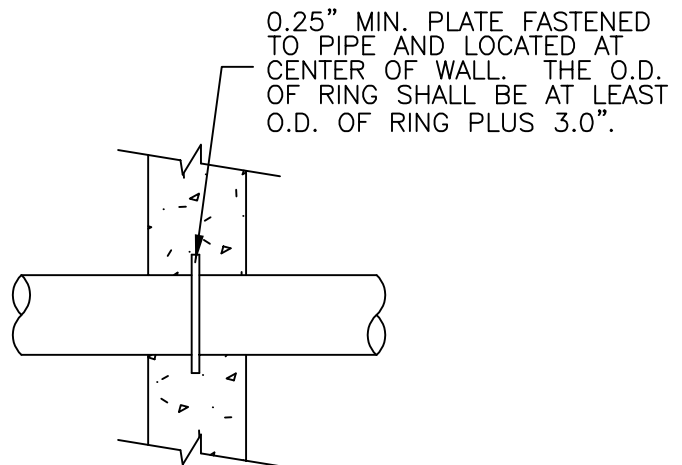
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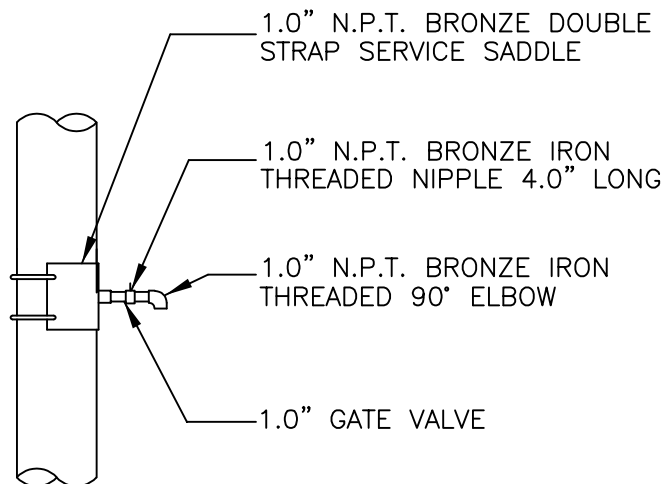
PLATE NO
S-13



Ⓐ WATER STOP DETAIL



Ⓑ CUT-OFF RING DETAIL



Ⓒ WASH DOWN DETAIL

NOT TO SCALE



STANDARD MISCELLANEOUS PUMPING STATION DETAIL

COUNTY OF KERN
STATE OF CALIFORNIA
DEVELOPMENT STANDARD

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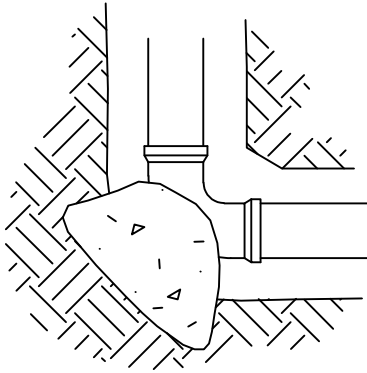
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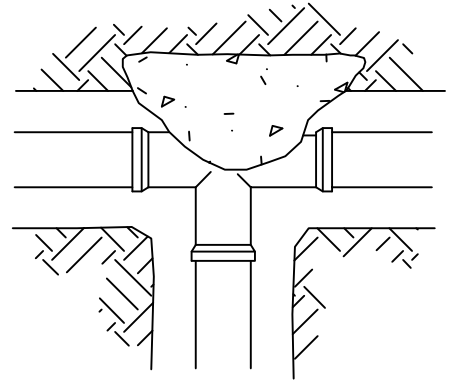
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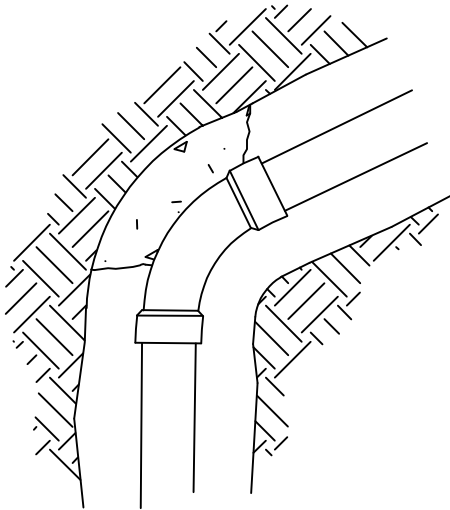
S-14



90° ELL



TEE



45° ELL

THRUST BLOCK DETAILS NOT TO SCALE

NOTES:

1. ALL VALVES, FITTINGS, AND DIRECTIONAL CHANGES ARE TO BE HELD IN PLACE BY CONCRETE THRUST BLOCKS.
2. BEARING AREAS INDICATED ARE BASED ON ALLOWABLE SOIL PRESSURE OF 1500 PSF.
3. CONCRETE IS NOT TO BEAR AGAINST PIPE. THRUST BLOCK TO ONLY BE IN CONTACT WITH THE FITTING.

* 1 S.F. (SQUARE FOOT)

THRUST BLOCK SCHEDULE

BEARING AREA IN SQUARE FEET*

PIPE SIZE	TEE OR PLUG	90° ELL	45° ELL	22.5° ELL
4.0"	2	2	2	1
6.0"	3	4	2	2
8.0"	5	7	4	2
10"	8	11	6	3
12"	11	16	8	4
16"	14	20	10	5



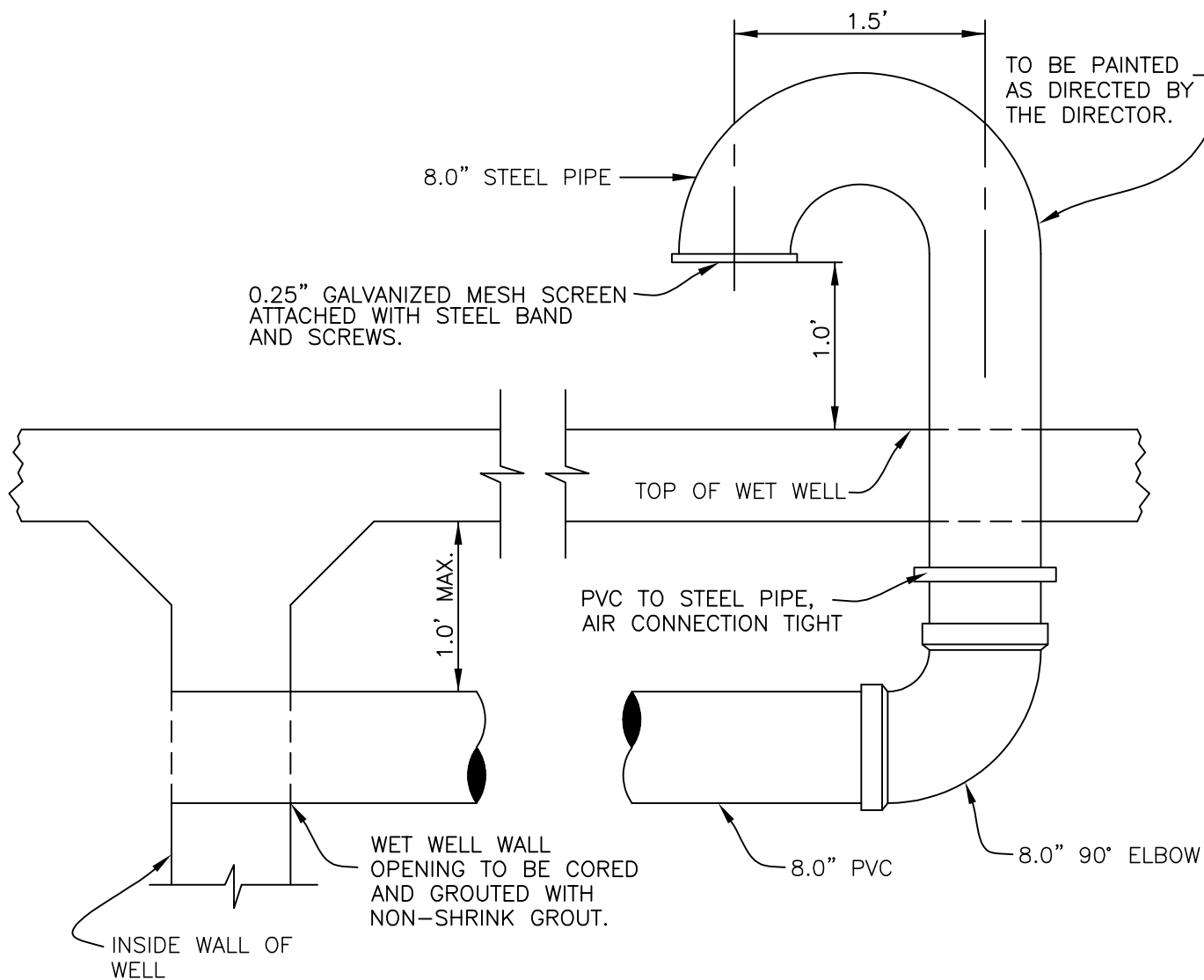
STANDARD PUMPING STATION THRUST BLOCK

COUNTY OF KERN
STATE OF CALIFORNIA
DEVELOPMENT STANDARD

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PLATE NO.
S-15



NOT TO SCALE



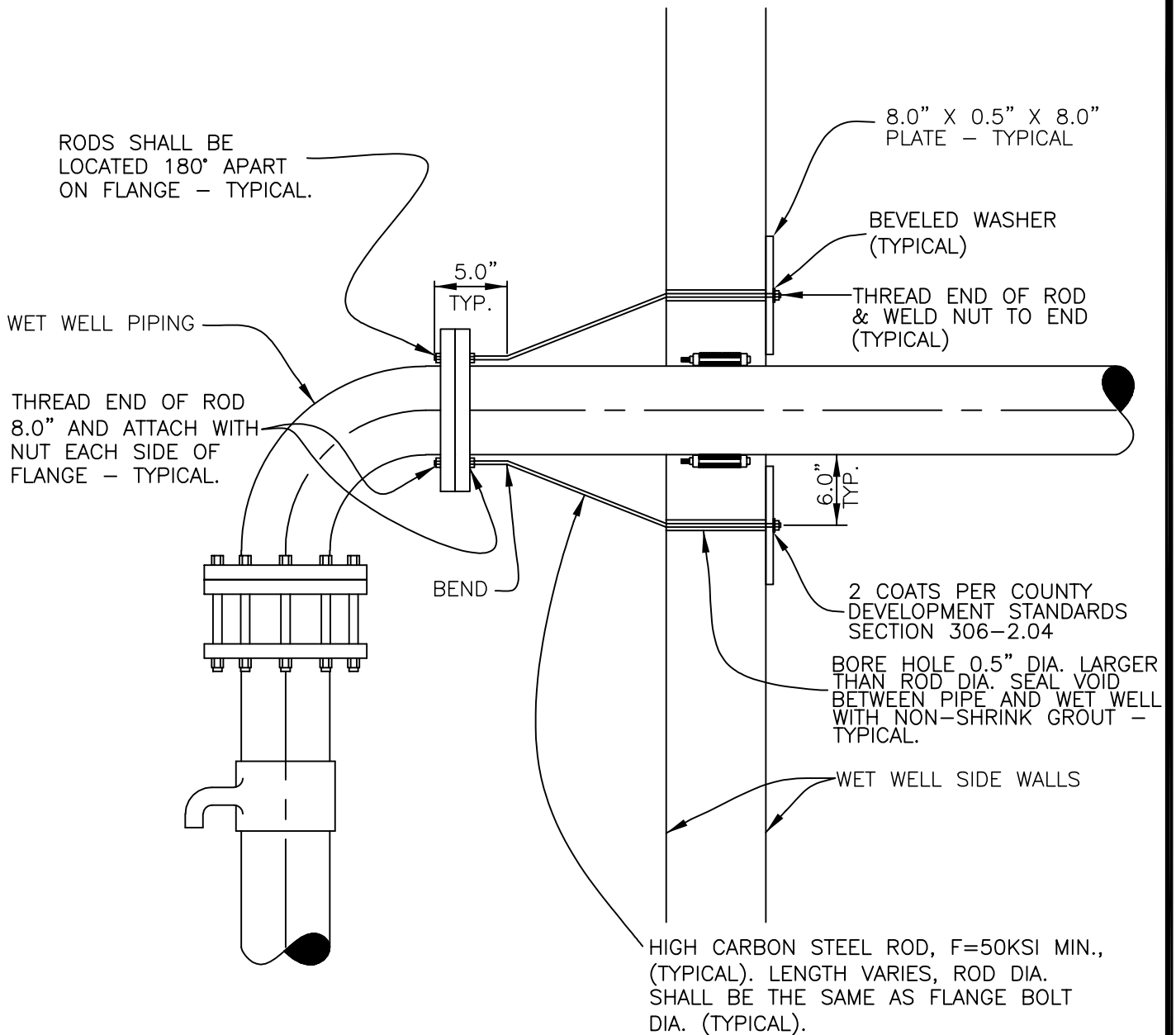
STANDARD PUMPING STATION AIR VENT DETAIL

COUNTY OF KERN
STATE OF CALIFORNIA
DEVELOPMENT STANDARD

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PLATE NO.
S-16



NOTES

- EXCEPT FOR PIPING, ALL METAL WORK WITHIN THE WET WELL SHALL BE STAINLESS STEEL.

NOT TO SCALE



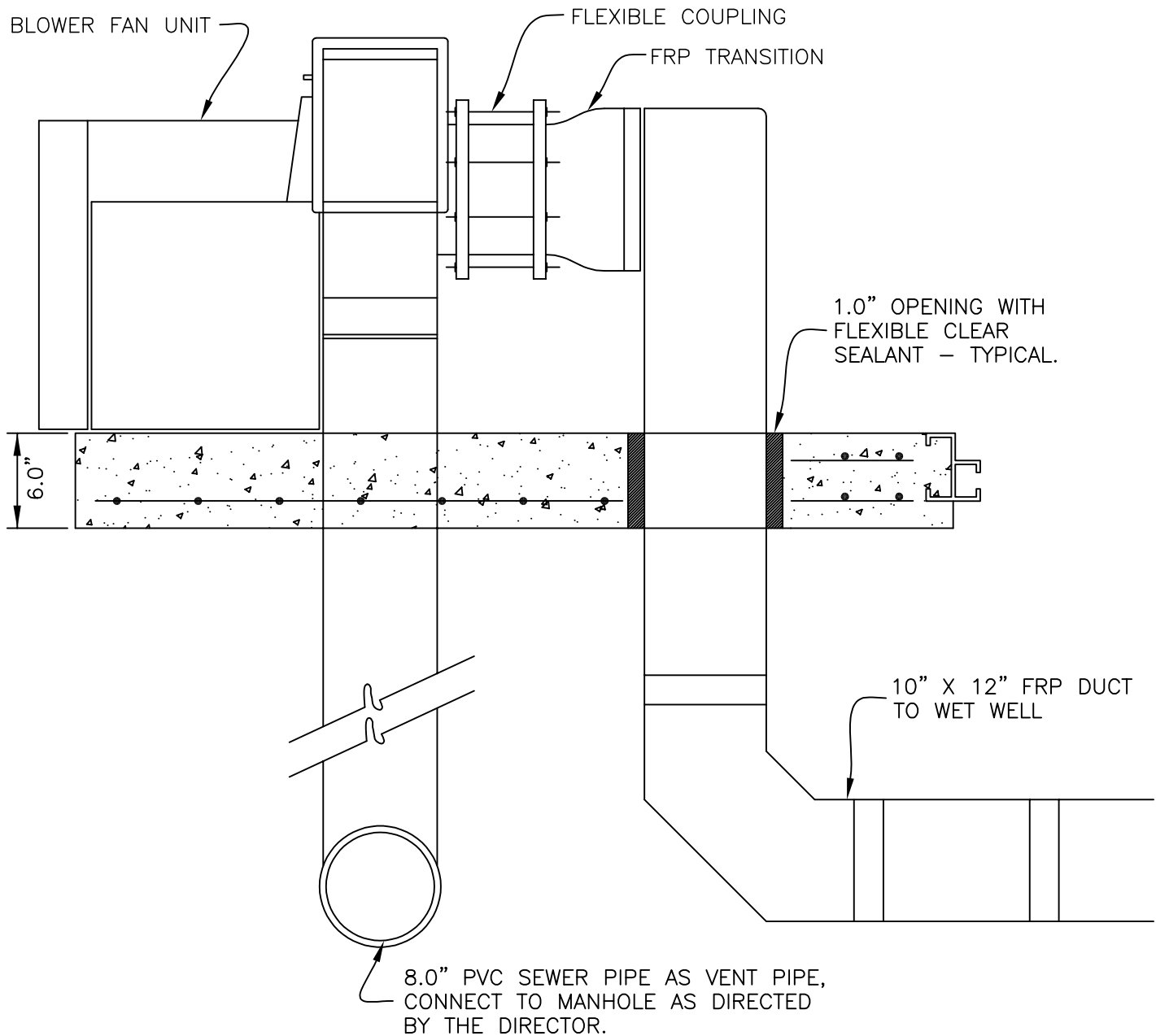
STANDARD PUMPING STATION PIPE RESTRAINT ASSEMBLY

COUNTY OF KERN
STATE OF CALIFORNIA
DEVELOPMENT STANDARD

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PLATE NO.
S-17



NOTES

- EXCEPT FOR PIPING, ALL METAL WORK WITHIN THE WET WELL SHALL BE STAINLESS STEEL.

NOT TO SCALE



STANDARD PUMPING STATION BLOWER FAN

COUNTY OF KERN
STATE OF CALIFORNIA
DEVELOPMENT STANDARD

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PLATE NO.
S-18