

# STANDARD SPECIFICATIONS AND DETAILS



**USD** TREAT  
PROTECT  
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**TRI-CITY WASTEWATER**

UNION SANITARY DISTRICT  
2017 (L)

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District  
Administration  
& Alvarado  
Wastewater  
Treatment Plant

**Union City**

**Hayward**

**Newark**

**Fremont**

**Milpitas**

San Francisco Bay



**Union Sanitary District  
Service Area Location Map**

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## **SECTION 1 - INTRODUCTION**

### **1.01 INTRODUCTION**

The STANDARD SPECIFICATIONS for sanitary sewers shall govern requirements, design and all work in connection with main and building sewer construction within the Union Sanitary District of Alameda County, California. District Information Bulletin, applicable portions of the latest version of the "California Plumbing Code" not in conflict with these Specifications, and all Ordinances of the District shall be considered a part of these Specifications. All plans, profiles, cut sheets, easement documents and specifications shall conform to the Standards established herein.

Special Provisions, specifications addenda, and/or notes on the plans shall be provided when deemed necessary, and shall be considered as part of the specifications for the work.

## **SECTION 2 - DEFINITIONS AND TERMS**

### **2.01 DEFINITIONS AND TERMS**

For the purpose of these specifications, the following words, and abbreviations shall be defined as follows:

**ABANDONMENT** - The permanent removal of main and/or building sewers from service.

**BUILDING PLUMBING (BUILDING DRAIN)** - The lowest piping of a gravity drainage system which receives the discharge from waste and other sewer drainage pipes inside the building and conveys it to the building sewer.

**BUILDING SEWER** - A Building Sewer shall refer to any existing or proposed sewer for private use. It extends from the main sewer to within 30 inches or less of the building or house to be served. It is subject to inspection and approval by the Union Sanitary District and when so approved, becomes the maintenance responsibility of the property owner, per Resolution No. 5, Section 5, dated December 12, 1949. Also referred to as a lateral or house sewer.

**CALTRANS** - Shall mean State of California, Business and Transportation Agency, Department of Transportation.

**CITY** - City of Fremont, City of Newark, or City of Union City.

**CONTRACTOR** - Company or individual authorized by the Union Sanitary District to perform work as called for by issuance of a sewer construction permit.

**DEFLECTION** - The changing in alignment or grade by movement of a pipe or joint. In the case of Flexible Pipe, it also means the outward movement of the sides of the pipe and the inward movement of the top and bottom of the pipe.

**DEFLECTOMETER** - Instrument used to determine the acceptability of deflections within Flexible Pipe. Also referred to as a mandrel.

**DEVELOPER** - Any public agency, private company, or individual who proposes the development of property which requires construction of sanitary sewers.

**DISTRICT** - Shall mean Union Sanitary District of Alameda County, California.

**ENCROACHMENT AGREEMENT** – An agreement between USD and a contractor that identifies the location and type of work allowed to be performed on USD Manholes and sanitary sewer mains by contractor.

**ENGINEER** - District Engineer of the Union Sanitary District or his/her authorized representative(s).

**FIXTURE UNIT** - The unit equivalent of plumbing fixtures as tabulated in the latest version of the California Plumbing Code.

**FLEXIBLE PIPE** - Sewer pipe made of Acrylonitrile-Butadiene-Styrene (ABS), Poly Vinyl Chloride (PVC), or High Density Polyethylene (HDPE).

**HOUSE SEWER** – See Building Sewer.

**LAYERING** – CADD file layer names.

LATERAL – See Building Sewer.

MANDREL – See Deflectometer.

MAIN SEWER - A main sewer shall refer to any existing or proposed sewer dedicated to public use within the public right of way or easement. It is subject to inspection and approval by the Union Sanitary District and when accepted, becomes the maintenance responsibility of the Union Sanitary District, per Resolution No. 5, Section 5, dated December 12, 1949.

PIPE (SEWER) EMBEDMENT - Earth or other special material used to replace material removed from trenches during construction from the sewer subgrade to a point at least six (6) inches, but no more than twelve (12) inches above the outside top of the pipe barrel.

PLANS - Drawings approved by the Engineer for construction in the Union Sanitary District.

PRIVATE SEWER – The portion of the sewer main, including manholes, or building sewer located within private property, unless dedicated to the public with an easement. Maintenance responsibility of private sewers is with the owner of the private property.

RELATIVE COMPACTION - Refers to the Compaction Test No. 216 or 231 of the State of California, Caltrans, Standard Specifications.

RIGID PIPE - Sewer pipe made of Vitrified Clay (VCP) or Ductile Iron (DIP)

SEWER SUBGRADE - Is defined as being six (6) inches below the exterior bottom of the pipe.

SPECIFICATIONS - Union Sanitary District's "Standard Specifications and Information Bulletin" available at the District Office.

STANDARD DETAILS - Detailed standard drawings of approved construction in the Union Sanitary District.

TRENCH (SEWER) BACKFILL - Earth or other special material used to replace material removed from trenches during construction above the pipe embedment.

UTILITY – Refers to cable TV, water, storm, fiber optics, electrical, gas, recycled water, telecommunications, nitrogen and other public or private utility lines.

## **2.02 ABBREVIATIONS**

ANSI – American National Standards Institute

ASTM – American Society for Testing Materials

AWWA – American Water Works Association

CADD – Computer Aided Drafting and Design

CBR – California Bearing Ratio

CPC – California Plumbing Code

DWG – Standard AutoCAD drawing file format

DXF – Standard CADD drawing file exchange format

GIS – Geographic Information System

NAD83 – North American Datum 1983 used for horizontal ground control

NAVD88 – North American Vertical Datum 1988 used for vertical ground control

NGVD29 - National Geodetic Vertical Datum 1929 used for vertical ground control

UPC – Uniform Plumbing Code

## **2.03 PIPE TYPES**

ABS – Acrylonitrile-Butadiene-Styrene Pipe

DIP – Ductile Iron Pipe

PVC – Poly Vinyl Chloride Pipe

RCP – Reinforced Concrete Pipe

VCP – Vitrified Clay Pipe

HDPE – High Density Polyethylene Pipe

## **SECTION 3 - SCOPE OF WORK**

### **3.01 SCOPE**

The work shall include the furnishing of all materials, labor, tools, implements and equipment necessary to construct the sewers with all appurtenances, complete and ready to operate. All construction shall be done in strict accordance with the approved Plans and the provisions of these Specifications unless otherwise authorized by the Engineer.

### **3.02 GUARANTEE OF WORK**

All work performed and materials used shall be guaranteed for a period of one (1) year after acceptance of the work by the District. A Surety Bond may be required to be filed with the District.

### **3.03 INDEMNIFICATION**

Contractor shall defend, indemnify and hold harmless the District, and each of its directors, officers, employees, agents, and, if applicable, any public entities or private property owners on whose property the work is being performed from and against any and all liability, including but not limited to, penalties, fines, costs, losses, damages, expenses, causes of action, claims or judgments, including attorney's fees and expert witness fees (collectively "Claims") resulting from:

- (a) any alleged or actual infringement or violation of any patent or patent right arising in connection with the performance of the Work and anything done there under;
- (b) any injury to or death sustained by any person (including Contractor's own employees) or damage to property of any kind, which injury, death or damage arises from or is in any way connected with the Contractor's performance of the Work;
- (c) any breach by Contractor of any of the obligations and covenants, and any other terms and conditions of the permit; or
- (d) any violation by Contractor or its subcontractors of one or more occupational safety and health standards, regulations, or orders, where the Contractor or its subcontractor is found to be the "Causing Employer" as defined by Title 8, CCR Section 336.10. Contractor or its subcontractor shall have the right to appeal such citations at their sole expense. The District shall provide reasonable cooperation to Contractor in its appeal of any Citations. In the event Contractor or subcontractor either fails to timely appeal the Citations and/or Citations are upheld after an appeal hearing, Contractor shall promptly pay the fines that were assessed against the District.

Contractor's aforesaid obligation of indemnity and defense shall not extend to that portion of the Claims that is caused by the sole negligence or willful misconduct of the District its directors, officers, employees, agents, or, if applicable, any public entities or private property owners on whose property the work is being performed. These obligations of defense and indemnification shall extend to Claims asserted after the completion of the Work.

### **3.04 SAFETY**

The Contractor shall be solely and completely responsible for conditions of the job site, including the safety of all persons (including employees) and property during the performance of the work. This requirement shall apply continuously and not be limited to normal working hours. Safety provisions shall conform to Cal-OSHA and all other applicable federal, state, county, and local laws, ordinances, codes, and regulations. Job site safety shall include confined space entry, traffic control, protection of public, above ground and below ground utility hazards and all incidental hazards. Where any of these are in conflict, the more stringent requirement will be followed. The Contractor's failure to thoroughly familiarize himself/herself with the aforementioned safety provisions shall not relieve him/her from compliance with the obligations and penalties set forth therein.

## **SECTION 4 - SITE PREPARATION**

### **4.01 SITE PREPARATION**

Site preparation shall consist of removing, and properly disposing of, all objectionable material such as fences, trees, brush, debris, etc., from the construction site which would interfere with the prosecution of the work.

On District contract jobs, approval must first be obtained from the Engineer to remove items that cannot practicably be replaced in kind, such as trees and limbs.

### **4.02 ACCEPTANCE OF GROUNDWATER FROM CLEANUP PROJECTS**

Water generated from the cleanup of spills, leaking underground storage tanks, monitoring wells or other similar sources shall not be discharged through direct or indirect connections to a community sewer unless a discharge permit is issued by the District. The District may approve the discharge of such water at its discretion only when no reasonable alternative method of disposal is available. If a discharge permit is granted for the discharge of such water into the community sewer, the user shall pay the applicable charges and fees and meet such other conditions as required by the District. For the purpose of permits and fees, the discharge shall be considered a Class I discharge subject to permit requirements and discharge limitations or prohibitions set by USD Environmental Compliance. The District retains the right to terminate the discharge at any time for cause. Each discharge permit must be reviewed on an annual basis.

## SECTION 5 - SEWER PIPE LINES

### 5.01 SEWER CONSTRUCTION MATERIALS

All sewer construction materials proposed to be used shall be new materials approved by the Engineer, prior to start of construction.

Where material specification numbers are used herein, they shall refer to the latest revision thereof.

For the purpose of these specifications, all pipe materials are classified as either "rigid" or "flexible."

### 5.02 PIPE MATERIALS

#### A. RIGID PIPE AND FITTINGS

Rigid pipe and fittings may be used only under prior approval of the Engineer to accommodate special circumstances. Rigid pipe, fittings, and joint materials specified herein consist of Vitrified Clay Pipe (VCP) and Ductile Iron Pipe (DIP). All materials incidental to rigid pipe installations shall be supplied by the Pipe Manufacturer. All rigid pipe required in odd lengths shall be cut using a proper cutting tool and guide that insures true line cut on planes perpendicular to the pipe axis. No bevel cuts for pipeline alignment will be permitted.

#### 1. VITRIFIED CLAY PIPE (VCP) AND FITTINGS

Vitrified clay pipe and fittings shall conform to ASTM Designation C-700. Mechanical type joints having resilient properties conforming to ASTM Designation C-425 shall be used and installed. The pipe shall be tested during manufacture in accordance with ASTM Designation C-301. The use of VCP shall only be allowed with special approval from the District Engineer.

#### 2. DUCTILE IRON PIPE (DIP) AND FITTINGS

Ductile iron pipe and fittings shall conform to ANSI/AWWA C151/A21.51 minimum pressure Class 350 for pipe 12 inches and smaller in diameter and minimum pressure Class 250 for pipe greater than 12 inches in diameter.

- a. Bell and spigot joint assemblies shall conform to the requirements of Federal Specification WW-P-421c, Section 3.1.2 as it applies to Type II, Grade B or C pipe.
- b. Standardized mechanical joint assemblies shall conform to the applicable requirements of ANSI/AWWA Standards for the pipe specified and ANSI/AWWA C111/A21.11.
- c. Any ductile iron pipe used in gravity sewer application or in pressure sewer applications where air and gasses can accumulate shall be lined. Lining shall be with high density polyethylene, ceramic epoxy, or glass as specified herein.
  - 1) HDPE lining shall be factory applied, certified and tested for absence of holidays and pinholes. Lining shall be minimum 40 mils thick. Lining shall be light colored for improved video inspection purposes.
  - 2) Ceramic epoxy lining shall be Protecto 401 as manufactured by Induron Coatings or equal. Ceramic epoxy shall be applied 40 mil thick.
  - 3) Glass lining shall be 2 dual layer system such as Fast Fabricators MEH-32, Vitco SG-14 or equal. Glass lining shall be a minimum 10 mils thick.
  - 4) Linings shall be applied under pipe factory supervision in accordance with liner manufacturers' published requirements. Liners shall be spark tested at

voltage of 60 V per mil thickness. Pinholes and holidays will be cause for pipe rejection.

- d. DIP shall be wrapped in polyethylene encasement per manufacturer's recommendation and conforming to ANSI/AWWA C105. Encasement shall be securely taped and extended/overlapped by a minimum of 12-inches.

## B. FLEXIBLE PIPE AND FITTINGS

Flexible pipe, fittings and joint materials specified herein consist of Acrylonitrile-Butadiene-Styrene (ABS) and Polyvinyl Chloride (PVC). All materials incidental to flexible pipe installations such as gaskets, joint lubricants, cements, etc. shall be supplied by the pipe manufacturer. All flexible pipe required in odd lengths shall be cut using a proper cutting tool and guide that insures true line cut on planes perpendicular to the pipe axis. No bevel cuts for pipeline alignment adjustments will be permitted. All flexible pipe for new construction shall be solid wall pipe.

### 1. ABS SOLID PIPE

ABS Schedule 40 pipe shall only be used for building sewers. All ABS pipe and fittings shall be solid wall pipe manufactured in accordance with ASTM Designation D-2661, and tested in conformance with the requirements of paragraphs under Section 7 and 10 of ASTM D-2680, for SDR 26 pipe.

Cement used for non-gasketed ABS pipe shall conform to ASTM Designation D-2235. Jointing of wet pipe is not allowed. No primer shall be used in the pipe installation. Jointing shall be accomplished by applying a coating of cement to the inside of the socket, and to the outside of the spigot end of the pipe to be joined in sufficient quantity that when the spigot is fully inserted into a socket, a bead of excess cement will form around the entire circumference of the outside juncture of said spigot and socket. Excess cement shall then be removed.

### 2. PVC SOLID WALL PIPE

All PVC solid wall pipe and fittings shall be in accordance with the requirements for SDR 26 sewer pipe as stated in ASTM Designation D-3034, minimum wall thickness of SDR 26, ASTM Designation F-679 Type PS-115, or the requirements for PVC pressure pipe. Pipe joints and fittings shall be factory assembled, integral wall bell and spigot configuration, compatible with the pipe.

Gasketed PVC Pipe shall have a solid cross section rubber ring gasket. The gasket shall be securely attached to the pipe to prevent displacement of the gasket when installed in the field. All rubber ring gaskets shall be in accordance with ASTM Designation F-477. Lubricant used for field assembly of gasketed PVC Pipe shall have no detrimental effect on the gasket, joint, fitting or pipe and shall be as recommended by the manufacturer.

Cement used for non-gasketed PVC Pipe shall conform to ASTM Designation D 2564. Jointing of wet pipe is not allowed. Jointing of pipe shall be accomplished by applying a coating of cement to the inside of the bell and the outside of the spigot. The cement shall be applied in sufficient quantity to produce a bead of cement around the entire circumference of the pipe joint. Excess cement shall then be removed.

### 3. PVC PRESSURE PIPE

Where PVC pressure pipe is required, PVC pressure pipe shall conform to the requirements of AWWA C-900-16 minimum Class 150 for Pressure Pipe manufactured in sizes from four (4) inches to thirty-six (36) inches in diameter. PVC pressure pipe

shall be furnished in Ductile Iron Pipe equivalent outside diameters with rubber gaskets, separate couplings, or approved equal. Thrust restraint shall be provided at valves and changes of direction for pressure flow applications.

#### 4. HDPE PIPE

All HDPE pipe shall be solid wall, butt-fused pipe conforming to AWWA C906 and ASTM D-3035 and shall meet the minimum cell classification of 345434 E for gravity sewers or 345434 C for pressure sewers as described in ASTM D3350. HDPE pipe shall meet the requirements of TYPE III, Class B, category 5 grade P34 material as described in ASTM D-1248. The pipe may contain no more than 10 percent reworked resin gathered from within the manufacturer's own plant from resin meeting these specifications. Pipe color for gravity sewer application shall be natural gray. Pipe color for pressure sewer applications may be natural gray or black. Wall thickness shall be no less than DR 21.

The pipe shall be marked at 5-foot intervals or less with a coded number that identifies the manufacturer, SDR, size, material, machine, date and shift on which the pipe was extruded.

Any pipe, which has cuts or abrasions in the pipe wall exceeding 10 percent of the wall thickness, shall be removed from the site.

The pipe shall be joined using the butt fusion method in strict accordance with the pipe manufacturer's recommendations and ASTM F2620. The fusion equipment shall be capable of meeting all conditions recommended by the pipe manufacturer, including, but not limited to, fusion temperature, alignment and fusion pressure.

Pipes 4-inches to 12-inches in diameter shall be de-beaded. Pipes larger than 12 inches in diameter are not required to be de-beaded. De-beading method shall be pre-approved by the District.

Fittings shall conform to ASTM D-3261. Electro-fusion fitting may be used provided approval is granted in advance by the Engineer.

#### 5. STORAGE

- a. Pipe shall be stored if possible at the job site in unit packages provided by the manufacturer. Caution shall be exercised to avoid compression, damage or deformation to bell ends of the pipe and barrel.
- b. When unit packages of flexible pipe are stacked, insure that weight of upper units do not cause deformation to pipe in lower units.
- c. Flexible pipe unit packages shall be supported by racks or dunnage to prevent damage to the bottom during storage. Supports shall be spaced to prevent pipe bending.
- d. When long-term storage with exposure to direct sunlight is unavoidable, flexible pipe shall be covered with an opaque material while permitting adequate air circulation above and around the pipe as required to prevent excessive heat accumulation.
- e. Flexible pipe shall not be stored close to heat sources or hot objects such as heaters, boilers, steam lines, engine exhaust, etc.
- f. Gaskets, if required, shall be protected from excessive exposure to heat.

## 6. DEFLECTION

The inside diameter of an installed section of flexible pipe shall not be allowed to deflect more than five percent (5%) of the base inside diameter (as defined in ASTM D3034) following 30 days after installation. Deflection testing conducted during daily installation and any time prior to 30 days after installation, shall be based on an allowable deflection of 3-1/3 percent of the base inside diameter. The testing mandrel sizes for PVC SDR 26 pipe are shown in the following table. For flexible pipe materials other than PVC SDR 26, the mandrel diameter shall be calculated based on the minimum inside diameter according to manufacturer's published information.

Nominal Diameter, inches	Pipe Specification	Base Inside Diameter, inches	96-2/3 Percent Mandrel Diameter <sup>(1)</sup> , inches	95 Percent Mandrel Diameter <sup>(2)</sup> , inches
8	PVC SDR 26	7.488	7.24	7.11
10	PVC SDR 26	9.342	9.03	8.87
12	PVC SDR 26	11.102	10.73	10.55
15	PVC SDR 26	13.575	13.12	12.90
18	PVC SDR 26	16.570	16.02	15.74
<sup>(1)</sup> Use for testing less than 30 days after installation				
<sup>(2)</sup> Use for testing 30 days or more after installation				

Flexible pipe deflection shall be checked by means of a 9-arm "go – no go" mandrel pipe deflection gauge. The mandrel shall have pulling rings at each end and shall be pulled by hand through the sewer without the aid of mechanical pulling devices. The pipe deflection shall be checked in the presence of the Engineer after conducting air testing described in Section 12.

The mandrel deflection gauge shall be fabricated to permit passage through installed sections of pipelines within the specified tolerances for flexible pipe. Any section or sections of flexible pipe that does not permit deflection gauge passage will not be accepted and said section or sections shall be properly repaired or replaced and rechecked as directed by the Engineer.

## 7. MISCELLANEOUS REQUIREMENTS

- a. Wyes or tees for buildings sewers or lateral connections shall be completed using in line bell and spigot type fittings molded from resins specified. Exception to this is when a saddle-type fitting is authorized on the plans, or as directed by the Engineer in the field. Fittings and taps that protrude into the sewer main will not be allowed.
- b. Fittings shall be sized to receive type of pipe specified for building sewer lateral. Installation of fittings will be in accordance with manufacturer's recommendations.
- c. Two water stops specified by the pipe manufacturer and approved by the District shall be installed at all manhole connections. The water stops shall be placed in the manhole base and centered under the manhole wall. The water stops shall be firmly fitted around the pipe exterior. Said water stops may also consist of a manhole coupling with rubber sealing rings cast into the structure base. No rubber boot type connections are allowed. The water stops shall consist of at least two continuous circles of contact such as two O-rings or a shear band coupling with two stainless steel bands.

C. OTHER PIPE

Other pipe materials may be used for sewer installation provided approval by the Engineer is granted.

The pipe shall be joined with couplings as furnished with the pipe by the manufacturer, and installed as specified by the manufacturer.

**5.03 PIPE COUPLINGS**

Pipe couplings (such as shear band couplings) shall be used to join pipes of unlike materials and to join pipes of like materials when a splice is made. Pipe couplings shall be banded rubber couplings with four clamps and Type 316 stainless steel shear bands. Pipe couplings shall be fastened on each end with Type 316 stainless steel worm-gear bands. Couplings shall be installed as recommended by the coupling manufacturer. A concrete collar around the joint may be required by the Engineer.

Acceptable shear band couplings include Fernco 5000 Repair Coupling Series and Mission Rubber Adjustable Repair Coupling.

**5.04 SADDLE**

A tee-branch saddle fitting fabricated of material approved by the Engineer and with a flange which will prevent the saddle from entering the main sewer beyond its inside surface. The flange shall have a curvature designed for the size main on which it is to be used.

The saddle shall create an airtight connection and at the option of the Engineer may require air testing.

**5.05 EMBEDMENT**

All pipe shall be embedded and backfilled as specified with extra care taken in compaction of said embedment and backfills as specified in Section 9 of these Specifications.

**5.06 STAINLESS STEEL BANDS**

Stainless steel bands shall be ASTM A-167, Type 316. Any fitting or coupling using stainless steel bands shall have the area of the band wrapped twice with 10 mil plastic tape.

## SECTION 6 - PORTLAND CEMENT CONCRETE AND MORTAR

### 6.01 CONCRETE

Concrete shall consist of a mixture of Type II Portland Cement, sand, fine aggregate, coarse aggregate and water. The proportions of the water, sand and aggregate shall be regulated so as to produce a plastic, workable and cohesive mixture yielding the strength indicated. Unless noted otherwise, all concrete shall be Class "A".

#### A. CLASS "A"

Class "A" concrete shall contain 564 pounds (6 sacks) of Portland Cement per cubic yard and shall have a minimum 28-day compressive strength of 4,000 psi in accordance with ASTM C-39.

#### B. CLASS "C"

Class "C" concrete shall contain 376 pounds (4 sacks) of Portland Cement per cubic yard and shall have a minimum 28-day compressive strength of 2,500 psi in accordance with ASTM C-39.

All material required, and the procedure of mixing, shall meet the requirements set forth in Section 90 of Caltrans State Standard Specifications, except that 3/4 inch maximum size aggregate shall be used and slump ranges of three (3) to four (4) inches for Class "A" concrete and four (4) to eight (8) inches for Class "C" concrete shall be maintained.

No admixtures will be permitted unless authorized by the Engineer.

Cement and aggregates shall be stored in such a manner as to prevent deterioration or intrusion of foreign matter.

Mixed concrete shall be used before initial set and in no case will retempering with additional water be permitted.

### 6.02 MORTAR AND GROUT

The dry materials used for mortar shall be thoroughly mixed with sufficient clean water to produce a uniform, plastic, workable and cohesive mixture.

Sand for mortar and grout shall be clean, dry, well-graded sand, free of organic or other deleterious matter, silt or other objectionable inorganic matter, pH level  $\geq 7$ , and shall be of such size as determined by laboratory sieves, conforming to the following gradation.

Sieve Size	Percent Passing
3/8-inch	100
No. 4	95-100
No. 8	80-100
No. 16	50-85
No. 30	25-60
No. 50	5-30
No. 100	0-10
No. 200	0-5

Cement shall be Type II Portland Cement. An industrial grade all-purpose non-shrinking cement such as "All Crete" or "Speed Crete" may be used.

No admixtures shall be used in the mortar or the grout unless otherwise specified or approved by the Engineer.

Mortar shall be composed of cement and sand proportioned and mixed as specified herein. Type "A" mortar shall be used unless Type "B" is specified by the Engineer.

A. TYPE "A"

Type "A" shall consist of one part by volume of cement and two parts by volume of sand. Minimum compressive strength shall be 5,000 psi at 28 days.

B. TYPE "B"

Type "B" shall be a case basis, mixed and used in accordance with manufacturer's recommendations. Minimum compressive strength shall be 5,000 psi at 28 days.

Mixed mortar shall be used before initial set and in no case will retempering with additional water be permitted.

## SECTION 7 - SEWER PIPE AND STRUCTURE INSTALLATION

### 7.01 SEWER PIPE LAYING

#### A. CONSTRUCTION STAKING

All main sewers and building sewers shall be staked in the field in accordance with the requirements of the Union Sanitary District. The grades and alignment of the sewer so staked shall be approved by the Engineer prior to start of sewer construction. (See Standard Specifications Sections 19.02, 22.07 and 23.06 for staking requirements and submission of cut sheets.)

#### B. ALLOWABLE DEVIATION OF ALIGNMENT AND GRADE

The horizontal deviation of the sewer from the line shown on the Plans shall be not more than three (3) inches. The sewer grade shall not deviate from the profile shown on the Plans, and the grade shall be maintained during and after backfilling operations. Sewer grades with deviations exceeding 1/2 inch shall be removed and replaced at Contractor's expense. If deviations less than 1/2 inch from the design grade occurs, pipe joints may be deflected to bring the invert back to grade. Grade corrections shall be made gradually to prevent sags in the pipe invert at low spots. Pipe shall be installed to be free draining (no sags) between any two points. No reverse (adverse) grade will be allowed.

#### C. LASERS

When laying main sewers, unless otherwise approved by the Engineer, the contractor shall use a commercial laser grade setting system. When using a laser, the following requirements and conditions must be met:

1. The Contractor shall have the responsibility of providing an instrument operator who is qualified and trained in the operation of the laser and said operator shall adhere to the provisions of the State of California Construction Safety Orders issued by the Division of Industrial Safety. Attention is particularly directed to Section 1514, 1800 and 1801 of said orders for applicable requirements.
2. When using a laser, the laser shall be connected firmly to a tripod, set firmly on compacted soil. The laser height of instrument shall be taken from one (1) offset hub and checked with at least two (2) more hubs, until 2 or more hubs show consistent readings or until readings coincide. This shall be done every time the laser is set up, or disturbed.
3. The laser and level instruments shall be properly calibrated within six (6) months prior to use. A laser or level instrument found to be out of calibration or without records showing it has been calibrated within the last six months, shall be removed from the job site until it has been properly calibrated.

#### D. GRADE LINE

When laying pipe for building sewers, in lieu of a laser grade setting system, the Contractor may use a grade line. When laying the pipe, except where vertical curves are shown on the Plans, or otherwise authorized by the Engineer, the Contractor shall use a grade line with at least two (2) adjacent runs up at all times in order to detect any variation from a straight grade. The grade line must be established over the center of the trench in vertical trenches and over the center of the pipe in V-type trenches during the laying operations, and grade line shall be maintained up until the pipe grade is checked by the Engineer.

The grade line shall be accurately and securely fastened at each staked station to securely erected batter boards and kept taut at all times.

The measuring pole shall be a solidly constructed straight pole with a metal foot at one end at right angles to the pole. The batter board construction, string line and measuring pole construction shall be approved by the Engineer prior to start of sewer pipe laying.

In caving ground and in other circumstances when the above is not practicable, and when so authorized by the Engineer, the pipe must be checked by surveying instruments under the direction of a Registered Civil Engineer or Land Surveyor who shall accept the responsibility for the pipe being installed on the proper grade.

E. SEWER PIPE PLUGS

Sewer pipe stubs, or other open ends, which are not to be immediately connected, shall be plugged or capped with a standard watertight plug or cap as approved by the Engineer for use in the particular installation. The plugs or caps may only be removed when so authorized by, and in the presence of, the Engineer.

F. JOINT DEFLECTIONS AND MINIMUM RADIUS

When approved by the Engineer, curved sewers shall be in conformance with the following requirements.

1. RIGID PIPE

The deflection in the joint between any two successive pipe sections shall not exceed 75% of the maximum allowable deflection as recommended by the pipe manufacturer. For rigid pipe, two (2) foot minimum pipe lengths may be supplied or pipe may be cut, if approved joint material is available, to install short radius curves and conform with the joint deflection limitations. When short lengths are to be used, it shall be so shown on the Plans.

2. FLEXIBLE PIPE

For flexible pipe, horizontal curves shall be achieved without joint deflection. Flexible pipe horizontal curves shall be achieved by bending pipe barrel to the required radius and securing the bent pipe barrel with stake restraints prior to backfilling. The minimum allowable bending radius is shown in the following table.

Pipe Diameter, inches	Minimum Radius, feet
4	100
6	150
8	200
10	250
12	300
15	350
18	450

G. VERIFICATION OF EXISTING SEWER OR STRUCTURE

Where connection is to be made to an existing sewer or structure, said existing sewer or structure shall be uncovered and checked for location and elevation prior to submitting cut

sheets. Any discrepancy between the Plans and field information shall be reported immediately to the Engineer.

H. COMMENCEMENT OF NEW SEWER PIPE LINE

Unless otherwise authorized by the Engineer, the laying of the pipe in finished trenches shall be commenced at the lowest point of the project, with the spigot ends abutting and pointing in the direction of the flow. The joints shall be carefully centered so that when laid to proper grade and alignment as designated on the Plans, they will form a sewer with a uniform invert.

I. SEWER PIPE LINE THROUGH MANHOLES

Except when precast manhole base blocks are used, sewers shall be laid continuously through proposed manhole locations on all straight runs and at angle points. When excavation is made below the pipe for manhole construction, care must be taken that the pipe spanning this area is firmly supported.

J. SHEAR BAND COUPLINGS AT MANHOLES

For rigid pipes, a shear band coupling with four clamps, shall be installed at a point 6 to 12 inches outside of the manhole base block on both upstream and downstream sides. In all cases, the flexibility of the coupling must be maintained by keeping all concrete away from the joint or coupling. A bell joint is not acceptable for this requirement.

K. GROUND TO BE FILLED

In ground to be filled, fill shall be placed up to 3 feet above where the outside of the pipe would be and laterally to a width of the pipe outside diameter plus six (6) feet centered on where the pipe would be, and compacted prior to the construction of the sewer. The compaction requirements, as specified by the Agency governing the fill, shall be considered adequate except that not less than 90% relative compaction per ASTM D-1557 "Modified Proctor" shall be achieved. Evidence of these results in the areas concerned shall be furnished to the District (from an approved testing laboratory) prior to construction of the affected sewer.

L. HANDLING OF PIPE

Pipe shall be protected during handling against impact shocks. Prior to making pipe joints, all surfaces of the portion of the pipe to be joined shall be cleaned, dried, primed or otherwise prepared as called for in these Specifications. The interior of all pipe shall be kept free from all dirt and foreign matter as the work progresses.

—At the close of each day's work, and at such other times when the pipe is not being laid, the ends of all open pipes shall be closed with a water tight plug or cap. Any modification of this requirement must be approved by the Engineer.

M. FIELD CUTTING PIPE

Unless otherwise permitted by the Engineer, pipes that must be cut in the field shall be cut with mechanical cutters or as recommended by the pipe manufacturer.

## 7.02 **SPLICE**

When a pipe is to be spliced into an existing sewer, the sewer shall be exposed and then mechanically cut at right angles to the pipe barrel, with sufficient length removed so that a pipe section with plain ends can be joined to the cut pipe with approved couplings to form an airtight joint. All work shall be done in the presence of the Engineer. Care must be taken to

fill all voids under and around the pipe splice with Type "B" Import material to properly support the new pipe and prevent any settlement of the spliced section.

### **7.03 MANHOLE**

Manholes shall be sound watertight structures, constructed as shown on the Standard Details or on the Plans in the case of special structures. The type of manhole and its location is to be shown on the Plans. The manhole shall be constructed to the rim elevations shown on the Plans.

#### **A. MANHOLE BASE BLOCK**

The base block shall be poured using Class "A" concrete and in accordance with the design shown on the Standard Details. Precast base blocks may be used for standard manholes approved by the Engineer and City jurisdiction. Precast base blocks may not be used for trunk manholes.

The concrete pour shall be made only on dry, firm undisturbed ground or on "rock ballast" placed on undisturbed ground. If the pour is on filled ground, the ground shall be compacted to a 95% Relative Compaction per ASTM D-1557 "Modified Proctor." The concrete shall be placed with a continuous pour deposited in such a manner that segregation of material does not occur. Once deposited, the concrete shall be consolidated with mechanical vibrators so as to secure a dense watertight mass.

An approved metal form ring shall be used so that a level keyed slot is formed in the fresh concrete to receive the pre-cast manhole shaft section.

When the sewer pipe has been laid through the proposed manhole, the top half of the sewer pipe shall be removed to within one (1) inch longitudinally of the inside wall of the manhole and the cut finished with mortar as specified by the Engineer.

The width of opening at the top of base block shall be the inside diameter of the pipes in the manhole.

In angle point manholes and in junction manholes, the pipes shall be joined by smooth curves, warped to conform to the lower half of the pipe. In all cases, the upper portion of the manhole channel from the mid-point of the pipes in the manhole to the top of the base block shall be constructed vertically.

When the manhole channel is not completed in the original pour, it shall be finished smooth by use of mortar with per Section 6.02. Before application of the mortar, the existing concrete surface shall be thoroughly cleaned and roughened to secure a firm bond. All channels shall be troweled smooth so that a smooth uninterrupted surface is achieved. The top of the base block shall be troweled to slope towards the channel at an approximate slope of one (1) inch in six (6) inches.

Placement of manhole components on cast-in-place manhole bases shall not occur until the next working day, at a minimum, after the base has been placed.

#### **B. MANHOLE SHAFT AND PRECAST BASE BLOCK**

The manhole shaft shall be composed of precast concrete sections. These sections shall be installed plumb and aligned so that the steps are in a straight vertical line. Unless otherwise required by the Engineer, the steps shall be aligned horizontally forty-five (45) degrees away from the direction of the flow of the sewer main on the upstream side.

Precast concrete sections shall be in accordance with the Standard Details and shall conform to the requirements of ASTM Designation C-487 except that Type II or Type V Portland Cement shall be used. The cone section shall be concentric unless eccentric is allowed by the Engineer.

Unless otherwise directed by the Engineer, manholes to be installed in all proposed City streets and paved Public Easements will be constructed with standard cone section per Standard Detail Sheets. In these cases, the neck rings and cast rings shall be installed after the street section has been completed.

Joints between precast sections shall have a "Ram-Nek" flexible plastic gasket installed between the tongue and groove joint to make a watertight joint. After the shaft is in place, the joint shall be trimmed smooth with a sharp tool on the inside of the manhole.

Manhole sections will be ordered without steps when the distance between the top rim and top of base block is less than four (4) feet. Precast manhole base blocks, when allowed by the Engineer and city jurisdiction for standard manholes, shall have a standard pipe bell cast into the base block. Rubber boot type connections are prohibited.

C. DROP CONNECTIONS

Drop connections are only allowed with prior District Engineer approval. When a drop connection is shown on the Plans, it shall be included as part of the manhole construction. The drop shall be made with approved fittings outside the manhole shaft as shown on the Standard Details. The lowest pipe shall be constructed into the base block by aforementioned channeling procedures. The base block shall be enlarged to encase these lower fittings.

After the manhole shaft is in place, the upper pipe run shall be constructed through the precast wall, flush with the inner wall. The hole between the pipe and the precast section shall be mortared to a watertight condition. This pipe and drop shall then be encased in concrete to the point where the upstream sewer trench is of normal width and depth.

D. MANHOLE CASTINGS

Manhole frame and cover shall be Class 30 cast iron designed as shown on the Standard Details and conforming to ASTM Designation A-48. Manufacture's name, initials or logotype shall be cast in the frame and cover. The bearing surfaces of the frame and cover shall be machined and the cover shall seat firmly without rocking. Before leaving the foundry, all casting shall be protected with an asphalt coating as follows:

1. The surface to be protected shall be clean, uncoated cast iron free of oil, grease, scale or rust.
2. The casting shall be painted with asphalt paint or as an alternative the entire casting shall be dipped in asphalt paint.

The manhole frame and cover shall be permanently set when so authorized by the Engineer.

The frame shall be centered on the manhole shaft and laid on mortar to final grade. The mortar shall be neatly struck.

E. MANHOLE STEPS

Steps shall be installed in the manhole cone and barrel sections by the manhole manufacturer before being shipped to the job site unless the manhole is specifically ordered without steps.

Steps for manholes shall be made of Copolymer Polypropylene that encapsulates a 1/2" grade 60 steel reinforcing rod. This step shall conform to ASTM Designation C-478, Paragraph 16.

The steps shall be PS2-PFS manhole steps as manufactured by M.A. Industries Inc. (800-241-8250), P-13938 as manufactured by Lane International Corporation (800-666-0076), or approved equal.

F. MANHOLE COLLAR

Unless otherwise specified by the Engineer, a concrete collar shall be poured around the frame and shaft so as to securely anchor the frame to the shaft. (See the Standard Details)

G. MANHOLE LINERS

All trunk manholes and drop manholes shall be lined with 65 mil thickness PVC liner embedded into the manhole concrete at time of pour. Standard manholes shall be lined where required by the Engineer. Liner shall be T-lock as manufactured by Ameron or approval equal. Liner shall extend from the bottom of the grade rings to the top of the bench wall shelf.

Joints in liner shall be heat welded with strips of PVC, same thickness as liner. Liner and joints shall be spark tested in the presence of the Engineer. Spark testing shall be performed at minimum 15,000 volts with a Tinker and Razor Holiday Detector, or approved equal. Any holidays or pinholes shall be patched by thermal welding strips over the pinhole and the area patched shall be retested. The manhole will not be accepted until it is holiday and pinhole free.

**7.04 RISER (MAIN SEWER ONLY)**

A. RISER SHAFT

The riser shaft shall be a straight piece of pipe joined to the main by means of a 45-degree bend fitting, with both shaft and fitting joined in the same manner, as required in the pipe laying section of these Specifications.

The shaft shall be installed at a 45-degree angle and so positioned that the 45-degree bend fitting is located at the station shown on the Plans. The shaft will be cut smoothly at a 45-degree angle so that the highest point will extend to within two (2) inches of the casting cover. The exposed end of the shaft shall be temporarily sealed to prevent dirt or debris from entering into the sewer until such time as the frame and cover are permanently installed.

B. RISER CASTINGS

The riser frame and cover shall be Class 30 Cast Iron designed as shown on the Standard Details and conforming to ASTM Designation A-48. Manufacturer's name, initials or logotype shall be cast in frame and cover. The cover shall seat firmly without rocking. Before leaving the foundry, all castings shall be cleaned and coated with asphaltic material.

The frame shall be centered on the riser shaft opening so that the pipe does not touch the frame. When the frame has been set to final grade, a concrete block shall be poured around the frame.

The riser frame and cover shall be permanently set when so authorized by the Engineer.

#### **7.05 CLEANOUT TO GRADE (BUILDING SEWER ONLY)**

A wye-branch fitting, with branch the same diameter as the building sewer, shall be installed so that it opens in a direction opposite to the flow of the sewer, vertically above the pipe barrel. Necessary fittings and pipe, of the same diameter as the building sewer, shall be used to bring the "cleanout" vertically to ground surface and an approved box and cover installed, all as shown on the Standard Details.

Cleanouts shall be constructed as shown on the Standard Details and in locations shown on approved plans. A transition coupling and cleanout shall be provided and installed at the property line.

The vertical pipe shall be plugged below subgrade of surface in improved areas and sufficiently below the ground surface in unimproved areas so as to be protected during final site preparation. After surface work is complete, the riser pipe will be extended to finished grade, capped with an airtight threaded body and cap plug and protected with an approved cleanout box per Standard Details.

#### **7.06 TWO-WAY CLEANOUT TO GRADE (BUILDING SEWER ONLY)**

A two-way fitting with a riser pipe, both of the same diameter as the building sewer, shall be installed vertically above the pipe barrel. The "two-way cleanout to grade" will be brought to finished grade, capped with an airtight threaded body and cap and protected with an approved cleanout box per Standard Details.

When a plastic two-way fitting is used, a six (6) inch long plastic stub must be installed into the downstream bell of the two-way fitting in order to permit a proper coupling to be made with other types of material used for the building sewer.

#### **7.07 TEST WYE (BUILDING SEWER ONLY)**

A wye-branch fitting, with branch the same diameter as the building sewer, shall be installed so that it opens in a direction opposite to the flow of the sewer vertically above the pipe barrel. The test wye shall not be removed after testing, but shall be capped with an airtight threaded body and cap and left in place. Rubber caps shall not be used.

#### **7.08 SEWER THROUGH CASING**

Unless otherwise required by the Engineer, when main sewer pipe cannot be installed by open cut methods, it must be installed in a casing as shown on the Plans.

Pipe casing size, material and thickness will be as specified on the Plans.

The casing material will be delivered to the job site with ends fabricated to a true right angle with the axis of the pipe to facilitate accuracy of jacking.

Welded Steel Pipe Casing shall conform to ASTM Designation A-53 Grade B, A-139 grade B or A-252 Grade 2.

Where approved by the Engineer, 4 inch and 6 inch pipes can be bored; larger diameters require casing. The minimum inside diameter of the pipe casing shall be eight (8) inches greater than the maximum outside diameter of the sewer to be installed therein, with a minimum outside diameter of thirty (30) inches for any casing unless otherwise approved by the Engineer.

The casing sections shall be joined by a continuous watertight weld.

The jacking pits shall be excavated and backfilled in accordance with Section 8 and 9 respectively, of these specifications. A submittal for the jacking pit installation shall be required prior to the start of the jacking operation.

The guide rails for the jacking machine shall be accurately set and checked by a licensed surveyor, so that the casing, while being jacked, will be guided to correct line and grade to enable the sewer pipe to be centered in the casing.

The front of the casing pipe shall be provided with mechanical arrangements or devices that will positively prevent the auger from leading the pipe so that no unsupported excavation is ahead of the pipe. The auger and cutting head arrangement shall be recessed to prevent the flowing of material from the face of the casing into the casing. The auger and cutting head arrangement shall be removable from within the pipe in the event an obstruction is encountered.

The Contractor shall be responsible for surface subsidence and damage or disturbance to adjacent property and facilities that may result from the Contractor's Construction method. In the event that loose material is encountered and cave-ins occur or are anticipated, all jacking will be discontinued, approved shoring shall be provided and all voids filled by pressure grouting.

It is recommended that the Contractor make frequent checks on the casing grade during installation. Grade stakes, indicating pipe invert elevations, shall be located at both ends of proposed casing.

Immediately after completion of the jack and bore operation, lean grout shall be injected through the grout holes of casings 30-inches and larger in a manner that will completely fill all voids outside the casing pipe resulting from the jack and bore operation. The lean grout shall consist of one part Portland cement, four parts sand, 2% bentonite by weight of cement, and sufficient water to produce a workable mixture. Bentonite shall be commercially processed powdered bentonite. Sand gradation shall be 100% pass No. 8 sieve and at least 45% pass No. 50 sieve. Grout pressure is to be controlled so as to avoid deformation of the casing and/or avoid movement of the surrounding ground. Sand for grout to be placed outside the casing shall be of such fineness that 100% will pass a No. 8 sieve and not less than 35% will pass a No. 50 sieve. After completion of grouting, the grout connections shall be closed with cast-iron threaded plugs.

When the casing has been completed, and before the sewer is installed, it shall be inspected and approved by the Engineer. Pipe material as shown on the Plans shall then be joined and installed on proper grade through the casing.

The sewer pipe shall be securely supported through the casing as shown on the Standard Details. After the sewer pipe is installed, it shall be given a preliminary air test in the presence of the Engineer (See Section 12 of these Specifications) and internally inspected by closed circuit television (see Section 13 of these Specifications). After the test is satisfactorily completed, and the television inspection favorably reviewed, the annular space between the pipe and the casing shall be filled with dry sand (see Section 6.02 of these Specifications) mechanically blown in or filled with cellular concrete so as to completely fill all voids after which the space between the end of the casing and the pipe shall be sealed to a watertight condition. The pipe shall be anchored and secured to prevent movement during the filling of the annular space.

## **7.09 REHABILITATION OF BUILDING SEWERS USING PIPE-BURSTING**

### **A. GENERAL**

Building sewers in poor condition due to cracked pipe or joints, leaking joints (infiltration), or root intrusion may be rehabilitated using the pipe-bursting method, if approved in advance by the District. Certain conditions, such as building sewers with insufficient grade, sags, or in close proximity to other utilities may not be suitable for rehabilitation using the pipe-bursting method. This specification is intended for rehabilitation of 4-inch or 6-inch diameter building sewers only.

Approval of the pipe-bursting method by the District can only be made after reviewing the pre-rehabilitation inspection video, which is a required submittal item. Approval of the submittal by the District does not imply that the proposed pipe-bursting installation is appropriate for the specific location being proposed for installation. The Contractor is completely responsible for all elements of the pipe-bursting installation, including safety of installation, conflicts or damage to: utilities, property improvements, sidewalks, driveways, curbs, gutters, pavement, and equipment, or installation problems caused by existing building sewer pipe materials, subsurface conditions, or access restrictions.

B. DESCRIPTION

Pipe-bursting rehabilitation consists of splitting and expanding the existing pipe and simultaneously pulling, or pushing, a new high-density polyethylene (HDPE) pipe into the resulting void. The method requires the excavation of two pits. The insertion pit shall be used to insert the pipe splitting device followed by the new pipe. The exit pit shall be used to receive the splitting device and new pipe through the existing building sewer. After insertion, a cleanout to grade shall be installed at the property line and the new pipe shall be connected to the existing pipe.

C. SUBMITTALS

1. A letter signed by the property owner authorizing the installation of the building sewer using the pipe-bursting method. The letter must also acknowledge that the pipe-bursting procedure and limitations have been explained to the property owner by the Contractor.
2. Pre- and post-rehabilitation video inspections: The Contractor shall inspect the building sewer using a CCTV camera and provide video files and inspection reports for each building sewer on a flash drive or in a DVD format. Submitted files shall only contain information from one building sewer per flash drive or DVD. The video shall show the footage of the camera and shall include the complete length of the building sewer to be replaced. Prior to video inspection, the existing pipe must be clean of all debris and must be wet so that sags can be easily detected. The video inspection shall adequately document the location of the work by capturing the address number of the structure and any other details pertinent to the work. If the videos do not adequately show the location of the work or the condition of the lateral, the Engineer will require the video inspections to be redone and may require a District Representative to be present for video inspections.

D. EQUIPMENT

The pipe-bursting equipment may be either hydraulic, pneumatic, or the cone cracking type. The bursting head shall be specially designed to force its way through the existing pipe materials by fragmenting the pipe and compressing the old pipe section into the surrounding soil as it progresses. The head shall be designed to produce a maximum opening dimension of 1 inch (diameter) larger than the outside diameter of the new HDPE pipe. The pipe-bursting system shall be used to replace the existing building sewer with the same nominal size pipe. The system shall not be used to increase the size of the building sewer.

E. PIPE

The HDPE pipe shall be as specified in Section 5.02 of these Standard Specifications.

F. UTILITIES

At least 48 hours prior to excavation, the Contractor shall call Underground Services Alert (USA) at 811 or (800) 227-2600. The Contractor shall request utility markings for the entire reach of the proposed pipe burst. The Contractor shall pothole all utilities crossing the

proposed pipe burst to determine the clear distance between each utility and the existing building sewer. Utilities with less than 12 inches of clearance or water mains and services with less than 24 inches of clearance shall be left exposed during the pipe-bursting installation.

G. INSTALLATION

1. After coordinating with the property owner and residents, plug existing building sewer or provide by-pass pumping system to prevent sewage spills. Dumping or free flow of sewage within the excavation or on public or private property, gutters, streets, and storm drain facilities is prohibited.
2. The insertion pit shall be large enough so that HDPE pipe can be installed without exceeding the minimum bending radius. The minimum bending radius shall be 20 times the outside diameter of the pipe or as recommended by the pipe manufacturer, whichever value is larger.
3. After installation, the Contractor shall allow a minimum of four (4) hours for relaxation due to tensile stressing and to allow the pipe to thermally acclimate with the soil prior to installing final connections to main sewer or building sewer. Temporary connections can be installed sooner to reinstate sewage flows.
4. Any installed pipe, which has cuts or abrasions in the pipe wall exceeding 10 percent of the wall thickness, shall be cut out and removed from the site.
5. After final cleaning of the building sewer, water shall be introduced into the new pipe section and the post-rehabilitation video inspection shall be completed and the video submitted to the District for approval.

H. TESTING

Refer to Section 12.01 for testing requirements.

I. CONNECTIONS

A cleanout to grade, including box and cover, shall be installed at or near the property line as shown on the Standard Details. Connections shall be completed using shear band couplings with Type 316 stainless steel bands.

## SECTION 8 - EXCAVATION

### 8.01 DEFINITION

Excavation shall mean all of the below ground-surface work (including cutting of pavement; control of ground water, storm water and other extraneous water; removal, handling, stockpiling and/or proper disposal of removed material and water) necessary to prepare a firm, dry bed for the sewer line and structures.

The Contractor shall be solely and completely responsible for conditions of the jobsite, including safety of all persons and property during performance of the Work. This requirement shall apply continuously and not be limited to normal working hours. Safety provisions shall conform to U.S. Department of Labor (OSHA), the California Occupational Safety and Health Act (CalOSHA), and all other applicable Federal, State, County, and local laws, ordinances, codes, including but not limited to the requirements set forth below, and any regulations that may be detailed in other parts of these Standard Specifications. In the event of conflicting requirements, the most stringent requirement as it pertains to the Contractor's safety responsibility, shall be followed by the Contractor.

The excavation shall be made to enable the sewer to be laid to the grade and alignment designed on the Plans.

### 8.02 OPEN TRENCHING

The excavation for sewers shall be made by open trenching except where tunneling is necessary. Existing pavement shall be saw cut and replaced in accordance with Section 10. The walls of the sewer trench shall be vertical in the region between the bottom of the trench and the top of the sewer pipe. In this region, at least six (6) inches but not more than twelve (12) inches of clearance shall be maintained between the outer wall of the pipe barrel and the embankment or shoring, unless otherwise approved by the Engineer.

The trench shall be excavated to a level section and to such elevation as will give a uniform bearing and true flow line elevation when the sewer pipe is laid. All loose dirt in the bottom of the trench must be removed.

#### A. MUD OR OTHER SOFT OR SPONGY MATERIAL

Where mud or other soft or spongy material incapable of proper pipe support is encountered, it shall be excavated to a minimum depth of twelve (12) inches below sewer subgrade. Limits of the material to be removed shall be designated by the Engineer in the field. However, this does not relieve the Contractor of the requirements of these Specifications, including, but not limited to, allowable deviation of alignment and grade.

#### B. ROCK

Where rock is encountered, the trench shall be excavated to a minimum depth of three (3) inches below the sewer subgrade and backfilled to sewer subgrade with Type "B" Import, thoroughly compacted to grade before the sewer pipe is laid.

#### C. OVER EXCAVATED AREAS

Over excavated areas in the trench bottom where "Type B" Import bedding will be placed, shall be restored to sewer subgrade with "Type B" Import, thoroughly compacted before the sewer pipe is laid. (Exception to this requirement is for private sewer lateral trenches in unpaved private property from the property line to the building, where gravel, crushed rock or sand may be placed).

D. COMPACTION

In all the above situations, the compaction shall be achieved by mechanical means. Water settling, flooding, jetting, and other water consolidation methods are expressly prohibited.

E. BRACING AND SHORING

The contractor shall at all times furnish, install, and maintain sufficient bracing and shoring in trenches to insure safety of the workmen and to protect and facilitate the work. When practical, all such bracing and shoring shall be removed from the trench as the backfilling proceeds.

F. BLASTING

In the event that blasting is necessary in excavation, special permission, in writing, must be obtained from the Agency having jurisdiction over the issuance of blasting permits before any blasting will be permitted. Such permission shall in no way relieve the Contractor of the responsibility for obtaining any permits or licenses required by State Law or Local Ordinance.

G. SEWER SUBGRADE

The sewer subgrade shall be kept dry at all times and precautions shall be taken that no storm water is allowed to enter the excavation prior to backfilling. The Contractor shall, at all times, have on the job, sufficient pumping machinery for immediate use. Water shall be disposed of in accordance with the requirements of the city having local jurisdiction, and in such a manner as to cause no damage to public health or safety, or to public or private property.

H. EXCAVATION MATERIAL

Material excavated in streets and roadways and required for backfill, shall be laid alongside the trench and kept trimmed up so as to cause as little inconvenience as possible to public travel.

Free access must be provided to all fire hydrants, water gates, meters and private drives, and means shall be provided so that water can flow in the gutters uninterruptedly.

All materials excavated in streets and roadways and not required for backfill, shall be immediately removed and properly disposed of by the Contractor. No surplus material shall be disposed on private property.

I. OPEN TRENCH PERMITTED

The Engineer will specify the amount of open trench permitted at any one time. In general, the length of trench open at any time shall be limited to 100 feet in business areas; 250 feet or one block (whichever is less) in residential areas; and 1,000 feet in undeveloped areas.

No trench shall be allowed to remain open outside of work hours. At the end of a work day the trench shall be backfilled or secured with steel plates.

J. CONTRACTORS RESPONSIBILITY

It shall be the responsibility of the Contractor to conform to all the requirements of all permits obtained from all Agencies and to make the construction site safe against injury to people and/or livestock by erection of adequate posted barricades and/or temporary fences.

K. GROUNDWATER

The Contractor shall keep excavations free from water during construction. Groundwater shall be controlled to prevent softening of the bottom of excavations, or formation of "quick" conditions. The static water level shall be drawn down to a sufficient depth below the bottom of excavations to maintain the undisturbed state of natural soils and allow the placement of any fill to the specified density. Dewatering systems shall not remove natural soils. The Contractor shall control surface runoff to prevent entry or collection of water in excavations.

The Contractor shall obtain any and all permits required in conjunction with the installation and removal of the dewatering system and shall meet all permit requirements.

The Contractor shall contact the local drainage authority for discharge requirements. The Contractor shall dispose of water from dewatering operations so as not to cause injury or damage to adjacent property and shall at all times remain in compliance with the requirements of the local drainage authority.

## SECTION 9 - TRENCH BACKFILLING

### 9.01 TRENCH BACKFILLING

Trench backfilling shall consist of all materials placed in an excavation in the process of constructing a sewer line and/or appurtenances. No backfill shall be deposited over a sewer line and/or appurtenances until pipe laid has been inspected and approved by the District for backfilling operations.

### 9.02 PIPE FOUNDATION - (IF REQUIRED BY ENGINEER)

Pipe foundation shall be that portion of the trench which is nine (9) inches below the sewer subgrade. This portion of the trench shall be backfilled with "Rock Ballast" thoroughly compacted to achieve a firm, dry bed for the sewer pipe or structure. Locations of the "Rock Ballast" will be designated by the Engineer in the field. However, this does not relieve the Contractor of the requirements of these Specifications, including, but not limited to, allowable deviation of alignment and grade. Rock ballast shall be wrapped in non-woven geotextile fabric composed of polypropylene. The fabric shall be consistent with the physical characteristics of Mirafi: 140N, or approved equal.

#### A. ROCK BALLAST:

Rock Ballast shall be 1 1/2 by 3/4-inch gravel conforming to the following gradation.

Sieve Size	Percent Passing (by weight)
2-inch	100
1-1/2-inch	95-100
3/4-inch	5-30
3/8-inch	5-20
No. 200	0-4

### 9.03 GEOTEXTILE FILTER FABRIC

If required by the Engineer, geotextile filter fabric shall be used to wrap pipe foundation and pipe embedment as specified herein and as indicated on the Standard Details. The requirement for geotextile filter fabric may vary depending on groundwater and soil conditions.

Geotextile filter fabric shall be a non-woven material consisting of polyester, nylon, polypropylene filaments formed into a stable network. The fabric shall be permeable, not act as a wicking agent, be inert to commonly encountered chemicals, be rot-proof, and resistant to ultraviolet light.

The geotextile fabric shall also conform to the following physical properties:

Property	Test Value	Test Method
Weight	5.4 oz/yd <sup>2</sup> (min.)	ASTM D3776/D5261
Grab tensile strength	150 lb (min.)	ASTM D4632
Elongation at break	50% (max.)	ASTM D4632
CBR Puncture	410 lb (min.)	ASTM D6241
Apparent opening size	#70 (max.)	ASTM D4751
Permittivity	1.0 sec-1 (min.)	ASTM D4491
UV resistance	70% (min.)	ASTM D4355

The geotextile fabric shall be Mirafi 160N, Linq Industrial Fabrics 150 EX, or equal.

## 9.04 PIPE EMBEDMENT

Pipe embedment shall mean that portion of the material placed within the trench from the sewer subgrade to a point at least six (6) inches, but no more than twelve (12) inches above the outside top of the pipe. "Sewer Subgrade" is defined in Section 2.

### A. PIPE EMBEDMENT MATERIAL

#### 1. IMPORT "TYPE A"

Shall be creek or bank gravel, crushed gravel, crushed rock, bank run rock or a mixture of these materials.

The material shall be free from roots, vegetable matter, or other deleterious substance and shall be of such nature and so graded that it will bind readily when watered and compacted to the requirement specified herein.

When tested in accordance with Section 6 of Caltrans, State Standard Specifications, the material shall meet the following requirements:

- a. The material shall be of such size that the percentage composition by weight, as determined by laboratory sieves, will conform to the following grading:

Sieve Size	Percent Passing (by weight)
1-inch	100
3/4-inch	90-100
No. 4	35-100
No. 30	10-30
No. 200	2-9

- b. The material shall also have a minimum sand equivalent of 22 and a minimum resistance (R) value of 78.
- c. Reclaimed or recycled material is not acceptable, unless pre-approved by the District Engineer.

#### 2. IMPORT "TYPE B"

"Type B" Import shall be crushed rock (chips). This material shall contain at least 75% of the particles having one or more fractured faces. Not over 25% shall be pieces that show no such faces resulting from crushing. Rock will be designated by normal size.

When tested in accordance with Section 6 of Caltrans State Standard Specifications, the material shall meet the following requirements:

- a. The material shall be of such size that the percentage composition by weight, as determined by laboratory sieves will conform to the following graduations:

Sieve Size	Percent Passing (by weight)
1-inch	100
3/4-inch	90-100
No. 4	0-15
No. 200	0-4

In any of the subsequent sections of these Specifications where "Type B" Import is specified, "Type A" Import may be used if so authorized by the Engineer.

- b. Reclaimed or recycled material is not acceptable, unless pre-approved by the District Engineer.

3. TRENCH EXCAVATION MATERIAL

Acceptable trench excavation material shall be that material which is free from vegetable matter and refuse and shall contain no concrete, stones or clods larger than 3/4 inch in diameter and shall contain sufficient fines so that all voids will be filled when compacted.

B. PIPE EMBEDMENT INSTALLATION

1. MAIN AND BUILDING SEWERS IN PUBLIC UTILITY AND U.S.D. EASEMENTS, PUBLIC RIGHT OF WAYS AND PAVED PRIVATE PROPERTY

a. RIGID PIPE

That portion of the pipe embedment from the sewer subgrade to outside bottom of the sewer pipe, shall be "Type B" Import graded so that the pipe can be laid to proper line and grade.

Remainder of embedment to a point at least six (6) inches, but no more than twelve (12) inches above the outside top of the pipe barrel shall be "Imported Material" and unless otherwise required by the Engineer, either Import "Type A", or Import "Type B" may be used.

For building sewers, a transition coupling and cleanout shall be provided and installed at the property line. The transition coupling pipe embedment shall be Type B imported from three inches below the outside bottom of the coupling to a point at least six (6) inches, but no more than twelve (12) inches above the outside top of the coupling.

b. FLEXIBLE PIPE

That portion from the sewer subgrade to the spring line of the pipe shall be "Type B" Import. This Import shall be installed in two (2) stages.

STAGE ONE - Shall be from the sewer subgrade to the outside bottom of the sewer pipe, the import shall be graded so that the pipe can be laid to proper line and grade.

STAGE TWO: - After the pipe has been installed to the proper line and grade, the remaining import shall be installed around the pipe from the outside bottom of the pipe to the spring line.

Remainder of embedment to a point at least six (6) inches, but no more than twelve (12) inches above the outside top of the pipe barrel shall be "Imported Material" and unless otherwise required by the Engineer, either Import "Type A", or Import "Type B" may be used.

For building sewers, a transition coupling and cleanout shall be provided and installed at the property line. The transition coupling pipe embedment shall be Type B imported from three inches below the outside bottom of the coupling to a point at least six (6) inches, but no more than twelve (12) inches above the outside top of the coupling.

2. BUILDING SEWERS IN UNPAVED PRIVATE PROPERTY FROM PROPERTY LINE TO BUILDING

a. RIGID PIPE

That portion of the pipe from the sewer subgrade to outside bottom of the sewer pipe, shall be "Type A" Import, "Type B" Import, or a material approved by the District such as sand or pea gravel, graded so that the pipe can be laid to proper line and grade.

A transition coupling and cleanout shall be provided and installed at the property line. The transition coupling pipe embedment shall be Type B imported from three inches below the outside bottom of the coupling to a point at least six (6) inches, but no more than twelve (12) inches above the outside top of the coupling.

b. FLEXIBLE PIPE

That portion from the sewer subgrade to the spring line of the pipe shall be "Type A" Import, "Type B" Import, or a material approved by the District such as sand or pea gravel. This Import shall be installed in two (2) stages.

STAGE ONE - Shall be from the sewer subgrade to the outside bottom of the sewer pipe, the import shall be graded so that the pipe can be laid to proper line and grade.

STAGE TWO - After the pipe has been installed to the proper line and grade, the remaining import shall be installed around the pipe from the outside bottom of the pipe to the spring line.

Remainder of embedment to a point at least six (6) inches, but no more than twelve (12) inches above the outside top of the pipe barrel shall be "Type A" Import, "Type B" Import, or Trench Excavated material.

A transition coupling and cleanout shall be provided and installed at the property line. The transition coupling pipe embedment shall be Type B imported from three inches below the outside bottom of the coupling to a point at least six (6) inches, but no more than twelve (12) inches above the outside top of the coupling.

**9.05 TRENCH BACKFILL MATERIAL**

Trench backfill material is considered to be all material placed in the trench between the pipe embedment and the road bed or ground surface. Reclaimed or recycled backfill material is not allowed, unless pre-approved by the District Engineer.

A. BACKFILL IN PUBLIC RIGHTS OF WAY, UNION SANITARY DISTRICT EASEMENTS, PUBLIC UTILITY EASEMENTS, OR IN EXISTING OR FUTURE PAVED AREAS

The material, placement and compaction shall be done in accordance with the requirements and inspection of the City having jurisdiction there over. Backfill shall be compacted to a minimum 95% Relative Compaction per ASTM D-1557.

B. BACKFILL IN EXISTING AND FUTURE UNPAVED PRIVATE PROPERTY AREAS

The material placed must meet the following requirements:

1. NATIVE BACKFILL

Unless otherwise shown on the Project Plans or Specifications or otherwise required by the Engineer, "Native Backfill" may be used provided that it is free from vegetable matter and refuse and shall contain no concrete, stones or clods larger than four (4) inches in diameter and shall contain sufficient fines so that all voids will be filled when compacted, and shall be so constituted that compaction requirements can be met.

It shall be compacted to the same degree of compaction as the adjacent ground or a minimum of 85% Relative Compaction per ASTM D-1557, whichever is greater.

2. IMPORTED BACKFILL

In areas where the excavated material does not meet the requirements for "Native Backfill", then material meeting the requirements for Import "Type A", or "Trench Excavated Material" under Section 9.04 may be used. It shall be compacted to the same degree of compaction as the adjacent ground or a minimum of 85% Relative Compaction, whichever is greater.

C. COMPACTION

The method the Contractor uses to meet compaction requirements is not specified except for the following limitations.

1. Compaction shall be achieved by mechanical means. Water settling, jetting, ponding, and other water compaction methods are prohibited. Compaction testing shall be done in accordance with the requirements of the city or other agency having jurisdiction.
2. For sloped trenches, or when heavy-impact compaction equipment is used, such as sheep-foot wheels and self-propelled compactors, The Contractor shall protect the pipe from being damaged during mechanical compaction. To provide this protection, the pipe shall be covered with a minimum of 30 inches of Type "A" import at the time of installation. The remainder of the backfill shall be in accordance with the requirements of the City or other Agency having jurisdiction.

## **SECTION 10 - PAVING REPLACEMENT**

### **10.01 DEFINITION**

Paving shall mean that portion of the material in the trench, from the top of the backfill to the surface of the ground. It includes all lime or cement treated base material, rock, aggregate base, and surface pavement material.

### **10.02 PAVING IN PUBLIC RIGHTS-OF-WAY OR PUBLIC UTILITY EASEMENT**

Paving in these areas shall be done in accordance with the requirements of the City or other Agency having jurisdiction there over.

### **10.03 PAVING IN UNION SANITARY DISTRICT EASEMENTS AND IN PRIVATE PROPERTY**

Paving shall be replaced in kind unless otherwise shown on Plans or required by the Engineer.

All existing pavement at trench edges shall be saw cut to sound pavement and the exposed surfaces coated with tack coat applied in accordance with Caltrans Standard Specification 39-4.02 just prior to paving.

The pavement shall in all cases be removed to a minimum of three (3) inches outside of the excavation to permit proper keying of the restored pavement.

## **SECTION 11 - MISCELLANEOUS REQUIREMENTS**

### **11.01 INSPECTION**

#### **A. CONFORMANCE TO THESE SPECIFICATIONS**

All work done under these specifications shall be subject to rigid inspection and shall be performed to the satisfaction of the Engineer.

#### **B. DOCUMENTS OF MATERIALS AND PERFORMANCE TESTS**

The Contractor shall, at any time when requested by the Engineer, submit at his/her expense, properly authenticated documents of materials and performance tests as proof to the District of compliance with these Specifications.

#### **C. ACCESS TO JOB SITE**

The Engineer shall, at all times, have access to the work during construction, and the Contractor shall provide proper and safe facilities for such access and inspection.

### **11.02 ALTERATIONS**

The Engineer reserves the right to increase or decrease the quantity of any item or portion of the work, and to make such alterations or deviations, additions or omissions from the approved Plans as may be determined during the progress of the work to be necessary and advisable for the proper completion thereof.

### **11.03 DEFECTIVE WORK AND/OR MATERIALS**

All work which has been rejected shall be remedied, or removed and replaced by the Contractor in an acceptable manner.

All materials not conforming to these Specifications shall be considered as defective and all such materials, whether in place or not, will be rejected. They shall be removed immediately from the site of the work.

### **11.04 MANHOLE PROTECTION**

Particular care must be taken to protect new and existing manholes from damage and to keep rock, dirt or debris from getting into the sewer.

On new manholes, or manholes that have had frame and cover removed, a steel cover of adequate strength, close fitted and well secured, shall be installed over the manhole opening until the frame and cover are permanently installed.

Ground or surface water must be kept out of existing sewers. Temporary plugs may be required by the Engineer to effect this protection.

When so indicated on the Plans or required by the Engineer, manholes in unpaved areas subject to future development will be protected by installation of a 3/4-inch plywood cover installed directly on the manhole block. This cover will be close fitting (cut in two (2) pieces to facilitate installation down the manhole neck) and installed immediately after final inspection by the Engineer.

### **11.05 USE OF EXISTING BUILDING SEWERS**

Existing building sewers disconnected from buildings that have been demolished, or moved, may be used for new buildings only when found by the Engineer to be in conformity with these Specifications.

Full bore rodding and television inspection of the building sewer will be required as part of the review process.

#### **11.06 BUILDING SEWER MARKING**

Each building sewer shall be marked at the location where it passes under the property curb in the following manner:

A. NEW CURB

Where new curbs are constructed, a two (2) inch high letter "S" shall be impressed with an approved stamp into the fresh concrete on the curb so as to be clearly visible.

B. EXISTING CURBS

Where curbs already exist, a two (2) inch high letter "S" shall be neatly chiseled on the curb so as to be clearly visible.

#### **11.07 MANHOLE MARKING**

If deemed necessary by the Engineer, manholes located in easements will be marked with a District Marker. Marker will be supplied and installed by District Forces (at others expense.)

#### **11.08 REPAIR OF DAMAGED SEWERS AND OTHER UTILITIES**

A. NEW MAIN AND/OR BUILDING SEWERS

Main and/or building sewers not yet accepted by the District that are damaged during construction will be repaired by the Sewer Contractor in accordance with these Specifications and Standard Details. The work shall be done in the presence of and to the satisfaction of the Engineer. The portion of the pipe bedding from sewer subgrade to outside bottom of sewer pipe shall be satisfactorily installed before the pipe is laid.

B. EXISTING MAIN SEWER OR APPURTENANCES

Repairs or relocations of existing main sewers or appurtenances required by reason of damage, or conflict, will be performed by the District or by Contractors engaged by the District through a Contract or Encroachment Agreement.

Before any such work is started by District Forces, a standard District "Work Order" must be signed by the party or his/her agent, responsible for payment, authorizing the work by District Forces and agreeing to pay charges incurred. Upon completion of the work, the District will bill the party responsible for payment thereof.

C. EXISTING BUILDING SEWERS

Except as noted below or otherwise agreed to by the District, all work involving repair or relocation of existing building sewers shall be done by private Contractors. Permit requirements per Ordinance 34 Series must be met in order for a construction permit to be issued prior to the start of work. All work must be done per District Specifications and subject to District Inspection.

If such work is to be done by District Forces, a standard District "Work Order" must be signed by the party or his/her agent, responsible for payment, authorizing the work by District Forces and agreeing to pay charges incurred. Upon completion of the work, the District will bill the party responsible for payment thereof.

In event repair work is deemed necessary by the District, in its sole discretion, to alleviate a threat to the District's sewer system, and no "Work Order" is signed by the party or agent responsible for payment, or emergency repairs are undertaken by District, no approval and acceptance of construction will be issued by District until the reasonable cost of repairs are paid or arrangements appropriate to District are made for such reimbursement.

**D. REPAIR OF OTHER AGENCY FACILITIES**

Repair of other Agency utilities damaged during construction shall be made in accordance with the requirements of the Agency concerned.

**11.09 CONNECTION OR ADJUSTMENTS TO EXISTING MAIN SEWERS OR APPURTENANCES**

Except for work on sewers not yet accepted by the District and work specifically authorized by an Encroachment Agreement, all work on existing main sewers shall be done by District Forces, including:

- A. Splice into Main Sewer (See Section 23.08).
- B. Stub into Existing Public Manhole (See Section 22.20)
- C. Rechanneling Existing Public Manhole.
- D. Installation of Plywood Cover (False Bottom) Over Existing Public Manhole Base Block.

The charge for said work by District Forces is based on the District's current rate schedule. A sewer "work Request Form" signed by the Contractor shall be submitted and the charges as estimated by the District paid prior to issuance of a sewer construction permit. Refunds or additional billing will be made after completion of the work and will be based upon actual costs incurred.

The exact time that the work is to be done by District Forces must be arranged by the Contractor with the District Office (an inspector or an inspection coordinator) at least 48 hours (2 business days) in advance preceding the work day. Messages or voicemails are not acceptable.

Work to be done by District Forces that, due to its' unusual character, is not listed on the rate schedule will be billed after the work is accomplished on the basis of actual costs. Before any such work is started by District Forces, a standard District "Work Order" must be signed by the party responsible for payment, authorizing the work by District Forces.

All work done by District Forces must be paid, or appropriate arrangements satisfactory to District made, prior to District accepting construction and reporting acceptance and approval to the Governing Municipality.

**11.10 ABANDONMENTS**

Abandonment of existing District facilities shall be performed by Contractors engaged by the District through a Contract or Encroachment Agreement.

**A. MAIN SEWERS**

Main sewer pipe that is required to be abandoned shall be abandoned by one of the following methods:

- 1. Filling with slurry or cellular concrete. Slurry shall be a flowable mix containing a minimum of 1 sack cement, maximum of 1-1/2 sack cement per cubic yard.
- 2. Removing the existing pipe.

**B. BUILDING SEWER**

When an existing building sewer will no longer be in service, such as when a building is demolished, the building sewer shall be located and capped with an approved coupling and a

watertight cap as close to the main as possible but in no case further from the main than property line. This work requires a USD permit and shall be done in the presence of and to the satisfaction of the Engineer.

C. MANHOLE

Remove the castings, manhole body, and base block to a minimum of five (5) feet below final street grade or existing ground elevation, whichever is lower. The castings shall be delivered to Union Sanitary District, 5072 Benson Road, Union City, California 94587.

The manhole channel shall be sealed to a watertight condition with concrete. The manhole shall then be filled and compacted with self-compacting material as approved by the Engineer and City jurisdiction.

D. SEPTIC TANK

Every cesspool, septic tank, and seepage pit which has been abandoned or has been otherwise discontinued from further use, or to which no waste or soil pipe from a plumbing fixture is connected, shall have the sewage removed and be completely filled with earth, sand, gravel, concrete or other approved material.

The top cover or arch over the cesspool, septic tank or seepage pit shall be removed before filling and the filling shall not extend above the top of the vertical portions of the sidewalls or above the level of any outlet pipe until it has been inspected. After such inspection, the cesspool, septic tank or seepage pit shall be filled to the level of the top of the ground.

## SECTION 12 - TESTING

### 12.01 TESTING MAIN SEWERS

The Contractor shall, in the presence and under the direction of the Engineer, test the water tightness of all main sewer lines. The test will be made between each adjacent structure and between the most upstream structure and dead-end. The test will be made only after all other utilities and the curb and gutter have been installed and before any street base rock has been oiled. All gravity sewer pipes shall be tested for exfiltration and/or infiltration and deflection, as specified.

#### A. LEAKAGE TESTS

The Contractor may test using either the Water Exfiltration Test or the Air Test as described below. Due to the safety concerns when air testing large-diameter sewers, it is recommended (not required) that sewer mains larger than 15 inches be tested using Water Exfiltration Test.

#### B. WHEN TESTED

1. In areas to be left unpaved, the air test shall be made after the backfill is satisfactorily compacted.
2. In areas to be paved, per Improvement Plans, when the outside top of the sewer is less than three (3) feet below the top of backfill, the air test shall be made after the "base rock" portion of the paving is satisfactorily compacted and final paving has been installed.

The test as noted in 1 or 2 above is considered the "official test". However, preliminary testing is strongly recommended and may be conducted by the Contractor at any time prior to the "official test".

#### C. EQUIPMENT

The Contractor shall furnish all necessary equipment, including but not limited to: an air compressor, air hoses, test water, blank plug, test gauge, test plug, standpipe, stopwatch, and personnel for conducting the test.

#### D. AIR TEST PROCEDURE

1. Air shall be slowly fed into the plugged pipe until the internal air pressure reaches 4.0 pounds per square inch greater than the average back pressure of any groundwater that may submerge the pipe.
2. At least two minutes shall be allowed for temperature stabilization before proceeding further.
3. The rate of air loss shall then be determined by measuring the time interval required for the internal pressure to decrease from 3.5 to 2.5 pounds per square inch greater than the average back pressure of any groundwater that may submerge the pipe.
4. Air testing sewer mains, particularly larger diameter mains, can be very dangerous due to the very large forces developed. The Contractor shall be fully responsible and take all precautions necessary to ensure the safety of their workers. All plugs shall be adequately braced to support the full load developed. No workers shall be allowed in the excavation or manhole while the line is under pressure. The Contractor shall make provisions for reading the pressure at the ground surface and for safely releasing the air pressure without entering the manhole or excavation.

E. AIR TEST REQUIREMENTS

1. The pipeline shall be considered acceptable, when the total time interval for the pressure drop from 3.5 to 2.5 pounds per square inch meets or exceeds the calculated test time based on the following table. This table is based on a rate of 0.0015 cubic feet per minute per square foot of internal pipe surface when tested per ASTM F-1417. At the Inspector's option, the test may be conducted for a pressure drop of 3.5 to 3.0 pounds per square inch and 1/2 of the time shown.

Minimum Test Time for 1 PSI Pressure Drop

Pipe Diameter, inches	Test Time, seconds/ft x feet	Minimum Test Time, minutes:seconds
4	0.38	3:46
6	0.85	5:40
8	1.52	7:34
10	2.37	9:26
12	3.42	11:20
15	5.34	14:10
18	7.69	17:00
21	10.47	19:50
24	13.67	22:40
27	17.31	25:30
30	21.37	28:20
33	25.85	31:10
36	30.77	34:00

2. If the pipe installation fails to meet these air test requirements, the Contractor shall determine the source or sources of leakage, and he shall repair or replace all defective materials or workmanship in accordance with these Specifications and in the presence of the Engineer. The completed pipe installation shall meet the requirements of this test.

F. WATER EXFILTRATION TEST REQUIREMENTS

1. After pipe installation and cleaning, the section of pipeline to be tested shall be prepared for testing by plugging the upper side of the downstream manhole and all openings in the upstream manhole except the downstream opening.
  - a. Where manholes are widely spaced, sections may be tested by blocking upstream end of pipe.
  - b. Where grades are slight, two or more sections between manholes may be tested at once.
2. A section of pipe prepared as above shall be tested by filling with water to an elevation 5 feet above the top pipe at the upstream end of the test section, or 5 feet above the existing groundwater elevation, whichever is greater.
  - a. Where required due to high groundwater levels, Contractor shall provide standpipe to allow for the required testing head.
  - b. The testing head may be above the ground surface in some cases.
  - c. The water shall be introduced into the test section at least 24 hours in advance of the test period to allow the pipe and joint material to become saturated.

- d. The loss in water may be determined by measuring additions of water required to maintain the specified head or by measuring the rate of fall of water level, but the level shall not be allowed to fall more than 1 foot below the initial elevation.
3. Should the initial test show excess leakage in a section of pipe, it is permissible to draw the water off and test the manholes that contained water.
  - a. This test shall be made by plugging all the openings in the manholes and filling with water to the same elevation as existed during the test.
  - b. The leakage from the manhole may be deducted from the total leakage of the test section in calculating the pipe leakage.
4. The water level shall be maintained for not less than 2 hours. Leakage shall not exceed 50 gallons per inch of diameter per mile of pipe for 24 hours. All expense of testing shall be borne by the Contractor.

G. LEAKAGE TEST ACCEPTANCE

1. Where the actual leakage exceeds the allowable, the Contractor shall determine the cause and remedy it before the pipeline is accepted.
2. For the purpose of this subarticle, a section of pipeline is defined as the length of pipe between successive manholes or special structures.
3. The Contractor shall correct any visible leaks in the pipeline, manholes, and special structures.
4. The Contractor shall dispose of all water so as not to cause a public nuisance and as approved by the Engineer.

H. MANDREL OR DEFLECTOMETER TEST

Mandrel test for flexible pipes shall also meet the requirements specified in Section 5.02.B.6.

1. FLEXIBLE PIPE LESS THAN 18" IN DIAMETER

Upon completion of the air test and before final paving is installed, the Contractor shall pull a mandrel or deflector, approved by the Engineer, through the installed flexible pipe. This test shall be performed without mechanical pulling devices. Mandrel shall not be tampered with.

2. FLEXIBLE PIPE 18" OR GREATER IN DIAMETER

At the end of each working day, or as directed by the Engineer, the Contractor shall pull an approved Mandrel or Deflector through the portion of the pipe specified by the Engineer. This section of pipe will have pipe embedment fully in place and compacted per these specifications plus at least four feet of backfill in place with a minimum of 85% relative compaction per ASTM D-1557. This shall be a preliminary test only to insure the integrity of the pipe at the time of installation. The Mandrel test for acceptance shall be performed after the air test as described in Section 12.01.D, but before final paving is installed.

## 12.02 TESTING BUILDING SEWERS

The Contractor shall, in the presence and under the direction of the Engineer, test the air-tightness of all building sewer lines. The test will be made between the cleanout to grade at the property line, "test-ye" or manhole and the most upstream dead-end at a point not more than five (5) feet outside the building line (See A-2 below for exception). Note that actual connection of the building sewer to the building plumbing will not be permitted until the main sewer to which it connects has been accepted for use by the District and the herein described testing has been satisfactorily completed. Entry into "live" District manholes requires an Encroachment Agreement from the District.

A. WHEN TESTED

1. In all areas, the official air test shall be made after the backfill is satisfactorily compacted, base rock installed and all other underground utilities, private and public, installed.

Preliminary air testing is strongly recommended and may be conducted by the Contractor at any time prior to the "official test".

2. Exception to 1 above is when a water test is authorized by indication on the Plans or as directed by the Engineer in the field. In these cases, the following procedure will be used: After the building sewer has been laid, and the pipe bedding installed to the satisfaction of the Engineer, the sewer shall be filled with water in the presence of the Engineer. Any and all leaks shall be found and repaired by the Contractor in accordance with these Specifications, after which the sewer trench shall be immediately backfilled.

B. EQUIPMENT

Same as for main sewers

C. PROCEDURE

Same as for main sewers

D. REQUIREMENTS

Same as for main sewers

E. MANDREL OR DEFLECTOMETER

Upon completion of the air test, the Contractor shall pull a mandrel or deflector approved by the Engineer between manholes on sewer lines six (6) inches in diameter and larger. This test shall be performed without mechanical pulling devices,

### **12.03 TESTING PRESSURE SEWERS**

This section is intended to be used for small diameter private pressure sewers 4 inches in diameter or less with normal operating pressures of 10 psi or less. The same procedure as described in "Testing Main Sewers" shall be used except that no air loss will be permitted in time period computed for a gravity sewer of same size and length.

The pressure used will be determined by the Engineer and will be equal to 1 1/2 times the maximum pressure the sewer will be expected to withstand in actual use.

### **12.04 MANHOLE VACUUM TESTING**

All manholes shall be vacuum tested. Vacuum test procedures and requirements shall be as follows:

1. After completion of the manhole barrels but prior to backfilling, sealing of PVC liner seams and installing grade rings, all openings in the manholes are sealed with plugs and a rubber ring "donut" type plug inserted inside the opening of the cone.
2. A small vacuum pump is attached to a hose connected to the plug and 4 psi (8 in. Hg) of vacuum applied.
3. The vacuum is permitted to stabilize at 3.5 psi (7 in. Hg) for 1 minute; then the test is begun.
4. The manhole must maintain vacuum such that no greater than 0.5 psi (1 in. Hg) of vacuum is lost during the specified test period. The specified test period is as follows:

Manhole depth, feet	Test period, minutes
0-5	4.5
5-10	5.5
10-15	6.0
Greater than 15	6.5

5. Manholes that fail the test shall be corrected as required and retested.
6. A vacuum regulator shall be provided on the vacuum pump such that no greater than 10 psi (20 in. Hg) can be applied to the manhole during the test. All manholes that do not meet the leakage test, or are unsatisfactory from visual inspection, shall be repaired to the satisfaction of the Engineer.

## **SECTION 13 - TELEVISION INSPECTION**

### **13.01 INSPECTION OF MAIN SEWERS**

Television inspection of sewer mains is required to be inspected with District television equipment operated by District Forces. The cost of initial television inspection is considered to be included in the permit fees. Any subsequent reinspection shall be at the cost of the permit holder.

### **13.02 WHEN TESTED**

After final air testing and mandrel testing in conformance with Section 12.

Any portion of the sewer found not to be in conformance with these Specifications must be corrected by the Contractor. Sewers so corrected shall be re-tested and inspected in accordance with the requirements of these Specifications.

## SECTION 14 - CLEANING

### 14.01 CLEANING

After the sewers have satisfactorily passed the tests required in Section 12, structures, backfilling and final paving are completed, the Contractor, in the presence of the Engineer, shall clean each section of the sewer in the following manner:

A. SEWERS EIGHT (8) INCHES THROUGH TWELVE (12) INCHES IN DIAMETER

High pressure hydraulic cleaning or jetting shall be used to remove dirt, grease, rocks, sand, and other materials or obstructions from the sewer line and manholes. District may clean the sewer in these sizes at Contractor's request and at his/her expense.

Sludge, dirt, sand, rocks, grease, and other solid or semi-solid material resulting from the cleaning operation shall be removed at the downstream manhole of the section being cleaned. Passing materials to downstream sewer reaches is not permitted.

The "Wayne Ball" or "ball and flush" method may be allowed with prior approval from the District Engineer.

B. SEWERS FIFTEEN (15) INCHES IN DIAMETER AND LARGER

The Engineer shall visually inspect the sewer and if in his/her opinion cleaning is necessary, the Contractor shall clean the sewer to the satisfaction of the Engineer. District may clean the sewer in these sizes at Contractor's request and at his/her expense. Clean sewer main as described in Paragraph A.

C. FOUR (4) INCH AND SIX (6) INCH BUILDING SEWERS

When in the opinion of the Engineer, the sewer is not clean it shall be flushed or otherwise cleaned so as to properly serve its intended function. Clean building sewer as described in Paragraph A.

### 14.02 DISCHARGE OF CLEANING WATER

Water used for cleaning the lines shall be screened to remove sediments prior to being discharged into the existing sewer system.

## SECTION 15 - SITE CLEANUP AND RESTORATION

### 15.01 SITE CLEANUP AND RESTORATION

Surplus pipeline material, tools, remaining material from site preparation, etc., shall be removed by the Contractor, and all dirt, broken pavement, rubbish and excess earth from excavation shall be hauled to an approved disposal site provided by the Contractor and the construction site left clean, to the satisfaction of the Engineer.

Replaceable items such as fences, signs, landscaping, etc., requiring removal during construction operations must be replaced in kind by the Contractor at his/her expense or disposed of as noted on the Plans. Any driveway areas or other improvements requiring removal and/or excavation will be restored in accordance with the requirements of the city having local jurisdiction, to a condition equivalent to their original condition, and to the satisfaction of the Engineer.

#### A. DISTRICT CONTRACT JOBS

1. On District contract jobs, the value of and the responsibility for damage to objects that cannot be replaced in kind must be negotiated between the Contractor and the District before the removal of those objects.

#### B. DRIVEWAY REPAIRS

1. City of Fremont – No. 3 Rebar, 12 inches long shall be placed at 2 foot on center, a minimum of 3 inches into existing concrete. Epoxy grout if drilled.
2. City of Newark – No. 4 rebar, 24 inches long shall be placed at 4 foot on center.
3. City of Union City
  - a. Residential Driveways – No. 4 rebar, 12 inches long at 4 foot on center.
  - b. Commercial and Industrial Driveways – No. 3 rebar, 12 inches long at 4 foot on center.

## **SECTION 16 - REQUIREMENTS FOR ISSUANCE OF SEWER CONSTRUCTION PERMITS**

### **16.01 PROPERTY TO BE SERVED BY USD**

All property to be served must be within the District boundaries.

### **16.02 INSURANCE REQUIREMENTS**

All main sewer and building sewer work in the District shall be performed by Contractor with current Worker's Compensation and Public Liability insurance.

### **16.03 LICENSE REQUIREMENTS**

All Main Sewer and Building Sewer work in the District shall be performed by Contractors licensed by the State of California to perform such work except as noted in 16.03 B below. The Contractor will be required to sign necessary District forms prior to being issued a sewer construction permit.

### **16.04 BOND/DEPOSIT REQUIREMENTS**

#### **A. MAIN SEWER WORK**

For construction, repairing or altering a "Main Sewer", a Surety Bond in a sum equal to 100% of the estimated cost of the work, guaranteeing the faithful performance of the work in accordance with the ordinances and rules and regulations of the District, including making good any defects through faulty, improper or inferior workmanship or materials arising or discovered within one (1) year after the completion of said work and acceptance thereof by the District. However, if the City or municipality within which such work is to be performed requires the filing of a Faithful Performance Bond guaranteeing making good defects through faulty, improper or inferior workmanship or materials arising or discovered within one (1) year after completion and acceptance of said work, no such bond will be required to be filed with the District.

#### **B. BUILDING SEWER WORK BY CONTRACTOR OR OWNER**

An individual or a contractor may apply for a permit for the installation or repair of a portion of a building sewer which is on private property by posting a cash deposit with the District, in accordance with the provisions of District Ordinance No. 34 or subsequent amendments thereto. The cash deposit will be refunded within 60 days of approval of work by the District.

#### **C. PERMIT HOLDER DEPOSIT**

A cash deposit will be required from the person(s) or Contractor(s) performing sewer work for possible damage to District and private facilities and additional expense for correcting poor or improper workmanship and materials. Within 60 days after final approval of the sewer per Section 20 herein, this deposit will be refunded.

#### **D. DEVELOPER DEPOSIT**

A cash deposit per "Cleanout to Grade" or "Control Manhole" may be required from the Developer prior to issuance of a sewer construction permit. District construction unit prices are used for determination of deposit. Within 60 days after final approval of the sewer per Section 20 herein, this deposit will be refunded.

## 16.05 FEES AND CHARGES

All fees and charges levied by the District are payable before issuance of a sewer construction permit unless otherwise noted herein. Except for any special fees or charges, all types are noted below:

### A. ANNEXATION FEE

Process Application Fees and Annexation Fees are payable by all Developers or Property Owners for land not within the District boundaries per current District Ordinance No. 20 and 25 series.

The Process Application Fee and the First Installment of the Annexation Fee is due and payable upon request for annexation. The request must be signed by the Owner of the property and be accompanied by a copy of the Title Report and a location drawing of the property to be annexed.

The applicant is required to provide, at his/her expense, all necessary maps and descriptions required for approval by the Local Agency Formation Commission along with digital copies of all maps and descriptions in accordance with Section 16.09, Minimum Requirements for Digital Submittal. These documents are submitted to the District for transmittal to Alameda County for review and ultimately to the Commission for their review and approval.

A building sewer construction permit may not be issued, or construction work may not be accepted, until the property is annexed to the District. The annexation process may take up to 6 months or longer.

### B. DOCUMENT REVIEW FEE

Per current District Ordinance No. 34 Series. Payable for the review of documents such as an easement or an encroachment agreement.

### C. STUDY FEE

Per current District Ordinance No. 34 Series. Payable for the costs of a study of the effects of the proposed development.

### D. PLAN REVIEW FEE

Plan review fees are payable by all Developers per current District Ordinance No. 34 Series. District construction unit prices are used in the computation.

### E. INSPECTION FEE

Inspection fees are payable by all Developers and/or permit holders per current District Ordinance No. 34 Series. District construction unit prices are used in the computation.

### F. CAPACITY CHARGES

Capacity charges are payable by all Developers and/or Owners per current District Ordinance No. 35 Series.

### G. FRONTAGE FEE

Frontage fees are payable by all Developers proposing to connect directly to District financed main sewers per current District Ordinance No. 30 Series.

H. MATERIALS AND SERVICE FEE

Those fees, per current District Ordinance No. 34 Series, that are payable to the District for materials furnished by the District and work done by District Forces in accordance with the construction requirements as shown on approved Plans and in the Standard Specifications. (See Section 18.02 herein).

I. REIMBURSEMENT FEE

Reimbursement fees are payable by Developers per current District Ordinance No. 9 Series, connecting to the frontage of main sewers installed by others, or tributary to the area, which are subject to reimbursement. Conditions and requirements of specific Reimbursement Agreements may apply.

J. WASTEWATER DISCHARGE PERMIT FEE

Per current District Wastewater Discharge Ordinance No. 36 Series. Payable by users who are required to obtain a Wastewater Discharge Permit for discharge on non-domestic type wastes.

K. FAILURE-TO-OBTAIN-A-PERMIT FEE

Per current District Ordinance No. 34 Series. Payable by the person(s) or Contractor(s) performing sewer work without a valid USD permit.

**16.06 SUBMISSION OF DATA FOR MAIN SEWERS**

A. PRELIMINARY PLANS

Three (3) sets of Preliminary Improvement Plans, Development Plans and Maps (tract map, parcel map, etc.), prepared by a Registered Civil Engineer in the State of California, must be submitted to the District. Standard size sheet of 22" x 34", 24" x 36", or 30" x 42" with a scale of 1"=40' or 1"=50' and profile to 1"=4' or 1"=2' must be used unless otherwise authorized by the Engineer. These will be reviewed by the Engineer and one (1) corrected copy returned to the applicant.

A digital copy of all preliminary plans shall be submitted in one (1) drawing file in accordance with Section 16.09, Minimum Requirements for Digital Submittal.

B. FINAL PLANS

After corrections are made, the original drawing can be signed by the Engineer. After all approving Agencies have signed the Plans, one (1) Plan of the Development drawn to a scale of 1"=100 and two (2) sets of Final Improvement Plans, Development Plans, Final Maps and Certificate Sheet suitable for microfilming must be furnished to the District. Unless otherwise authorized by the Engineer, these signed plans must be submitted to the District prior to issuance of a main sewer construction permit.

A digital copy of all final plans shall be submitted in one (1) drawing file in accordance with Section 16.09, Minimum Requirements for Digital Submittal.

C. ESTIMATE OF THE QUANTITY OF MATERIAL

One (1) copy of the final estimate of the quantities of the materials for the sanitary sewer system shall be submitted to the District prior to the issuance of a main sewer construction permit.

D. EASEMENT REQUIREMENTS

A main sewer authorized by the Engineer to be constructed on private property may require that a Sanitary Sewer Easement be granted to the District. It must be prepared by the Grantor on Standard District Forms properly signed and notarized. The easement must be defined on a Legal Description and Plat prepared by a licensed surveyor, separate from the tract or parcel map. A Title Report shall also be submitted with the easement documentation. A digital copy of the Legal Description and Plat shall be submitted in accordance with Section 16.09, Minimum Requirements for Digital Submittal. After approval by the District, it shall be recorded by the Design Engineer with the Alameda County Recorder. Once it is recorded, a copy of the recorded document will be furnished to the District. This must be accomplished prior to acceptance by the District of the sewer that lies within the easement.

E. QUITCLAIM REQUIREMENTS

When a Sanitary Sewer Easement is to be quitclaimed, a Legal Description and Plat shall be prepared by a licensed surveyor and submitted to the District with a Title Report. After the documents are reviewed and accepted by the District, the District will prepare a Quitclaim Deed and submit it to the Alameda County Recorder. Once it is recorded, a copy of the recorded document will be furnished to the District.

F. FIELD CHANGES

Two (2) sets of Plans and one (1) digital copy in accordance with Section 16.09, Minimum Requirements for Digital Submittal showing field changes proposed must be submitted to the Engineer for approval prior to the work being started.

## **16.07 SUBMISSION OF DATA FOR BUILDING SEWERS**

Submittal requirements for District Plan Check for Building Sewers prior to approval of plans are shown in (A), (B), (C) and (D) below and in Section 16.09 – Minimum Requirements for Digital Submittal. (Does not apply to single family residences unless required by the Engineer).

After plan check is completed by the District, one (1) set of the checked submittals will be returned to the applicant for resubmittal of the required number of revised sets and digital files.

Plan submittals must have information listed below shown on original reproducible tracings to scale with prints submitted there from. Plan must be drawn to adequate scale, with north arrow, on a large enough sheet (11" x 17" min., 30" x 42" max.) and be suitable for microfilming. The minimum scale will be 1"=50' unless otherwise authorized by the Engineer. Digital files shall be in one (1) drawing file and shall be submitted in accordance with Section 16.09 – Minimum Requirements for Digital Submittal.

Name, address, telephone number and title of company or person preparing the plan must be clearly shown on the submitted plans.

Any office or field change from final approved construction plans must be re-approved by the District and may require resubmittal of revised plans and digital CADD files.

A. SITE PLANS

Four (4) copies of Site Plan plus one (1) copy of the digital CADD file. The Site Plan must show (unless otherwise permitted by the Engineer):

1. Public street and property dimensions.
2. All existing and proposed buildings, labeled with general usage and plotted accurately on site.

3. Areas to be paved and those left unpaved clearly marked.
4. Ground floor and pad elevations of all buildings.
5. Finish ground elevations at key points and curb elevations of public street.
6. Existing ground elevations where cover over proposed sewer is to be less than two (2) feet at time of construction.
7. Existing USD manhole number and rim elevation of nearest existing public sanitary sewer manhole in the street drawn to scale or with its distance shown to the site's nearest downstream property corner and the new sewer connection.
8. Existing and proposed utilities plotted correctly and labeled.
9. The proposed sanitary sewer must be shown with size, material, minimum slope, invert elevation to nearest 0.1 foot at connection to building plumbing (building drain).
10. Show invert elevations at all grade breaks.
11. Show invert elevation of all storm sewers at sanitary sewer crossings.
12. Structures proposed such as cleanouts, manholes (with rim and invert elevations), grease clarifiers, etc., labeled and shown on the plan.
13. Plumbing fixture unit count shown for each building.

**B. FLOOR PLANS**

Two (2) copies of Floor Plan. (Commercial and Industrial Only). Floor Plan must show area layout and proposed usage of various areas of building.

**C. PLUMBING AND / OR MECHANICAL PLANS**

Two (2) copies of Plumbing and/or Mechanical Plan. (Commercial and Industrial Only). Plumbing and/or Mechanical Plan must show interior plumbing (building drain) and the fixtures to be served, all properly labeled as to function.

**D. CUT SHEETS**

Receipt by District of three (3) sets of cut sheets on Standard District Forms prepared by a Registered Civil Engineer or Land Surveyor. Cut Sheets are required per Section 19.02 herein or when so stated by District on approved plans.

**E. WASTE DISCHARGE REPORT/PERMIT**

One (1) copy of either a Waste Discharge Report or Permit Form as required by the District Pretreatment Ordinance and Technically Based Local Limits (Ordinance No. 36 Series). (Commercial and Industrial Only). After review of these submittals, it may be necessary for the owner or his/her representatives to meet with the Engineer prior to approval of plans.

**F. EASEMENT REQUIREMENTS**

When a private easement (across adjoining property) is required for installation of a building sewer, a copy of the recorded document must be submitted to the District prior to issuance of a sewer construction permit.

**G. CITY BUILDING PERMIT**

Prior to issuance of the sewer connection permit, it shall be necessary for the applicant to provide evidence of the necessary Building Permits from the appropriate jurisdiction.

## **16.08 ENCROACHMENT AGREEMENT**

Whenever it will be necessary for workers, material, equipment or excavated trench material to be on real property not included in any deed, grant, easement or the like, an encroachment agreement, license or other permission in writing must be submitted to the District prior to issuance of a sewer construction permit.

## **16.09 MINIMUM REQUIREMENTS FOR DIGITAL SUBMITTAL**

The digital file submitted shall be one (1) drawing file in .dwg format containing all layers, illustrating all improvements within the project area, including all existing and proposed offsite improvements, tract boundary, street centerlines, outfall sewers, etc. in model space. No drawing entities shall be placed on layer "0". Descriptive information (i.e. text) shall not be included in the same layer as the feature, and should be added as a separate layer. Submitted digital files shall be in accordance with the Guidelines for Digital Submittal, or as otherwise approved by USD.

All maps, sanitary sewer easements (except those for private sewer or laterals), annexation maps and associated plans and drawings shall be submitted in digital format. Digital submittals shall be submitted with each plan check submittal and shall conform to the following:

### **A. FILE FORMAT**

1. AutoCAD (DWG)

### **B. MEDIA DELIVERY OPTIONS**

1. Compact Disk (CD)
2. Flash Drive
3. FTP site

### **C. MISCELLANEOUS**

1. Each submittal shall be labeled with the project name and/or map number (tract, parcel map, annexation number, etc.), project number, company name, address and contact phone number.
2. All drawing shall use the California State Plane Coordinate System – Zone III in units of feet. The horizontal datum shall be the North American Datum of 1983 (NAD83) and units of feet and the vertical datum shall be the North Geodetic Vertical Datum of 1929 (NGVD29) in units of feet, or other ties as authorized by USD.
3. Each drawing shall contain at least two survey control points.
4. All drawings shall have a North orientation of vertical (i.e. toward the top of the page).
5. All digital line work must be geometrically correct, without inappropriate breaks. Polygon features drawn as polylines must properly close without gaps.
6. All externally referenced files used shall be "bound" into the drawing file and submitted as one drawing package.
7. Compressed files are acceptable only when using the eTransmit function in the AutoCAD program.

### **D. LAYERING**

1. Layers shall contain, but not be limited to, the layers in the table named AutoCAD Layering Conventions. This table is for reference only and is not to be considered as a complete list of available layer names.
2. Layer colors, line types and line weights shall be left to the discretion of the engineer.

### AutoCAD Layering Conventions For Submission of Developer Projects

Digital files submitted shall be based on accurate coordinate geometry calculations and the NAD83 State Plane Coordinate System (Zone III) and NGVD29. USD requires that the digital file being submitted combines all elements of individual improvement plan sheets for the proposed subdivision along with the elements of the Parcel or Tract Map into a single CAD formatted drawing. This drawing shall contain (but not be limited to) the following layers.

Layer Group	Layer Name	Layer Type	Description
Default	0		AutoCAD default layer
Misc.	BORDER		Contains features such as north arrow, vicinity map, location map, title of plans, signature blocks, standard title block, scale bar, legend, page borders, etc.
Misc.	DETAILS		Standard construction details of jurisdictional agencies.
Misc.	TXT	Text	Layer containing general and construction notes, sheet index, special condition notes, bench mark description, etc.
Landbase	BLDG	Polygon	Building foot prints
Landbase	BLDG - SETBAK	Line	Building setback line
Landbase	BM	Point	Benchmark
Landbase	BNDRY	Polygon	Closed polygon of Tract or Parcel Map boundary
Landbase	CL	Line	Centerline - public streets
Landbase	CLPVT	Line	Centerline - private streets
Landbase	CONTOURS	Polyline	Finished contour lines (grading plans) with elevation attribute (Z value)
Landbase	ELEV	Point	Finished spot elevations (grading plans) with elevation attribute (Z value)
Landbase	EP	Line	Edge of pavement (I.e. lip of gutter or edge of pavement in the case of no curb and gutter construction)
Landbase	ESMT*	Line or Polygon	Easements not related to utilities, such as emergency vehicle access, pedestrian walkways, landscape maintenance, etc.
Landbase	FOC	Line	Face of curb
Landbase	LOT	Text	Text indicating lot number
Landbase	LP	Line	Lip of gutter
Landbase	MON	Point	Survey monuments
Landbase	MONL	Line	Monument line
Landbase	PARCEL	Polygon	Closed polygons of each parcel or lot
Landbase	ROW	Line	Public rights-of-way
Landbase	ROWPVT	Line	Private rights-of-way
Landbase	SL	Point	Street light poles
Landbase	SLCNDT	Line	Street lighting electrical conduit including pull boxes, service meters, etc.
Landbase	STRIPE	Line	Street striping and pavement markings

Layer Group	Layer Name	Layer Type	Description
Landbase	STSIGN	Point	Street/traffic signs
Landbase	SW	Line/Polygon	Sidewalks including handicapped ramps, driveways, back of walk and meandering walks
Landbase	TOPO		All existing topological features (maybe submitted as a separate drawing file)
Landbase	TS	Point	Traffic signal fixtures/poles
Landbase	TSCNDT	Line	Traffic signal conduit including loop detectors, pull boxes, control cabinets etc.
Landscaping	LSIRR	Line	Public landscape irrigation (i.e. landscape maintenance districts) including service line from public main, water meters, valves, backflow and pressure regulating devices, control valves, etc.
Landscaping	LSTREES	Block insert	Street tree plantings that will be maintained by jurisdictional agency
Landscaping	LSPLANT	Block insert	Bushes, shrubs, groundcover and all other organic landscape material
Landscaping	LID	Polygon	Landscape Improvement Dist.
Landscaping	LLD	Polygon	Landscape/Lighting Dist.
Landscaping	LSMOW	Line or Polygon	Concrete mow strips
Misc.	* TXT	Text	Layers containing text associated with various other layers where "?" denotes name of layer (e.g. sanitary sewer text would be named SSTEXT).
Misc.	*TIC	Point	Tics at all beginning and ending curves for all utilities, easement boundaries, street centerlines (public and private), tract or parcel boundary, lot boundaries, etc. where "?" denotes name of feature or utility (e.g. CLTIC, SEE NOTE 1).
Sewer	SS	Line	Sanitary Sewer mains
Sewer	SSLAT	Line	Sanitary Sewer laterals
Sewer	SSMH	Point	Sanitary Sewer manholes
Sewer	SSSMT	Polygon	Sanitary Sewer easements
Stormdrain	SDCI	Block insert	Storm drain curb inlets
Stormdrain	SDESMT	Polygon	Storm drain easements
Stormdrain	SDCMP	Line	Storm drain corrugated metal pipe
Stormdrain	SDDI	Block insert	Storm drain drainage inlet
Stormdrain	SDMH	Block insert	Storm drain manhole
Stormdrain	SD	Line	Storm drain
Stormdrain	SDVLT	Block insert	Storm drain vault
Stormdrain	SDFILT	Point	Storm drain filtering device
Stormdrain	SDMH	Point	Storm drain manholes and/or junction boxes
Utility	ELEC	Line	Electric utility line including power poles, underground conduit, pull boxes, vaults, manholes, ducts banks, etc.

Layer Group	Layer Name	Layer Type	Description
Utility	ESMT*	Polygon	Easements where "?" denotes jurisdiction or purpose (PG&E, PUE, EVAE, etc.). Each utility shall have a separate layer (i.e. ESMTPG&E, ESMTPUE, etc.)
Utility	GAS	Line	Gas utility lines including service lines, valves, etc.
Utility	TELECOM	Line	All telecommunications utilities including (but not limited to) MCI, PacBell, Sprint, GTE, etc. showing location of underground lines, manholes, pullboxes, junction boxes, utility poles, duct banks, etc. Line type shall include name of utility.
Utility	CATV	Line	Television, cable TV showing location of underground lines, manholes, pullboxes, duct banks, utility poles, etc.
Utility	UTILITY	Line	Conduit layout of all utilities not specifically designated in this schema. Each utility shall have a separate layer named for the utility and shall show all appurtenant facilities
Water	W	Line	Water mains
Water	WARV	Point	Air release valve
Water	WBV	Point	Butterfly valve
Water	WBO	Point	Blow off valve
Water	WESMT	Polygon	Waterline easements
Water	WFH	Point	Fire Hydrants
Water	WFHV	Point	Fire Hydrant valves
Water	WSVC	Line	Water service lines
Water	WM	Point	Water meters
Water	WV	Point	Water valves
<p>NOTES:</p> <ol style="list-style-type: none"> <li>Centerline intersection tics not required on sanitary sewer mains.</li> <li>Names for layers containing existing features shall be prefixed with "EX". For example, the layer containing existing sewer mains shall be named EX SS.</li> <li>Names for layers containing easements other than water, sewer and storm drain shall be prefixed with "ESMT". For example, the layer containing Emergency Vehicle Access Easements shall be named "ESMT EVAC".</li> <li>Name for layers containing temporary improvements or structures shall be prefixed with "TEMP" according to the type of improvement or structure. For example, the layer containing future curb would be named "TEMP FOC".</li> <li>Any repeatable feature such as sewer manholes, storm drain manholes, streetlight poles, tress, bushes, etc. may be designated with an appropriate symbol or AutoCAD block.</li> </ol>			

## **SECTION 17 - GREASE AND OIL COLLECTION SYSTEMS AND ADDITIONAL CONNECTION REQUIREMENTS**

### **17.01 GENERAL**

For the purpose of this specification section, a Food Service Establishment is any establishment primarily engaged in activities of food preparation, food service, or the making available for consumption foodstuffs and that use one or more of the following preparation methods: cooking by frying (all methods), baking (all methods), grilling, sautéing, rotisserie cooking, broiling, smoking (all methods), boiling, blanching, roasting, toasting, or poaching. Also included are infrared heating, searing, barbecuing, and any other food preparation activity that produces a heated food product, whether served on or in washable and reusable plates or containers or those of a disposable type. Food Service Establishments include those establishments or facilities where foodstuffs are served or prepared for consumption or sale. This includes but is not limited to cold dairy and frozen foodstuffs preparation and serving establishments that prepare or serve drinkable or edible products.

All Food Service Establishments shall be equipped with grease interceptors and/or grease traps designed to limit the discharge of grease and oil to the District's sewer system as required in Union sanitary District Ordinance 38. The size and type of Food Service Establishment shall dictate the size of the grease trap or grease interceptor required. The minimum sizes specified are subject to review and approval by the District Engineer.

### **17.02 GREASE INTERCEPTORS**

Most establishments shall have an outside grease interceptor installed with the minimum liquid capacity of 1500 gallons.

Designation as a grease intensive Food Service Establishment shall be as determined by the District Engineer. In given situations, or applications, the next larger size may be required due to the nature of the usage. Grease interceptors shall be two compartment interceptors as shown in the Standard Details and shall be manufactured by Jensen Precast, or approved equal.

### **17.03 GREASE TRAPS**

Non-grease intensive Food Service Establishments shall typically include delicatessens, bakeries/donut shops, ice cream/frozen yogurt shops, pizzerias and other Food Service Establishments with limited cooking that do not contain deep fryers, grills or other cooking equipment.

Designation as a non-grease intensive Food Service Establishment shall be as determined by the District Engineer. In most cases, a 200 lb. grease trap will be sufficient for food service establishments that only make sandwiches, bake pizza or are donut shops, which have no other additional food service preparations or cooking onsite. Grease Traps shall have two compartments with acid resistant coated interior and an exterior fabricated steel device as shown in the Standard Details and shall be manufactured by Zurn, or approved equal.

### **17.04 CONNECTIONS**

All kitchen area mop, pot and prep sinks shall be connected to the grease trap or interceptor. All Kitchen floor drains shall be connected to the interceptor.

### **17.05 DISHWASHERS**

Dishwashers drainage shall not be connected to any grease trap or grease interceptor.

#### **17.06 GARBAGE DISPOSALS**

Garbage disposals, grinders or other similar devices are prohibited to be installed at all Food Services Establishments.

#### **17.07 CAR WASH AND INDUSTRIAL VEHICLE CLEANING FACILITIES**

A Car Wash facility is any commercial enterprise operated for profit, and open to the public, for the purpose of cleaning, washing, waxing, vacuuming, polishing, or detailing cars. Car service facilities, including car dealerships, with any washing activities as part of their business are also considered car wash facilities. Industrial Vehicle Cleaning facilities are industrial/commercial facilities with wash racks or wash pads that clean vehicles, equipment, or a combination thereof.

Sanitary sewer connection and discharge requirements shall be as determined by the District Engineer. If wastewater from the facility must discharge to the sanitary sewer, then Union Sanitary District required pretreatment equipment must be installed. A car wash pad must be designed and constructed to prevent storm water from entering the work area, and to prevent run-off from the wash water generated during the car wash process. Facilities that wash cars and/or equipment onsite as part of their business shall have a 1500-gallon sand oil water interceptor and/or 1500-gallon clarifier installed in series.

#### **17.08 TRASH ENCLOSURES**

Trash enclosure connections to the sanitary sewer are limited to food service establishments only and are not permitted for residential developments. All trash enclosures approved to be connected to the sanitary sewer require the installation of a grease interceptor. Trash enclosures shall be designed such that no surface water outside the trash enclosure will drain into the trash enclosure area. The size of the grease interceptor shall be as determined by the District Engineer.

#### **17.09 TRASH COMPACTORS**

Trash compactor connections to the sanitary sewer are limited to those serving food service establishments only. The size will be as determined by the District Engineer. Trash compactor enclosures must be designed and constructed to prevent run-on to, or runoff from the area from entering the sanitary sewer connection.

#### **17.10 PARKING STRUCTURES AND LOTS:**

Sanitary sewer connections from parking structures and lot floor drains are not allowed.

#### **17.11 VEHICLE EQUIPMENT REPAIR AND MAINTENANCE SHOPS**

Sanitary sewer connections from tanks, containers, or sinks, used for motor vehicle parts cleaning or rinsing are not allowed. All parts cleaning solutions or solvents must be captured and hauled off site for proper disposal or recycling. Sanitary sewer connections from vehicle repair or maintenance facility floor drains are not allowed.

#### **17.12 FUELING STATIONS (RETAIL, WHOLESALE AND PRIVATE)**

Sanitary sewer connections from fueling areas are not allowed.

#### **17.13 TRENCH DRAINS:**

The use of the trench drains is restricted and will be evaluated by District Engineer on a case by case basis. Applicant must demonstrate other alternatives would not be functional.

#### **17.14 SWIMMING POOLS, SPAS AND FOUNTAINS**

Direct connections from swimming pools, spas, and fountains to the sanitary sewer are prohibited.

All filter backwash media shall be prevented from entering the sanitary sewer system. Wastewater from the backwash of Diatomaceous Earth Filters shall pass through a solids separation system prior to discharge to the sanitary sewer system. Wastewater from the backwash of sand filters shall pass through a sump or similar device to capture any sand prior to the discharge to the sanitary sewer system. The discharge of pool, spa and/or fountain water is restricted to a flow rate of twenty gallons per minute (20 gpm).

Any outdoor shower area with a drain to the sanitary sewer shall be bermed, raised and/or sloped to prevent the introduction of storm water. The outdoor shower area shall be roofed or equipped with a cover to prevent rainwater from entering the sanitary sewer system.

#### **17.15 OUTSIDE UTILITY EQUIPMENT AREAS**

All discharges of polluted water from outside utility equipment areas (roof ventilation systems, boiler blowdown, etc.) shall be discharged to a raised floor sink or similarly raised floor drain to prohibit the discharge of unpolluted (rainwater, storm water run-off) to the sanitary sewer.

#### **17.16 ELEVATOR AND ESCALATOR SUMPS**

Sanitary sewer connections from indoor and outdoor elevator and escalator sumps are not allowed.

#### **17.17 CLAY, CERAMIC, GRANITE, MARBLE, GLASS GRINDING AND STONE CUTTING FACILITIES**

A trap/sump or other pretreatment device as specified by USD shall be required for all classrooms, manufacturing, fabricating, and any other commercial facility that discharges wastewater containing significant amounts of clay, ceramic, marble, stone, grit, silt or other similar material residuals.

## **SECTION 18 - MISCELLANEOUS MAIN SEWER AND BUILDING SEWER REQUIREMENTS**

### **18.01 REPAIR OR RELOCATION OF EXISTING MAIN SEWER OR APPURTENANCES**

Repairs or relocations of existing main sewers or appurtenances required by reason of damage, or conflict, will be performed by the District or by Contractors engaged by the District, unless authorized otherwise through a USD approved encroachment permit.

Before any such work is started by District Forces, a standard District "Work Order" must be signed by the party or his/her agent, responsible for payment, authorizing the work by District Forces and agreeing to pay charges incurred. Upon completion of work, the District will bill the party responsible for payment thereof.

In event any of the District's existing sewer mains, manholes or other appurtenances are damaged during construction or repair, and the District Engineer, in his/her sole discretion, determines that a threat to the District's system, the District may employ District Forces or other Contractors to take the necessary steps to repair such damage. In such event, the owner of the property involved, the General Contractor and the Sewer Contractor shall jointly and severally be liable for the District's necessary repair cost. The District may withhold acceptance of construction and reporting the same to the Governing Municipality until payment of the District's necessary repair costs or other financial arrangements to compensate the District are made. No "Work Order" must be signed in order for the owner or any of the owners, agents or contractors to be responsible for repair costs sustained by the District in such an emergency situation.

### **18.02 CONNECTION OR ADJUSTMENTS TO EXISTING MAIN SEWERS OR APPURTENANCES**

Except for work on sewers not yet accepted by the District, all work on existing main sewers shall be done by District Forces, including:

- A. Splice into Main Sewer (See Section 23.08).
- B. Stub into Existing Public Manhole (See Section 22.20)
- C. Rechanneling Existing Public Manhole.
- D. Installation of Plywood Cover (False Bottom) Over Existing Public Manhole Base Block.
- E. Adjust Manhole Casting to Grade

The charge for said work by District Forces is based on the District's current rate schedule. A sewer "work Request Form" signed by the Contractor shall be submitted and the charges as estimated by the District paid prior to issuance of a sewer construction permit. Refunds or additional billing will be made after completion of the work and will be based upon actual costs incurred.

The exact time that the work is to be done by District Forces must be arranged by the Contractor with the District Office (an inspector or an inspection coordinator) at least 48 hours (2 business days) in advance preceding the work day. Messages or voicemails are not acceptable.

Work to be done by District Forces that, due to its' unusual character, is not listed on the rate schedule will be billed after the work is accomplished on the basis of actual costs. Before any such work is started by District Forces, a standard District "Work Order" must be signed by the party responsible for payment, authorizing the work by District Forces.

All work done by District Forces must be paid, or appropriate arrangements satisfactory to District made, prior to District accepting construction and reporting acceptance and approval to the Governing Municipality.

### **18.03 REPAIR, RELOCATION OF OR CONNECTION TO EXISTING BUILDING SEWERS**

Except as noted below, all such work will be done by private Contractors. Minimum inspection fees must be paid and a sewer construction permit issued prior to start of work and all work must be done per District Specifications and subject to District inspection.

In the event damage necessitating repair or relocation of existing building sewers is caused by a public agency, utility company or their respective agents, the work will be done by District Forces.

In these cases, before any such work is started by District Forces, a standard District "Work Order" must be signed by the party or his/her agent, responsible for payment, authorizing the work by District Forces and agreeing to pay charges incurred. Upon completion of the work, the District will bill the party responsible for payment thereof.

In event repair work is deemed necessary by the District, in its sole discretion, to alleviate a threat to the District's sewer system, and no "Work Order" is signed by the party or agent responsible for payment, or emergency repairs are undertaken by District, no approval and acceptance of construction will be issued by District until the reasonable cost of repairs are paid or arrangements appropriate to District are made for such reimbursement.

### **18.04 USE OF EXISTING BUILDING SEWERS**

(See Section 11.05 of the Standard Specifications for requirements).

### **18.05 ABANDONMENTS**

(See Section 11.10 of the Standard Specifications for requirements).

### **18.06 NUMBER OF BUILDING SEWERS REQUIRED**

In accordance with current District Ordinance, the following excerpts are quoted:

"Every building in which plumbing fixtures are installed shall be separately and independently connected to a main sewer or septic tank."

"Where there is more than one building on a lot and where the lot cannot be subdivided under the provisions of any local regulations, a separate building sewer will not be required." For example, "Service buildings, such as a garage, servant's quarters, power house, or other like buildings where required as an adjunct to and to be used in connection with a residence, public buildings, or commercial plant, may be connected to the building sewer serving the main building."

## **SECTION 19 - REQUIREMENTS PRIOR TO START OF CONSTRUCTION**

### **19.01 PERMIT**

The Contractor must have in his/her possession a valid sewer construction permit issued by the District for all sewer construction. Note that no permit will be issued for connection to, or extension of, any sewer not accepted by the District. See current District Ordinance for inspection fee penalty for starting work without a valid sewer construction permit.

No sewer construction permit will be issued by District until the applicant has a valid building permit issued by the Governing Municipality, unless the applicant is a public agency immune from building permit requirements.

Construction permits will be valid only as long as the building permit issued by the Governing Municipality remains valid. Upon the expiration of the building permit issued for such construction, or issuance of a new parcel map or subdivision map, for the construction on same parcel, additional connection charges will be based on any increase subsequent to the initial charges. Capacity charges along with plan checking and other administrative charges, must be paid prior to issuance of a new sewer construction permit.

### **19.02 STAKING AND CUT SHEETS**

(See Sections 22.07 and 23.06 herein for stake location requirements).

Before start of any sewer construction requiring staking, three (3) copies of cut sheets on the Standard District Form must be submitted to the District (Fax transmissions shall not be accepted). They will be checked within twenty-four (24) hours and one (1) approved copy will be furnished to the Contractor for use in construction. Stakes must not be marked with cuts prior to District approval of cut sheets.

#### **A. DISTRICT PROJECTS**

The District will provide all construction stakes and prepare all cut sheets necessary for District Projects.

#### **B. MAIN SEWERS**

A registered Civil Engineer or Land Surveyor engaged by the Developer will be responsible for setting stakes and preparing cut sheets.

#### **C. BUILDING SEWERS**

A Registered Civil Engineer or Land Surveyor engaged by the Developer will be responsible for setting stakes and preparing cut sheets for all "Townhouse" type projects and any other residential, commercial or industrial developments that in the opinion of the Engineer requires a good control of sewer grade and alignment due to flat slopes, other utilities, and/or circuitous routing.

When such staking and cut sheets are required it will be so indicated on the Plans by the Engineer, prior to approval of Plans. If in the opinion of the Engineer, construction requiring stakes have been set, a field check must be made by the Developer's Engineer to verify the accuracy of the stakes.

### **19.03 INSPECTION**

#### **A. DURING NORMAL DISTRICT WORKING HOURS**

A request for inspection must be made to the District Inspector or an inspection coordinator a minimum of 24 hours (one full business day) prior to the start of any sewer construction during normal District working hours. Inspection appointments must be confirmed by the District Inspector or inspection coordinator. This notification applies not only to starting new work, but also to restarting work which has been temporarily halted.

#### **B. OUTSIDE OF NORMAL DISTRICT WORKING HOURS**

The District Inspector or an inspection coordinator must be notified 48 hours (two business days) prior to the start of any sewer construction outside of normal District working hours and a request must be made for inspection. Messages or voicemails are not acceptable. All inspection performed during these hours shall be reimbursed to the District at the rates in effect at that time, and as part of the notification requires the signing of a "Work Request Form" prior to any inspection of work being performed. Payment of the inspection charges must be made upon receipt of the billing from the District. The current rate for this service can be determined by contacting the District Office. A minimum of four hours overtime will be charged for any inspections requested for weekends or District holidays. Overtime will be charged in one-hour increments for inspection requested in addition to the normal eight-hour working day.

## **SECTION 20 - APPROVAL AND ACCEPTANCE OF CONSTRUCTION**

### **20.01 MAIN SEWERS**

After all construction of the main sewer has been completed to the satisfaction of the Engineer, all fees and charges paid, all easements, annexations, and maps have been recorded and copies have been given to the District, and all other requirements have been met, the main sewer can be accepted as a public sewer by the District.

### **20.02 BUILDING SEWERS**

After all construction of the building sewer has been completed to the satisfaction of the Engineer, all fees and charges paid, and all other requirements met, the building sewer can be approved by the District. This approval of construction will be indicated by the notification of the City in which the work occurred.

### **20.03 PAYMENT**

In no event will a building or main sewer be approved and accepted, and so reported to the Governing Municipality, until all fees and charges are paid, including charges for work done by District Forces and repairs undertaken by District as provided in Sections 11 and 18.

## **SECTION 21 - SPECIFICATIONS AND DETAILS**

### **21.01 MATERIALS AND METHODS OF CONSTRUCTION**

Materials and methods of construction will be as required in the Standard Specifications, and on District-Approved Plans.

### **21.02 CONSTRUCTION DETAILS**

Construction Details will be required on Standard Details and on District-Approved Plans.

## SECTION 22 - DESIGN AND POLICY STANDARDS FOR MAIN SEWERS

### 22.01 PIPE MATERIALS

Limited to Vitrified Clay Pipe (VCP), Poly Vinyl Chloride Pipe (PVC, SDR 26 or less), High density Polyethylene pipe (HDPE, DR 21 or less) and Ductile Iron Pipe (DIP, Pressure Class 250 or greater with non-corrosive lining) all as listed in the Standard Specifications.

### 22.02 PIPE MATERIAL CHANGES

Size or pipe material changes are not allowed between any two manholes.

### 22.03 SIZE AND SLOPE

Minimum pipe size is eight (8) inches in diameter. The sewers should be designed as steep as possible with due consideration for service area and other controls. Unless otherwise permitted by the Engineer, the slopes shown in the following table will be minimum for sewer sizes shown:

Pipe Diameter, inches	Minimum Slope, feet per foot
8	0.0034
10	0.0026
12	0.0020
15	0.0015
18	0.0012
(Larger sewer sizes shall have a minimum slope as specified by the Engineer).	

Sewer design will be based on District Master Plans as to ultimate total volume of flow expected from the tributary area. Sewers are designed to flow full at peak flows. Peaking factors are based on location and expected future conditions. (Manning formula with  $n = 0.013$  will be used for all pipe materials).

### 22.04 ALIGNMENT

Sewer shall be laid in a straight alignment except that horizontal curved sewers may be used when located within a defined street area and concentric with center of street unless otherwise approved. Minimum curve radius shall be in accordance with Section 7.01.F.

### 22.05 CROSS CONNECTION

Sewers will be required to be designed cross-connected except in dead end streets.

### 22.06 GRADE

Sewer shall be laid on a straight grade except that vertical curved sewers may be used only in specific instances when so authorized by the Engineer. Conditions to be met will be specified in each instance by the Engineer.

### 22.07 GRADE STAKES

Unless otherwise required by the Engineer, sewer construction stakes will be located at 50 feet maximum intervals except that on horizontal curves and on sewers with a slope flatter than 0.0034 feet per foot the maximum spacing will be 25 feet. The maximum spacing of construction stakes on vertical curves shall be 10 feet.

The stakes shall be offset from the center line of the sewer at a safe distance from the edge of the trench but in no case greater than 10 feet unless authorized by the Engineer. The stakes will be marked with off-set distance and station only.

## **22.08 DESIGN DEPTH**

To avoid interference between building sewers and other utilities, the sanitary sewer main should be designed, when possible, at a minimum of 6.5 feet below finished grade.

## **22.09 MINIMUM PIPE COVER**

Minimum permitted cover in inches over outside top of pipe bell to top of "backfill" or to existing ground at time of sewer installation, whichever is lower, is shown in the table on Standard Detail No. 18B.

Cover requirements for other pipe materials and sizes will be based on their strength characteristics as approved by the Engineer.

## **22.10 TRENCH INTERSECTIONS**

Avoid non-perpendicular crossings/intersections between the sanitary sewer and other underground utilities.

## **22.11 HORIZONTAL UTILITY CLEARANCE**

A minimum horizontal clearance of five (5) feet should be maintained between the sewer main and adjacent underground utility mains and concrete curbs. A minimum horizontal clearance of ten (10) feet should be maintained between the sewer main and parallel water mains, unless approved in advance by the Engineer.

## **22.12 CROSSING STORM DRAINS**

### **A. VITRIFIED CLAY PIPE (VCP)**

Whenever a VCP pipe main or building sewer crosses over a storm drain, regardless of the vertical clearance, or under a storm drain with less than six (6) inches vertical clearance, span the storm drain trench with single length of PVC SDR 26 Pipe, and extend a minimum distance on each side of the trench per Standard Details.

### **B. FLEXIBLE PIPE**

Whenever a flexible pipe main or building sewer crosses over a storm drain, a single length of similar flexible pipe may span the storm drain trench. Pipe couplings are not allowed within the storm drain trench.

If the strength characteristics of the flexible pipe is exceeded, the span of the storm drain trench shall be made with a single length of PVC SDR 26 Pipe, and extend a minimum distance on each side of the trench per Standard Details. Conditions to be met will be specified in each instance by the Engineer.

## **22.13 CROSSING WATER MAINS**

No main or building sewer shall be installed over a water main where the vertical clearance is less than twelve (12) inches. The water main shall be spanned with a single length of PVC Pressure Pipe (SDR 14) per Standard Details.

No main sewer shall be installed under a water main with less than twelve (12) inches of vertical clearance.

#### **22.14 STRUCTURE LOCATIONS**

Except as noted below, manholes are required at all angle points, changes in grade and permanent dead ends. Maximum structure spacing is 450 feet unless otherwise permitted by the Engineer. Risers are not allowed for new construction.

#### **22.15 MAIN LOCATIONS**

To accommodate traffic control and access, mains should be located in the center of traffic lanes, when possible. For two-lane streets without medians, the mains should be located approximately 5 feet on either side of the street centerline.

#### **22.16 INVERT ELEVATIONS AT MANHOLES**

The invert elevations of the incoming and outgoing sewers shall be shown on the plans, and unless authorized by the Engineer, the following shall apply:

##### **A. SEWERS OF SAME DIAMETER**

Where two or more main sewers of the same diameter intersect, the difference in invert elevations of the incoming and outgoing sewers shall be a minimum of 0.01 foot per 10-degree deflection between mains with a maximum of 0.10 foot for a deflection of 90 degrees. Main sewers through manhole with no deflection will be designed with no change in invert elevation. In situations where the flow in the downstream sewer is more than half full, the District (at their discretion) may require the incoming sewer's invert to be installed higher to minimize backwater conditions

##### **B. SEWERS OF DIFFERENT DIAMETERS**

Where two or more main sewers of different diameters intersect, the invert elevations of the incoming and outgoing sewers shall be so related that the inside tops (crown) of the sewers are at the same elevation. In situations where the flow in the downstream sewer is more than half full, the District (at their discretion) may require the incoming sewer's invert to be installed higher to minimize backwater conditions.

#### **22.17 MAXIMUM DEFLECTION AT MANHOLES**

At manholes, the upstream deflection angle at the intersection of two main sewers must not be greater than 100 degrees.

#### **22.18 BUILDING SEWER CONNECTION AT MANHOLES**

Four (4) inch and six (6) inch Building Sewers will not normally be permitted to be connected into manholes except for dead end manholes. (See Section 23.08 herein).

#### **22.19 MANHOLE RIM ELEVATION**

Manhole rim elevation shall be shown on Plans to nearest 0.10 foot, unless otherwise indicated on the Plans, it shall be assumed to be flush with the adjacent ground surface. In areas where future streets will be constructed, rim elevation shall also be shown for future finished grade.

#### **22.20 CONNECTION TO EXISTING MANHOLE**

In existing manholes where no stub exists, District forces will provide a channel in the portion of the base block located inside the manhole two inches larger than the outside diameter of the proposed stub. It shall be the responsibility of the Contractor to perform all the necessary work on the exterior of the manhole in preparation for the installation of the new stub. The Contractor shall be responsible for the alignment and grade of the new stub. The Contractor shall make a water-tight seal of the new stub from the outside of the manhole. All work by the Contractor shall be performed in a manner that will

maintain the integrity of the existing manhole. District forces will finish the inside channel at the developer's expense. The Contractor shall provide 24 hours' notice to the District prior to the start of any work.

#### **22.21 CONNECTIONS BETWEEN MAIN SEWERS**

Connections of new main sewers into existing main sewers must be made by means of a new manhole installed by the Contractor with District Forces doing the channeling at Developers cost. (See Sections 18.02 and 23.08 herein for connection of building sewer into existing main sewer).

#### **22.22 DROP MANHOLES**

Normally, drop manholes are not permitted. Use of vertical curve is usually more desirable. Use of drop manholes will be at the discretion of the District Engineer.

#### **22.23 BOLT-DOWN MANHOLES**

Standard District bolt-down manhole frame and cover without vent holes shall be required when manhole is located on a lot where there will be a residence.

#### **22.24 EASEMENT WIDTH REQUIREMENTS**

Main sewers not located in public streets must be situated within Sanitary Sewer Easements or within Public Utility Easements. Unless otherwise required by the Engineer, 15 feet is the minimum width when manholes lie within the easement and 10 feet is minimum otherwise.

#### **22.25 EASEMENT PAVING REQUIREMENTS**

All manhole structures appurtenant to sanitary main sewers must be accessible to District maintenance vehicles.

Where deemed necessary by the Engineer, this accessibility shall be achieved by means of an adequately surfaced roadway of a design approved by said Engineer.

#### **22.26 EASEMENT ACCESS REQUIREMENTS**

Access to and along the easement, including all manholes shall be feasible and safely achievable by District maintenance vehicles.

## SECTION 23 - DESIGN AND POLICY STANDARDS FOR BUILDING SEWERS

### 23.01 SIZE AND SLOPE

Minimum size of building sewer shall be four (4) inches in diameter but in no case smaller than the building drain (building plumbing) stub diameter. Plumbing fixture unit values, as established by the latest edition of the California Plumbing Code, shall be used in designing the building sewer.

The following Table shows (for four-inch and six-inch diameter sewers) the minimum slope in percent permissible for the maximum number of plumbing fixture units noted. Note that cut sheets will be required for 6 inch sewers with slope less than 1.0%.

(Please note however, that in areas where the mains are of adequate depth that 2% slope is the preferred minimum for 4-inch sewers and 1% slope is the preferred minimum for 6-inch sewers.)

Maximum Fixture Units	4-inch Diameter Building Sewer	6-inch Diameter Building Sewer
200	1.0%	0.5%
600	N.A.	0.5%
700	N.A.	0.6%
800	N.A.	0.7%
900	N.A.	0.8%
1000	N.A.	0.9%
1200	N.A.	1.0%

When over 1200 fixture units are to be accommodated, 8 inch or larger diameter building sewer may be used, in accordance with main sewer design criteria. (See Section 22 herein).

### 23.02 PIPE MATERIALS

All materials authorized for use in the Standard Specifications may be used for domestic waste. Additionally, Schedule 40 PVC can be used for 4-inch and 6-inch diameter building sewers. Specific District approval of pipe material will be required for a sewer that will convey industrial waste. When building sewers are located under porches, steps, breezeways, roofed patios, carports, covered walks, covered driveways and similar structures they shall be constructed of P.V.C. (SDR 18 or 14).

### 23.03 ALIGNMENT

Sewer alignment shall be as straight as possible. When angle points are approved, only one 45 degree (maximum) change of direction (horizontal or vertical) is permissible without a cleanout. Any additional changes of direction (horizontal or vertical), thereafter, in excess of 22 ½ degrees shall be served by a cleanout or manhole. Ninety-degree bends or tees are not permitted.

### 23.04 BUILDING PLUMBING (BUILDING DRAIN) LOCATION

The location should be arranged so that the point of connection with the building sewer is on that portion of the building facing the public sewer main.

### 23.05 GRADE

Unless otherwise authorized by the Engineer, the sewer shall be laid on a straight grade between the main sewer and the property line and between the property line and the building drain (building plumbing). Changes in grade shall be served by a cleanout or manhole.

### **23.06 GRADE STAKES**

When cut sheets are required, sewer construction stakes shall be located at angle points, grade breaks, cleanouts, wyes, structures and at a 50-foot maximum spacing. An additional stake will also be required at property line and at connection point with building plumbing (building drain).

The stakes shall be offset from the center line of the sewer at a safe distance from the edge of the trench but in no case greater than 10 feet unless authorized by the Engineer. The stakes will be marked with off-set and station only.

When the sewer is to be constructed to property line only, the Engineer may require a stake to be set at the point prior to construction.

### **23.07 CURB MARKING**

At the time the curb stakes are set (prior to construction of curb and gutter) an additional stake must be set by the Developer's Engineer on the curb stake line opposite the point at which the building sewer crosses the property line. This will insure that the "S" can be stamped in the fresh concrete in the proper location as required under Section 11.06 of the Standard Specifications.

### **23.08 CONNECTION TO EXISTING MAIN SEWER**

Unless otherwise permitted or required by the Engineer, the connection of a four (4) inch diameter building sewer into an existing eight (8) inch or larger diameter main sewer, or the connection of a six (6) inch diameter building sewer into an existing 10 inch or larger diameter main sewer will be made by installation of a wye spliced into the existing main sewer or a stub installed by means of a tap made by "Tap Tite" or approved equal. The connection of the building sewer to the main sewer shall be airtight and at the option of the Engineer may require air testing.

The connection of a four (4) inch diameter building sewer into an existing six (6) inch sewer main, or the connection of a six (6) inch diameter building sewer into an existing eight (8) inch main sewer will be made by installation of a wye spliced into the existing main sewer.

Contractor will not be permitted to splice wye on existing USD main sewers (see Section 18.02 herein), unless approved by the Engineer.

Connection of building sewers to sewer lines larger than 15 inches in diameter will only be permitted when so approved by the Engineer.

### **23.09 ELEVATION AT CONNECTION TO MAIN SEWER**

When sufficient grade is available, design sewer elevations at connection to main sewer on the basis that the invert elevation of the building sewer is equal to the inside top elevation of the main sewer.

### **23.10 CONNECTION TO EXISTING BUILDING SEWER**

The connection may be made by means of a private manhole, wye spliced into existing building sewer or stub installed by means of a tap made by "Tap Tite" or approved equal, all as shown on Standard Details and on District Approved Plans.

Actual connection of a new building sewer to an existing building sewer will not be permitted until the new sewer has been satisfactorily tested. If authorized by the Engineer, a test wye may be used with a plug in lieu of leaving a temporary gap in the sewer.

### **23.11 CONNECTION TO BUILDING DRAIN (PLUMBING KICK-OUT)**

After a permit authorizing said construction has been issued, building sewers may be constructed up to a point 5 feet from the building wall. Actual connection of the building sewer to the building drain (building plumbing) will not be permitted however, until the main sewer or building sewer to which it connects has been accepted by the District and the subject building sewer has been satisfactorily tested in accordance with Standard Specifications Section 12.

Actual connection must be done by a sewer contractor with a valid sewer construction permit issued by the District. Work must be done in the presence of and to the satisfaction of the Engineer.

### **23.12 CLEARANCES**

- A. Unless otherwise permitted by the Engineer, when a building sewer crosses another utility, a vertical clearance of at least six (6) inches shall be maintained.
- B. Unless otherwise permitted in the California Plumbing Code, building sewers and other utilities shall be kept sufficiently separated to be laid in separate trenches.

### **23.13 PARALLEL TO FOOTING**

Any sewer deeper than the footing of any building or structure and paralleling the same must be designed to be of sufficient distance from the footing so that no part of the trench will fall within a 45-degree line drawn downward from the bottom of the footing (see Standard Details).

### **23.14 CROSSING STORM DRAINS**

#### **A. VITRIFIED CLAY PIPE (VCP)**

Whenever a VCP pipe building sewer crosses over a storm drain, regardless of the vertical clearance, or under a storm drain with less than six (6) inches vertical clearance, span the storm drain trench with a single length of PVC Pressure Pipe (SDR 18), and extend a minimum distance on each side of the trench per Standard Details.

#### **B. FLEXIBLE PIPE**

Whenever a flexible pipe building sewer crosses over a storm drain, a single length of similar flexible pipe may span the storm drain trench. Pipe couplings are not allowed within the storm drain trench.

If the strength characteristics of the flexible pipe are exceeded, the span of the storm drain trench shall be made with a single length of PVC Pressure Pipe (SDR 18), and extend a minimum distance on each side of the trench per Standard Details. Conditions to be met will be specified in each instance by the Engineer.

### **23.15 CROSSING WATER MAINS**

No building sewer shall be installed over a water main where the vertical clearance is less than twelve (12) inches. Where the vertical clearance over a water main is more than twelve (12) inches span the water main with one length of PVC Pressure Pipe (SDR 18) per Standard Details.

### **23.16 MINIMUM PIPE COVER**

Minimum permitted cover in inches over outside top of pipe bell to top of "Backfill" or to existing ground at time of sewer installation, whichever is lower, is shown in the table on Standard Detail Sheet titled: Sewer Pipe Installation.

Cover requirements for other pipe materials and sizes will be based on their strength characteristics as approved by the Engineer.

### **23.17 TRENCH INTERSECTIONS**

Avoid non-perpendicular crossings/intersections between the sanitary sewer and other underground utilities.

### **23.18 HORIZONTAL UTILITY CLEARANCE**

A minimum horizontal clearance of five (5) feet should be maintained between the building sewer and adjacent underground utility lines and concrete curbs. A minimum horizontal clearance of ten (10) feet should be maintained between the building sewer and parallel water mains or services.

### **23.19 STRUCTURE TYPE AND LOCATION**

#### **A. PRIVATE MANHOLE**

Private manholes must be constructed on building sewers eight (8) inches in diameter and larger with maximum spacing of 450 feet, at changes in horizontal or vertical direction, and at other locations required by the Engineer. They may be used on smaller building sewers in lieu of cleanouts.

A "control manhole" is required on the building sewer serving each user in an industrial building, if so required by the Engineer in accordance with District Ordinances.

#### **B. CLEANOUT TO GRADE (FULL BORE) "C.O.T.G."**

A cleanout shall be constructed on four (4) inch and six (6) inch sewer at intervals not to exceed 100 feet as well as at locations indicated in Section 23.03 herein. See Section "C" below for requirements at connection to building plumbing. Also see "A" above for use of manholes in lieu of cleanout to grade. No cleanout is required on runs less than 10 feet in length (See Section 7.05 in Standard Specifications).

#### **C. TWO-WAY CLEANOUT TO GRADE**

Two-way cleanouts shall be constructed on all four (4) inch sewers at the connection of the building sewer with the plumbing drain. This cleanout shall be located no further than 30 inches from the building wall and protected with an approved box. (See Section 7.06 in Standard Specifications).

#### **D. TEST WYE**

A test wye shall be constructed at locations shown on Plans or as required by the Engineer to facilitate testing of the building sewers. (See Section 7.07 in Standard Specifications).

#### **E. ANY OTHER STRUCTURES**

Other structures required will be located as shown on approved Plans and be constructed in accordance with District requirements.

### **23.20 OVERFLOW DEVICES**

Overflow protection devices shall be installed on building sewers when specifically required by the Engineer. The particular device to be used and its installation must be approved by the Engineer. This device will be required on all residential and commercial buildings where the floor elevation is six (6) inches or less above the closest upstream manhole rim elevation.

### **23.21 NUMBER OF BUILDING SEWERS REQUIRED**

See Section 18.06.

### **23.22 PRIVATE PUMPING STATIONS**

Private pumping stations should be avoided if possible. Private pumping stations must be approved by the Engineer. The pumping stations should be designed and stamped by a California registered civil engineer. Submittals including design calculations, flows, pump information, etc. shall be made to the Engineer. Minimum requirements for private pumping stations are shown in the Standard Details.

### **23.23 NEW UTILITIES CROSSING EXISTING SEWER MAINS AND BUILDING SEWERS**

- A. New utilities shall be installed with a minimum of 12-inches of clearance when crossing an existing sewer main or building sewer.
- B. If requested by the District, existing sewer main or building sewer shall be CCTV inspected prior to and after installation of new utility.
- C. If requested by the District, submit work plan and provide final clearance measurement of crossing utility.

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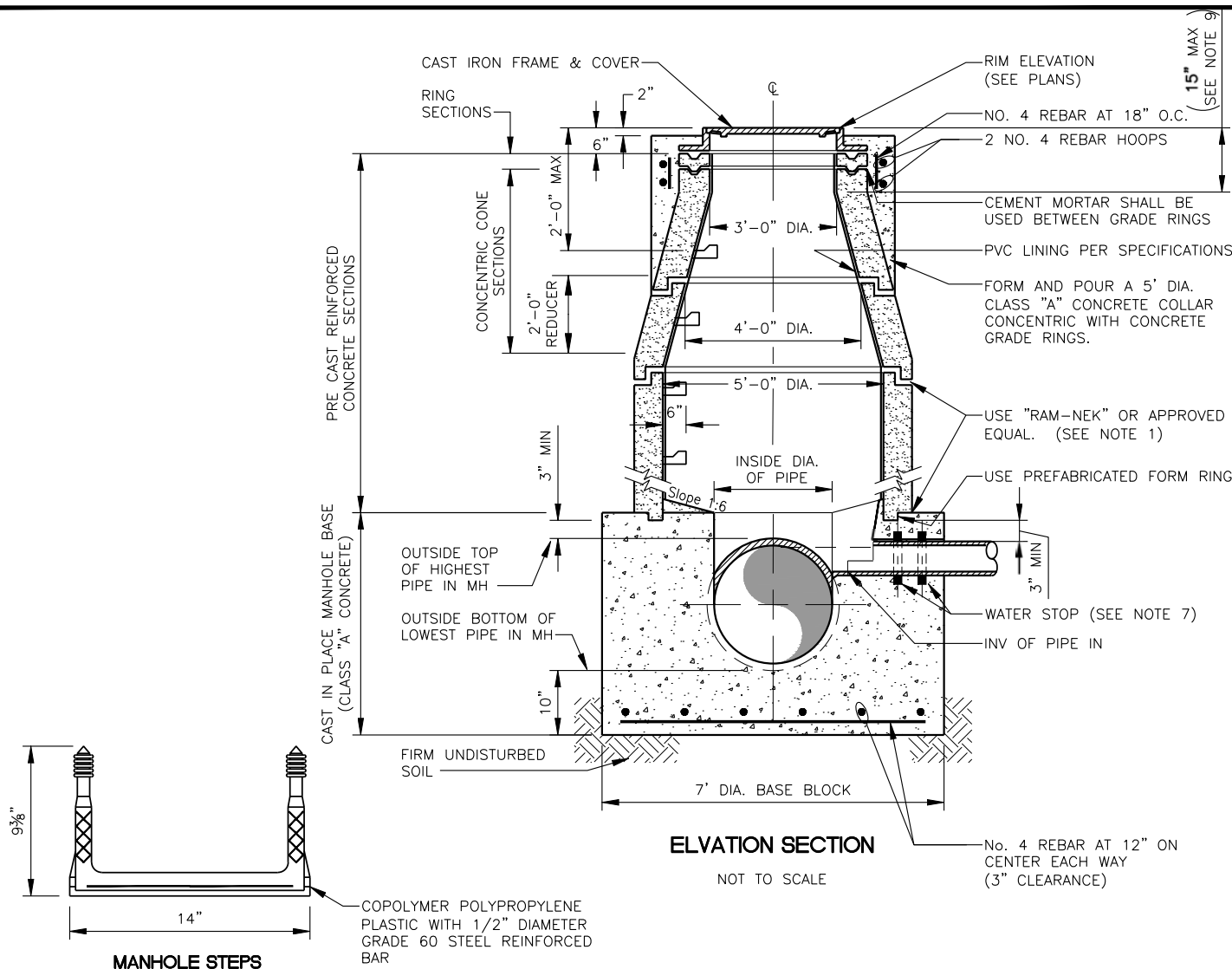
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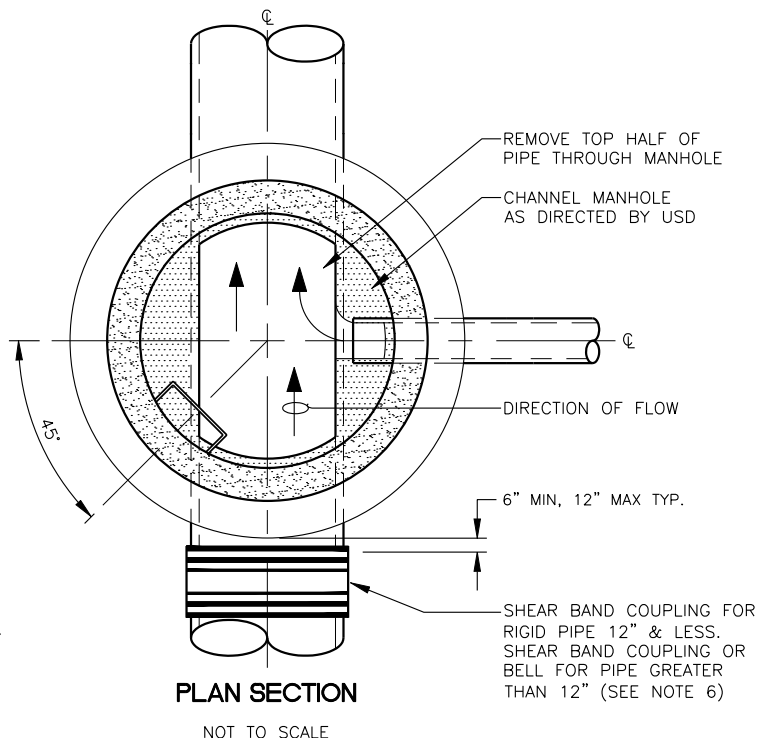
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#### NOTES:

1. INSTALL "RAM-NEK" OR APPROVED EQUAL BETWEEN EACH JOINT OF THE CONE AND BARREL SECTIONS TO MAKE A FLEXIBLE WATER-TIGHT JOINT. AFTER JOINT IS MADE, TRIM JOINT SMOOTH ON THE INSIDE OF MANHOLE.
2. ALL STEPS SHALL BE INSTALLED IN PRE-CAST SECTIONS BY MANUFACTURER AND SPACED 10"-15" APART.
3. PRE-CAST SECTIONS SHALL BE INSTALLED SO THAT STEPS ARE ALIGNED VERTICALLY AND AS SHOWN IN THE PLAN SECTION.
4. IF DISTANCE FROM MANHOLE RIM TO TOP OF BASE BLOCK IS LESS THAN 4'-0", ORDER PRE-CAST SECTIONS WITHOUT STEPS.
5. TRUNK MANHOLES ARE REQUIRED WHEN THE SEWER LINE IS 24" OR LARGER IN DIAMETER.
6. SHEAR BAND COUPLING NOT REQUIRED FOR FLEXIBLE PIPE OR IF MANHOLE IS INSTALLED OVER EXISTING SANITARY SEWER.
7. FLEXIBLE PIPE ONLY - AN APPROVED WATER STOP, SUCH AS TWO O-RINGS OR A BANDED RUBBER COUPLING, SHALL BE INSTALLED ON ALL FLEXIBLE PIPE ENTERING OR LEAVING A MANHOLE AND CENTERED UNDER THE MANHOLE WALL AS SHOWN.
8. CEMENT MORTAR SHALL BE USED BETWEEN ALL GRADE RINGS.
9. 1'-6" MAX FOR EXISTING MANHOLES.
10. CONCRETE COLLAR IN PAVED AREA SHALL BE 5'-0" DIAMETER AND IN UNPAVED AREA, IT SHALL BE 7'-0" DIAMETER SQUARED.



Date 3/15/17 (L) Detail No. 2

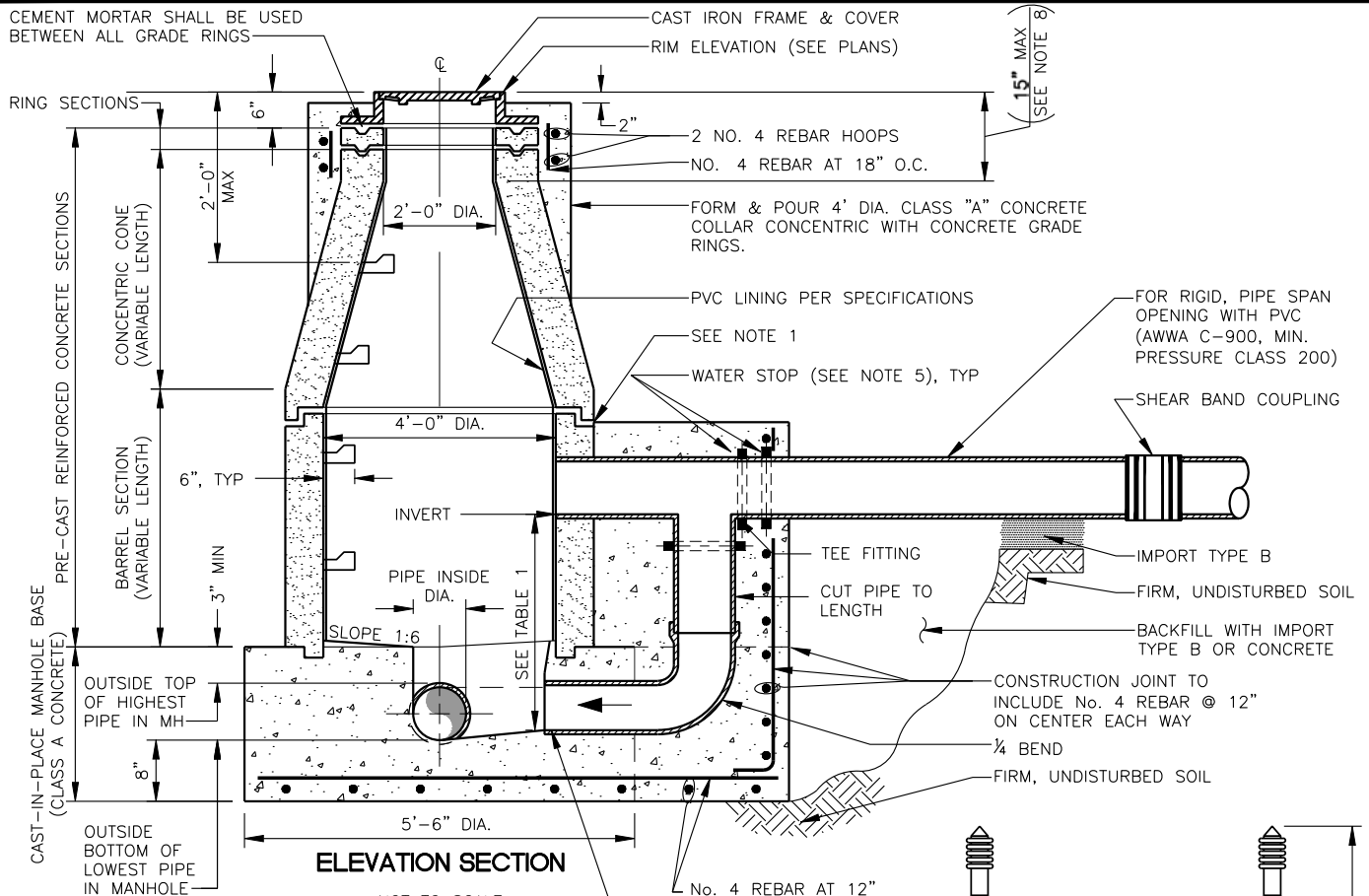
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PAUL R. ELDRIDGE, RCE 60211



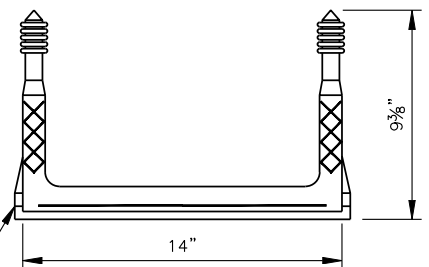
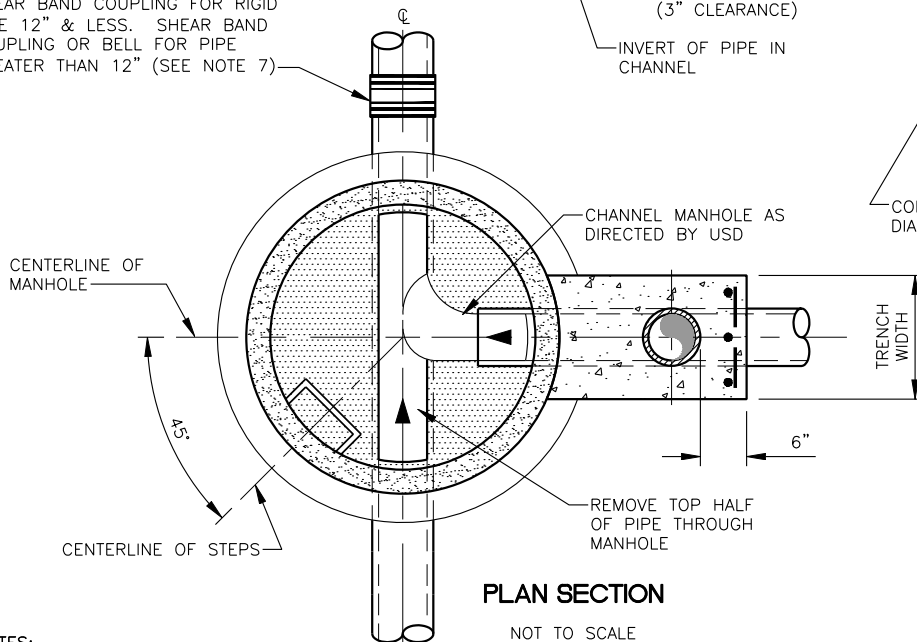
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UNION SANITARY DISTRICT

TRUNK MANHOLE

2



SHEAR BAND COUPLING FOR RIGID PIPE 12" & LESS. SHEAR BAND COUPLING OR BELL FOR PIPE GREATER THAN 12" (SEE NOTE 7)



#### MANHOLE STEPS

TABLE 1

PIPE DIAMETER	MIN DROP
8"	24"
10"	31"
12"	35"
15"	42"

#### NOTES:

1. INSTALL "RAM-NEK" OR APPROVED EQUAL BETWEEN EACH JOINT OF THE CONE AND BARREL SECTIONS. AFTER JOINT IS MADE, TRIM JOINT SMOOTH ON THE INSIDE OF MANHOLE.
2. ALL STEPS SHALL BE INSTALLED IN PRE-CAST SECTIONS BY MANUFACTURER AND SPACED APART BY 10"-15".
3. PRE-CAST SECTIONS SHALL BE INSTALLED SO THAT STEPS ARE ALIGNED VERTICALLY AND AS SHOWN IN THE PLAN SECTION.
4. IF DISTANCE FROM MANHOLE RIM TO TOP OF BASE BLOCK IS LESS THAN 4'-0", ORDER PRE-CAST SECTION WITHOUT STEPS.
5. FLEXIBLE PIPE ONLY - AN APPROVED WATER STOP, SUCH AS TWO O-RINGS OR A BANDED RUBBER COUPLING, SHALL BE INSTALLED ON ALL FLEXIBLE PIPE ENTERING OR LEAVING A MANHOLE, AND CENTERED UNDER THE MANHOLE WALL AS SHOWN.
6. CEMENT MORTAR SHALL BE USED BETWEEN ALL GRADE RINGS.
7. SHEAR BAND COUPLING NOT REQUIRED FOR FLEXIBLE PIPE OR IF MANHOLE IS INSTALLED OVER EXISTING SANITARY SEWER.
8. 1'-6" MAX FOR EXISTING MANHOLES.

Date 3/15/17 (L) Detail No. 3

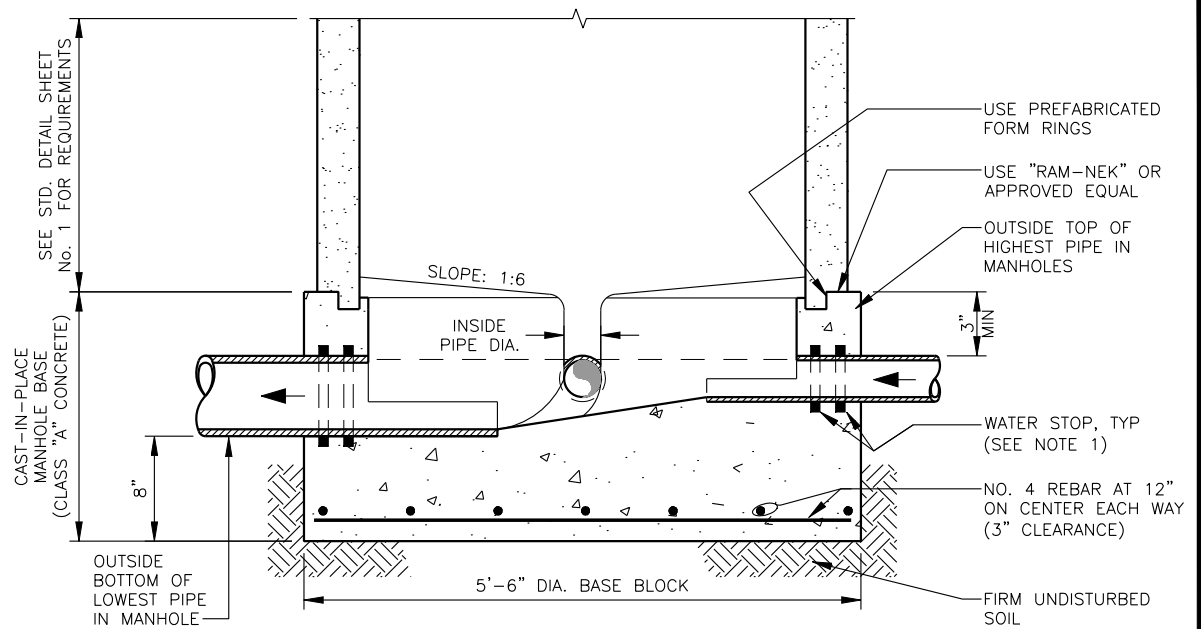
Approved By *Paul R. Eldredge*  
PAUL R. ELDRIDGE, RCE 60211



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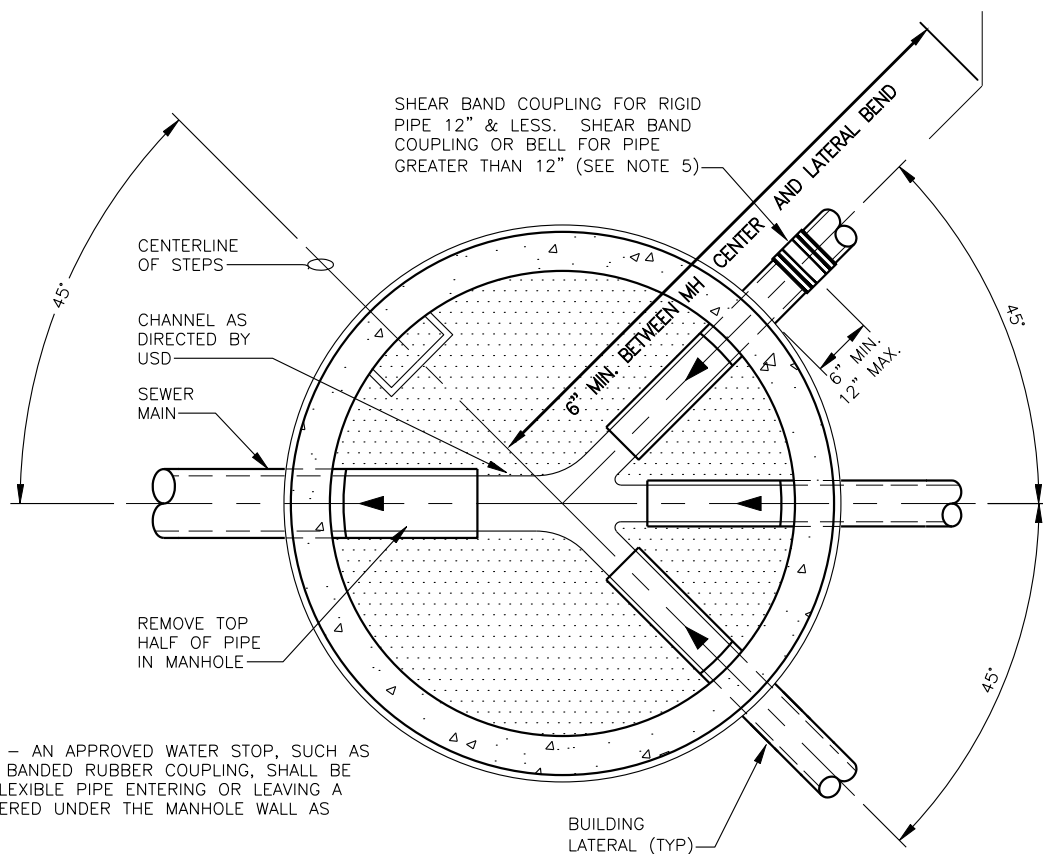
UNION SANITARY DISTRICT

DROP MANHOLE



**ELEVATION SECTION**

NOT TO SCALE



**PLAN SECTION**

NOT TO SCALE

**NOTES:**

1. FLEXIBLE PIPE ONLY – AN APPROVED WATER STOP, SUCH AS TWO O-RINGS OR A Banded RUBBER COUPLING, SHALL BE INSTALLED ON ALL FLEXIBLE PIPE ENTERING OR LEAVING A MANHOLE, AND CENTERED UNDER THE MANHOLE WALL AS SHOWN.
2. ALL PIPES IN MANHOLE BASE BLOCK SHALL MATCH TOPS.
3. MAXIMUM NUMBER OF LATERALS TO BE CONNECTED TO A DEAD END MANHOLE IN A CUL-DE-SAC IS THREE (3).
4. INSTALL "RAM-NEK" OR APPROVED EQUAL BETWEEN EACH JOINT OF THE CONE AND BARREL SECTIONS TO MAKE A FLEXIBLE WATER-TIGHT JOINT. AFTER JOINT IS MADE, TRIM JOINT SMOOTH ON THE INSIDE OF MANHOLE.
5. SHEAR BAND COUPLING NOT REQUIRED FOR FLEXIBLE PIPE OR IF MANHOLE IS INSTALLED OVER EXISTING SANITARY SEWER.

Date 3/15/17 (L)

Detail No. 4

Approved By Paul R. Eldredge

PAUL R. ELDRIDGE, RCE 60211



**USD**

**UNION SANITARY DISTRICT**

**SPECIAL MANHOLE BASE FOR DEAD  
END MANHOLES IN CUL-DE-SACS**

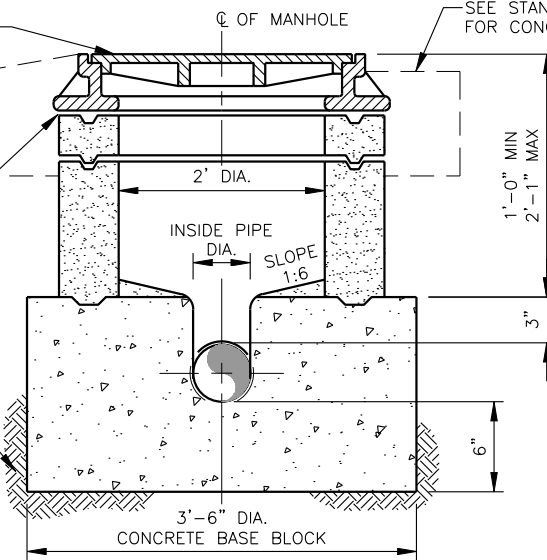
**4**

SEE STANDARD DETAIL SHT 10  
FOR FRAME & COVER DETAIL

SEE STANDARD DETAIL SHT 6  
FOR CONCRETE COLLAR DETAIL

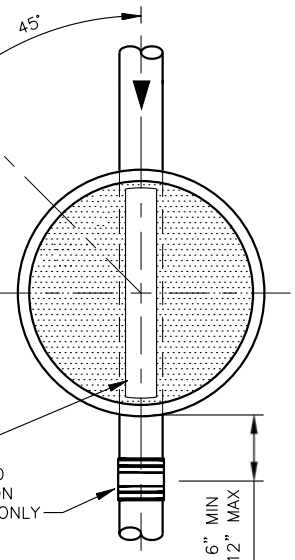
CEMENT MORTAR SHALL  
BE USED BETWEEN  
GRADE RINGS, TYP.

FIRM UNDISTURBED SOIL



**TYPE "A" MANHOLE**

NOT TO SCALE



**TYPICAL PLAN SECTION**

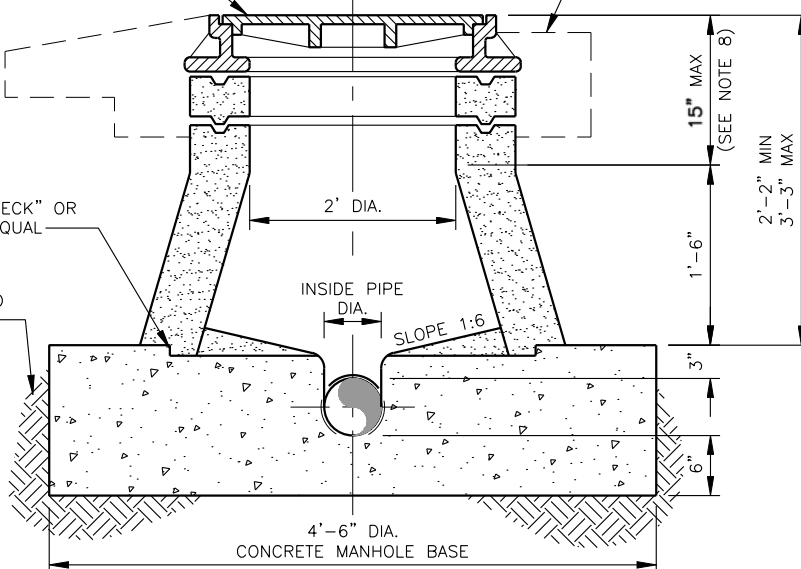
NOT TO SCALE

SEE STANDARD DETAIL NO. 10  
FOR FRAME & COVER DETAIL

SEE STANDARD DETAIL SHT 6  
FOR CONCRETE COLLAR DETAIL

USE "RAM-NECK" OR  
APPROVED EQUAL

FIRM UNDISTURBED  
SOIL



**TYPE "B" MANHOLE**

NOT TO SCALE

**NOTES:**

1. TYPE "C" PRIVATE CONTROL MANHOLE (DETAIL NO. 6) SHALL BE USED IN MOST CIRCUMSTANCES. TYPE "A" & "B" SHALL BE USED ONLY WITH SPECIAL PERMISSION BY THE ENGINEER.
2. INSTALL "RAM-NEK" OR APPROVED EQUAL BETWEEN EACH JOINT OF THE CONE AND BARREL SECTIONS TO MAKE A FLEXIBLE, WATER-TIGHT JOINT. AFTER JOINT IS MADE, TRIM JOINT SMOOTH ON THE INSIDE OF MANHOLE.
3. DO NOT INSTALL STEPS IN MANHOLE NECKS OR IN A MANHOLE THAT IS LESS THAN 4 (FOUR) FEET DEEP. IF MANHOLE IS GREATER THAN 4 (FOUR) FEET DEEP, STEPS SHALL BE INSTALLED AND EQUALLY SPACED AT INTERVALS FROM 10"-16" APART AND ALIGNED VERTICALLY.
4. COLLAR AND MANHOLE BASE SHALL BE CLASS "A" CONCRETE POURED IN PLACE.
5. INSTALL PRIVATE CONTROL MANHOLE FRAME AND COVER AS SHOWN ON DETAIL NO. 10 OF USD STANDARD SPECIFICATIONS.
6. ALL CONCRETE GRADE RINGS, CONES AND BARREL SECTIONS SHOWN ABOVE ARE PRECAST AS MANUFACTURED BY OLDCASTLE PRECAST, 3786 VALLEY AVE, PLEASANTON, CA 94566, OR AN APPROVED EQUAL.
7. FOR FLEXIBLE PIPE ONLY - AN APPROVED WATER STOP, SUCH AS BANDED RUBBER COUPLING, SHALL BE INSTALLED ON ALL FLEXIBLE PIPE ENTERING OR LEAVING A MANHOLE AND CENTERED UNDER THE MANHOLE WALL.
8. 1'-6" MAX FOR EXISTING MANHOLES.

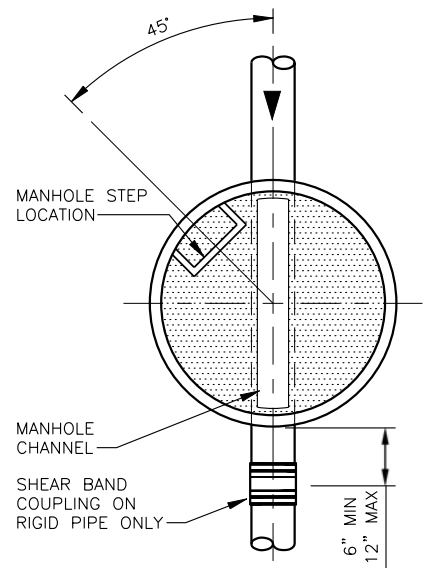
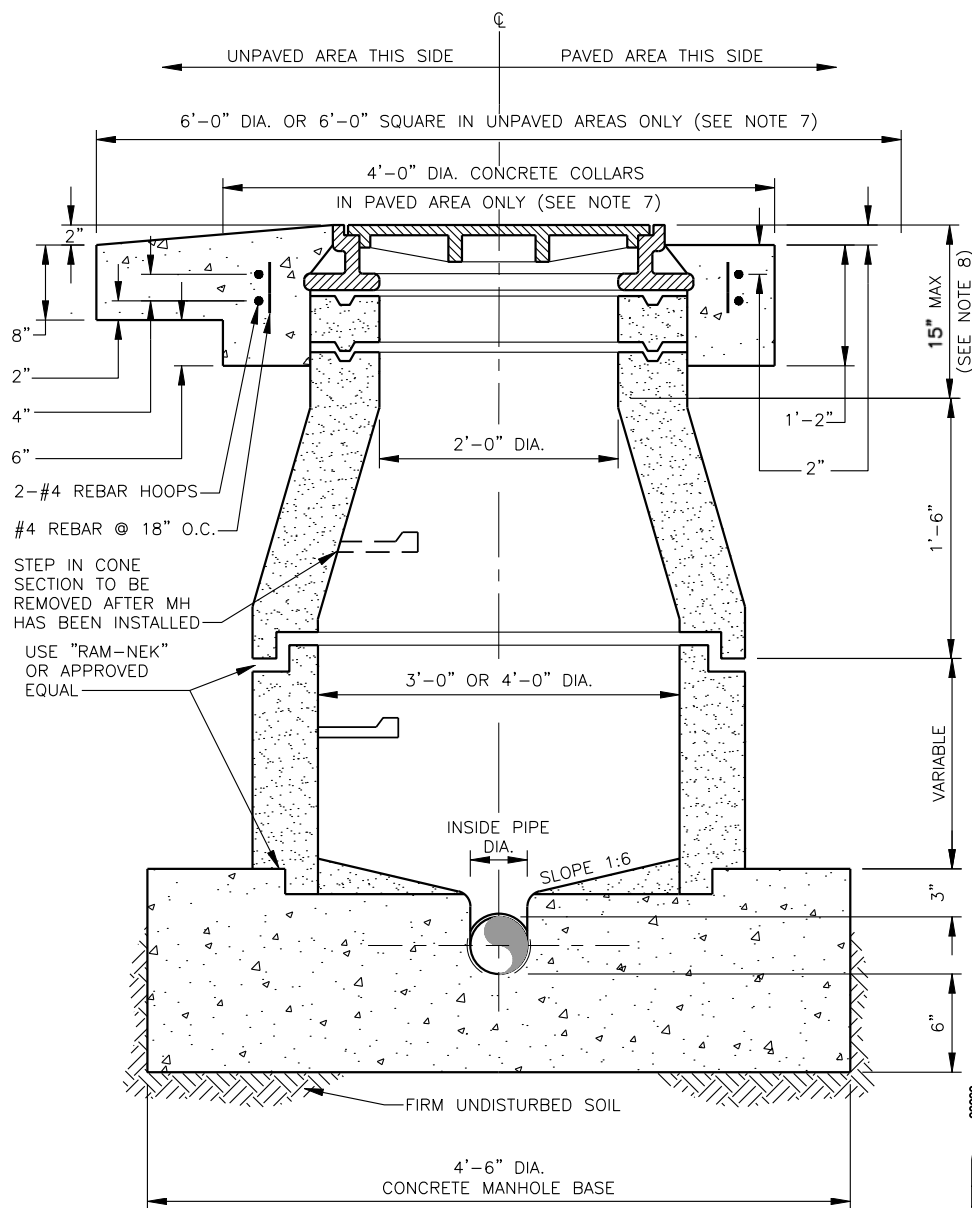
Date 3/15/17 (L) Detail No. 5

Approved By Paul R. Eldredge  
PAUL R. ELDRIDGE, RCE 60211



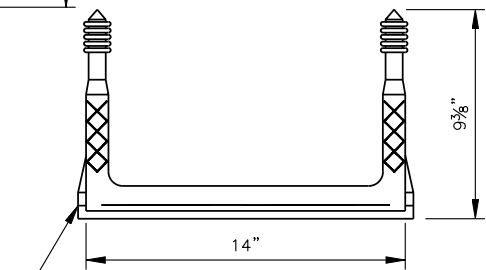
**UNION SANITARY DISTRICT**

**PRIVATE CONTROL MANHOLE  
TYPES "A" AND "B"**



**TYPICAL PLAN SECTION**

NOT TO SCALE



COPOLYMER POLYPROPYLENE PLASTIC WITH 1/2" DIAMETER GRADE 60 STEEL REINFORCED BAR

**MANHOLE STEPS**

**NOTES:**

1. INSTALL "RAM-NEK" OR APPROVED EQUAL BETWEEN EACH JOINT OF THE CONE AND BARREL SECTIONS TO MAKE A FLEXIBLE, WATER-TIGHT JOINT. AFTER JOINT IS MADE, TRIM JOINT SMOOTH ON THE INSIDE OF MANHOLE.
2. DO NOT INSTALL STEPS IN MANHOLE NECKS OR IN A MANHOLE THAT IS LESS THAN 4 (FOUR) FEET DEEP. IF MANHOLE IS GREATER THAN 4' DEEP, STEPS SHALL BE INSTALLED AND EQUALLY SPACED AT INTERVALS FROM 10"-15" APART AND ALIGNED VERTICALLY.
3. COLLAR AND MANHOLE BASE SHALL BE CLASS "A" CONCRETE POURED IN PLACE.
4. INSTALL PRIVATE CONTROL MANHOLE FRAME AND COVER AS SHOWN ON STANDARD DETAIL NO. 10.
5. ALL CONCRETE GRADE RINGS, CONES AND BARREL SECTIONS SHOWN ABOVE ARE PRE CAST AS MANUFACTURED BY OLDCASTLE PRECAST, 3786 VALLEY AVE, PLEASANTON, CA 94566, OR AN APPROVED EQUAL.
6. FLEXIBLE PIPE ONLY - AN APPROVED WATER STOP, SUCH AS BANDED RUBBER COUPLING, SHALL BE INSTALLED ON ALL FLEXIBLE PIPE ENTERING OR LEAVING A MANHOLE, AND CENTERED UNDER THE MANHOLE WALL.
7. CONCRETE COLLAR IN PAVED AREA SHALL BE 4'-0" DIAMETER AND IN UNPAVED AREA IT SHALL BE 6'-0" DIAMETER OR SQUARED.
8. 1'-6" MAX FOR EXISTING MANHOLES.

Date 3/15/17 (L) Detail No. 6

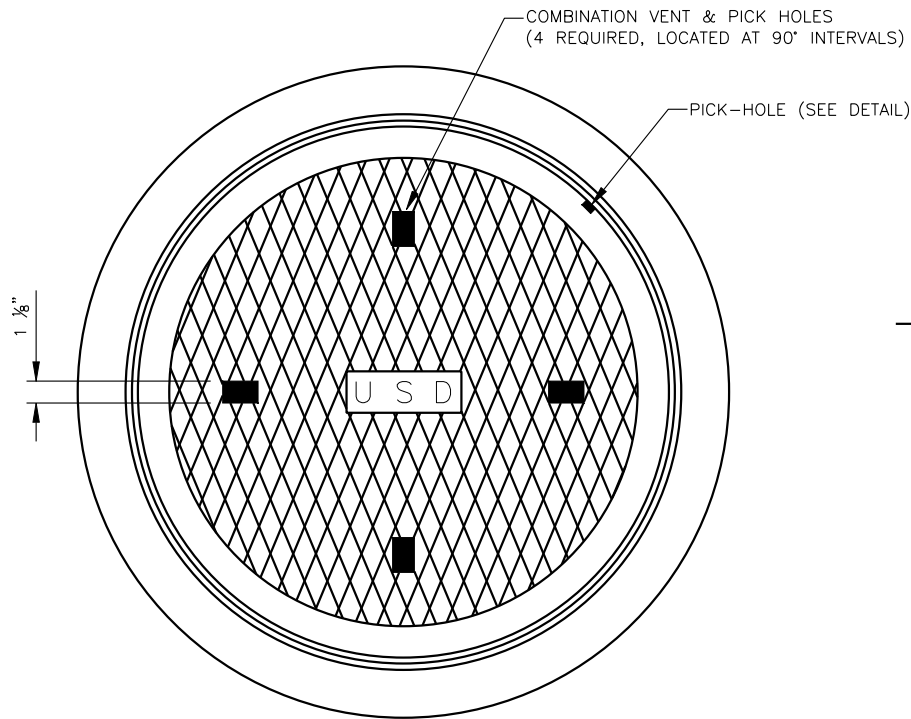
Approved By Paul Eldredge  
PAUL ELDREDGE, RCE 60211



UNION SANITARY DISTRICT

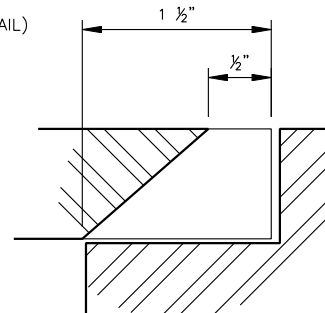
PRIVATE CONTROL MANHOLE  
TYPE "C"

6

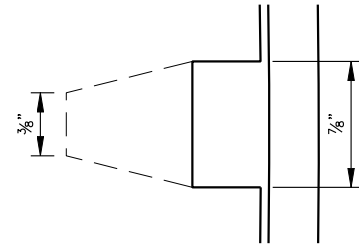


PLAN SECTION

NOT TO SCALE



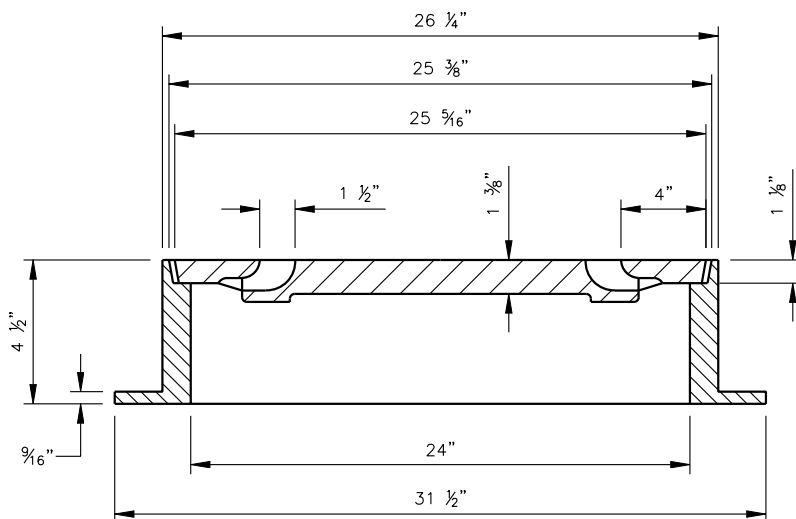
ELEVATION SECTION



PLAN SECTION

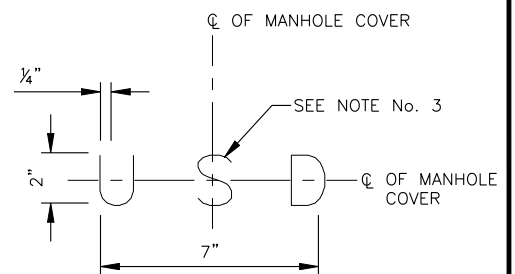
PICK HOLE DETAIL

NOT TO SCALE



ELEVATION SECTION

NOT TO SCALE



LETTERING DETAIL

NOTES:

1. MINOR MODIFICATIONS IN ABOVE DIMENSIONS AND MANUFACTURING CONFIGURATIONS ARE PERMISSIBLE SUBJECT TO DISTRICT APPROVAL.
2. CAST IRON FOR FRAME AND COVER SHALL BE CLASS 30 MINIMUM AS PER ASTM A-48.
3. RAISED LETTERS 1/4" HIGH TO BE CAST IN CENTER OF MANHOLE COVER.
4. BEFORE LEAVING THE FOUNDRY, THE FRAME AND COVER SHALL BE PAINTED OR DIPPED IN ASPHALT PAINT.
5. MANHOLE FRAME AND COVER SHALL BE AS MANUFACTURED BY SOUTH BAY FOUNDRY, 42 N. CLUFF AVE., LODI, CA 95240, OR APPROVED EQUAL.
6. FRAME AND COVER BEARING SURFACES SHALL BE MACHINED TO ASSURE CLOSE, QUIET FIT.
7. CONCRETE COLLAR IN PAVED AREA SHALL BE 4'-0" DIAMETER AND IN UNPAVED AREA IT SHALL BE 6'-0" DIAMETER OR SQUARED.

Date 3/15/17 (L) Detail No. 7

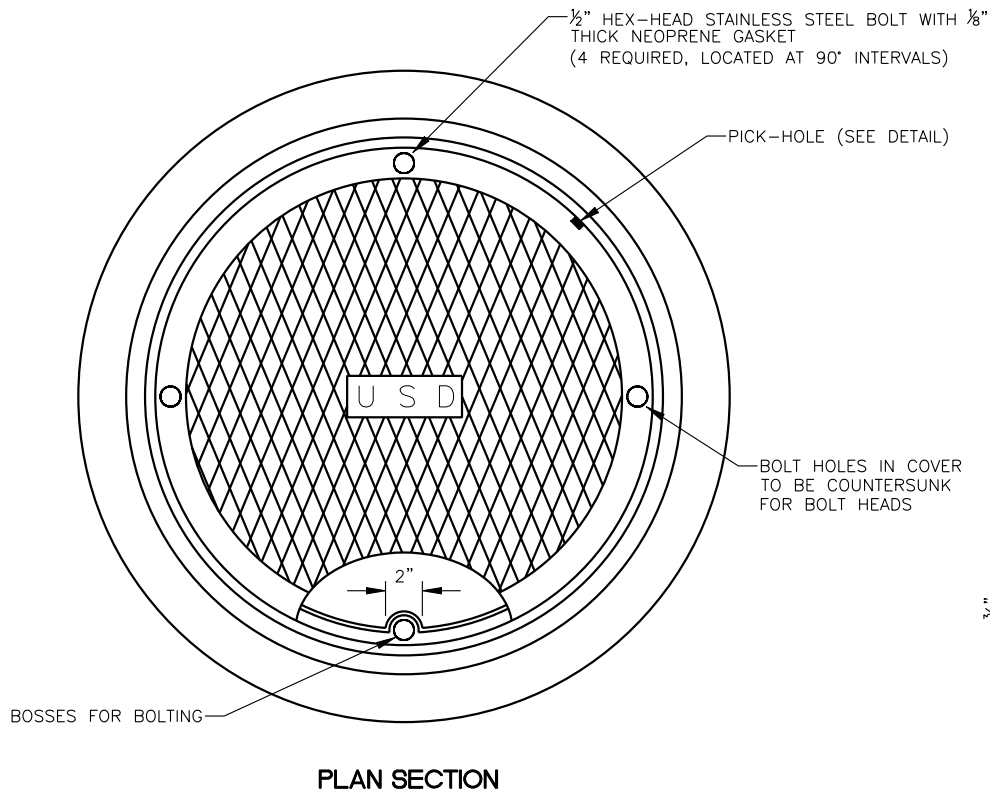
Approved By *Paul R. Eldredge*  
PAUL R. ELDREDGE, RCE 60211



USD

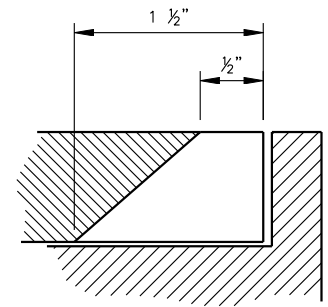
UNION SANITARY DISTRICT

MANHOLE FRAME AND COVER

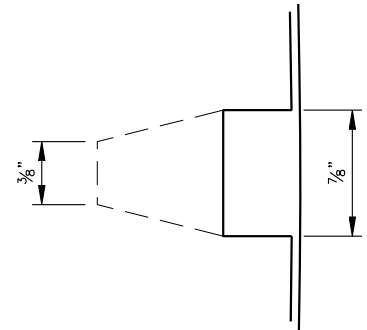


PLAN SECTION

NOT TO SCALE



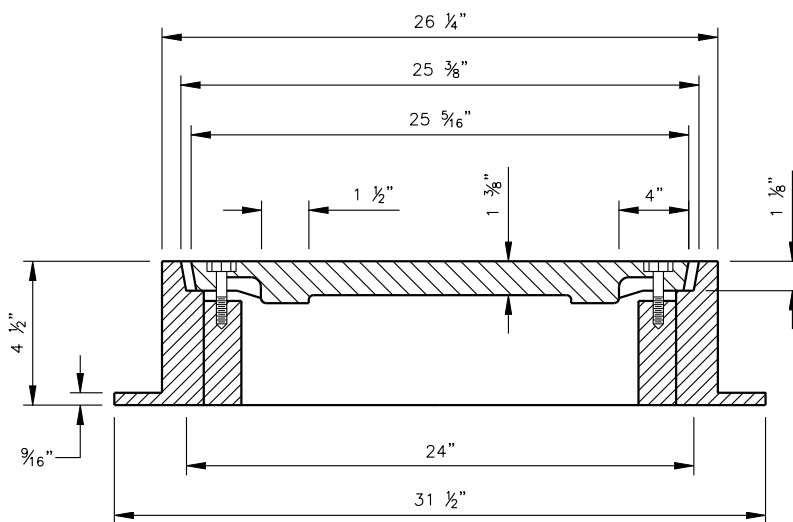
ELEVATION SECTION



PLAN SECTION

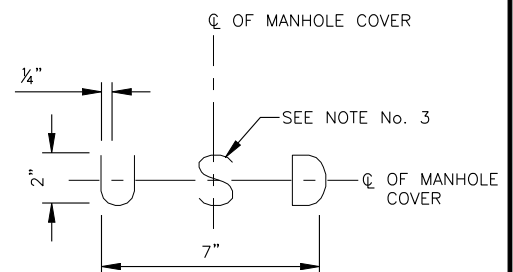
PICK HOLE DETAIL

NOT TO SCALE



ELEVATION SECTION

NOT TO SCALE



LETTERING DETAIL

NOTES:

1. MINOR MODIFICATIONS IN ABOVE DIMENSIONS AND MANUFACTURING CONFIGURATIONS ARE PERMISSIBLE SUBJECT TO DISTRICT APPROVAL.
2. CAST IRON FOR FRAME AND COVER SHALL BE CLASS 30 MINIMUM AS PER ASTM A-48.
3. RAISED LETTERS  $\frac{1}{4}$ " HIGH TO BE CAST IN CENTER OF MANHOLE COVER.
4. BEFORE LEAVING THE FOUNDRY, THE FRAME AND COVER SHALL BE PAINTED OR DIPPED IN ASPHALT PAINT.
5. MANHOLE FRAME AND COVER SHALL BE AS MANUFACTURED BY SOUTH BAY FOUNDRY, 42 N. CLUFF AVE., LODI, CA 95240, OR APPROVED EQUAL.
6. FRAME AND COVER BEARING SURFACES SHALL BE MACHINED TO ASSURE CLOSE, QUIET FIT.
7. CONCRETE COLLAR IN PAVED AREA SHALL BE 4'-0" DIAMETER AND IN UNPAVED AREA IT SHALL BE 6'-0" DIAMETER OR SQUARED.

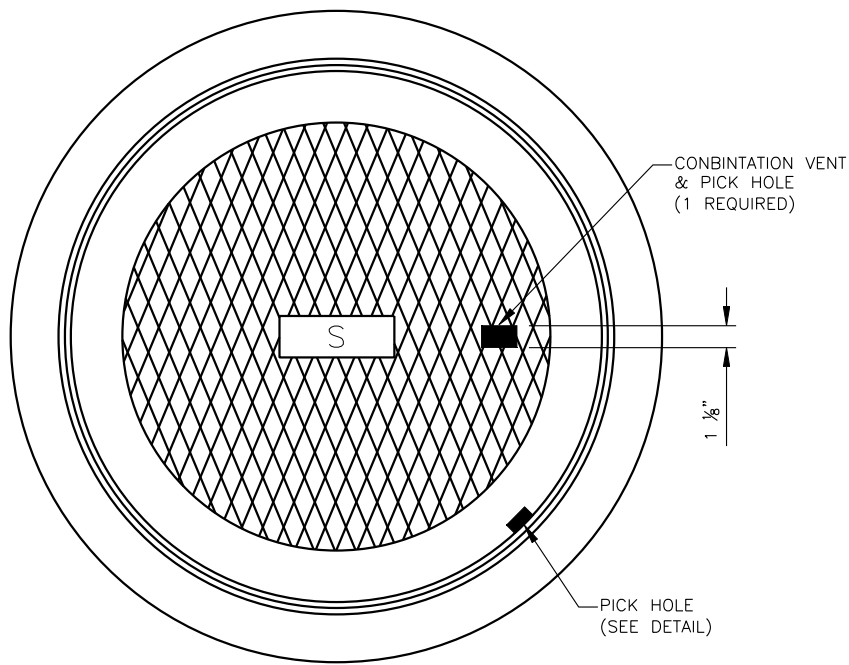
Date 3/15/17 (L) Detail No. 8

Approved By Paul R. Eldredge  
PAUL R. ELDRIDGE, RCE 60211



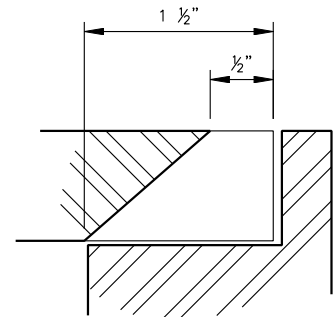
UNION SANITARY DISTRICT

BOLT-DOWN MANHOLE  
FRAME AND COVER

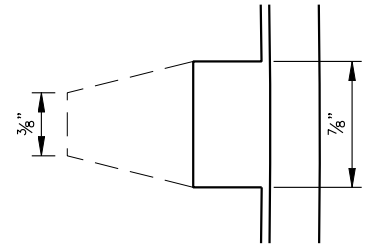


PLAN SECTION

NOT TO SCALE



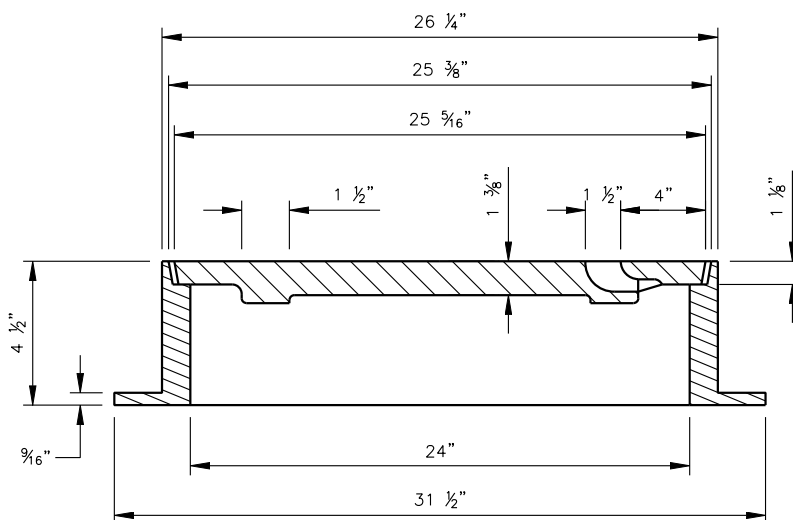
ELEVATION SECTION



PLAN SECTION

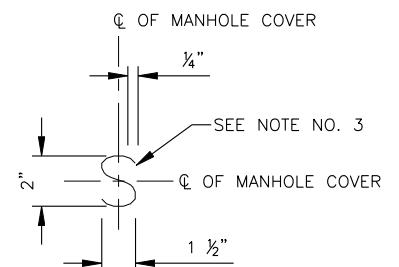
PICK HOLE DETAIL

NOT TO SCALE



ELEVATION SECTION

NOT TO SCALE



LETTERING DETAIL

NOTES:

1. MINOR MODIFICATIONS IN ABOVE DIMENSIONS AND MANUFACTURING CONFIGURATIONS ARE PERMISSIBLE SUBJECT TO DISTRICT APPROVAL.
2. CAST IRON FOR FRAME AND COVER SHALL BE CLASS 30 MINIMUM AS PER ASTM A-48.
3. RAISED LETTERS 1/4" HIGH TO BE CAST IN CENTER OF MANHOLE COVER.
4. BEFORE LEAVING THE FOUNDRY, THE FRAME AND COVER SHALL BE PAINTED OR DIPPED IN ASPHALT PAINT.
5. MANHOLE FRAME AND COVER SHALL BE AS MANUFACTURED BY SOUTH BAY FOUNDRY, 42 N. CLUFF AVE., LODI, CA 95240, OR APPROVED EQUAL.
6. FRAME AND COVER BEARING SURFACES SHALL BE MACHINED TO ASSURE CLOSE, QUIET FIT.
7. CONCRETE COLLAR IN PAVED AREA SHALL BE 4'-0" DIAMETER AND IN UNPAVED AREA IT SHALL BE 6'-0" DIAMETER OR SQUARED.

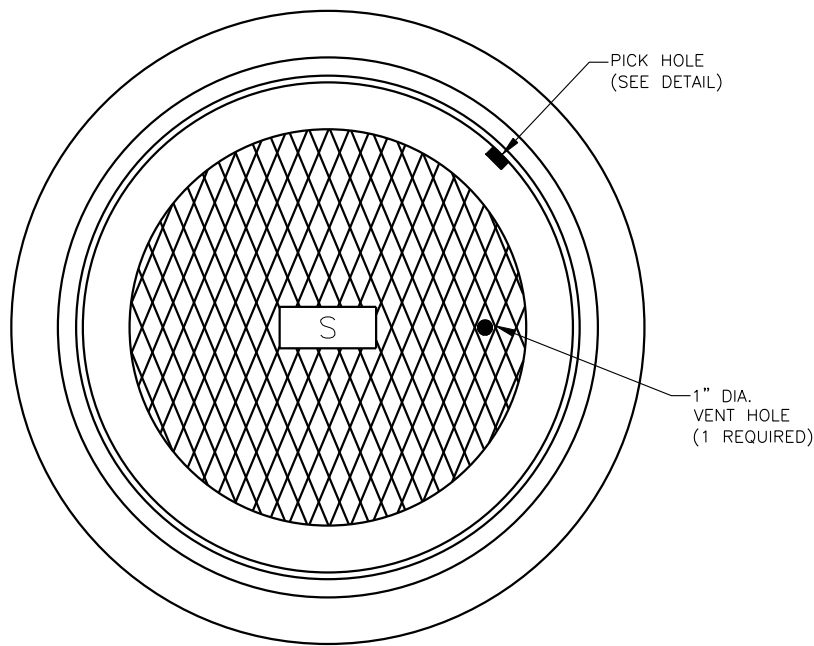
Date 3/15/17 (L) Detail No. 9

Approved By *Paul R. Eldredge*  
PAUL R. ELDREDGE, RCE 60211



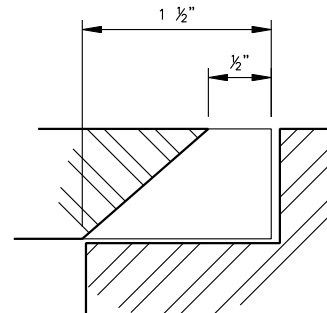
USD  
UNION SANITARY DISTRICT

PRIVATE MANHOLE  
FRAME AND COVER

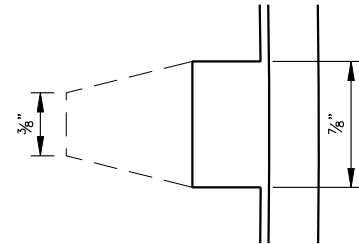


PLAN SECTION

NOT TO SCALE



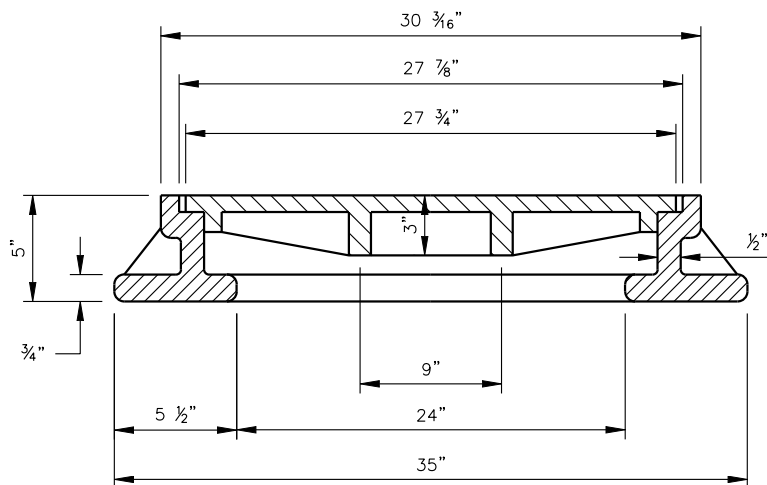
ELEVATION SECTION



PLAN SECTION

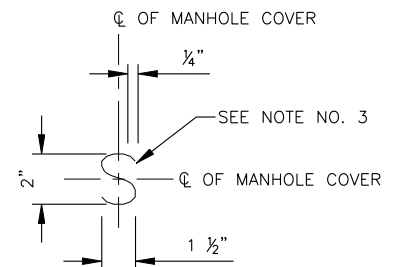
PICK HOLE DETAIL

NOT TO SCALE



ELEVATION SECTION

NOT TO SCALE



LETTERING DETAIL

NOTES:

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2. CAST IRON FOR FRAME AND COVER SHALL BE CLASS 30 MINIMUM AS PER ASTM A-48.
3. RAISED LETTERS 1/4" HIGH TO BE CAST IN CENTER OF MANHOLE COVER.
4. BEFORE LEAVING THE FOUNDRY, THE FRAME AND COVER SHALL BE PAINTED OR DIPPED IN ASPHALT PAINT.
5. MANHOLE FRAME AND COVER SHALL BE AS MANUFACTURED BY SOUTH BAY FOUNDRY, 42 N. CLUFF AVE., LODI, CA 95240, OR APPROVED EQUAL.
6. FRAME AND COVER BEARING SURFACES SHALL BE MACHINED TO ASSURE CLOSE, QUIET FIT.
7. CONCRETE COLLAR IN PAVED AREA SHALL BE 4'-0" DIAMETER AND IN UNPAVED AREA IT SHALL BE 6'-0" DIAMETER OR SQUARED.

Date 3/15/17 (L) Detail No. 10

Approved By Paul R. Eldredge  
PAUL R. ELDREDGE, RCE 60211



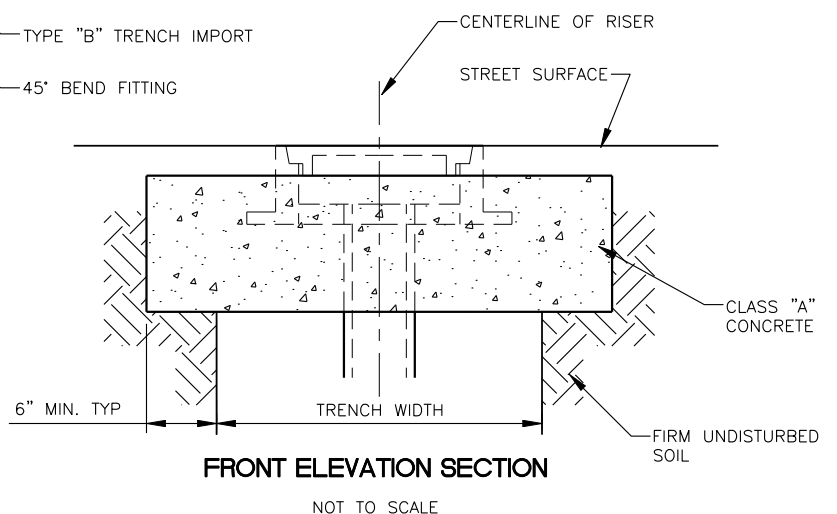
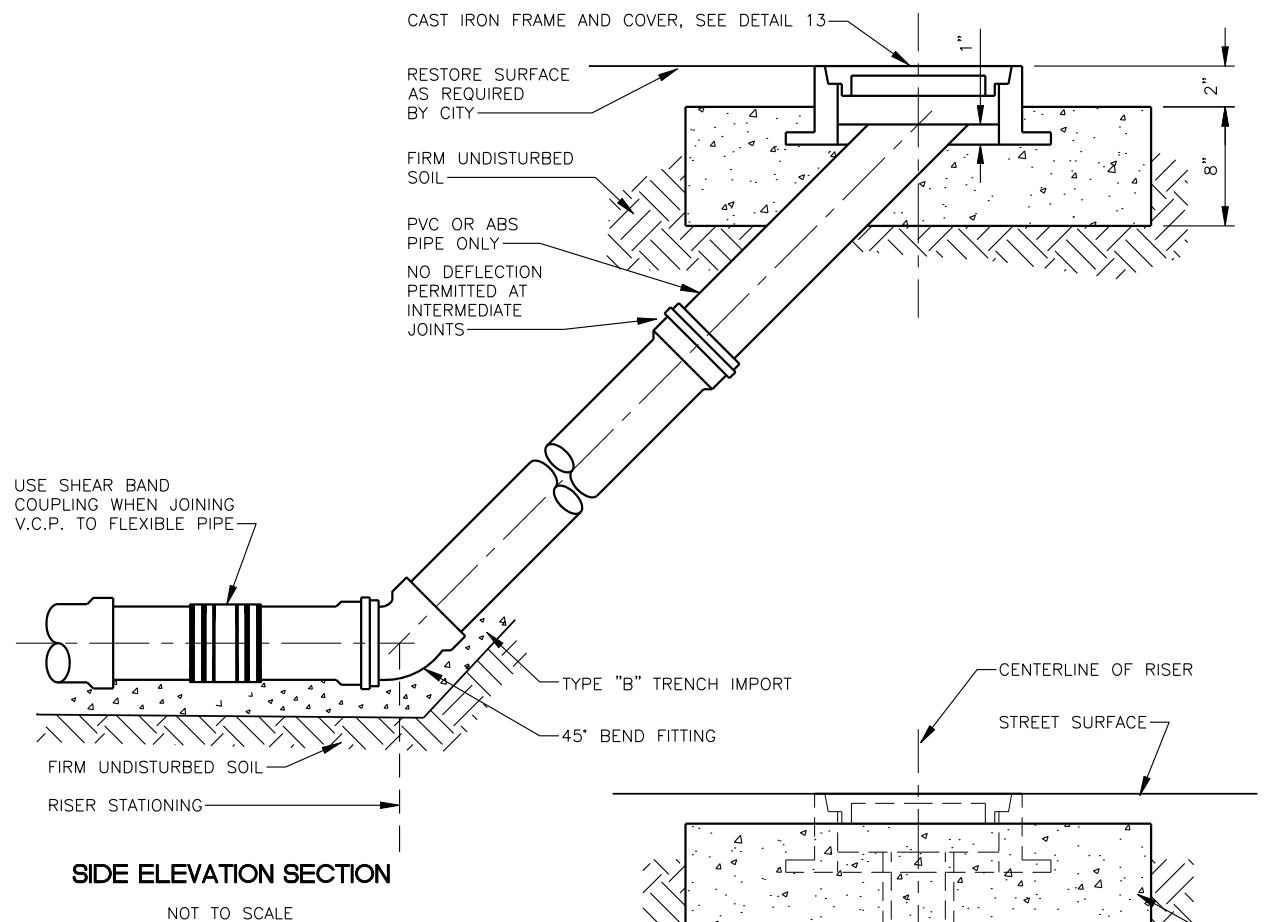
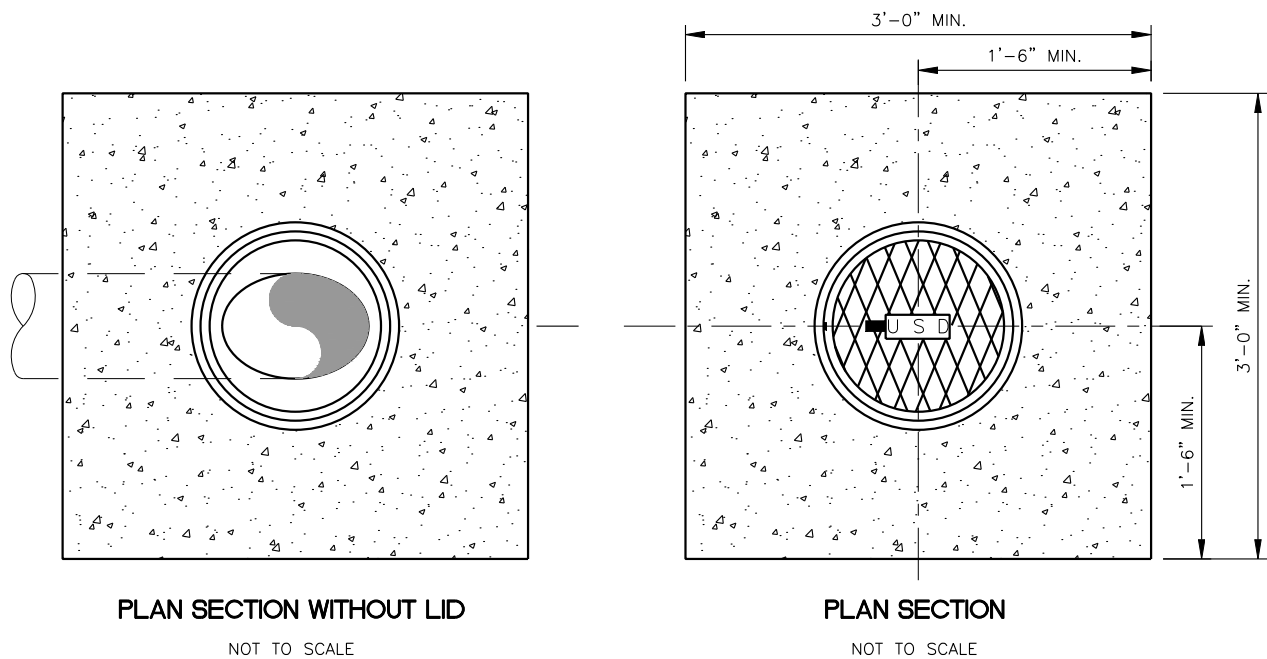
USD

UNION SANITARY DISTRICT

PRIVATE CONTROL MANHOLE  
FRAME AND COVER

10





- NOTES:
1. THIS DETAIL IS ONLY APPLICABLE FOR REPLACING EXISTING RISERS, IF APPROVED BY DISTRICT ENGINEER.
  2. THIS DETAIL IS NOT INTENDED TO BE USED FOR CONSTRUCTION OF NEW SEWER SYSTEMS.

Date 3/15/17 (L) Detail No. 12

Approved By Paul R. Eldredge  
PAUL R. ELDRIDGE, RCE 60211



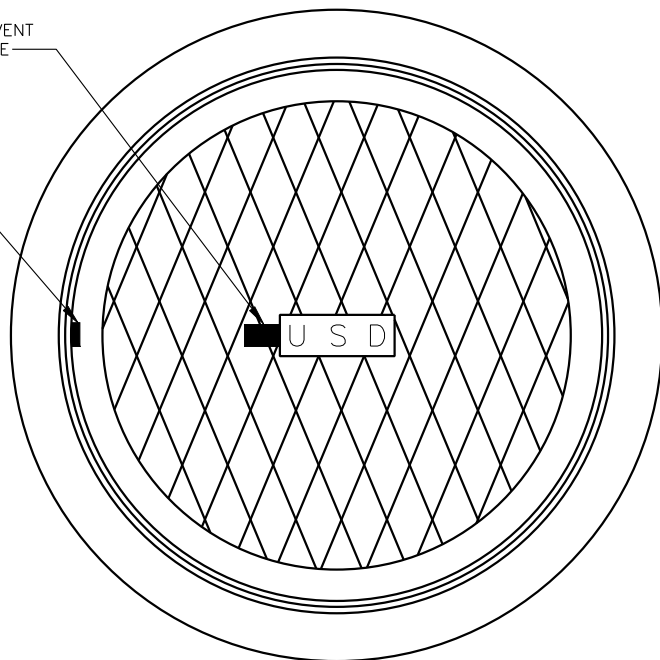
UNION SANITARY DISTRICT

RISER

12

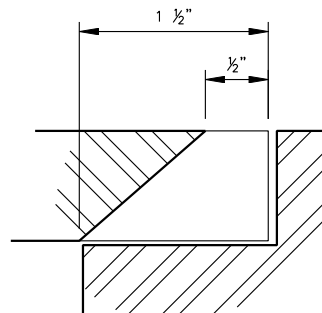
COMBINATION VENT  
AND PICK HOLE

PICK HOLE

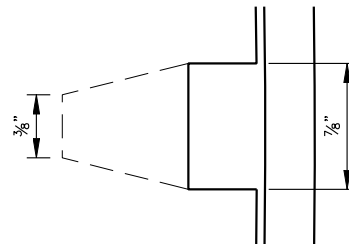


PLAN SECTION

NOT TO SCALE



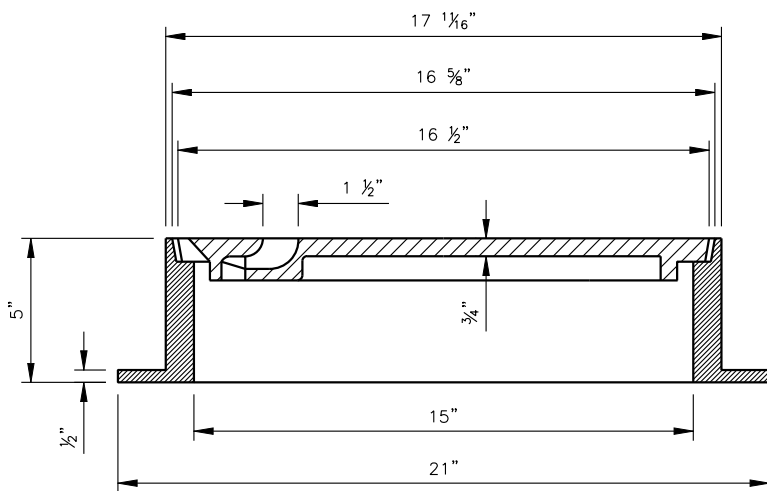
ELEVATION SECTION



PLAN SECTION

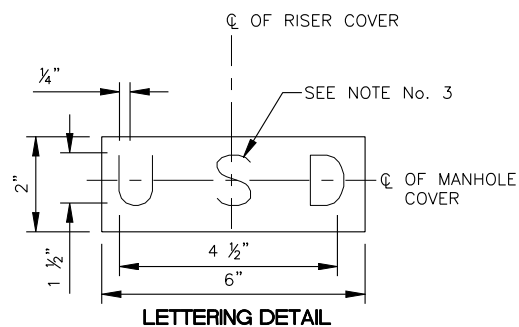
PICK HOLE DETAIL

NOT TO SCALE



ELEVATION SECTION

NOT TO SCALE



LETTERING DETAIL

NOTES:

1. MINOR MODIFICATIONS IN ABOVE DIMENSIONS AND MANUFACTURING CONFIGURATIONS ARE PERMISSIBLE SUBJECT TO DISTRICT APPROVAL.
2. CAST IRON FOR FRAME AND COVER SHALL BE CLASS 30 MINIMUM AS PER ASTM A-48.
3. RAISED LETTERS 1/4" HIGH TO BE CAST IN CENTER OF MANHOLE COVER.
4. BEFORE LEAVING THE FOUNDRY, THE FRAME AND COVER SHALL BE PAINTED OR DIPPED IN ASPHALT PAINT.
5. SEE UNION SANITARY DISTRICT STANDARD DETAIL NO. 12 FOR INSTALLATION REQUIREMENTS.
6. MANHOLE FRAME AND COVER SHALL BE AS MANUFACTURED BY SOUTH BAY FOUNDRY, 42 N. CLUFF AVE., LODI, CA 95240, OR APPROVED EQUAL.
7. FRAME AND COVER BEARING SURFACES SHALL BE MACHINED TO ASSURE CLOSE, QUIET FIT.

Date 3/15/17 (L) Detail No. 13

Approved By Paul R. Eldredge  
PAUL R. ELDREDGE, RCE 60211



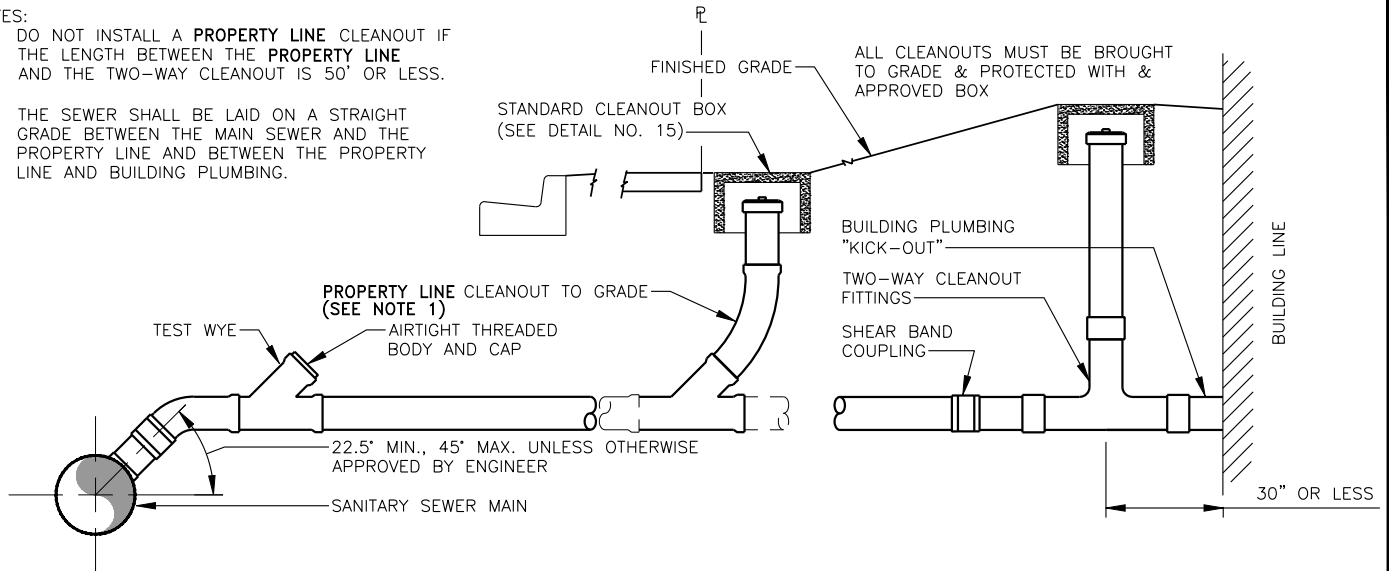
USD

UNION SANITARY DISTRICT

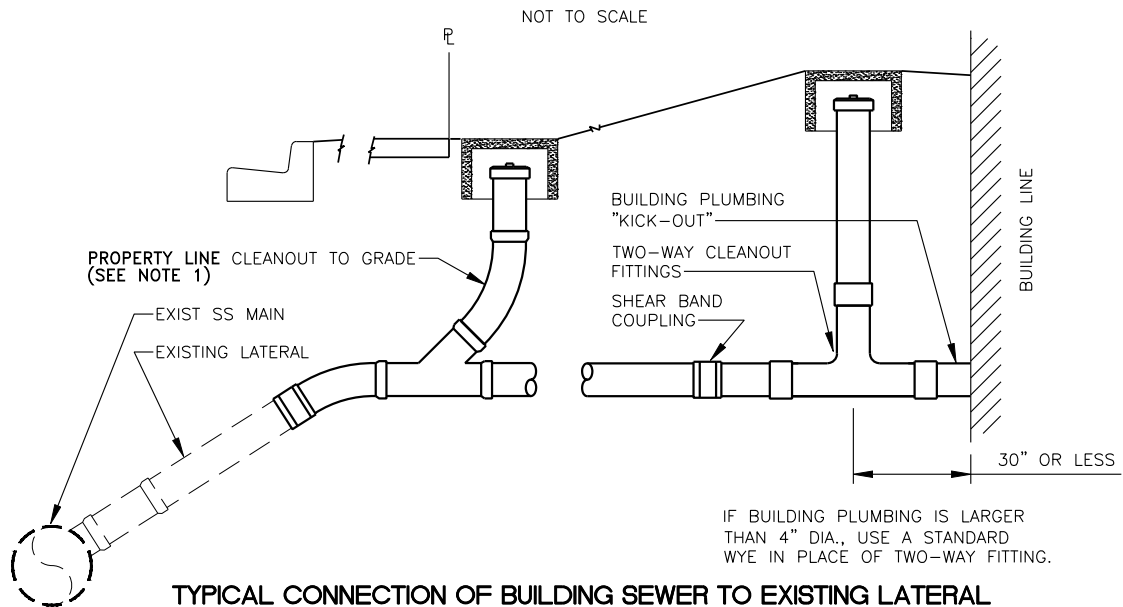
RISER FRAME AND COVER FOR  
6", 8" AND 10" DIAMETER PIPE

NOTES:

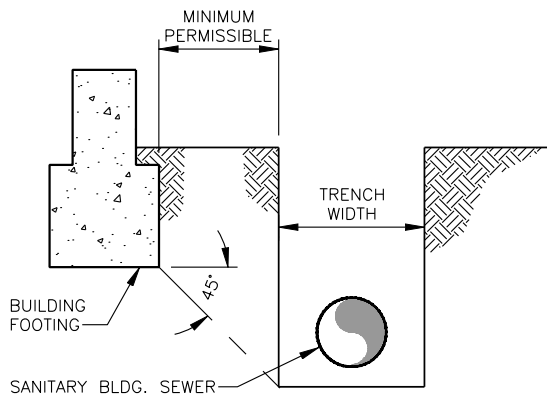
- DO NOT INSTALL A **PROPERTY LINE** CLEANOUT IF THE LENGTH BETWEEN THE **PROPERTY LINE** AND THE TWO-WAY CLEANOUT IS 50' OR LESS.
- THE SEWER SHALL BE LAID ON A STRAIGHT GRADE BETWEEN THE MAIN SEWER AND THE **PROPERTY LINE** AND BETWEEN THE **PROPERTY LINE** AND BUILDING PLUMBING.



TYPICAL CONNECTION OF BUILDING SEWER TO EXISTING MAIN SEWER

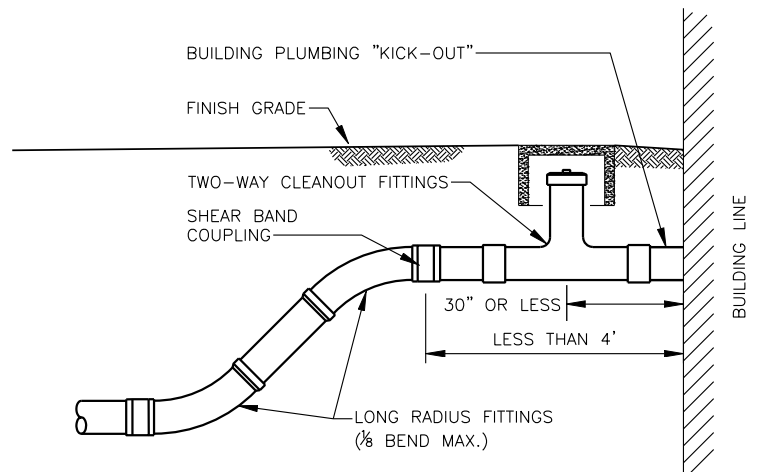


TYPICAL CONNECTION OF BUILDING SEWER TO EXISTING LATERAL



DETAIL - BUILDING SEWER ADJACENT TO BUILDING FOOTING

NOT TO SCALE



TYPICAL CONNECTION TO BUILDING SEWER FOR SHALLOW BUILDING PLUMBING "KICK-OUT"

NOT TO SCALE

Date 3/15/17 (L) Detail No. 14A

Approved By *Paul R. Eldredge*  
PAUL R. ELDRIDGE, RCE 60211



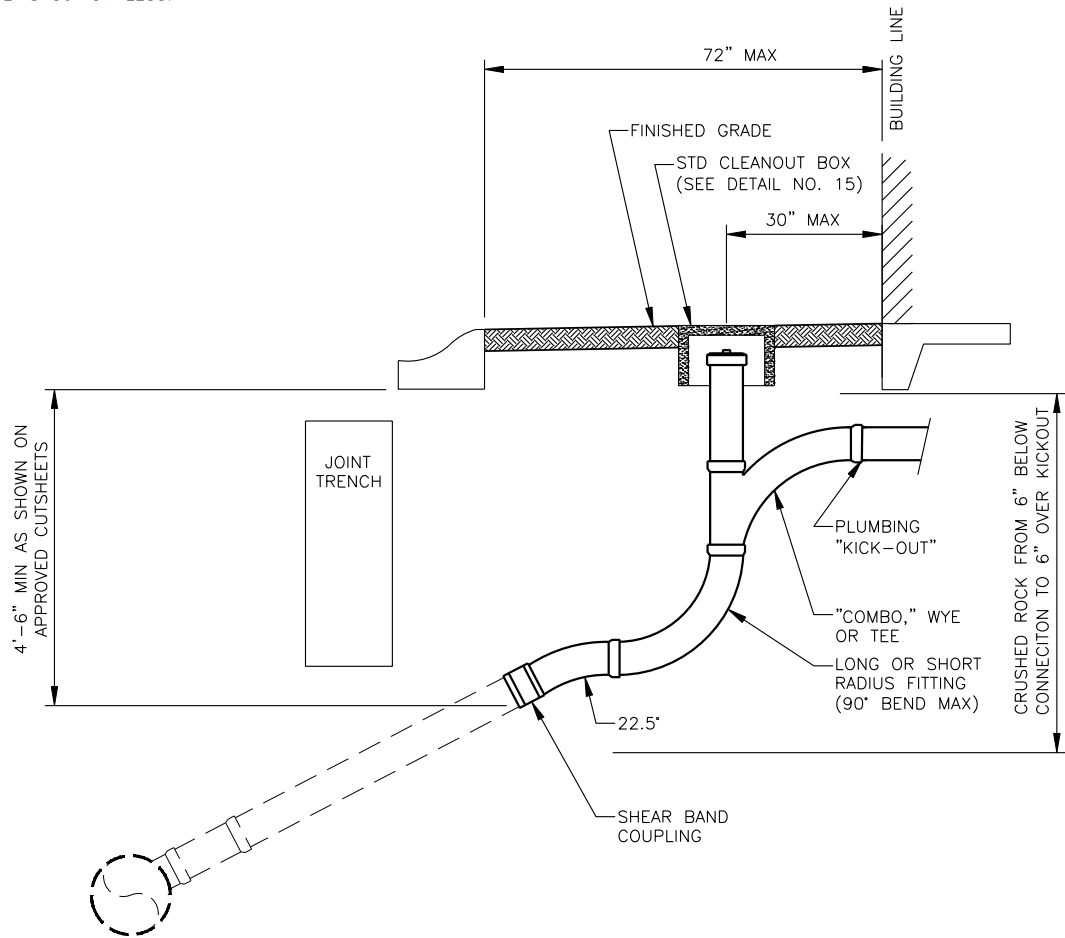
UNION SANITARY DISTRICT

BUILDING SEWER DETAILS

14A

NOTES:

1. THIS DETAIL MAY APPLY WHEN PROPERTY LINE IS 6' OR LESS FROM BUILDING AND THERE IS AN END RUN CLEANOUT IN THE BUILDING PLUMBING.
2. THE SEWER SHALL BE LAID ON A STRAIGHT GRADE BETWEEN THE MAIN SEWER AND THE PROPERTY LINE.
3. DO NOT INSTALL A PROPERTY LINE CLEANOUT IF THE LENGTH BETWEEN THE PROPERTY LINE AND THE COMBO WYE IS 50' OR LESS.



**BUILDING SEWER CONNECTION  
FOR ZERO LOT LINE BUILDING PLUMBING "KICK-OUT"**

NOT TO SCALE

Date 3/15/17 (L) Detail No. 14B

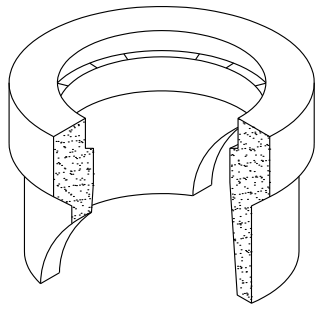
Approved By Paul R. Eldredge  
PAUL R. ELDREDGE, RCE 60211



**USD**  
UNION SANITARY DISTRICT

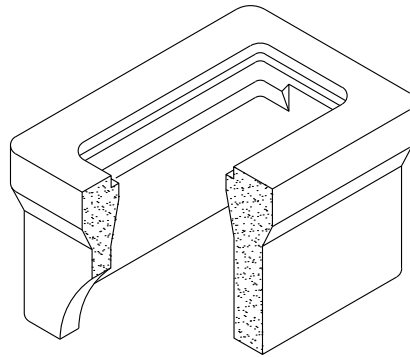
**BUILDING SEWER DETAILS  
ZERO LOT LINE CONNECTION**

**14B**



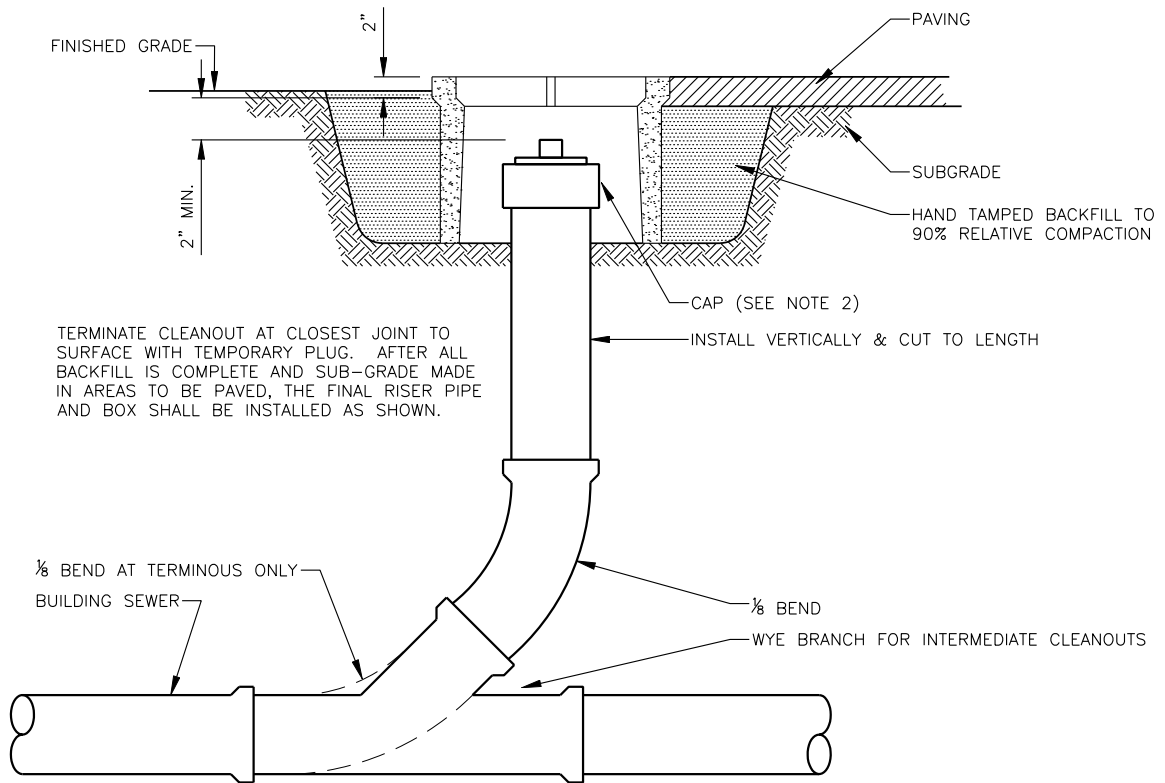
**CIRCULAR CONCRETE BOX**

NOT TO SCALE



**RECTANGULAR CONCRETE BOX**

NOT TO SCALE



**ELEVATION**

NOT TO SCALE

**NOTES:**

1. RECTANGULAR OR CIRCULAR BOXES ARE PERMITTED.
2. CLEANOUT CAPS SHALL CONSIST OF AN AIRTIGHT THREADED BODY AND CAP.
3. CIRCULAR BOXES INSTALLED IN SIDEWALK AND WALKWAY AREAS SHALL HAVE A SOLID METAL COVER WITHOUT HOLES.
4. **APPROVED BOXES ARE:**
  - a) RESIDENTIAL DRIVEWAYS, SIDEWALKS/WALKWAYS: F08 WITH F08C (CAST IRON) LID, B03 WITH B03C (CAST IRON) LID, OR B12 WITH B12C (CAST IRON) LID.
  - b) COMMERCIAL/INDUSTRIAL & TRAFFIC AREAS (H20): G05T WITH G05TC (CAST IRON) LID, OR B1017 WITH B017-51JH STEEL LID.
5. CONCRETE LIDS ARE ACCEPTABLE FOR USE IN LANDSCAPE AREAS, WHILE METAL LIDS MUST BE USED ELSEWHERE.
6. ALL CLEANOUT BOX LIDS SHALL BE MARKED WITH A LETTER "S" OR THE WORD "SEWER".

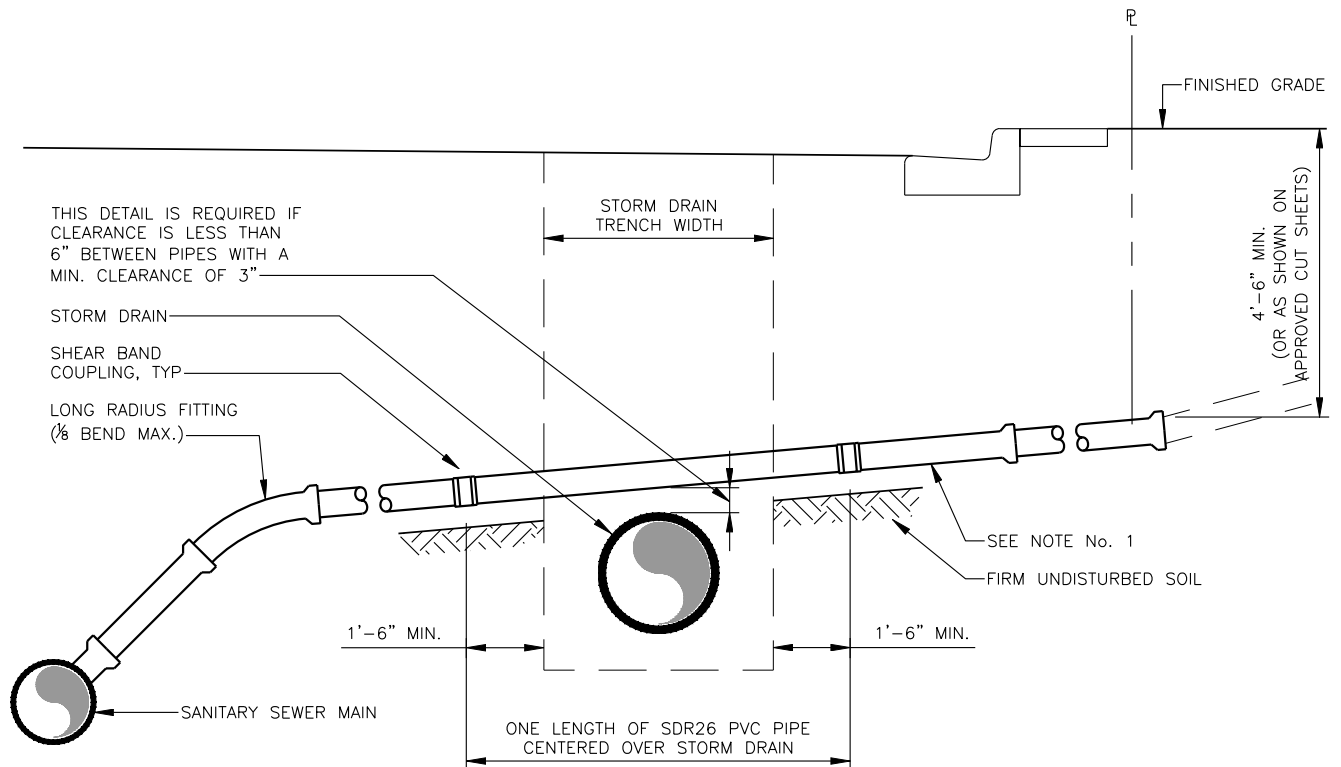
Date 3/15/17 (L) Detail No. 15

Approved By Paul R. Eldredge  
PAUL R. ELDREDGE, RCE 60211



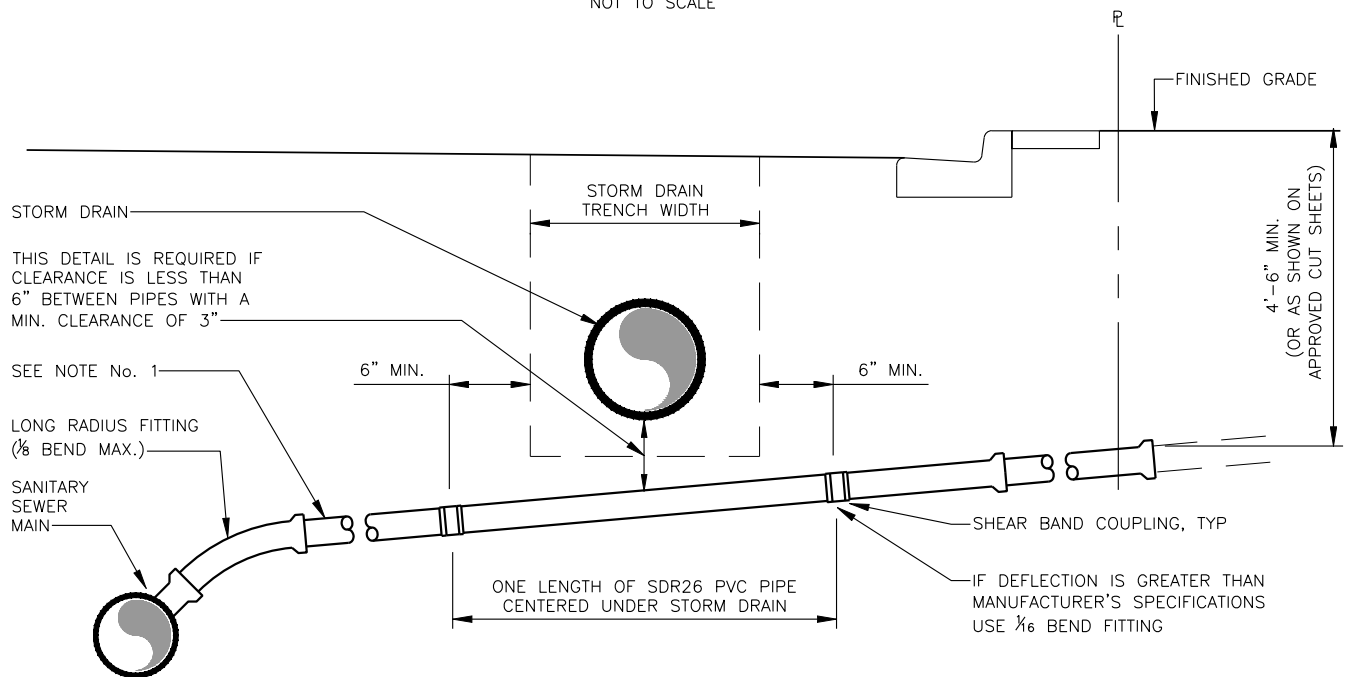
**USD**  
**UNION SANITARY DISTRICT**

**STANDARD BUILDING SEWER  
CLEANOUT TO GRADE**



### TYPICAL CROSSING OVER STORM DRAIN

NOT TO SCALE



### TYPICAL CROSSING UNDER STORM DRAIN

NOT TO SCALE

#### NOTES:

1. THE ABOVE DETAILS ARE TYPICAL FOR MAIN AND BUILDING SEWER WHEN VCP PIPE MATERIAL IS USED.
2. THIS TYPE OF CROSSING MAY BE REQUIRED BY UNION SANITARY DISTRICT WHEN CROSSING CERTAIN OTHER UTILITIES.
3. THE BOTTOM DETAIL IS TYPICAL FOR MAIN AND BUILDING SEWER WHEN PVC PIPE IS USED UNDER STORM SEWER PIPE 48 INCHES IN DIAMETER OR LARGER.

Date 3/15/17 (L) Detail No. 16

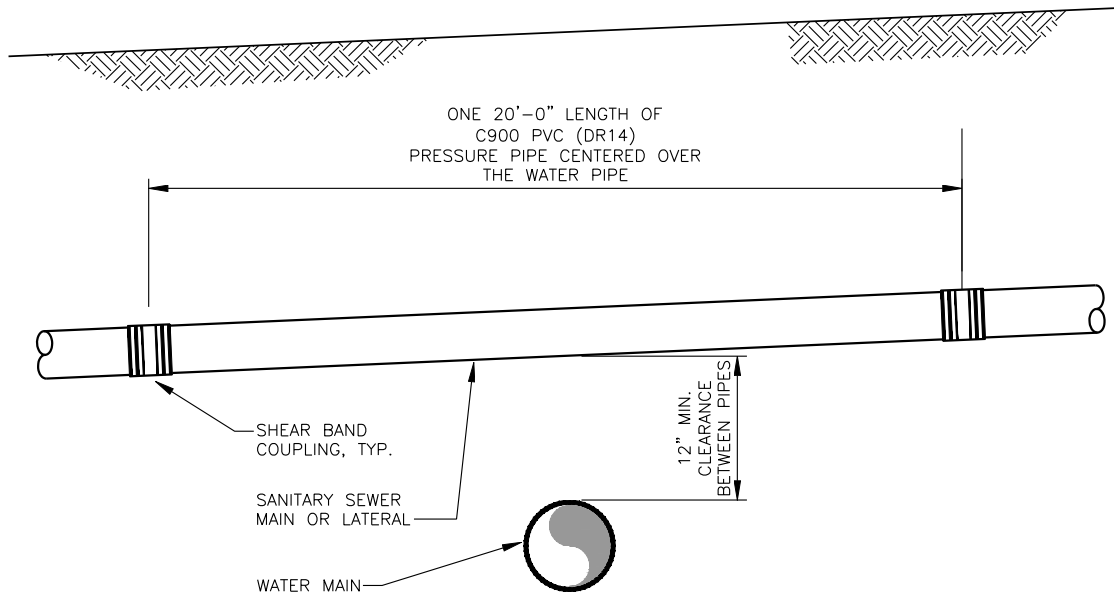
Approved By Paul R. Eldredge  
PAUL R. ELDRIDGE, RCE 60211



UNION SANITARY DISTRICT

SANITARY SEWER/STORM  
DRAIN CROSSING

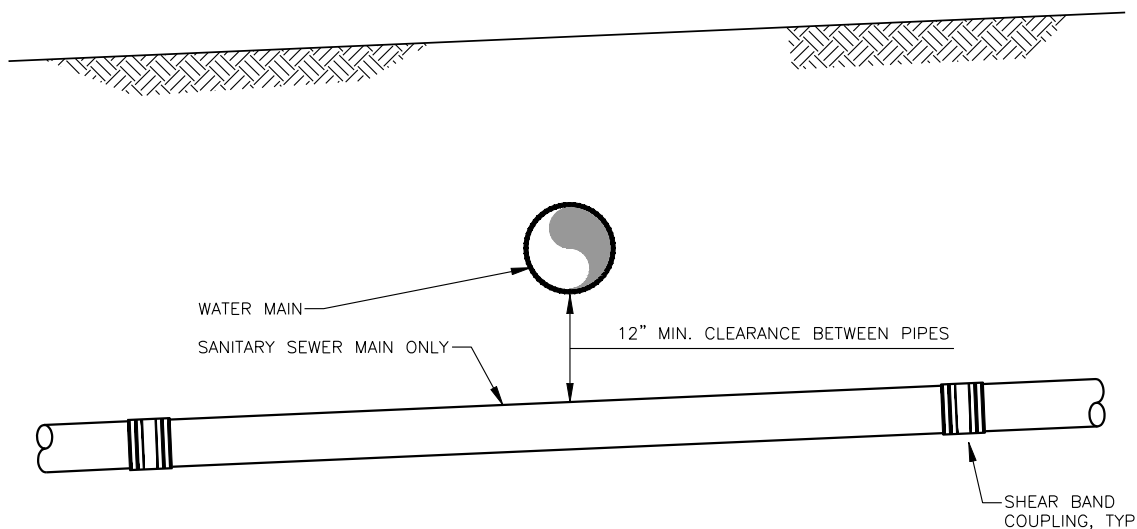
16



### TYPICAL CROSSING OVER WATER MAIN

NOT TO SCALE

NOTE: REQUIRED WHENEVER A SANITARY SEWER MAIN OR LATERAL CROSSES OVER A WATER MAIN



### TYPICAL CROSSING UNDER WATER MAIN

NOT TO SCALE

Date 3/15/17 (L) Detail No. 17

Approved By Paul R. Eldredge  
PAUL R. ELDREDGE, RCE 60211



USD

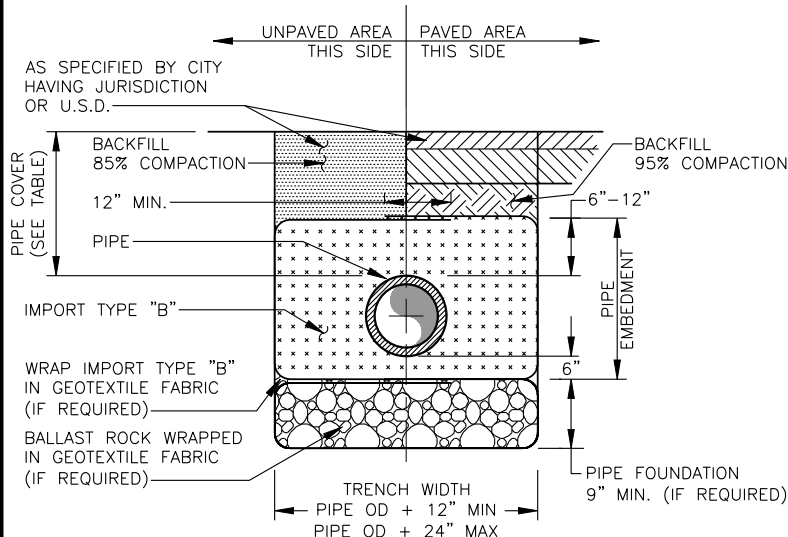
UNION SANITARY DISTRICT

SANITARY SEWER/WATER  
MAIN CROSSING

PIPE COVER LIMITATION TABLE				
PIPE SPECIFICATION – SEE SEC. 5			COVER IN FEET MIN – MAX**	
MATERIAL	TYPE AND MINIMUM CLASS		DETAIL A	DETAIL B
<b><u>BUILDING SEWERS</u></b> FROM PROPERTY LINE TO BUILDING IN UNPAVED PRIVATE PROPERTY				
4"–6"	VCP***		–	2.0 – 30
4"–6"	ABS	SOLID WALL	–	2.0 – 30
4"–6"	DIP	DUCTILE (CLASS 50 & 51)	–	0.5 – 30
4"–6"	PVC	SOLID WALL (C900–16 DR18)	–	1.0 – 30
4"–6"	PVC	SOLID WALL (CLASS SDR26)	–	2.0 – 30
4"–6"	HDPE	SOLID WALL (CLASS SDR17)	–	1.0 – 30
<b><u>BUILDING SEWERS</u></b> IN PUBLIC UTILITY & U.S.D. EASEMENTS, PUBLIC RIGHTS OF WAY & PAVED PRIVATE PROPERTY				
4"–6"	VCP***		3.0 – 19	–
4"–6"	DIP	DUCTILE (CLASS 50 & 51)	0.5 – 30	–
4"–6"	ABS	SOLID WALL	3.0 – 30	–
4"–6"	PVC	SOLID WALL (CLASS SDR26)	3.0 – 30	–
4"–6"	PVC	SOLID WALL (C900–16 DR14)	1.0 – 30	–
4"–6"	HDPE	SOLID WALL (CLASS SDR17)	1.0 – 30	–
<b><u>MAIN SEWERS</u></b> IN PUBLIC UTILITY & U.S.D. EASEMENTS, PUBLIC RIGHTS OF WAY & PAVED PRIVATE PROPERTY				
8"–Larger VCP***			3.0 – 14	–
8"–Larger DIP		DUCTILE (CLASS 50 & 51)	0.5 – 30	–
8"–Larger PVC		SOLID WALL (CLASS SDR26)	3.0 – 30	–
8"–Larger PVC		SOLID WALL (C900–16 DR14)	1.0 – 30	–

\*\*WHEN MAXIMUM COVER IS EXCEEDED, APPROVAL BY U.S.D. OF SPECIAL BEDDING REQUIREMENTS IS NECESSARY.  
\*\*\*ONLY ALLOWED WITH SPECIAL PERMISSION FROM DISTRICT ENGINEER.

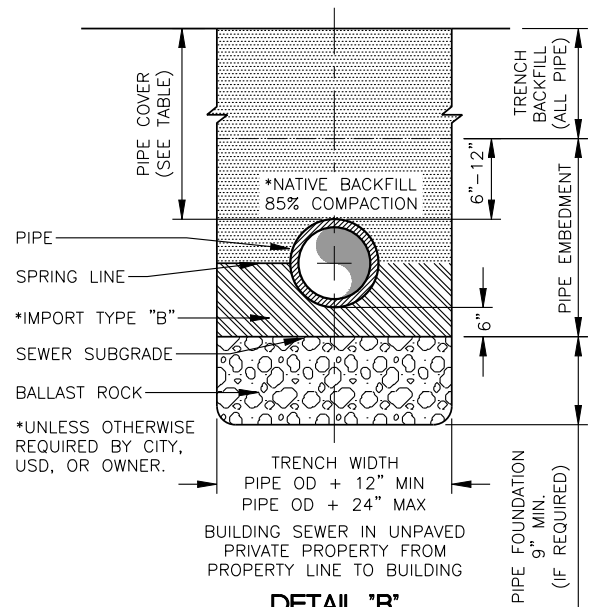
MINIMUM SIZE AND SLOPE LIMITATION TABLE			
SPECIFICATION – SEE SEC. 21 & 22			
PIPE DIAMETER	MINIMUM SLOPE (FT. PER FT.)	COMMENTS	MAXIMUM FIXTURE UNITS
<b>BUILDING SEWER</b> FROM SEWER MAIN TO BUILDING			
4"	0.020	IF MAIN IS NOT OF ADEQUATE DEPTH 0.01 FT/FT IS MINIMUM.	200
6"	0.005		600
6"	0.006		700
6"	0.007		800
6"	0.008		900
6"	0.009		1000
6"	0.010		1200
<b>MAIN SEWERS</b>			
8"	0.0034		—
10"	0.0026		—
12"	0.0020		—
15"	0.0015		—
18"	0.0012		—



MAIN & BUILDING SEWERS IN  
PUBLIC UTILITY & USD  
EASEMENTS, PUBLIC RIGHTS  
OF WAY & PAVED PRIVATE  
PROPERTY

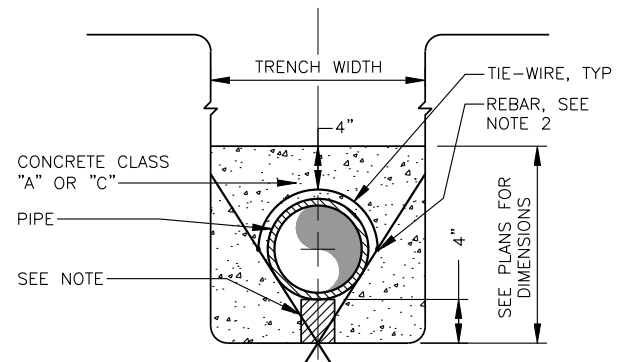
### DETAIL 'A'

NOT TO SCALE



### DETAIL 'B'

NOT TO SCALE



### CONCRETE ENCASUREMENT DETAIL

NOT TO SCALE

NOTES:

1. CONCRETE BLOCK OR BRICK ON FIRM UNDISTURBED GROUND BEFORE CONCRETE ENCASUREMENT IS POURED.
2. INSTALL REBAR AS NECESSARY TO PREVENT PIPE FLOTATION DURING CONCRETE POUR.

Date 3/15/17 (L) Detail No. 18A

Approved By *Paul R. Eldredge*  
PAUL R. ELDRIDGE, RCE 60211



UNION SANITARY DISTRICT

SEWER PIPE INSTALLATION (COVER,  
SLOPE, SPECIAL BEDDING AND  
ENCASUREMENT REQUIREMENTS)

18A

## PIPE FOUNDATION (IF REQUIRED BY ENGINEER)

### ROCK BALLAST:

ROCK BALLAST SHALL BE 1-½" BY ¾" GRAVEL CONFORMING TO THE FOLLOWING GRADATIONS:

SIEVE SIZE	PERCENT PASSING (BY WEIGHT)
2"	100
1-½"	95-100
¾"	5-30
⅜"	5-20
NO. 200	0-4

## PIPE EMBEDMENT MATERIAL

### IMPORT "TYPE A":

SHALL BE CREEK OR BANK GRAVEL, CRUSHED GRAVEL, CRUSHED ROCK, BANK RUN ROCK OR A MIXTURE OF THESE MATERIALS. RECLAIMED OR RECYCLED MATERIALS ARE NOT ACCEPTABLE.

THE MATERIAL SHALL BE FREE FROM ROOTS, VEGETABLE MATTER, OR OTHER DELETERIOUS SUBSTANCE AND SHALL BE OF SUCH NATURE AND SO GRADED THAT IT WILL BIND READILY WHEN WATERED AND COMPACTED TO THE REQUIREMENT SPECIFIED HEREIN.

THE MATERIAL SHALL BE OF SUCH SIZE THAT THE PERCENTAGE COMPOSITION BY WEIGHT, AS DETERMINED BY LABORATORY SIEVES, WILL CONFORM TO THE FOLLOWING GRADATIONS:

SIEVE SIZE	PERCENT PASSING (BY WEIGHT)
1"	100
¾"	90-100
NO. 4	35-100
NO. 30	10-30
NO. 200	2-9

THE MATERIAL SHALL ALSO HAVE A MINIMUM SAND EQUIVALENT OF 22 AND A MINIMUM RESISTENCE (R) VALUE OF 78.

### IMPORT "TYPE B":

"TYPE B" IMPORT SHALL BE WASHED CRUSHED ROCK (CHIPS). THIS MATERIAL SHALL CONTAIN AT LEAST 75% OF THE PARTICLES HAVING ONE OR MORE FRACTURED FACES. NOT OVER 25% SHALL BE PIECES THAT SHOW NO SUCH FACES RESULTING FROM CRUSHING. ROCK WILL BE DESIGNATED BY NORMAL SIZE. RECLAIMED OR RECYCLED MATERIALS ARE NOT ACCEPTABLE.

THE MATERIAL SHALL BE OF SUCH SIZE THAT THE PERCENTAGE COMPOSITION BY WEIGHT, AS DETERMINED BY LABORATORY SIEVES WILL CONFORM TO THE FOLLOWING GRADATIONS:

SIEVE SIZE	PERCENT PASSING (BY WEIGHT)
1"	100
¾"	90-100
NO. 4	0-15
NO. 200	0-4

### TRENCH EXCAVATION MATERIAL:

ACCEPTABLE TRENCH EXCAVATION MATERIAL SHALL BE THAT MATERIAL WHICH IS FREE FROM VEGETABLE MATTER AND REFUSE AND SHALL CONTAIN NO CONCRETE, STONES OR CLODS LARGER THAN ¾" IN DIAMETER AND SHALL CONTAIN SUFFICIENT FINES SO THAT ALL VOIDS WILL BE FILLED WHEN COMPACTED.

Date 3/15/17 (L) Detail No. 18B

Approved By Paul R. Eldredge  
PAUL R. ELDREDGE, RCE 60211



USD

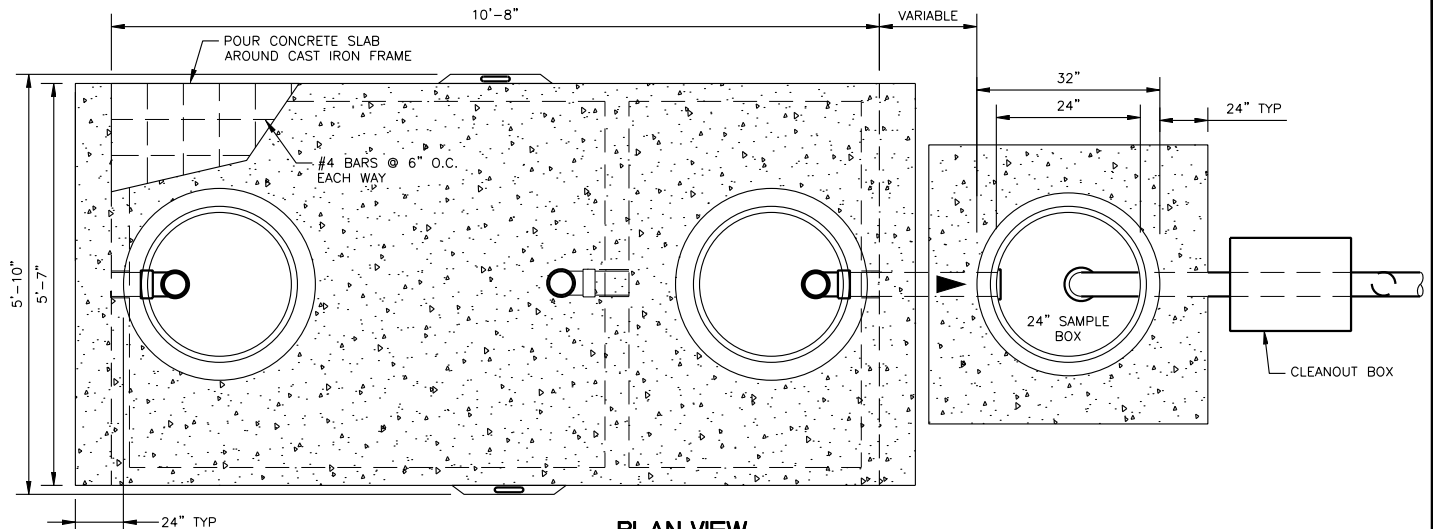
UNION SANITARY DISTRICT

SEWER PIPE INSTALLATION  
(TRENCH BACKFILL MATERIALS)

18B

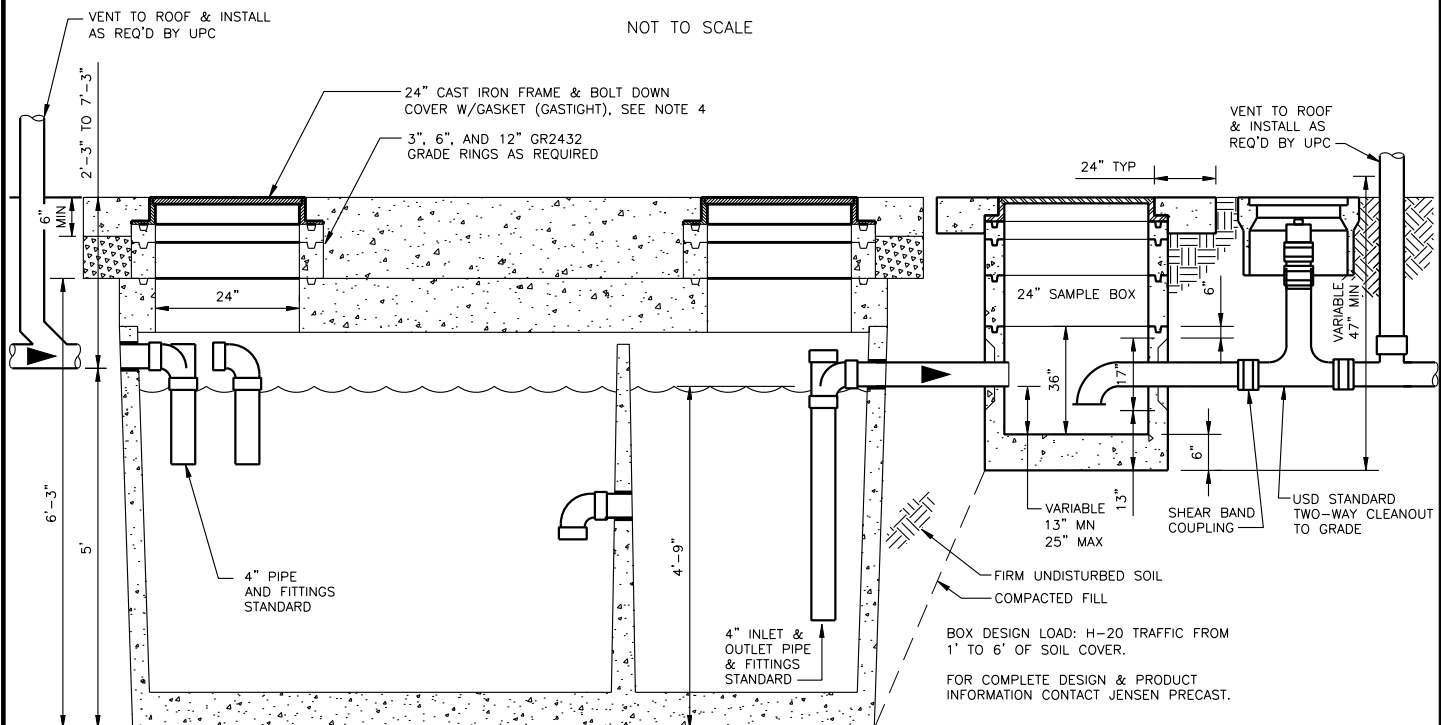
# NOTE TO ENGINEER OR ARCHITECT

PROVIDE 3" ELEVATION DROP BETWEEN INLET AND OUTLET PIPES THROUGH BOX. SHOW PIPE INVERT ELEVATIONS AT INLET AND OUTLET ON PLAN.



PLAN VIEW

NOT TO SCALE

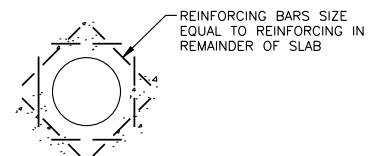


ELEVATION SECTION

NOT TO SCALE

## NOTES:

1. DIMENSION AS SHOWN UNLESS OTHERWISE SPECIFIED BY USD.
2. JENSEN 1500 PRECAST BOXES AS MANUFACTURED BY JENSEN PRECAST OR AN APPROVED EQUAL.
3. ALL CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 3000 PSI AT 28 DAYS.
4. CIRCULAR LIDS SHALL BE SOUTH BAY FOUNDRY 1900-BD OR APPROVED EQUAL, WITH RAISED "S" OR "SANITARY SEWER".
5. TANK TO BE PLACED ON TYPE "B" IMPORT.
6. HEIGHT OF TANK ABOVE FITTINGS IS VARIABLE, 6 OR 12 INCH SECTIONS MAY BE ADDED TO REACH THE REQUIRED FINISHED GRADE. MORTAR AND BAND BOTH SIDES IN FIELD.
7. ALL CONCRETE JOINTS SHALL BE CLEANED, WETTED AND MORTARED PRIOR TO SETTING NEXT SECTION. THE JOINTS SHALL BE PACKED, TROWELED AND BANDED SMOOTH ON BOTH SIDES OF THE BOX.



MANHOLE AREA REINFORCING DETAIL

NOT TO SCALE

Date 3/15/17 (L) Detail No. 19

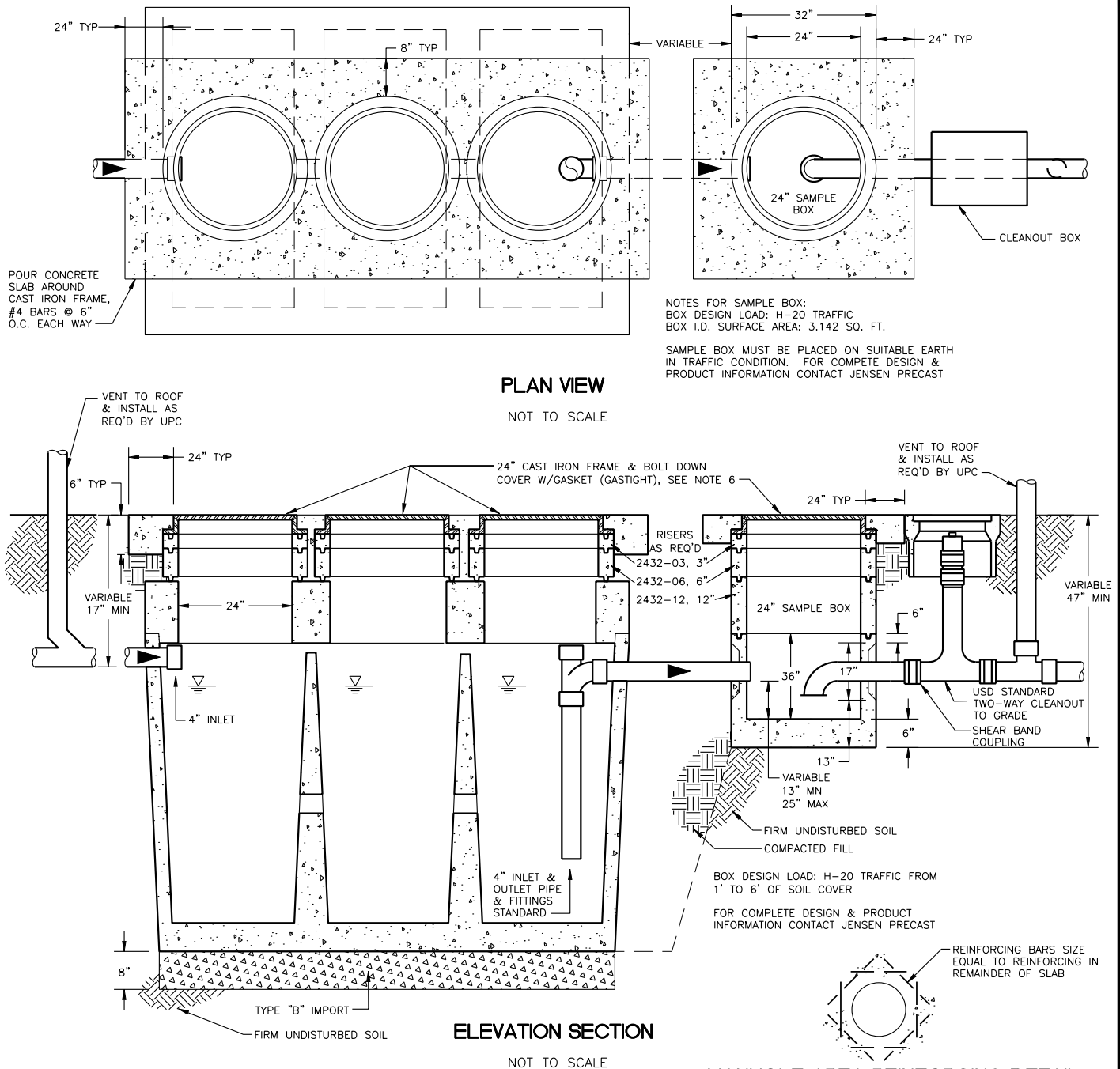
Approved By *Paul R. Eldredge*  
PAUL R. ELDREDGE, RCE 60211



UNION SANITARY DISTRICT

SAND/OIL/WATER SEPARATOR

NOTE TO ENGINEER OR ARCHITECT  
 PROVIDE 3" ELEVATION DROP BETWEEN INLET AND OUTLET PIPES THROUGH  
 BOX. SHOW PIPE INVERT ELEVATIONS AT INLET AND OUTLET ON PLAN.



NOTES:

- ALL CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 3000 PSI AT 28 DAYS.
- CIRCULAR LIDS SHALL BE SOUTH BAY FOUNDRY 1900-BD OR APPROVED EQUAL, WITH RAISED "S" OR "SANITARY SEWER".
- TANK TO BE PLACED ON TYPE "B" IMPORT.
- HEIGHT OF TANK ABOVE FITTINGS IS VARIABLE, 6 OR 12 INCH SECTIONS MAY BE ADDED TO REACH THE REQUIRED FINISHED GRADE. MORTAR AND BAND BOTH SIDES IN FIELD.
- ALL CONCRETE JOINTS SHALL BE CLEANED, WETTED AND MORTARED PRIOR TO SETTING NEXT SECTION. THE JOINTS SHALL BE PACKED, TROWELED AND Banded SMOOTH ON BOTH SIDES OF THE BOX.
- BOLT EACH OF THE THREE (3) COMPARTMENT COVERS DOWN TO FRAME WITH NOT LESS THAN TWO (2)  $\frac{1}{16}$ " HEX HEAD STEEL BOLTS.
- UNLESS OTHERWISE APPROVED BY THE CITY OF JURISDICTION, A VENT WILL BE REQUIRED ON THE INLET SIDE OF THE INTERCEPTOR WHEN ITS DISTANCE FROM THE VENT SYSTEM WITHIN THE BUILDING IS GREATER THAN 10 FEET. VENT PIPES ON THE INLET SIDE AND THE OUTLET SIDE MAY BE INSTALLED SEPARATELY OR COMBINED IN CONFORMANCE WITH THE UNIFORM PLUMBING CODE.
- STRUCTURE SHALL BE MANUFACTURED BY JENSEN PRECAST OR APPROVED EQUAL.
- PLUMBING THROUGH THE INTERCEPTOR SHALL MATCH LATERAL SIZE.
- SEE JENSEN PRECAST, OR APPROVED EQUAL, FOR DIMENSIONS OR EQUIVALENT TANK WITH PRIOR APPROVAL OF THE ENGINEER. MAXIMUM TANK SIZE SHALL BE 3,000 GALLONS. MULTIPLE TANKS SHALL BE USED FOR INTERCEPTORS REQUIRING MORE THAN 3,000 GALLON VOLUME.

Date 3/15/17 (L) Detail No. 20

Approved By *Paul R. Eldredge*  
 PAUL R. ELDRIDGE, RCE 60211



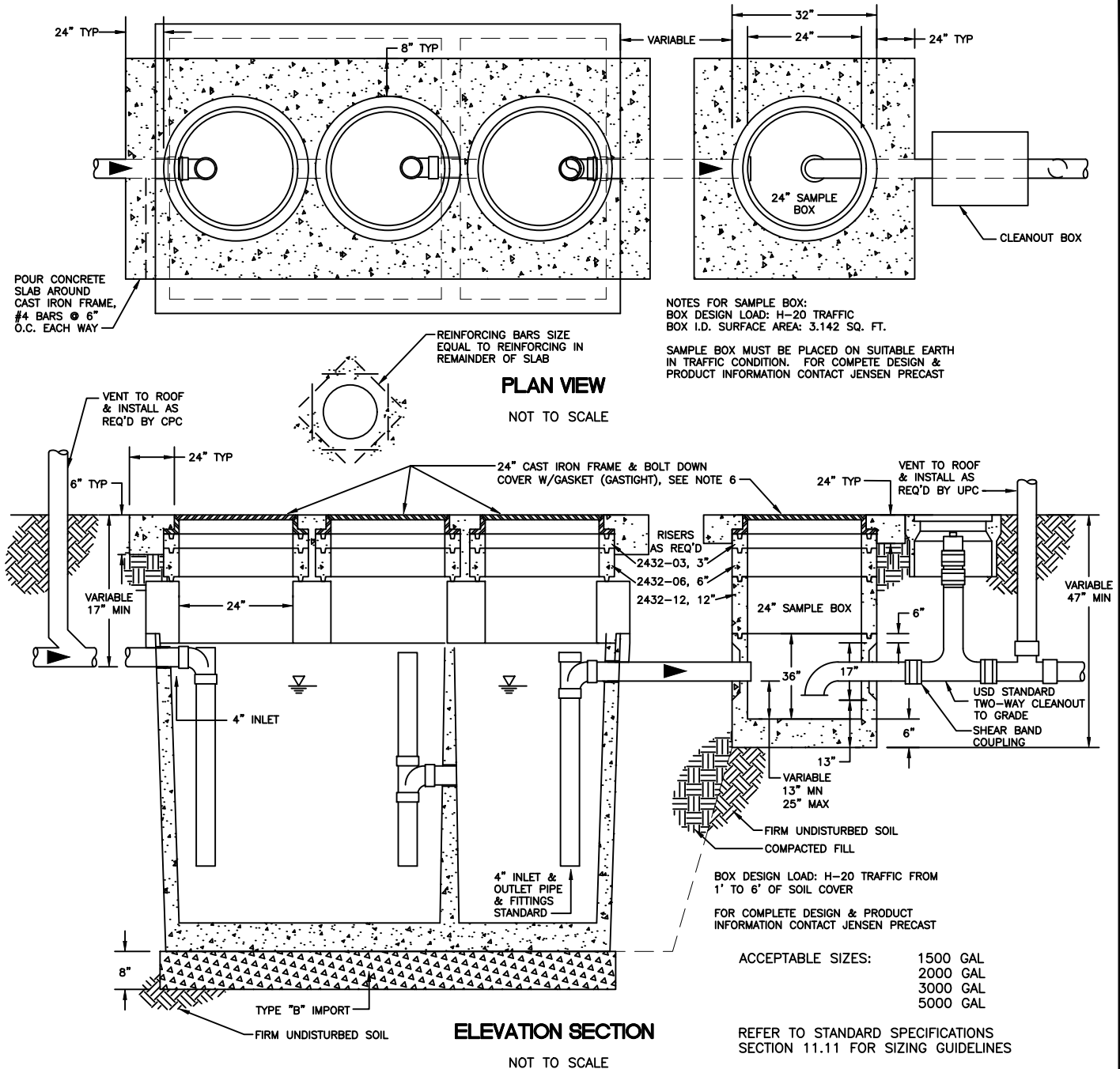
UNION SANITARY DISTRICT

CLARIFIER

20

**NOTE TO ENGINEER OR ARCHITECT**

PROVIDE 3" ELEVATION DROP BETWEEN INLET AND OUTLET PIPES THROUGH BOX. SHOW PIPE INVERT ELEVATIONS AT INLET AND OUTLET ON PLAN.



**NOTES:**

- ALL CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 3000 PSI AT 28 DAYS.
- CIRCULAR LIDS SHALL BE SOUTH BAY FOUNDRY 1900-BD OR APPROVED EQUAL, WITH RAISED "S" OR "SANITARY SEWER".
- TANK TO BE PLACED ON TYPE "B" IMPORT.
- HEIGHT OF TANK ABOVE FITTINGS IS VARIABLE, 6 OR 12 INCH SECTIONS MAY BE ADDED TO REACH THE REQUIRED FINISHED GRADE. MORTAR AND BAND BOTH SIDES IN FIELD.
- ALL CONCRETE JOINTS SHALL BE CLEANED, WETTED AND MORTARED PRIOR TO SETTING NEXT SECTION. THE JOINTS SHALL BE PACKED, TROWELED AND Banded SMOOTH ON BOTH SIDES OF THE BOX.
- BOLT EACH OF THE THREE (3) COMPARTMENT COVERS DOWN TO FRAME WITH NOT LESS THAN TWO (2)  $\frac{1}{8}$ " HEX HEAD STEEL BOLTS.
- UNLESS OTHERWISE APPROVED BY THE CITY OF JURISDICTION, A VENT WILL BE REQUIRED ON THE INLET SIDE OF THE INTERCEPTOR WHEN ITS DISTANCE FROM THE VENT SYSTEM WITHIN THE BUILDING IS GREATER THAN 10 FEET. VENT PIPES ON THE INLET SIDE AND THE OUTLET SIDE MAY BE INSTALLED SEPARATELY OR COMBINED IN CONFORMANCE WITH THE UNIFORM PLUMBING CODE.
- STRUCTURE SHALL BE MANUFACTURED BY JENSEN PRECAST OR APPROVED EQUAL.
- PLUMBING THROUGH THE INTERCEPTOR SHALL MATCH LATERAL SIZE.
- SEE JENSEN PRECAST, OR APPROVED EQUAL, FOR DIMENSIONS OR EQUIVALENT TANK WITH PRIOR APPROVAL OF THE ENGINEER. MAXIMUM TANK SIZE SHALL BE 5,000 GALLONS. MULTIPLE TANKS SHALL BE USED FOR INTERCEPTORS REQUIRING MORE THAN 5,000 GALLON VOLUME.

Date 3/15/17 (L) Detail No. 21

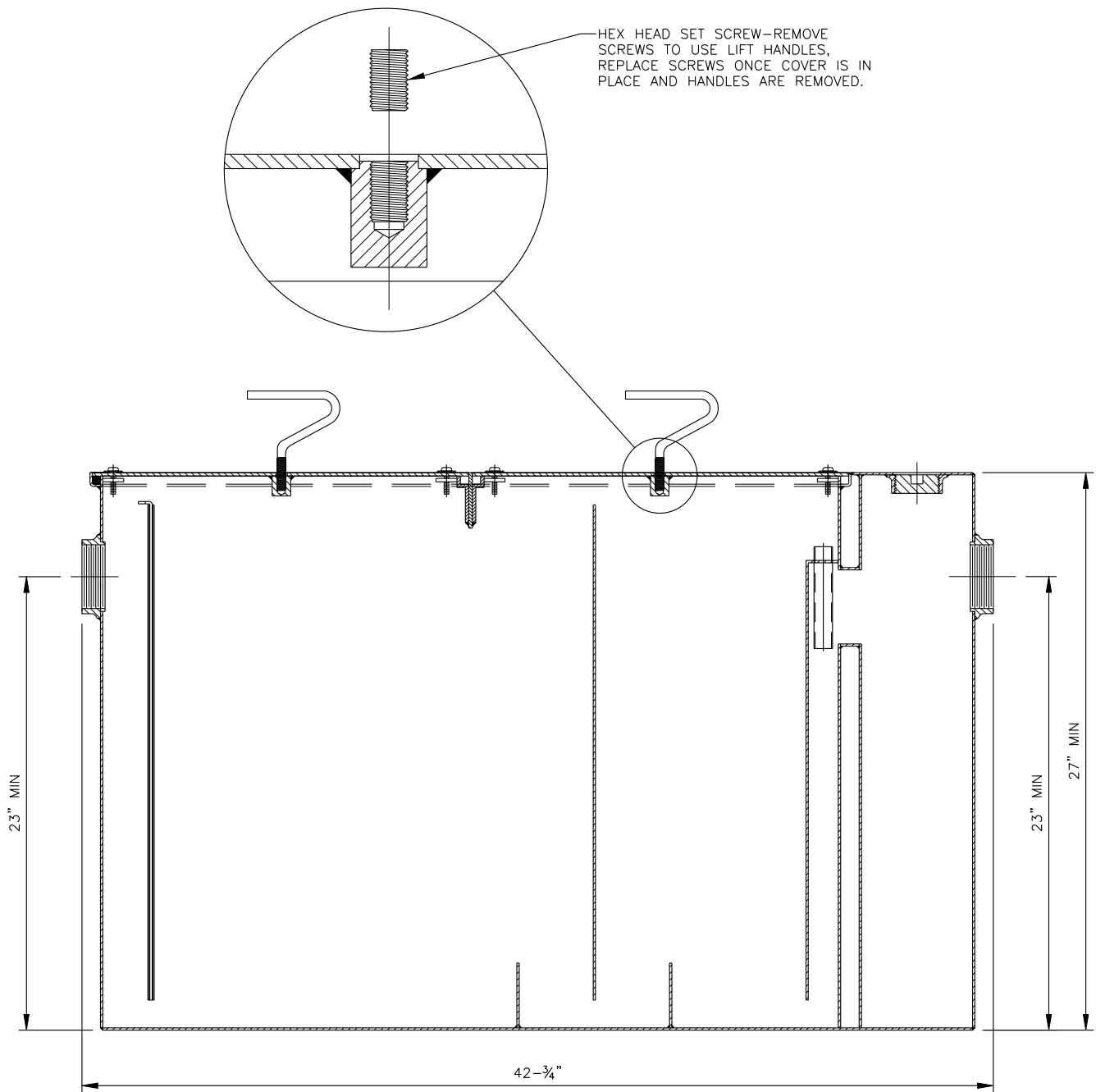
Approved By Paul R. Eldredge  
PAUL R. ELDREDGE, RCE 60211



UNION SANITARY DISTRICT

GREASE INTERCEPTOR

21



NOTES:

1. GREASE TRAP SHALL BE TWO COMPARTMENT WITH ACID RESISTANT COATED INTERIOR AND AN EXTERIOR FABRICATED STEEL DEVICE.
2. SHALL BE Z1172 MANUFACTURED BY ZURN OR AN APPROVED EQUAL.
3. SHALL BE SIZED FOR A MINIMUM GREASE CAPACITY OF 200 LBS.

Date 3/15/17 (L) Detail No. 22

Approved By Paul R. Eldredge  
PAUL R. ELDREDGE, RCE 60211



USD

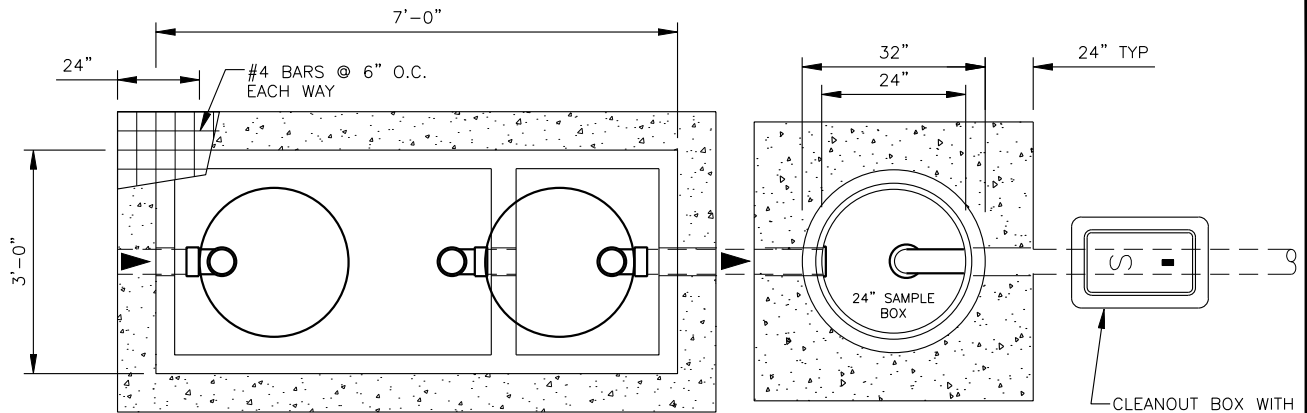
UNION SANITARY DISTRICT

GREASE TRAP

22

**NOTE TO ENGINEER OR ARCHITECT**

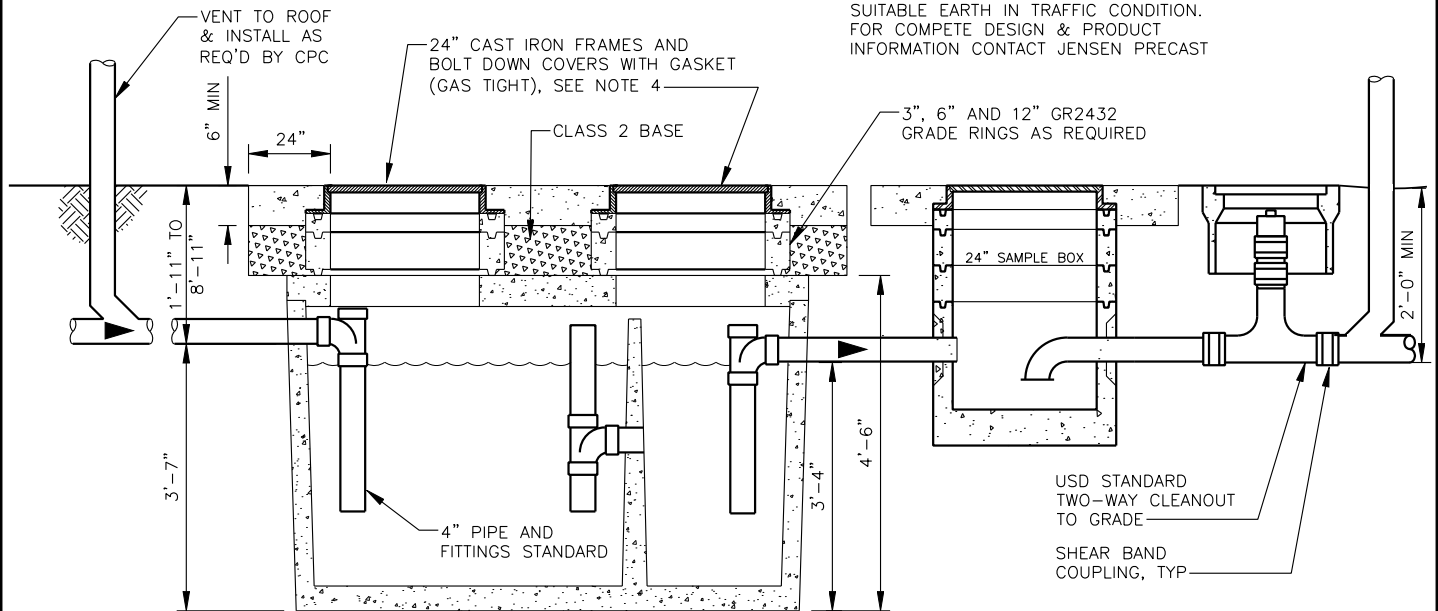
PROVIDE 3" ELEVATION DROP BETWEEN INLET AND OUTLET PIPES THROUGH BOX. SHOW PIPE INVERT ELEVATIONS AT INLET AND OUTLET ON PLAN.



**TOP VIEW**  
(COVERS & RINGS REMOVED)

NOTES FOR SAMPLE BOX:  
BOX DESIGN LOAD: H-20 TRAFFIC  
BOX I.D. SURFACE AREA: 3.142 SQ. FT.

SAMPLE BOX MUST BE PLACED ON  
SUITABLE EARTH IN TRAFFIC CONDITION.  
FOR COMPLETE DESIGN & PRODUCT  
INFORMATION CONTACT JENSEN PRECAST

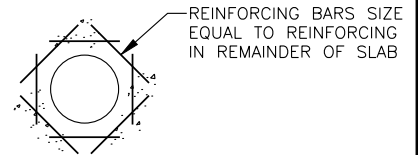


**SIDE SECTION VIEW**

BOX DESIGN LOAD: H-20 TRAFFIC FROM  
1' TO 6' OF SOIL COVER

FOR COMPLETE DESIGN & PRODUCT  
INFORMATION CONTACT JENSEN PRECAST

MINIMUM SIZE OF 320 GALLONS



**MANHOLE AREA REINFORCING DETAIL**

NOT TO SCALE

**NOTES:**

1. DIMENSION AS SHOWN UNLESS OTHERWISE SPECIFIED BY USD.
2. JENSEN 320 PRECAST BOXES AS MANUFACTURED BY JENSEN PRECAST OR AN APPROVED EQUAL.
3. ALL CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 3000 PSI AT 28 DAYS.
4. CIRCULAR LIDS SHALL BE SOUTH BAY FOUNDRY 1900-BD OR APPROVED EQUAL, WITH RAISED "S" OR "SANITARY SEWER".
5. TANK TO BE PLACED ON TYPE "B" IMPORT.
6. HEIGHT OF TANK ABOVE FITTINGS IS VARIABLE, 6 OR 12 INCH SECTIONS MAY BE ADDED TO REACH THE REQUIRED FINISHED GRADE. MORTAR AND BAND BOTH SIDES IN FIELD.
7. ALL CONCRETE JOINTS SHALL BE CLEANED, WETTED AND MORTARED PRIOR TO SETTING NEXT SECTION. THE JOINTS SHALL BE PACKED, TROWELED AND BANDED SMOOTH ON BOTH SIDES OF THE BOX.

Date 3/15/17 (L) Detail No. 23

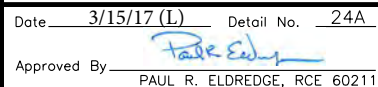
Approved By Paul R. Eldredge  
PAUL R. ELDRIDGE, RCE 60211

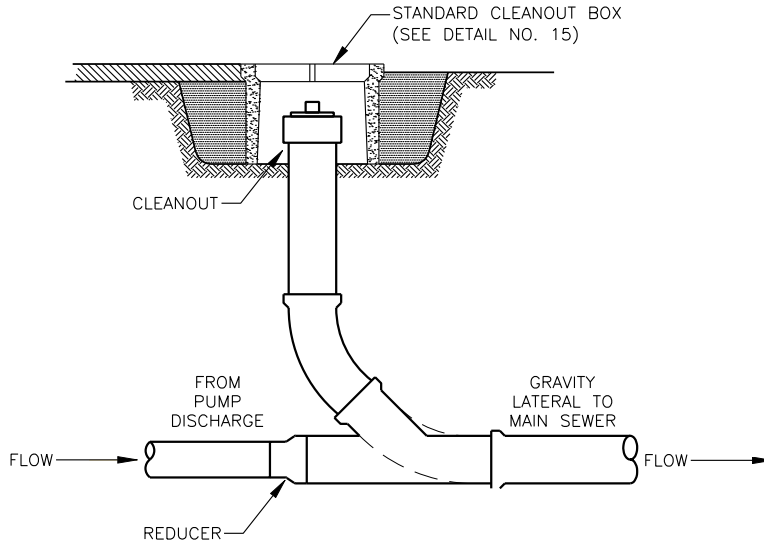


**UNION SANITARY DISTRICT**

**TRASH ENCLOSURE  
INTERCEPTOR**

**23**





### ELEVATION SECTION

NOT TO SCALE

#### NOTES:

1. THE MINIMUM REQUIREMENTS FOR A COMMERCIAL/MULTI-FAMILY RESIDENTIAL PUMPING SYSTEM CONNECTING TO THE DISTRICT'S SYSTEM ARE SPECIFIED IN THE FOLLOWING PARAGRAPHS.
2. THE DISTRICT ACCEPTS NO RESPONSIBILITY FOR THE DESIGN, OPERATION OR MAINTENANCE OF SUCH PRIVATELY-OWNED AND OPERATED SYSTEMS.
3. ALL EQUIPMENT AND ACCESSORIES SHALL BE STANDARD MANUFACTURED ITEMS AND THOSE COMING IN DIRECT CONTACT WITH SEWAGE SHALL BE SPECIFICALLY MANUFACTURED FOR SEWAGE USE.
4. WHEN INSTALLED OUTSIDE OF A BUILDING, THE MOTOR, CONTROLS AND VALVES SHALL BE READILY ACCESSIBLE FOR MAINTENANCE YET PROTECTED AND SHELTERED BY A WEATHER-PROOF, WELL VENTILATED ENCLOSURE SECURED AGAINST TAMPERING.

#### PUMPS:

THE PUMPS SHALL BE A CENTRIFUGAL, SUBMERSIBLE, NON-CLOG TYPE. THE IMPELLER SHALL BE CAPABLE OF PASSING A TWO (2) INCH SPHERE. THE MINIMUM PUMP DISCHARGE SHALL BE THREE (3) INCHES IN DIAMETER. THE PUMP CAPACITY AGAINST THE REQUIRED HEAD SHALL BE APPROVED BY THE DISTRICT.

SUBMERSIBLE PUMPS MUST BE U.L. RATED AS EXPLOSION PROOF. PUMP REQUIREMENTS INSOFAR AS SOLIDS HANDLING CAPACITY AND PUMP RATE AND HEAD, MUST CONFORM TO BASIC STANDARDS REQUIRED FOR STANDARD WET PIT INSTALLATIONS.

PUBLIC USAGE INSTALLATIONS (AS DEFINED IN THE UNIFORM PLUMBING CODE) WILL REQUIRE DUAL PUMPS MEETING ABOVE DESIGN STANDARDS AND ARRANGED TO FUNCTION INDEPENDENTLY IN CASE OF OVERLOAD OR MECHANICAL FAILURE.

#### PUMP SUMP:

THE PUMP SUMP TANK SHALL BE SIXTY (60) INCHES IN DIAMETER AND THE DEPTH SHALL BE AS REQUIRED TO EXTEND SIX (6) INCHES ABOVE GROUND AND THREE (3) FEET BELOW THE INLET PIPE (UNLESS OTHERWISE APPROVED BY THE DISTRICT). THE PUMP SUMP SHALL BE REINFORCED CONCRETE.

#### ELECTRIC POWER SERVICE:

THE POWER REQUIREMENTS SHALL BE AS RECOMMENDED BY THE PACIFIC GAS AND ELECTRIC COMPANY. THE NAME PLATE HORSEPOWER SHALL BE GREATER THAN THE BRAKE HORSEPOWER NECESSARY TO OPERATE THE PUMP AT THE TOTAL REQUIRED HEAD AND SHALL NOT OVERLOAD IF OPERATING HEAD SHOULD DROP 30%.

#### ELECTRICAL WORK AND CONTROL:

ALL ELECTRICAL WORK AND CONTROLS SHALL CONFORM TO THE REQUIREMENTS OF THE CITY HAVING JURISDICTION. THE ELECTRICAL CONTROLS SHALL PROVIDE ADEQUATE PROTECTION FOR THE MOTOR AND EQUIPMENT.

#### FLOAT SWITCH ASSEMBLY:

THE LEVEL CONTROL SWITCH SHALL HAVE GAS TIGHT MOUNTINGS WITH A NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION ONE (1) SWITCH ENCLOSURE.

#### VENT FOR PUMP SUMP:

WHERE SYSTEM IS LOCATED WITHIN THE DWELLING, A VENT SHALL BE PROVIDED AS REQUIRED BY LOCAL CODES. WHERE SYSTEM IS LOCATED OUTSIDE THE DWELLING, A THREE (3) INCH OR LARGER VENT SHALL BE EXTENDED TO A POINT TEN (10) FEET ABOVE THE PUMP SUMP COVER AND HAVE A RETURN BEND AT TOP.

#### DISCHARGE LINE:

THE PRESSURE PORTION OF THE DISCHARGE LINE, INCLUDING THE CHECK VALVE, GATE VALVE AND FLEXIBLE COUPLINGS SHALL BE EQUAL IN SIZE TO THE PUMP DISCHARGE. THE PIPE SHALL BE DUCTILE IRON OR APPROVED EQUAL SUITABLE FOR DESIGN PRESSURES. THE CHECK VALVE SHALL BE A STOCKHAM G-927 OR APPROVED EQUAL. THE GATE VALVE SHALL BE A STOCKHAM G-608 OR APPROVED EQUAL. THE FLEXIBLE COUPLING SHALL BE A STYLE 38 DRESSER COUPLING OR APPROVED EQUAL.

THE GRAVITY PORTION OF THE DISCHARGE LINE SHALL BE FOUR (4) INCH MINIMUM DIAMETER PIPE AND SHALL MEET THE DISTRICT REQUIREMENTS FOR BUILDING SEWERS.

#### SUBMITTAL REQUIRED FOR DISTRICT APPROVAL:

THE OWNER OR CONTRACTOR SHALL SUBMIT TO THE DISTRICT FOR APPROVAL A COMPLETE DESIGN SUBMITTAL, INCLUDING HYDRAULIC CALCULATIONS, LIST OF EQUIPMENT AND ACCESSORIES TO BE INSTALLED AND PUMP CURVES PRIOR TO DISTRICT ISSUANCE OF A BUILDING SEWER PERMIT. SUBMITTAL SHALL BE STAMPED BY A LICENSED CIVIL OR MECHANICAL ENGINEER.

Date 3/15/17 (L) Detail No. 24B

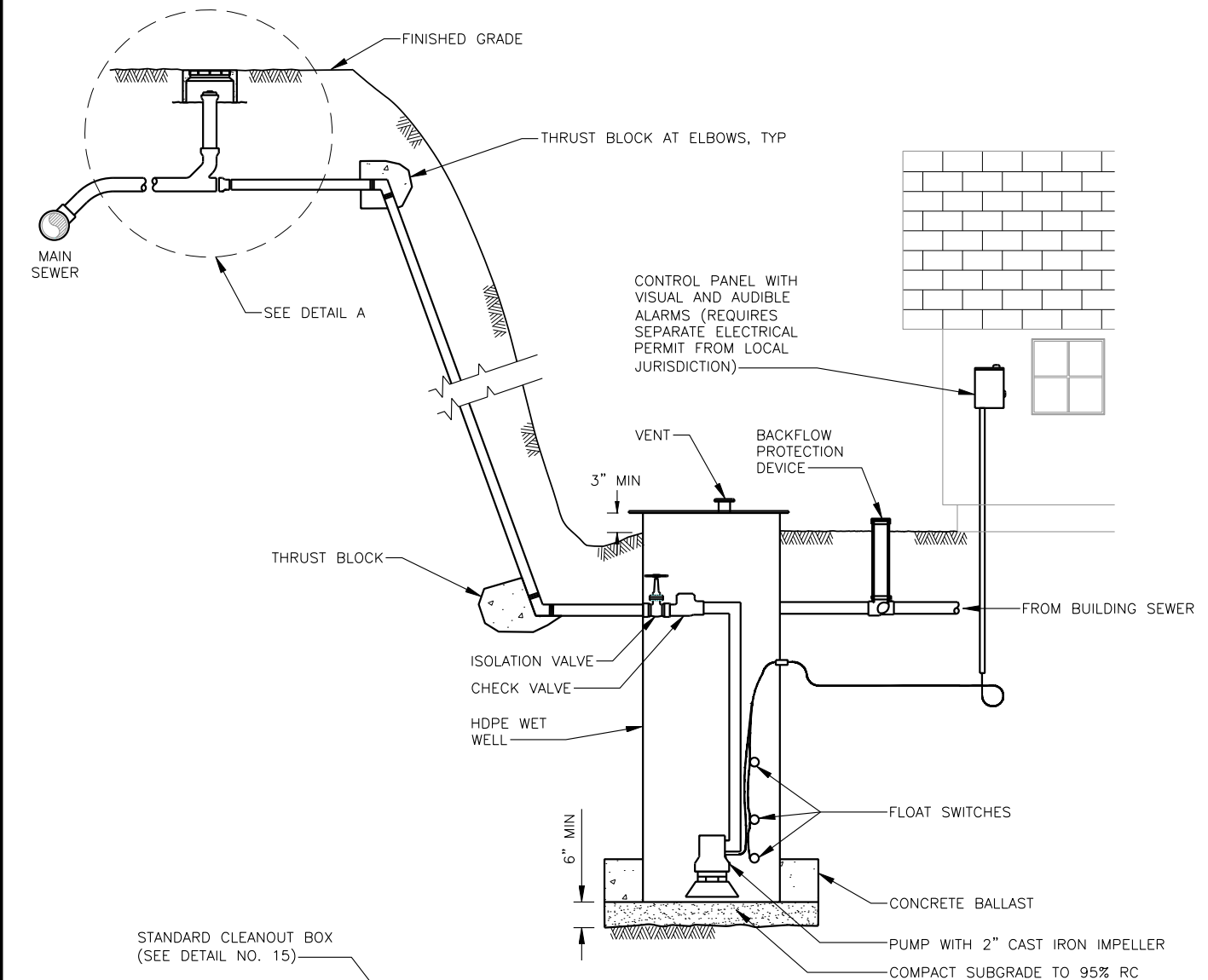
Approved By Paul R. Eldredge  
PAUL R. ELDREDGE, RCE 60211



UNION SANITARY DISTRICT

COMMERCIAL/MULTI-FAMILY  
RESIDENTIAL PUMPING STATION  
CONNECTION TO MAIN AND NOTES

24B

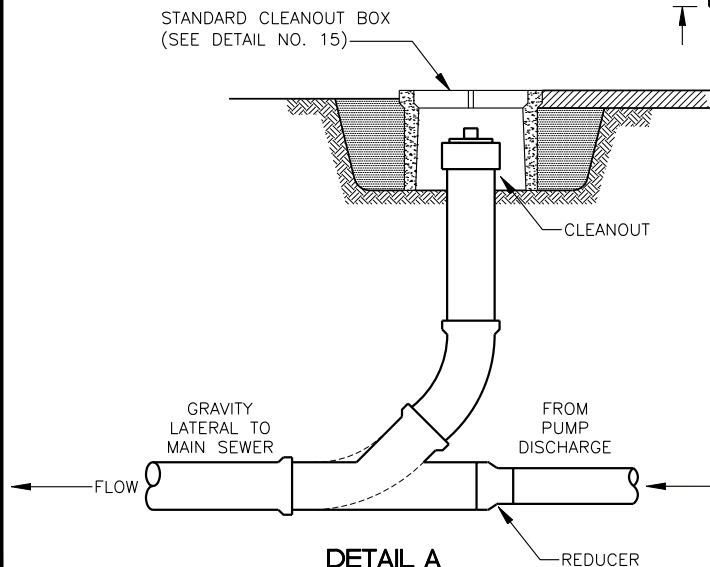


## ELEVATION

NOT TO SCALE

### NOTES:

- APPROVED PUMP SYSTEMS ARE:
  - E-ONE: DH071, DH151, OR DH 152
  - LIBERTY PRO 370 SERIES OR PRO 380 SERIES
  - AQUAPRO: E-SERIES, EDP SERIES, SG-SERIES, OR DG-SERIES.
- CLEANOUT WITH OVERFLOW PROTECTION DEVICE SHALL BE INSTALLED AT BUILDING CONNECTION.
- DISCHARGE PIPING SHALL NOT BE ABS. THE PIPE SHALL BE DUCTILE IRON, HDPE SDR11, OR PVC SCHEDULE 40 OR 80.
- WET WELL TANK SHALL BE HDPE.
- THE OWNER OR CONTRACTOR SHALL SUBMIT TO THE DISTRICT FOR APPROVAL A COMPLETE DESIGN SUBMITTAL, INCLUDING HYDRAULIC CALCULATIONS, LIST OF EQUIPMENT AND ACCESSORIES TO BE INSTALLED AND PUMP CURVES PRIOR TO DISTRICT ISSUANCE OF A BUILDING SEWER PERMIT. SUBMITTAL SHALL BE STAMPED BY A LICENSED CIVIL OR MECHANICAL ENGINEER.
- SEE STANDARD DETAIL NO. 18 FOR BEDDING AND BACKFILL REQUIREMENTS.



## DETAIL A

NOT TO SCALE

Date 3/15/17 (L) Detail No. 25

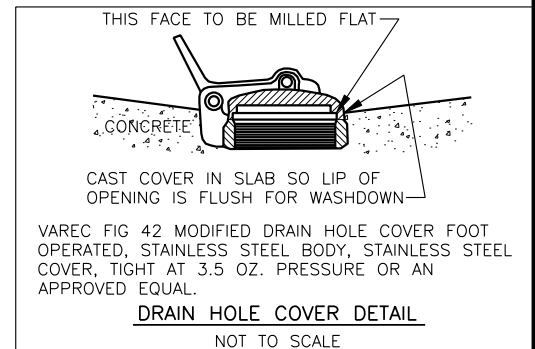
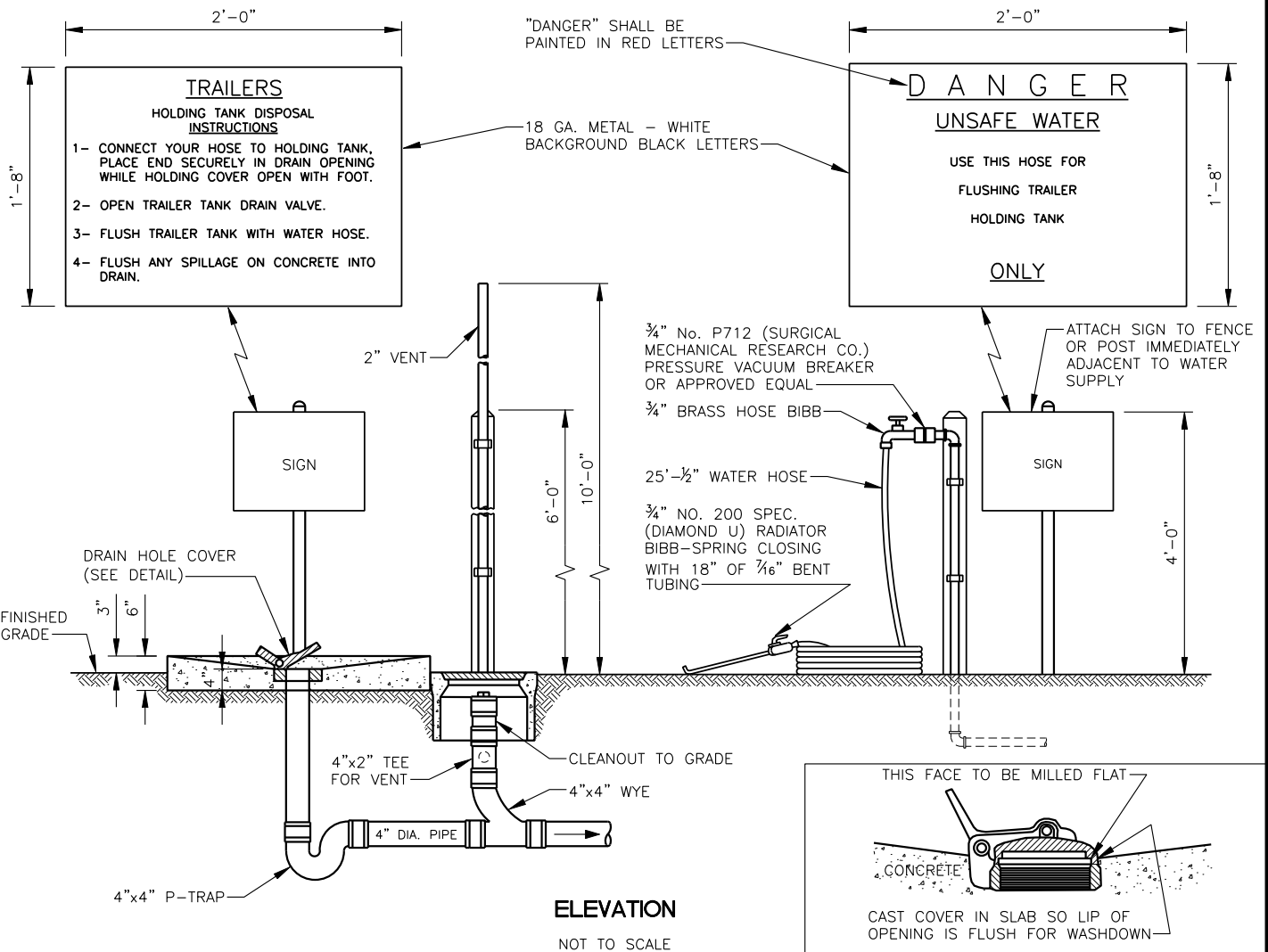
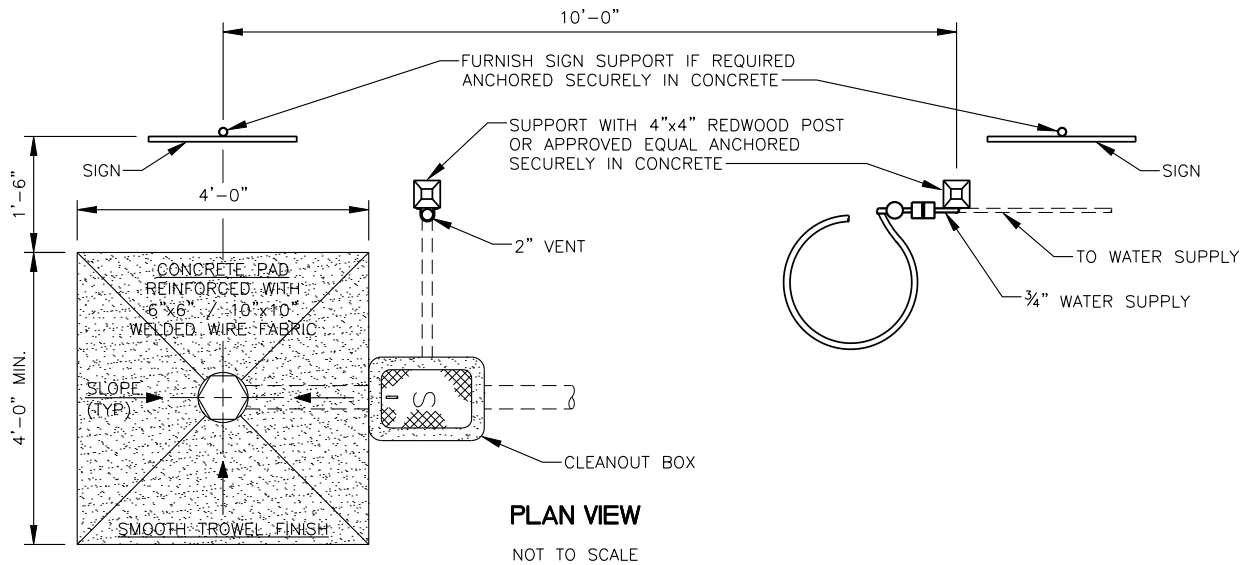
Approved By Paul R. Eldredge  
PAUL R. ELDREDGE, RCE 60211



UNION SANITARY DISTRICT

SINGLE-FAMILY RESIDENTIAL  
PUMPING STATION

25



Date 3/15/17 (L) Detail No. 26

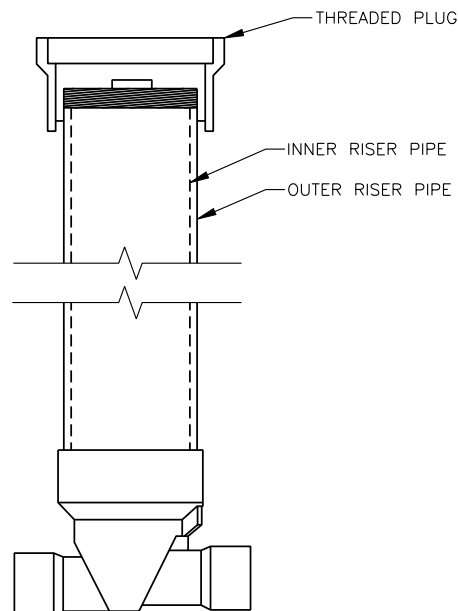
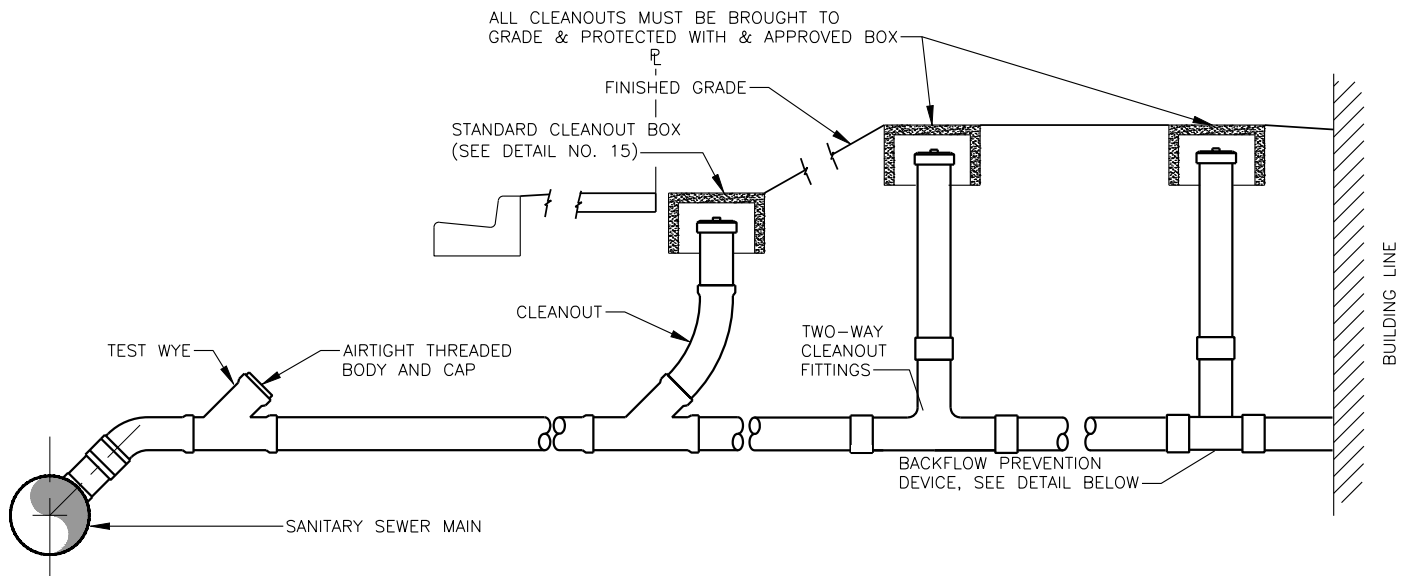
Approved By *Paul R. Eldredge*  
PAUL R. ELDREDGE, RCE 60211



UNION SANITARY DISTRICT

MOBILE HOME/RV/TRAILER  
HOLDING TANK DISPOSAL FACILITY

26



NOTE:  
INSTALL THE DEVICE SUCH THAT THE FLAPPER IS LOWER  
THAN THE ELEVATION OF THE LOWEST PLUMBING FIXTURE  
ATTACHED TO THE BUILDING DRAINS.

### EXTENDABLE BACKFLOW PREVENTION DEVICE

#### NOTES:

1. INSTALL WHEN REQUIRED BY THE ENGINEER.
2. APPROVED CONCRETE BOXES ARE:
  - a) CHRISTY CONCRETE PRODUCTS:  
**B03 RECTANGULAR BOX WITH B03C LID**
  - b) CHRISTY CONCRETE PRODUCTS:  
**F08 CIRCULAR BOX WITH F08C LID**
3. APPROVED MANUFACTURERS:
  - a) CLEAN-CHECK® BACKWATER VALVE BY RECTOR SEAL OR  
APPROVED EQUAL.
4. DO NOT INSTALL STANDARD CLEANOUT IF THE LENGTH  
BETWEEN THE STANDARD CLEANOUT AND THE 2-WAY  
CLEANOUT IS 50' OR LESS.

Date 3/15/17 (L) Detail No. 27

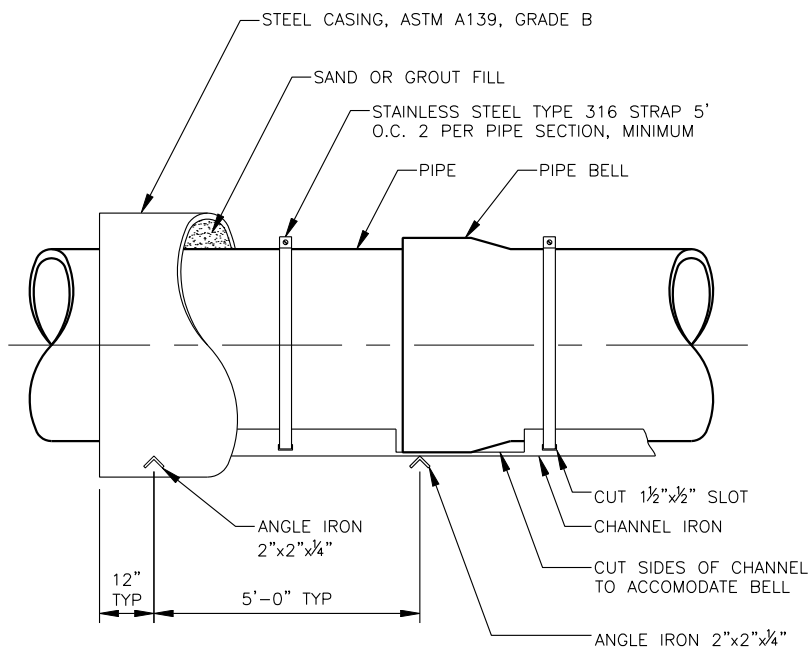
Approved By Paul R. Eldredge  
PAUL R. ELDREDGE, RCE 60211



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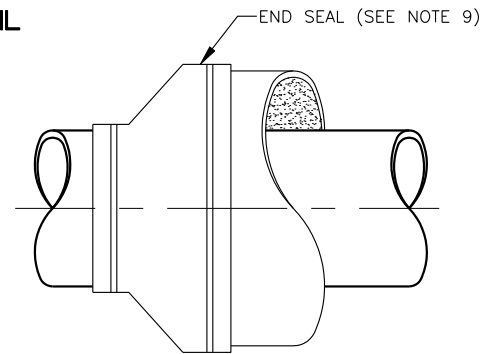
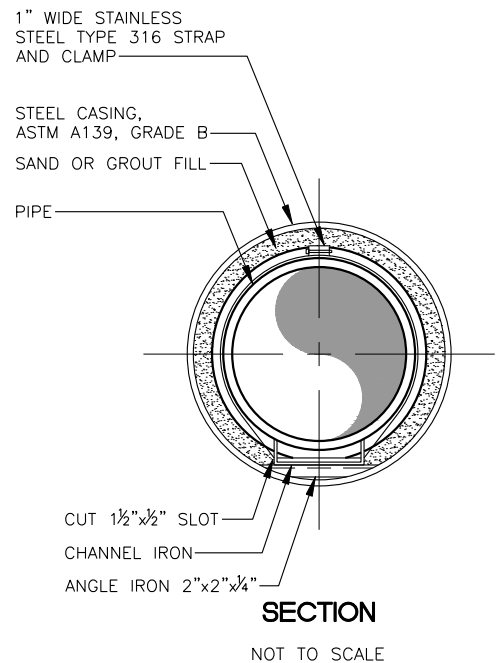
OVERFLOW/BACKFLOW  
PREVENTION DEVICE

27



**TYPICAL CASING PIPE DETAIL**

NOT TO SCALE



**END SEAL**

NOT TO SCALE

**NOTES:**

1. CASING SHALL BE STEEL, ASTM A139, GRADE B (MINIMUM YIELD STRENGTH OF 35,000 PSI). CASING INSIDE DIAMETER SHALL BE 30" OR 12" LARGER THAN OUTSIDE DIAMETER OF CARRIER PIPE BELL, WHICHEVER IS GREATER. MINIMUM CASING THICKNESS SHALL BE AS FOLLOWS:

MINIMUM CASING THICKNESS	CASING DIAMETER
1/2"	30"
3/4"	UP TO 48"

FOR CASING DIAMETERS LARGER THAN 48" OR IF REQUIRED BY THE ENGINEER, CONTRACTOR SHALL SUBMIT CASING THICKNESS CALCULATIONS SIGNED AND STAMPED BY A PROFESSIONAL ENGINEER REGISTERED IN THE STATE OF CALIFORNIA.

2. EACH CASING JOINT SHALL BE WELDED ALL AROUND.
3. CASING SHALL BE INSTALLED BY JACKING AND BORING, UNLESS OTHERWISE APPROVED BY DISTRICT ENGINEER.
4. ANNULAR SPACE BETWEEN INSIDE OF CASING AND OUTSIDE OF CARRIER PIPE SHALL BE COMPLETELY FILLED WITH CLEAN DRY SAND OR GROUT PER SPECS.
5. CARRIER PIPE AND CHANNEL WILL BE SUPPORTED BY ANGLE IRON WELDED TO THE INNER WALL OF CASING. CARRIER PIPE SHALL BE LAID SUCH THAT AN EVEN GRADE IS PROVIDED.
6. CHANNEL SECTIONS SHALL BE WELDED TO FORM CONTINUOUS CHANNEL. MAX ALLOWABLE UNSUPPORTED LENGTH OF CHANNEL IN CASING IS 5'-0". CHANNEL SHALL BE WELDED TO ANGLE IRON AT ENDS OF CASING ONLY.
7. CHANNEL SIDES SHALL BE CUT TO PROVIDE MIN. 1/8" CLEARANCE BETWEEN CHANNEL AND BELL END OF PIPE. PIPE SHALL NOT BE SUPPORTED BY BELL END OF PIPE.
8. PROVIDE ANGLE IRON MAX. 1'-0" FROM ENDS OF CASING.
9. END SEAL SHALL BE 1/8" THICK NEOPRENE RUBBER WITH TYPE 316 STAINLESS STEEL STRAPS.

Date 3/15/17 (L) Detail No. 28

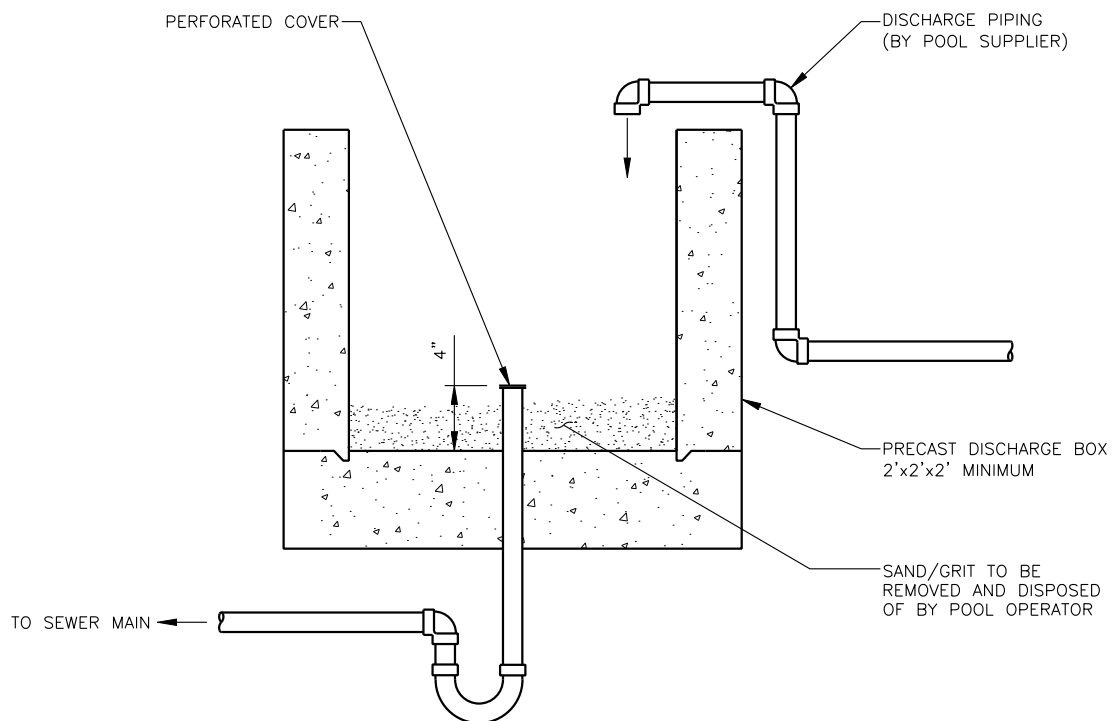
Approved By Paul R. Eldredge  
PAUL R. ELDREDGE, RCE 60211



**UNION SANITARY DISTRICT**

**PIPE CASING**

**28**



### ELEVATION SECTION

NOT TO SCALE

Date 3/15/17 (L) Detail No. 29

Approved By Paul R. Eldredge  
PAUL R. ELDREDGE, RCE 60211

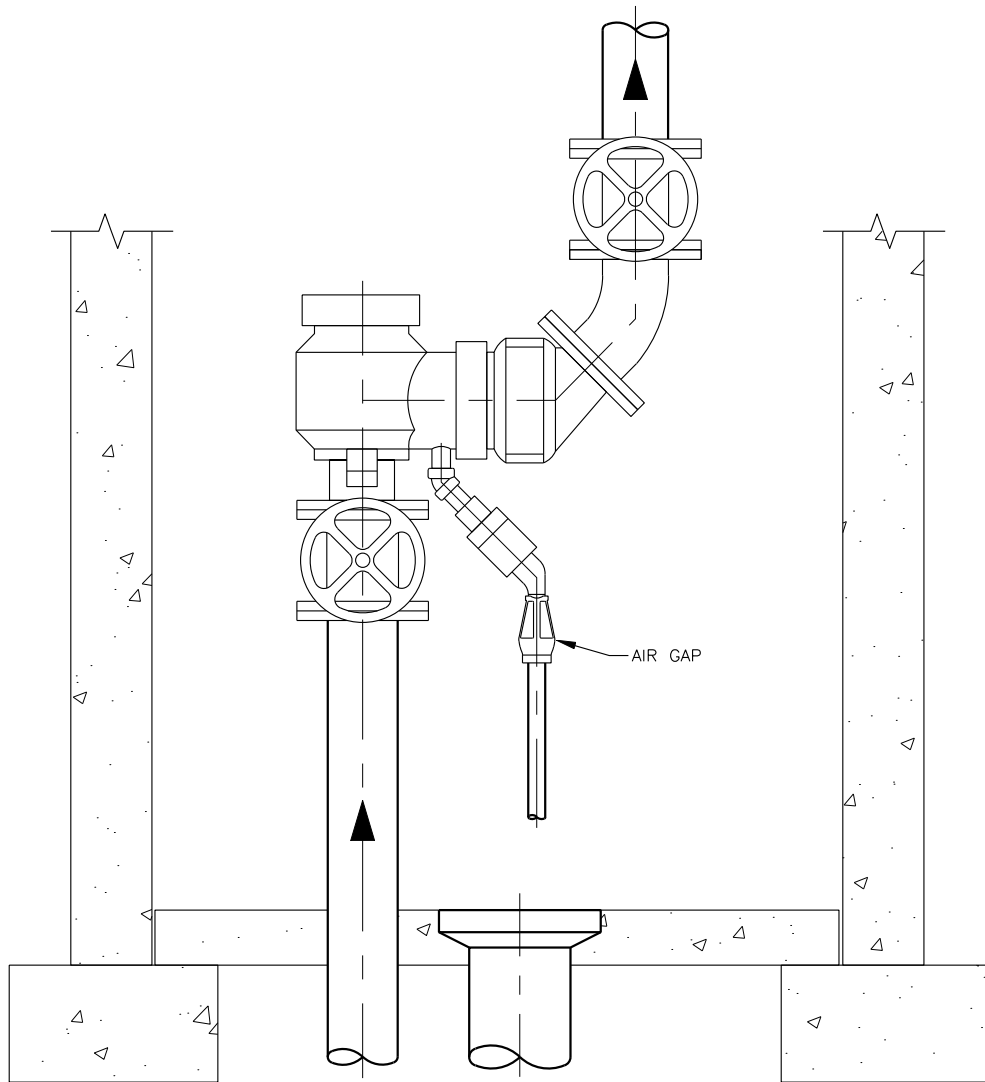


USD

UNION SANITARY DISTRICT

POOL FILTER BACKWASH SUMP

29



### INDOOR INSTALLATION

NOT TO SCALE

#### NOTES:

1. AIR GAP SHALL BE MODEL AG MANUFACTURED BY WILKINS OR AN APPROVED EQUAL.

Date 3/15/17 (L) Detail No. 30

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PAUL R. ELDREDGE, RCE 60211

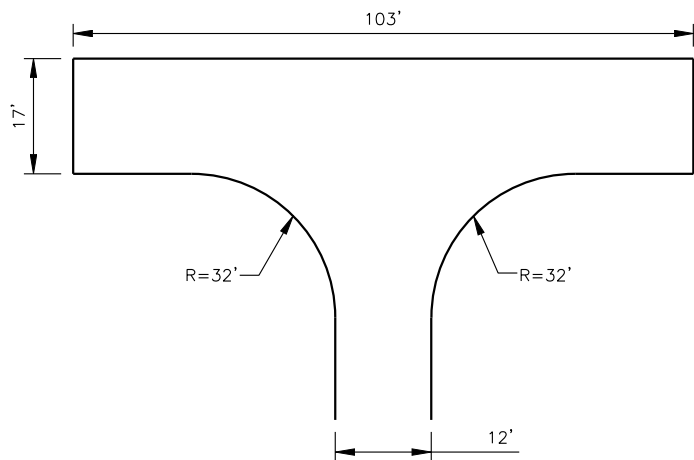


USD

UNION SANITARY DISTRICT

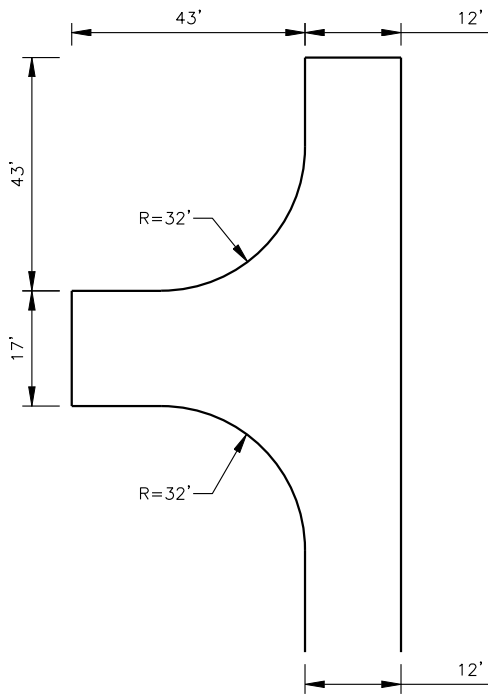
AIR GAP FOR FIRE  
SPRINKLER TEST

30



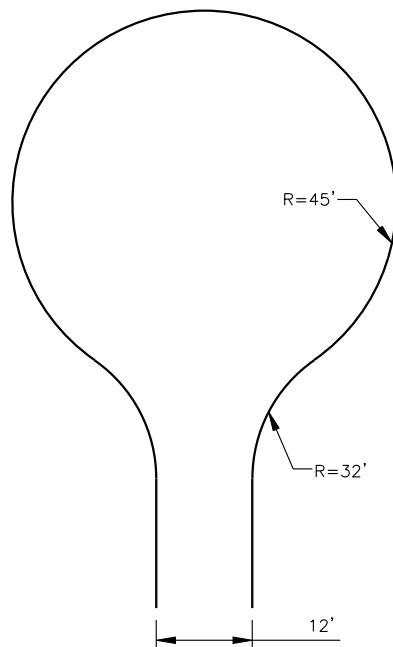
**T-TURN**

NOT TO SCALE



**HAMMER-HEAD**

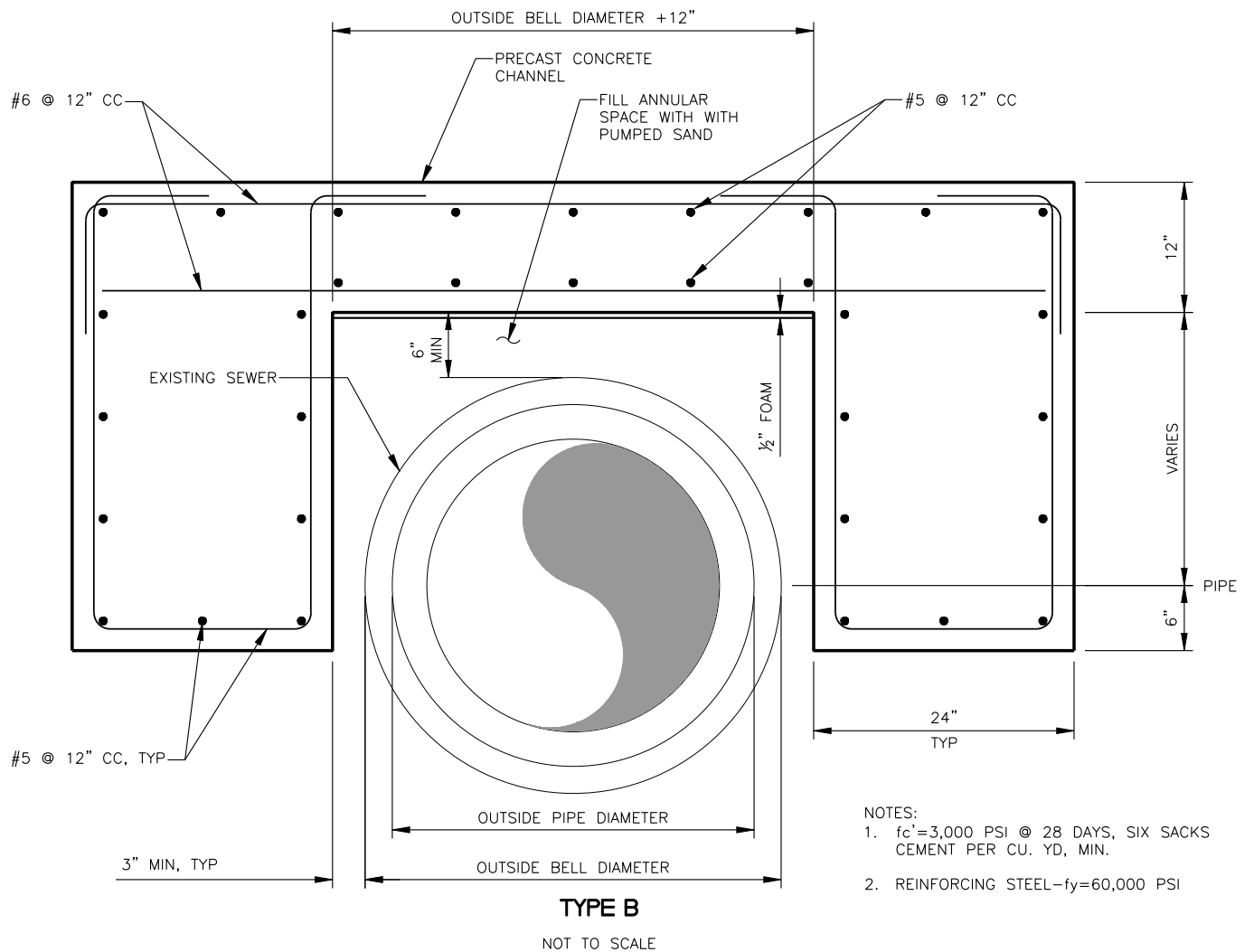
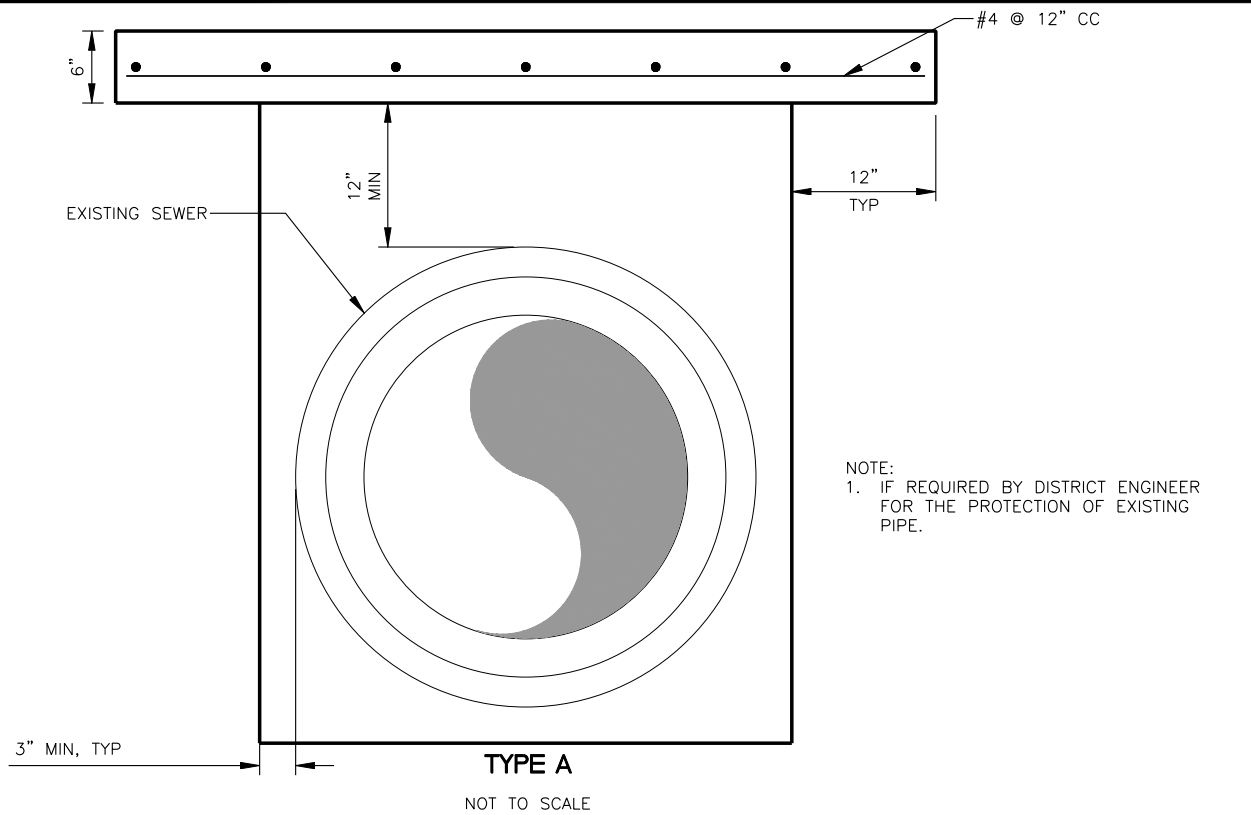
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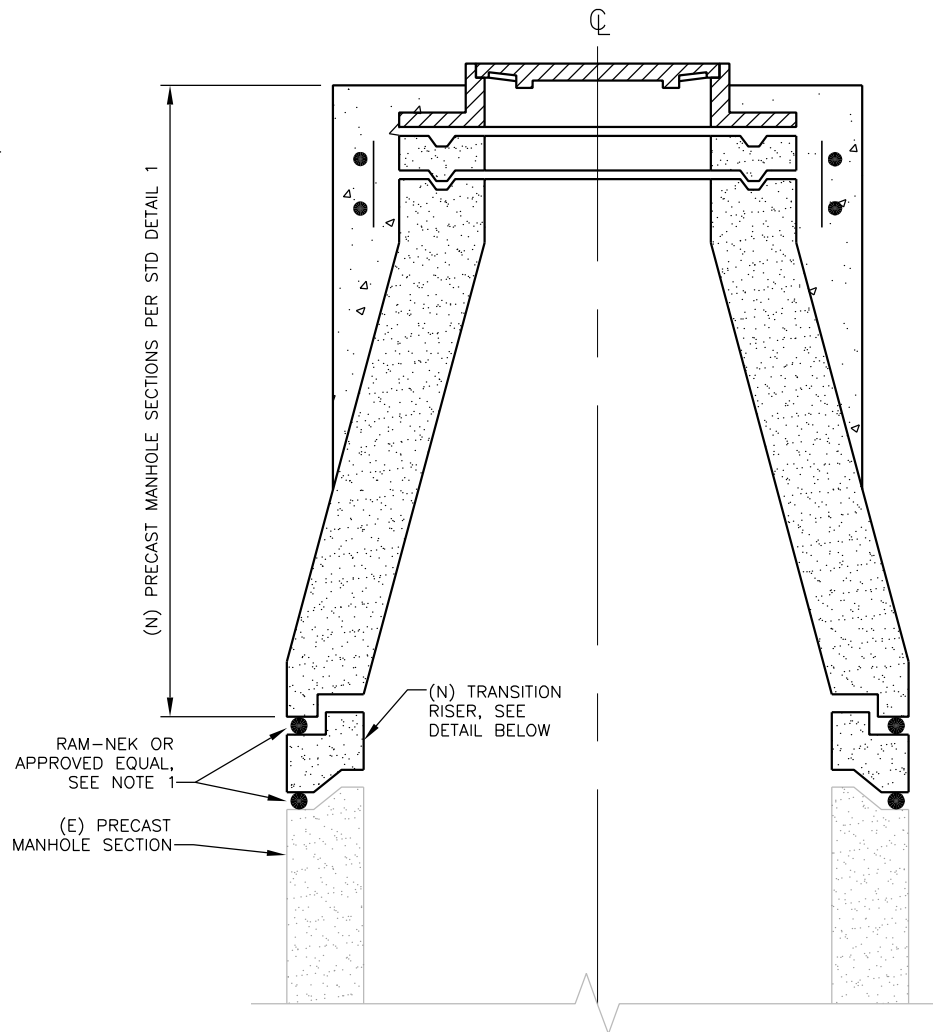
**CIRCLE**

NOT TO SCALE



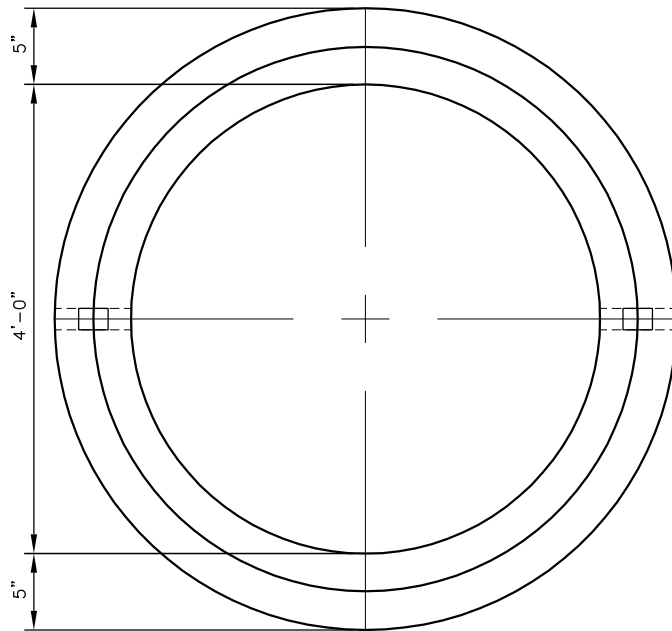


FOR USE IN THE ADJUSTMENT OF  
EXISTING MANHOLES WITH THE  
"TEICHERT" OR SIMILAR JOINTS.



**ELEVATION SECTION**

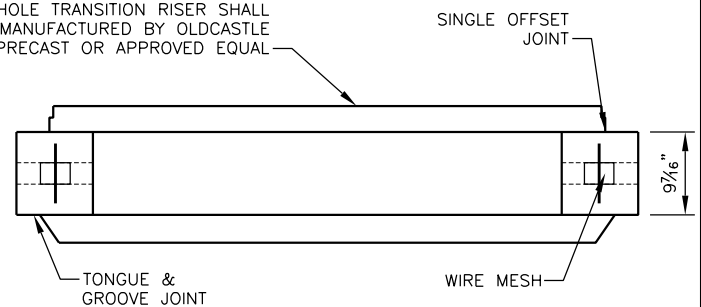
NOT TO SCALE



**PLAN VIEW**

NOT TO SCALE

MANHOLE TRANSITION RISER SHALL  
BE MANUFACTURED BY OLDCASTLE  
PRECAST OR APPROVED EQUAL



**TRANSITION RISER SECTION**

NOT TO SCALE

**NOTES:**

1. INSTALL "RAM-NEK" OR APPROVED EQUAL BETWEEN EACH JOINT OF THE CONE AND BARREL SECTIONS TO MAKE A FLEXIBLE WATER-TIGHT JOINT. AFTER JOINT IS MADE, TRIM JOINT SMOOTH ON THE INSIDE OF MANHOLE.
2. FOR TRUNK MANHOLES, INSIDE DIAMETER IS 5'-0".

Date 3/15/17 (L) Detail No. 33

Approved By Paul R. Eldredge  
PAUL R. ELDREDGE, RCE 60211



**USD**

**UNION SANITARY DISTRICT**

**MANHOLE TRANSITION RISER**

**33**