

The City of Fair Oaks Ranch

Construction Standard Specifications for Water and Sanitary Sewer Construction



January 2019

MISSION STATEMENT

THE MISSION OF THE CITY OF FAIR OAKS RANCH IS TO MAINTAIN AND ENHANCE THOSE QUALITY OF LIFE FACTORS WHICH INFLUENCED THE CITIZENS TO ESTABLISH A RESIDENCE WITHIN THE CITY, INCLUDING USE AND ACCESS TO WATER AND WATSEWER SERVICES.

INTRODUCTION

THE STANDARD SPECIFICATIONS AND DRAWINGS ARE PROVIDED AS A TECHNICAL RESOURCE FOR ENGINEERING PROFESSIONALS FOR USE IN DESIGN AND CONSTRUCTION OF WATER AND WASTEWATER PROJECTS MANAGED AND CONTRACTED BY FAIR OAKS RANCH. AS DESIGN PROFESSIONALS, THEY ASSUME RESPONSIBILITY FOR SELECTION, REFERENCE, AND APPROPRIATE APPLICATION OF THESE RESOURCES. THE STANDARD SPECIFICATIONS AND STANDARD DRAWINGS OFFERED HERE CAN BE AUGMENTED BY SUPPLEMENTAL SPECIFICATIONS AND MODIFIED DETAILS PRODUCED BY THE ASSIGNED OR CONTRACTED DESIGN PROFESSIONAL AND APPROVED BY FAIR OAKS RANCH. FAIR OAKS RANCH ACCEPTS NO LIABILITY FOR USE OF THESE RESOURCES. ANY PERSON MAKING USE OF THE INFORMATION CONTAINED IN THESE FILES SHALL BE SOLELY RESPONSIBLE FOR THEIR USE. THESE FILES ARE NOT INTENDED AS A SUBSTITUTE FOR THE PROFESSIONAL JUDGEMENT OF A DESIGN PROFESSIONAL. FOR REFERENCE, WE HAVE INCLUDED UNEDITED SPECIFICATIONS FROM THE CITY OF SAN ANTONIO.

AT ANY TIME, THESE SPECIFICATIONS AND DRAWINGS MAY BE ALTERED OR SUPERSEDED BY THE GENERAL CONDITIONS, SPECIFIC CONDITIONS, OR DRAWINGS WITHIN THE BID DOCUMENTS ISSUED FOR EACH PROJECT.

ALL “APPROVED EQUAL” PARTS AND MATERIALS SHALL BE DIRECTLY IN ACCORDANCE WITH FAIR OAKS RANCH’ MATERIAL SPECIFICATIONS. NO OUTSIDE MANUFACTURERS WILL BE USED UNLESS DIRECTLY SPECIFIED IN THE CONTRACT DOCUMENTS.

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Useful References:

1. American Water Works Association (AWWA) - <http://www.awwa.org/>
2. U.S. Environmental Protection Agency (EPA) - <http://epa.gov>
3. City of Fair Oaks Ranch - <https://www.fairoaksranchtx.org/>
4. Texas Administrative Code (TAC) - <http://www.sos.state.tx.us/tac/index.shtml>
5. Texas Commission On Environmental Quality (TCEQ) - <http://www.tceq.state.tx.us/>
6. Texas Department of Transportation (TxDOT) - <http://www.txdot.gov/>

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**ITEM NO. 100
MOBILIZATION**

- 100.1 DESCRIPTION:** This item shall govern the mobilization of personnel, equipment, and supplies at the project site in preparation for beginning work on other contract items. Mobilization shall include, but is not limited to, the movement of equipment, personnel, material, supplies, etc. to the project site and the establishment of office and other facilities necessary prior to beginning the work. Examples of inclusive material are those typical of payment aspects designated as large “EA” items (such as manholes, fire hydrants, water valves, etc), or “LF” items such as (water or sewer main piping).
- 100.2 MEASUREMENT:** Measurement of the Item, Mobilization, as specified herein, will be by the “Lump Sum,” as the work progresses.
- 100.3 PAYMENTS:** Partial payments of the “Lump Sum” bid for mobilization will be as follows: (The adjusted contract amount for construction items, as used below, is defined as the total contract amount, less the lump sum bid for Mobilization and Preparing Right-Of-Way).
1. When 1% of the adjusted contract amount for construction items is earned, 50% of the “Lump Sum” bid or 5% of the total contract, whichever is less, will be paid.
 2. When 5% of the adjusted contract amount for construction items is earned, 75% of the “Lump Sum” bid or 10% of the total contract amount, whichever is less, will be deducted from the above amount.
 3. When 10% of the adjusted contract amount for construction items is earned, 90% of the “Lump Sum” bid or 15% of the total contract amount, whichever is less, will be paid. Previous payments under this item will be deducted from the above amount.
 4. Payment for this line item will be reduced by half of the earned amount, until said documents are submitted and approved by Fair Oaks Ranch: all material submittals, Item No. 902, “Safety and Health Program”, , Item No. 903, Construction QC/QA Program, Item No. 1114, “Pre-Construction Video”, and Item No., 1110 “Progress Schedule”.
 5. Upon completion of all work under this contract, payment for the remainder of the “Lump Sum” bid for Mobilization will be made.
- NOTES: Cost for Insurance and Bond is inclusive to cost of Mobilization

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Item.

6. Payment shall be made by the Inspector for approved materials stored on the project site that are deemed necessary and required for the “PROJECT WORK” in accordance with all contract documents.

- End of Specification -

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ITEM NO. 101

PREPARING RIGHT-OF-WAY

101.1 DESCRIPTION: This item shall govern preparing the right-of-way for construction operations by removing and disposing of all obstructions from the right-of-way and from designated easements where removal of such obstructions is not otherwise provided for in the contract documents.

Such obstructions shall be considered to include, but not be limited to, remains of houses or structures not completely removed by Contractor or others, foundations, floor slabs, concrete, brick, lumber, plaster, cisterns, septic tanks, basements, abandoned utility pipes or conduits, equipment or other foundations, fences, retaining walls, outhouses, shacks, and all other debris, as well as buried concrete slabs, curbs, driveways and sidewalks.

This item shall also include the removable of trees, stumps, bushes, shrubs, brush, roots, vegetation, logs, rubbish, paved parking areas, miscellaneous stone, brick, drainage structures, manholes, inlets, abandoned railroad tracks, scrap iron and all debris, whether above or below ground, except live utility facilities.

This item shall not govern the demolition of buildings by the use of explosives. Such demolition work shall be governed by the use of a special specification controlling the work.

It is the intent of this specification to provide for the removal and disposal of all obstructions to the new construction, together with other objectionable materials, not specifically provided for elsewhere by the contract documents.

Unless shown otherwise in the contract documents, all fences along the right-of-way which are damaged or removed temporarily by the Contractor shall be replaced by the Contractor to an equal or better condition, at no additional cost to Fair Oaks Ranch.

101.2 CONSTRUCTION METHODS: Areas designated in the contract documents shall be cleared of all obstructions, vegetation, abandoned structures, etc., as defined above, except trees or shrubs specifically designated by the engineer for preservation. Trees and shrubs designated for preservation shall be carefully trimmed as directed and shall be protected from scarring, barking, or other injuries during construction operations. Exposed ends of pruned limbs shall be treated with an approved pruning material.

Unless otherwise indicated in the contract documents, all underground obstructions shall be removed to the following depths:

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1. In areas to receive embankment, 2 feet below natural finished grade.
2. In areas to be excavated, 2 feet below the lowest elevation of the excavation;
3. All other areas, 2 feet below finished grade.

Holes remaining after removal of all obstructions, objectionable materials, vegetation, etc., shall be backfilled and tamped as directed by the Inspector, and the entire area shall be bladed to prevent ponding of water and to provide drainage. In areas that are to be immediately excavated, backfilling and blading may be eliminated, if approved by the Inspector. Areas to be used as burrow sites and material sources shall have all obstruction, objectionable materials, vegetation, etc., removed to the complete extent necessary to prevent such objectionable matter from becoming mixed with the material to be used in the construction.

Where a conduit is shown to be replaced, it shall be removed in its entirety, and all connections to the existing conduit or pipe shall be made. Where an existing conduit or pipe is to be cut and plugged, the line shall be cut back not less than 2 feet, and a plug of concrete not less than 2 feet long shall be poured and held in the end of the conduit or pipe. The plug may also be accomplished by using a precast stopper grouted into place.

Material to be removed will be designated as “salvageable” or “non-salvageable” in the contract documents prior to bidding by the Contractor. All “salvageable” material will remain the property of Fair Oaks Ranch and will be stored at the site as directed by the Inspector. All “non-salvageable” materials and debris removed shall become the property of the Contractor and shall be removed from the site and shall be disposed of properly.

All asphaltic material shall be disposed of or recycled at the facility authorized to accept the asphalt for such purposes and applicable to appropriate guidelines and regulations.

1013 MEASUREMENT: Preparing Right-of-Way for new construction will be measured by the “Lump Sum.”

1014 PAYMENT: This item will be paid for at the contract “Lump Sum” price bid for Preparing Right-of-Way, which price shall be full compensation for work herein specified, including the furnishing of all materials, equipment, tools, labor, and incidentals necessary to complete the work. 10% of the payment will be withheld until final construction payment.

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NOTES: Additional requirements by Fair Oaks Ranch: Adherence to City of Fair Oaks Ranch Tree Ordinance as part of bid item.

- End of Specification -

**ITEM NO. 110
RECYCLED WATER SYSTEM**

1101 DESCRIPTION: Any work done on the existing or proposed recycled water distribution system shall be accomplished with the Fair Oaks Ranch Standard Specifications for Water, except as otherwise noted. All proposed contract documents must be reviewed and approved by Fair Oaks Ranch Backflow Prevention personnel prior to the start of any work.

Contractor must provide Geographic Information Systems (GIS) line .shp file for any installed recycled water line, and a point .shp file for any installed valves. The GIS .shp file must include information on the pipe diameter, location, and material at a minimum. Confirm the information to be included in the .shp file with Fair Oaks Ranch prior to submission. Additional information to be included in the shapefile may be requested by Fair Oaks Ranch.

1102 MATERIAL: All material used in the improvement, adjustment, removal and/or construction of the recycled water system shall meet Fair Oaks Ranch Standard Specifications for Water requirements and standards (i.e., uses of CSC pipe, trenching and excavation, etc.), except as otherwise noted, and must be wrapped or painted with pantone 512 color.

1103 INSTALLATION: The installation of any recycle water system components shall be done in accordance with the Fair Oaks Ranch Standard Specifications for Water, except as otherwise noted. Recycled Water mains shall also be installed at the TCEQ required separation distance between sewer and/or water mains as required by Texas Administrative Code (TAC) rules to include: The latest provision of 30 TAC § chapters 210, 290, and 217, or most applicable approved equal provision.

1104 PAYMENT: All work shall be paid in accordance with the other applicable specifications.

- End of Specification -

CUSTOMER MAINTAINED

Above Ground Fair Oaks Ranch Approved 4" Double Check Valve Backflow Preventer Assembly. Complete Assembly Painted Purple

Add Freeze Protection

Concrete (Typ.)

Mechanically Restrained Joints

Supports To Be Provided As Approved By Professional Engineer

Maloney Insulating Kit (See Note 2)

4" Gate Valve (#2)

Reducer

Flexible Coupling

Spool Piece (See Note 3)

4" Min 6" Max

2" Tap & Saddle With Plug Test Connection

See Note 1

3" Meter

Concrete Block

Strainer

2' Min. Separation

8'

15'

Property Line

R.O.W.

Existing Grade

4" Min

4" Gate Valve - Or - Tapping Valve

Mechanically Restrained Joints

Backflow Preventer Assembly

4" Gate Valve

- Or - Tapping Valve

Reducer

Strainer

3" X 5' X 3" Rectangular Steel Vault

3" Meter

4" Gate Valve

Flexible Coupling

2" Tap & Saddle With Plug Test Connection

NOTE:

NOTE:

NOTE:

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NOTE 1:	NON-DEGRADABLE COVER OVER OPENING REQUIRED TO PREVENT BACKFILL FROM ENTERING VAULT
NOTE 2:	REQUIRED WHEN UTILIZING DISSIMILAR METALS
NOTE 3:	MINIMUM LENGTH OF SPOOL PIECE IS AS FOLLOWS:

GATE VALVE SIZE (#2), IN.	SPOOL LENGTH, IN.
3	6
4	6
6	12
8	15
10	18

NOTE 4: VALVES OPEN LEFT

NOTE 5: VALVES CAPS SQUARE

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**ITEM NO. 200
FLEXIBLE BASE**

200.1 DESCRIPTION: This item shall govern a foundation course for surfacing, pavement, or other base courses in conformity with the typical sections shown in the contract documents and to the lines and grades as established by the Engineer.

200.2 MATERIAL: The material shall be crushed as necessary to meet the requirements hereinafter specified and shall consist of durable stone crushed and/or screened to the required particle size, with or without other approved fine- sized material. The material shall be from approved sources.

Testing of flexible base materials shall be in accordance with the following TXDOT standard laboratory test procedures:

Preparation for Soil Constants and Sieve Analysis	Tex-101-E
Liquid Limit	Tex-104-E
Plastic Limit	Tex-105-E
Plasticity Index	Tex-106-E
Linear Shrinkage	Tex-107-E
Sieve Analysis	Tex-110-E
Los Angeles Abrasion	ASTM C131 (Grade A)

Samples for testing the material shall be made available to the Inspector and taken prior to the compaction operations.

The material shall be well graded and, when properly tested, meet the following requirements:

Retained on 1- 3/4 inch sieve	0 %
Retained on No. 4 sieve	45 to 75 %
Retained on No. 40 sieve	60 to 85 %

The material passing the No. 40 sieve shall be known as Soil Binder and shall meet the following requirements:

Liquid Limit shall not exceed	40
Plasticity Index shall not exceed	12

The crushed stone shall have an abrasion of not more than 40, when subjected to the Los Angeles Abrasion Test.

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200.3 CONSTRUCTION METHODS: The flexible base material shall be placed on the approved subgrade, in courses not to exceed 6 inches compacted depth. It shall be the responsibility of the Contractor that the required amount of material be delivered and uniformly spread and shaped. All material shall be moved from the place where it is dumped by cutting into windrows. It shall be sprinkled, spread, shaped, and rolled in proper sequence to prevent segregation and as necessary for required compaction.

Upon completion, the surface shall be smooth and in conformity with typical sections and to the established lines and grades. Any deviation in excess of ¼ inch in cross section and in length of 16 feet measured longitudinally shall be corrected. All irregularities, depressions, or weak spots which develop shall be corrected.

Flexible base shall be compacted to an apparent dry density of not less than 95% of the maximum dry density as determined in accordance with TXDOT Test Method Tex 113-E. All density tests will be made within 24 hours after compaction operations are completed. If the material fails to meet the density specified, it shall be reworked as necessary to meet the required density. Just prior to the placing of any succeeding course of flexible base or surfacing on a previously completed course, the density and moisture of the top 3 inches of flexible base shall be checked and if the test shows the density to be more than 2% below the specified minimum or the moisture content to be more than 3% above or below the optimum, the course shall be reworked as necessary to obtain the specified compaction and moisture content.

200.4 MEASUREMENT: "Flexible Base" will be measured by the square yard, complete in place, for the thickness specified in the contract documents, or by the cubic yard, complete in place as indicated in the contract document bid proposal.

200.5 PAYMENT: This item will be paid for at the contract unit price bid for "Flexible Base" which price shall be full compensation for all work herein specified, including the furnishing, hauling, and placing of all materials, for all water required, and for all equipment, tools, labor, and incidentals necessary to complete the work.

- End of Specification -

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**ITEM NO. 300
CONCRETE (NATURAL AGGREGATE)**

300.1 DESCRIPTION: This item shall govern the storage, handling and usage of materials; and the proportioning, mixing and transportation of concrete for all concrete construction.

This specification does not cover the placement, consolidation, curing, or protection of the concrete.

300.2 MATERIAL: The concrete shall be composed of Portland Cement, mineral filler, if necessary, natural aggregates (fine and coarse), and water, proportioned and mixed as hereinafter provided in these specifications. Concrete shall meet all the requirements as set forth in the latest provision of ASTM C94 or the most applicable approved equal provision.

300.3 CLASSIFICATIONS AND PROPORTIONS: The minimum cement content, maximum allowable water content, and maximum slump of the various classes of concrete shall conform to Table 1.

300.4 MEASUREMENT: The quantities of concrete, of the various classifications which constitute the completed and accepted structure, will be measured by the cubic yard in place. Only accepted work will be included, and the dimensions used will be those shown in the contract documents or ordered in writing by the Engineer. No deductions in measurement will be made for paneling less than 3 inches in width, and by 1 inch in depth. For chambers less than 2 inches, for embedded reinforcing steel, or for embedded portions of structural steel members no deductions in measurement will be made as well.

300.5 PAYMENT: The concrete quantities, measured as provided above, will be paid for at the contract unit prices bid per cubic yard for the various classifications of concrete shown, which prices shall be full compensation for furnishing, hauling and mixing all concrete materials; placing, curing, and finishing all concrete; all grouting and pointing; furnishing and placing all drains and expansion joints, except as hereinafter provided; furnishing and placing metal flashing strips; and for all forms and false work, labor, tools, equipment, and incidentals necessary to complete the work.

The above provisions for payment shall not be interpreted to provide payment for concrete in railings, piping, concrete culvert pipe, precast prestressed concrete units, or other concrete items for which provision is otherwise made in the contract.

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The above provisions for payment for drains and expansion joints shall not be interpreted to provide payment for cast iron or structural steel shapes used in drains; for structural steel, cast iron or cast steel bearing plates; or for steel members used in armoring roadway joints. Payment for these materials shall be full compensation for work herein specified, including the furnishing of all materials, equipment, tools, labor, and incidental necessary to complete the work."

No direct measurement or payment will be made for Concrete Class "G," but shall be considered subsidiary to the particular items required by the contract documents.

Table 1				
Class	Minimum compressive strength @ 28 days, psi (Mpa)	Maximum water/cement ratio	Slump range, inches	Min.-max. sacks cement, cubic yard
A	3,000 (20)	7	2-5	5
B	2,500 (17)	8	2-5	4.5
C	2,000 (14)	9	1-4	4
D	1,000 (6)	11	1-4	2
G	(as specified in the contract documents)	5.5	2-3	6.0-8.0

- End of Specification -

**ITEM NO. 301
REINFORCING STEEL**

- 301.1 DESCRIPTION:** This item shall provide for the furnishing and placing of bar reinforcing steel for use in structures and other concrete items that require reinforcing steel as shown in the contract documents.
- 301.2 MATERIALS:** Reinforcing steel shall be grade 60 and all bar reinforcement shall be deformed, conforming to the latest provision of Item No. 440, "Reinforcing Steel" of the TX-DOT Standard Specifications or most applicable approved equal provision. Reinforcing steel bars produced outside of the United States are acceptable, if such bar reinforcement conforms to the requirements of the latest provision of the ASTM Specifications for the various designations of bars.
- 301.3 BENDING, TOLERANCES AND STORAGE:** Bending, tolerances and storage of reinforcing steel shall conform to the latest provision of Article 440.3.A-C, in Item No. 440, "Reinforcing Steel" of the TX-DOT Standard Specifications or most applicable approved equal provision.
- 301.4 SPLICES:** No splicing of bars, except when provided in the contract documents, will be permitted without written approval of the Engineer.
- 301.5 PLACING REINFORCEMENT:** All steel reinforcing shall be accurately placed in the position shown in the contract documents and firmly held during the placement and setting of concrete. All reinforcement shall be free from dust, rust, mill scale, paint, oil, mortar or foreign material. Bars shall be tied at all intersections. Where spacing of bars in each direction is less than 12 inches, only alternate intersections need be tied. Distances from forms shall be maintained by means of stays, precast blocks, ties, hangers, metal chairs or other approved supports. Blocks for holding reinforcing bars from contact with the forms shall be precast concrete blocks of approved shape and dimensions or other equally suitable devices. The use of pebbles, pieces of broken stones or brick, metal pipe and wooden blocks shall not be permitted. Reinforcement in any sections shall be placed and then inspected and approved by the Inspector before the placing of concrete begins.
- 301.6 MEASUREMENT:** The measurement of quantities of bar reinforcing furnished and placed will be based on the calculated weight of the steel actually placed in accordance with the contract documents with no allowance made for added bar lengths or splices, nor for extra steel used when bars larger than those specified

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are substituted with the permission of the Engineer. Tie wires and supporting devices will not be included in the calculated weights. The calculated weight of bar reinforcement will be determined using the theoretical bar weight set forth in Table No. 1, with no allowance for overrun or under runs:

301.7 PAYMENT: Reinforcing Steel measured, as provided above, will be paid for at the contract unit price bid per pound of "Reinforcing Steel," which price shall be full compensation for furnishing, bending, fabricating, welding and placing reinforcement; for all clips, blocks, metal spacers, ties, wire or other materials used for fastening reinforcement in place, and for all tools, labor, equipment and incidentals necessary to complete the work.

Payment for reinforcing an item which specifically includes the cost of reinforcement shall be paid for as provided in the specifications for those items.

TABLE 1			
Bar size, number	Nominal diameter, inches	Nominal Area, square inches	Weight, pound per linear foot
2	0.250	0.05	0.167
3	0.375	0.11	0.376
4	0.500	0.20	0.668
5	0.625	0.31	1.043
6	0.750	0.44	1.502
7	0.875	0.60	2.044
8	1.000	0.79	2.670
9	1.128	1.00	3.400
10	1.270	1.27	4.303
11	1.410	1.56	5.313
14	1.693	2.25	7.65
18	2.257	4.00	13.60

- End of Specification -

ITEM NO. 307

CONCRETE STRUCTURES

307.1 **DESCRIPTION:** This item shall govern the construction of box culverts, headwalls, wingwalls, bridges, box transitions, approach slabs, retaining walls, inlets, storm sewer structures, sanitary sewer structures and other designated structures. All concrete structures shall be constructed in accordance with the specifications herein outlined and in conformity with the required lines, grades, sections and details shown in the contract documents or as directed by the Engineer.

Contractor must provide Geographic Information Systems (GIS) point .shp file for any installed concrete structure. The GIS .shp file must include information on the location of the structure at a minimum. Confirm the information to be included in the .shp file with Fair Oaks Ranch prior to submission. Additional information to be included in the shapefile may be requested by Fair Oaks Ranch.

307.2 **MATERIALS:**

1. Concrete: All concrete shall conform to the latest provisions of Item No. 300, "Concrete (Class A)" or the most applicable approved equal provision, or the concrete shall be of a class as noted in the contract documents. All concrete structures must have some reinforcement (ie: reinforcing steel).
2. Reinforcing Steel: All reinforcing steel shall conform to the provisions of Item No. 301, "Reinforcing Steel."
3. Membrane Curing Compound: Provide membrane curing compounds that conform to the latest provision of TX-DOT's DMS-4650, "Hydraulic Cement Concrete Curing Materials and Evaporation Retardants" or most applicable approved equal provision.
4. Expansion Joint Materials: Provide materials that conform to the latest provision of TxDOT's DMS-6310, "Joint Sealants and Fillers" or most applicable approved equal provision.
5. Cast Iron Castings: All cast iron castings shall conform to the latest provision of the City of Fair Oaks Ranch Department of Public Works' Standard Specifications for Construction Item No. 409, "Cast Iron Castings", or most applicable approved equal provision.
6. Metal for Structures: Metal for structures shall conform to the latest provision of the City of Fair Oaks Ranch Department of Public Works'

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Standard Specifications for Construction Item No. 302, "Metal for Structures", or most applicable approved equal provision.

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CONSTRUCTION METHODS:

1. Forms: Forms shall be of wood, metal or other approved materials and shall conform to the following requirements:
 - a. Wood Forms:
 - (1) Unexposed concrete surfaces, No. 2 common or better lumber.
 - (2) Exposed concrete surfaces, dressed and matched boards of uniform thickness and width.
 - b. Plywood: Commercial Standard Douglas Fir, moisture resistant, concrete form plywood, not less than 5 ply and at least 9/16th of an inch in thickness. The face of the plywood shall be free from knot holes and other blemishes.
 - c. Metal Forms: Metal forms of an approved type that will produce surfaces equal to or better than those specified for wood forms.

Forms may be constructed of any of the above substances or of other material if suited to the intended purpose and when approved by the Inspector. Forms shall be built mortar tight and of sufficient strength to prevent bulging between supports and shall be set and maintained to the line and grade designated until the concrete is sufficiently hardened to permit removal. All details of form construction shall be subject to the approval of the Inspector and, in special cases, the approval of the Engineer may be required. Permission to place concrete will not be given by the Inspector until all form work has been placed in accordance with the above requirements. If at any stage of the work, the forms show signs of bulging, sagging or moving, that portion of the concrete causing such conditions shall be immediately removed, if required by the Inspector, and the forms reset and securely braced against further movement.

All corners and edges, which will be exposed after construction, shall be chamfered with triangular chamfer strips 3/4 inch measured on the sides.

2. Placing Reinforcement: All steel reinforcement shall be placed in accordance with Item No. 301, "Reinforcing Steel."
3. Placing Concrete: The base slabs of inlets, junction boxes, headwalls,

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culverts and other structures shall be placed and allowed to set before the remainder of the structure is constructed. Suitable provisions shall be made for bonding the sidewalls to the base slab by means of longitudinal keys so constructed as to prevent the percolation of water through the construction joints. Before concrete is placed in the walls, the keyed-edge joints shall be thoroughly cleaned of all shavings, sticks, trash or other extraneous materials. The top slabs of culverts and like structures may be poured monolithic with the walls, provided the walls are poured and allowed to set a minimum of 1 hour, no more than 2 hours, shall elapse between the placing of the concrete in the wall and that in the top slab; such interval is to allow for shrinkage of the concrete in the wall. Under adverse weather conditions, the minimum time will be increased by the Engineer.

All concrete shall be placed with the aid of mechanical vibrating equipment supplemented inside the forms. Vibrating equipment shall be of the internal type and shall maintain a speed of 6,000 impulses per minute, when submerged in concrete. Vibrators shall be adequate in number of units to properly consolidate all concrete. Form or surface vibrators shall not be used. The duration of vibration shall be limited to properly consolidate the concrete without causing objectionable segregation of aggregates. Insertion of vibrators into lower courses that have commenced initial set, or the disturbance or reinforcement in concrete beginning to set, shall be avoided.

Concrete shall not be allowed to drop freely more than 5 feet in unexposed work, nor more than 3 feet in exposed work; where greater drops are required, a tremie or other approved means shall be employed. Concrete shall not be placed when the ambient temperature is below 40° F, nor where the concrete is likely to be subject to freezing before final set has occurred. When the air temperature is expected to drop below 40° F during the first 72 hours of the curing period, polyethylene sheeting or burlap-polyethylene blankets shall be placed in direct contact with the top surface of the concrete. Concrete may be poured in temperatures below 40° F, when poured in protected areas, or where adequate protection can be provided against freezing, if approved by the Engineer. When concrete is poured in air temperatures above 85° F, an approved retarding agent, meeting the latest provision of ASTM C494, Type B or most applicable approved equal provision, will be required in all concrete used in superstructures and top slabs of culverts unless directed otherwise by the Engineer.

4. Form Removal: Forms shall be removed only with the approval of the Inspector and in a manner to insure complete safety of the structure when the structure as a whole is supported on shoring. Form removal from structures shall not begin until the concrete has attained the following compressive strengths:

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- a. Vertical forms shall not be removed until the concrete has set a minimum of 24 hours, or the concrete has attained a minimum compressive strength of 500 psi.
 - b. When wall and top slabs are poured monolithically, wall forms shall not be removed until the concrete has attained a minimum compressive strength of 2,000 psi.
5. Finish: Honeycomb and other minor defects shall be patched with one part of cement to 2 parts fine aggregate. All exposed surfaces shall be given one of the following finishes:
- a. Rough Finish: Concrete for which no other finish is indicated or specified shall have fins and rough edges removed.
 - b. Smooth Finish: Smooth finish shall be given to the interior of inlets, junction boxes, culverts and other structures. Joint marks, fins and rough edges shall be smoothed off and blemishes removed, leaving finished surfaces smooth and unmarred, subject to approval by the Inspector.
 - c. Floor Finish: Floor finish shall be given to the floors of all inlets, culverts and other structures, and shall be struck off true to the required grade as shown in the contract documents and floated to a smooth, even finish by manual or mechanical methods. No coarse aggregate shall be visible after finishing.
 - d. Rubbed Finish: All exposed surfaces of retaining walls, wingwalls, headwalls and other structures, after patching and painting has been completed and the surface has been wetted, shall be given a first rubbing with a No. 16 Carborundum Stone. After the first rubbing is completed and the ground material has been evenly spread, the material shall be allowed to take a reset. After sufficient aging, the surface shall be wetted and given a finish rubbing with a No. 30 Carborundum Stone, after which the surface shall be neatly striped with a brush and allowed to take a reset. On the inside surfaces of all culvert walls an area from the top slab, on a line 30 degrees from the vertical, to the bottom slab shall be rubbed as specified above.
- The entire structure shall be left with a clear, neat, uniform finish, free from form markings and shall be uniform in color.
- e. Sidewalk surfaces shall be given a wood float finish, a light broom finish, or may be stripped with a brush as directed by the Inspector

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or specified in the contract documents.

- f. Roadway slabs shall be given a broom finish after completion of the floating or straight-edging operation, but before the disappearance of the moisture sheen. The grooves of the finish shall be parallel to the centerline of the roadway. The average texture depth of the grooves shall be a minimum of 0.035 inches.

The Contractor has the option of substituting the surface finish described in the latest provision of the City of Fair Oaks Ranch Department of Public Works' Standard Specifications for Construction Item No. 311, "Concrete Surface Finish," or most applicable approved equal provision, on the surface areas listed in the specification.

6. Curing: Immediately after placing or finishing, concrete surfaces not covered by forms shall be protected from loss of surface moisture for not less than 4 curing days. When forms are left in place, they shall be kept sufficiently wet to reduce cracks in the forms and prevent the form joints from opening. If forms are removed before 4 curing days have transpired, the formed surface shall be protected for the remainder of the 4 day curing period. Protection and curing shall be accomplished by one of the following methods and shall be subject to the approval of the Inspector during the entire curing process:
 - a. Water Curing: Water curing shall be effected by covering exposed surfaces with cotton or burlap mats, previously wetted before applying, and kept thoroughly wet during the entire curing period. The application of the mats shall not mar or disturb surfaces which will be exposed on completion.
 - b. Membrane compound curing: Provide membrane curing compounds that conform to the latest provision of TxDOT's DMS-4650, "Hydraulic Cement Concrete Curing Materials and Evaporation Retardants" or the most applicable approved equal provision.
7. Fine Grading: All fine grading of structure foundations shall provide for seating on firm, clean, natural earth foundation except as otherwise provided. Any under-cut foundations, except where authorized, shall be corrected to the satisfaction of the Inspector, at the sole expense of the Contractor.
8. Excavation and Backfilling shall conform to the latest provision of the City of Fair Oaks Ranch Department of Public Works' Standard Specifications for Construction Item No. 306, "Structural Excavation" or the most

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applicable approved equal provision. All references therein to density and/or compaction levels are superseded by those of Fair Oaks Ranch, described elsewhere in these standard specifications.

307.4

MEASUREMENT AND PAYMENT: No direct measurement or payment will be made for the work to be done or the equipment to be furnished under this item, but shall be considered subsidiary to the particular items of work for which unit prices are required in the proposal.

- End of Specification -

ITEM NO. 550

TRENCH EXCAVATION SAFETY PROTECTION

550.1 DESCRIPTION: This item shall govern the trench excavation safety protection required for the construction of all trench excavation protection systems to be utilized in the project and including all additional excavation and backfill necessitated by the protection system.

A trench shall be defined as a narrow excavation made below the surface of the ground or pavement. In general, the depth is greater than the width, but the width of a trench is not greater than 15 feet. If forms or other structures are installed or constructed in an excavation so as to reduce the dimension measured from the forms or structure to the side of the excavation to 15 feet or less (measure at the bottom of the excavation), the excavation is also considered to be a trench. In addition, "Trench Excavation Protection" will not be limited to these applications, but may be used whenever deemed expedient and proper to ensuing work.

550.2 CONSTRUCTION: Trench excavation safety protection shall be accomplished as required by the latest provision of Part 1926, Subpart P - Excavations, Trenching, and Shoring of the Occupational Safety and Health Administration (OSHA) Standards and Interpretations, or the most applicable approved equal provision, as may be amended.

550.3 MEASUREMENT: Trench Excavation Safety Protection shall be measured by the linear foot along the centerline of any OSHA defined trench that may be entered by personnel and is not greater than 15 feet wide, including manholes and other structures.

550.4 PAYMENT: Payment for Trench Safety Excavation Protection, measured as prescribed above, shall be made at the unit price bid per linear foot of Trench Excavation Safety Protection regardless of the depth of the trench.

Payment shall include all components of the Trench Excavation Safety Protection System which can include, but not be limited to, sloping, sheeting, trench boxes or trench shields, sheet piling, cribbing, bracing, shoring, dewatering or temporary diversion and proper recapture and transportation of water to provide adequate drainage. Payment shall also include the additional excavation and backfill required, any jacking, jack removal, and removal of the trench supports after completion.

Payment of all work prescribed under this item shall be full compensation for all additional excavation and backfill associated with the item; for any retention by

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Contractor of structural design/geotechnical/safety/equipment consultant; for furnishing, placing and removing all shoring, sheeting, or bracing; for dewatering or temporary diversion and proper recapture and transportation of water; for all jacking and jack removal; and for all other labor, material, tools, equipment and incidentals necessary to complete this portion of the work.

- End of Specification -

ITEM NO. 804
EXCAVATION, TRENCHING AND BACKFILL

8041 **DESCRIPTION:** This section shall govern the excavation, trenching, and backfilling for water, sanitary sewer, and recycled water construction, unless otherwise noted in the contract documents. The work shall include all necessary drainage, dewatering, pumping, bailing, sheeting, shoring and incidental construction. All existing utilities shall be protected from damage during the excavation and backfilling of trenches and, if damaged, shall be replaced by the Contractor at his expense. Unless otherwise shown in the contract documents, all excavation shall be unclassified and shall include all materials encountered regardless of their nature or the manner in which they are removed, to include but not limited to rock, stone, sand, organic material, or whatever material is encountered. The Contractor shall at all times conform to the latest applicable provision of subpart “P” entitled “Excavation, Trenching, and Shoring of OSHA Safety and Health Regulations for Construction”, or most applicable approved equal provision. An excavation plan submittal signed and sealed by a Texas licensed professional engineer shall be submitted for review and acceptance by the Owner or Engineer, if applicable, one week prior to start of actual construction activities where the planned excavation is 20 feet or greater.

8042 **SUBMITTALS:** Submit any applicable manufacturer’s product data, instructions, recommendations, and certifications.

8043 **EXCAVATION:** The Contractor shall perform all excavation of every description and of whatever substances, including rock, encountered to the lines and grades shown in the contract documents or determined by the Engineer. During excavation, material suitable for backfilling shall be stockpiled in orderly manner a sufficient distance from the banks of the trench to avoid overloading and to prevent slides or cave-ins. All excavated materials not required or suitable for backfill shall be removed and properly disposed of by the Contractor or as directed by the Engineer. Grading shall be done as may be necessary to prevent surface water from flowing into trenches or other excavations, and any water accumulating therein shall be removed by pumping or by other approved methods.

Sheeting and shoring shall be installed in accordance with all applicable safety requirements for the protection of the work, adjoining property, and for the safety of all personnel. Unless otherwise indicated, excavation shall be by open cut, whether by hand, backhoe, ram-hoe, rock saw, or whatever method as necessary. Short sections of a trench may be tunneled, if in the opinion of the Engineer, the pipe or structure can be safely and properly installed or constructed, and backfill

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can be properly compacted in such tunnel sections.

1. Archaeological (Unidentified Archaeological Sites): If the Contractor should encounter a section of an archeological feature, such as a acequia (early Spanish irrigation ditch) or any other archaeological deposits during construction operations, the Contractor must stop excavation immediately and contact the Fair Oaks Ranch Inspector, who will call the City Historic Preservation Officer at (210) 299-8303 for an archaeological investigation as per Section 35-432.3 of the City Code, "Unidentified Sites Archaeological." The Contractor cannot begin excavation again without written permission from Fair Oaks Ranch. If more than three days are required for investigation (not including holidays and weekends) and the Contractor cannot work on other project scope items, the Contractor will be permitted to negotiate for additional construction time. The Contractor shall submit a request in writing within ten days after date of the first notice. If the time required for investigation does not exceed three days for each event, contract duration will not be extended.
2. Safety Devices: The Contractor shall provide and maintain barricades, flags, torches, and other safety devices as required by local, state, and federal codes and ordinances and conduct work to create a minimum inconvenience to the public. Temporary suspension of work does not relieve responsibility for the above requirements.
3. Safety and Health Regulations: The Contractor shall at all times conform to all of the latest applicable regulations of Subpart "P" entitled "Excavation, Trenching, and Shoring of OSHA Safety and Health Regulations for Construction," or most applicable approved equal provisions, and all other applicable state and local rules and regulations

8044

TRENCHING:

1. Trench walls shall be vertical. The practice of undercutting at the bottom or flaring at the top will not be permitted except where it is justified for safety or at the Engineer's and/or Inspector's direction. In special cases, where trench flaring is required, the trench walls shall remain vertical to a depth of at least 1 foot above the top of the pipe.

The trench bottom shall be square or slightly curved to the shape of the trenching machine cutters. The trench shall be accurately graded along its entire length to provide uniform bearing and support for each section of pipe installed upon the bedding material. Bell holes and depressions for

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joints shall be dug after the trench bottom has been graded and bedding installed. The pipe shall rest upon the new bedding material for its full length.

Where over-excavation occurs and when not as directed by the Engineer or Inspector, the under-cut trench shall be restored to grade at no cost to Fair Oaks Ranch by replacement with a material conforming to the requirements of the bedding material or a material approved by the Engineer.

The depth of cuts indicated on the cut sheets, as furnished by the Engineer, are from the off-set or cut hub elevation to the invert, or as indicated otherwise therein.

Minimum Width of Trench: The minimum width of pipe trenches, measured at the crown of the pipe, shall be not less than 12 inches greater than the exterior diameter of the pipe, exclusive of bells. The minimum base width of such trench shall be not less than 12 inches greater than the exterior diameter of the pipe, exclusive of special structures or connections. Such minimum width shall be exclusive of trench supports and not greater than the width at the top of the trench.

Maximum Width of Trench: The maximum allowable width of trench for pipelines measured at the top of the pipe shall be the outside diameter of the pipe (exclusive of bells or collars) plus 24 inches. A trench wider than the outside diameter plus 24 inches may be used without special bedding if the Contractor, at his sole expense, furnishes pipe of the required strength to carry additional trench load. Such modifications shall be submitted to the Inspector and approved in writing. Whenever such maximum allowable width of trench is exceeded, except as provided for in the contract documents, or by written approval of the Engineer, the Contractor, at his sole expense, shall encase the pipe in concrete from trench wall to trench wall, or with other approved pipe bedding material. Any excavation wider than this maximum width or subsequent surface or paving work, will be done at the Contractor's sole expense.

The depth of cut as indicated on the cut sheet for pay purposes may be more or less than the actual excavated depth. The variation is based on the surface elevation prior to the Contractor's operation and the invert of the sewer line.

2. When unsuitable bearing materials such as water, silt, muck, trash, debris or rock in ledge, boulder or coarse gravel (particle size larger than 1- $\frac{3}{4}$

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inch) is encountered at the bearing level, the Contractor shall over- excavate and remove such materials to a depth no less than 6 inches below the bottom of the pipe and replace it with a material conforming to the requirements of Paragraph 804.5.2.a, 804.6, or as approved by the Engineer and/or Inspector.

3. Dewatering: Prevent surface water and subsurface or groundwater from flowing into excavations and from flooding project site and surrounding area.
 - a. The Contractor shall not allow water to accumulate in excavations or at subgrade level. Remove water to prevent softening of foundation bottoms and soil changes detrimental to stability of subgrades and foundations. Provide and maintain dewatering system components necessary to convey water from excavations.
 - b. Convey water removed from excavation and rainwater to collecting or runoff areas away from buildings and other structures. Establish and maintain temporary drainage ditches and other diversions outside excavation limits. Do not use trench excavations as temporary drainage ditches.
 - c. Dewatering devices shall be provided by the Contractor with filters to prevent the removal of fines from the soil. Should the pumping system draw fines from the soil, the Inspector shall order immediate shutdown, and remedial measures will be the responsibility of the Contractor.
 - d. Upon completion of the dewatering work, the Contractor shall remove all equipment and leave the construction area in a neat, clean, condition that is acceptable to the Inspector
 - e. The Contractor shall maintain groundwater table at least 12 inches below the finished excavation subgrade.
 - f. Dewatering Performances. Performances of the dewatering system for lowering groundwater shall be measured by observation wells on piezometers installed in conjunction with the dewatering system, and these shall be documented at least daily. The Contractor shall maintain a log of these readings and submit them to the Inspector.

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No direct payment shall be made for costs associated with dewatering. All costs in connection therewith shall be included in the applicable contract price for the item to which the work pertains.

8045

BACKFILLING SANITARY SEWER TRENCHES:

1. General: Trenches shall not be backfilled until the construction structures or appurtenances, as installed, conform to the requirements specified. Where specified, only the secondary backfilling may incorporate excavated materials approved for backfilling, consisting of earth, loam, sandy clay, sand and gravel, soft shale or other approved materials, free from large clods of earth or stones. Where pipe is specially coated or sleeve/tape wrapped for protection against corrosion, care shall be taken not to damage the coating or sleeve/tape wrap.

Where a trench has been improperly backfilled, or where settlement occurs, the identified section shall be excavated to a depth and length 50 feet beyond the failed area, then refilled and compacted to the grade and compaction level required. The use of sand backfill shall not be allowed. All compaction within the secondary backfill zone shall be such that the apparent dry density of each layer shall be not less than 98% from the top of the initial backfill to the bottom of pavement section. The pavement (asphalt) section shall have 95% compaction density with a maximum dry density at + or - 2% optimum moisture content as determined by tests on samples as outlined in the latest provisions of TX-DoT Testing Method Tex 113-E or most applicable approved equal provisions, unless otherwise shown on the contract documents. At the time of compaction, the water content shall be at optimum moisture content, + or - 2% points.

See Table 1 at the end of this specification for an outline of the bedding and initial backfill requirements for various pipe types.

2. Sanitary Sewer Backfilling: Backfilling for sanitary sewers is divided into three (3 separate zones: (a) bedding: the material in the trench bottom in direct contact with the bottom of the pipe; (b) initial backfill: the backfill zone extending from the surface of the bedding to a point 1 foot above the top of the pipe; and (c) secondary backfill: the backfill zone extending from the initial backfill surface to the top of the trench. Materials and placement for each of the zones shall be as described herein.
 - a. Bedding:

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- (1) Stable Material: Existing stable material present during excavation includes:

Trench bottom (free of water, muck, debris);

Rock in boulder, ledge or coarse gravel (particle size not larger than 1- $\frac{3}{4}$ inch) formations;

Coarse sand and gravels with maximum particle size of 1- $\frac{3}{4}$ inch, various graded sands and gravels containing small percentages of fines, generally granular and non-cohesive either wet or dry; and

Fine sands and clayey gravels; fine sand, sand-clay mixtures, clay and gravel-clay mixtures.

- (2) Unstable Material: Existing unstable materials are silt, muck, trash or debris in the trench bottom bearing level; rock on boulder ledge or coarse gravel (particle size larger than 1- $\frac{3}{4}$ inch) formations.

- (3) Bedding Material: The existing material at the bearing level shall be removed and replaced to a minimum depth of 6 inches or $\frac{1}{8}$ of the outside diameter of the pipe, whichever is greater, with bedding material. The bedding material shall extend up the sides of the pipe sufficient to embed the lower quadrant of the pipe. The bedding material shall be composed of well-graded, crushed stone or gravel conforming to the following requirements unless modified by the Engineer in writing.

<u>Sewer Gravel</u>	<u>Percent</u>
Passing 1- $\frac{1}{2}$ inch sieve	100
Passing 1 inch sieve	95 to 100
Passing 1/2" inch sieve	25 to 60
Passing No. 4 sieve	0 to 10
Passing No. 8 sieve	0 to 5

- (4) Over Excavation: Where the trench bottom has been over

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excavated beyond the limits as defined in Item No. 848, "Sanitary Sewers," due to removal of unstable material, the pipe shall be concrete-encased. Encasement shall extend from the trench wall to trench wall and be a minimum of 6 inches above the top of pipe. No separate pay item (See Item No. 858).

- (5) Reduced Excavation: Where the trench bottom is not excavated in accordance with the specification due to rock or other hard under lying materials, then the pipe shall be concrete encased as defined in Item No. 858, "Concrete Encasement."
- (6) Consolidating Backfill Material: The Initial Bedding material shall be consolidated to assure it is incorporated from the bottom of the trench up to the pipe centerline. A hand-held vibrator, commonly used for concrete work, can be used for this purpose. The vibrator shall be inserted every 3 feet on each side of the pipe.

- b. Initial Backfill: Initial backfill is defined as backfill having a thickness in its compacted state from the surface of the bedding to a point 1 foot above the top of the pipe.

Initial backfill shall consist of gravel which conforms to the requirements of Item No. 804.5.2. a (3).

For sewer lines up to 24 inches in diameter initial backfill material shall be placed in two separate lifts above the bedding material the pipe is set on. The first lift shall be spread uniformly and simultaneously on each side and under the bottom quadrant of the pipe to the mid-point or spring line of the pipe.

Consolidate the Initial Backfill material as per section 804.5.2.(6).

Placement of the first lift of initial backfill shall be subject to inspection and approval prior to placement of second lift, which shall extend from the spring line of the pipe to a minimum of 1 foot above the top of the pipe. The second lift shall be evenly spread in a similar manner as the first lift.

For diameters larger than 24 inches, initial backfill material shall

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be evenly and simultaneously spread alongside, under the lower quadrant the pipe and over the pipe in 12-inch lifts to a point sufficient to a minimum of 1 foot above the top of the pipe.

Consolidate the Initial Backfill material as per section 804.5.2.(6).

- c. Secondary Backfill: Secondary backfill is defined as backfill from 1 foot above the top of the pipe to the top of the trench or bottom of pavement section. Secondary backfill shall be constructed in accordance with details shown in the construction documents.

Secondary backfill shall generally consist of materials removed from the trench and shall be free of brush, debris and trash. Rock or stones having a dimension larger than 6 inches at the largest dimension shall be sifted out and removed before the material is used in the secondary backfilling zone. Secondary backfill material shall be primarily composed of compactible soil materials. The secondary backfill material shall be placed in maximum 12-inch loose lifts or as directed by the Design Engineer and/or Inspector.

- d. Trench Surface Restoration: The surface of the backfilled trench shall be restored to match the previous existing conditions. This shall include final grading, placement of topsoil and seeding, placement of sod (such as at homes or businesses that had maintained grass), or other unprepared and prepared surfaces.

Trenches in alleys actively being used by vehicles (such as trash pickup, vehicle parking, etc.) shall be restored by grading and compacting to 98% or higher with a minimum of 4 inches of flex-base materials for the entire width of the alley. Asphaltic materials shall have a compaction density of 95%. Alleys not actively used by vehicles shall be graded and compacted to 98% or higher from the top of the initial backfill to the bottom of the pavement section, then spread grass seed for entire width of the alley.

Trenches in paved streets shall be covered with a temporary all-weather surface to allow for vehicular traffic until the final asphalt/concrete paving is complete. This surface shall be a minimum of 4 inches compacted and rolled asphaltic black base, either hot-mix or cold-mix applied. It is the Contractor's

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responsibility to maintain this surface until the final street restoration is complete. Temporary street striping may also be required. This surface must be removed prior to final asphaltting. All street work shall be done in accordance with the latest City of Fair Oaks Ranch Public Works' (or other city as applicable) construction specifications.

Included in this requirement is replacement of any curbs or sidewalks damaged or removed during the construction.

No separate payment for the surface restoration is permitted. The cost for this work must be included in the appropriate bid item.

804.6

BACKFILLING POTABLE WATER TRENCHES: Mains and service line trenches shall be excavated in accordance with Item No. 804.3 and Item No. 804.4 for placement of potable water appurtenances.

1. Bedding/Initial Backfilling: The bedding and initial backfill materials for concrete steel cylinder pipe (CSC), ductile iron pipe (DI), HDPE Pipe, Wrapped Steel Pipe, and Polyvinyl Chloride Pipe (PVC) in all nominal diameters shall be composed of well graded crushed stone or gravel conforming to the following requirements unless modified by the Engineer.

Modified Grade 5 gravel:

<u>MODIFIED GRADE 5</u>	<u>PERCENT</u>
Retained on 1/2" sieve	0
Retained on 3/8" sieve	0-5
Retained on No. 4 sieve	20-80
Retained on No. 10 sieve	75-100
Retained on No. 20 sieve	98-100

The quantity and thickness of materials lifts and compaction of initial backfill materials shall be in accordance with the provisions of Item No. 804.5.2.b and Item No. 804.6.1.

Where polyethylene services (3/4" – 2") are installed, initial backfill shall be sand conforming to the following requirements: Natural sand or sand produced from crushed gravel or crushed rock maximum 1/4-inch; 95 percent shall pass No. 4 sieve, free from clay and organic material, with a maximum 8 percent passing the No. 200 sieve. Larger services utilizing DI pipe or PVC (C-900) pipe shall be backfilled the same as mains.

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2. Secondary Backfill: Secondary backfill materials for all types and sizes of pipe shall be as defined in Item No. 804.5.2. (c), "Secondary Backfill." Secondary backfill materials shall be placed and compacted in accordance with the provisions of Item No. 804.5.2. (c), "Secondary Backfill."
3. Trench Surface Restoration: Trench surface restoration shall be accomplished as defined in Item No. 804.5.2. (d).

804.7

DISPOSAL OF EXCAVATED MATERIALS: Any excess excavated material, not utilized after all fill requirements have been met, shall become the responsibility of the Contractor. The Contractor shall dispose of it by hauling and wasting outside the limits of the rights-of-way or easements of this project and of public thoroughfares and water courses, in conformity with pertinent City, County, State and Federal codes and ordinances and in a manner meeting the approval of the Engineer.

804.8

QUALITY CONTROL:

1. The Contractor shall procure, store, and place materials from either onsite or offsite sources which comply with the specified requirements.
2. Quality Assurance Testing: The Owner shall have such tests and inspections as he may desire performed by a nationally-accredited, independent testing laboratory for his guidance and control of the work. Payment for such tests shall be the responsibility of the Owner, including the material proctor tests and density tests. The Contractor shall request testing work performed by the Owner by notifying the Owner of the areas available by Station Numbers or Dimensions and Lift Numbers. The Contractor shall provide access to the test area, associated trench excavation safety protection, and backfilling of the test areas. The frequency and location of testing shall be determined solely by the Owner. The Owner may test any lift of fill at any time, location, or elevation.
3. Quality Control Testing: The Contractor shall be responsible for compaction in accordance with the appropriate Specification. Compaction tests will be done at one location point randomly selected or as indicated by the Fair Oaks Ranch Inspector/Test Administrator, per each 12 inch loose lift per 400 linear feet. The inspector shall determine the depth at which the density test shall be taken. All depths shall be considered for testing without a predetermined maximum or minimum.

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Note: Tests requirements above are indicated as a minimum requirement, but maybe subjected to follow more stringent requirements as established by other appropriate agencies (such as City of Fair Oaks Ranch Public Works Right-of-Way Management Plan, etc.).

Note: Any failed test shall require the Contractor to remove and replace that layer of backfill to 50 feet from either side from the failed test location. The Contractor will also be required at no cost to Fair Oaks Ranch to provide two additional tests at the replaced location where the initial test failed and at one location point, randomly selected or as indicated by the Fair Oaks Ranch Inspector/Test Administrator.

Note: Sanitary Sewer Laterals will be subject to compaction tests at the discretion of the Fair Oaks Ranch Inspector/Test Administrator within 400 linear foot segments. Any failed test shall require the Contractor to remove and replace failed backfill. The Contractor will also be required at no additional cost to Fair Oaks Ranch to provide one test at the replaced location where the initial tests failed.

The Contractor shall be responsible for all costs associated with the proctor and density tests, and for providing to Fair Oaks Ranch and Consultant, if applicable, verification that necessary compaction levels were achieved. These tests shall be performed by a nationally-accredited, independent testing laboratory. .

The Contractor shall provide access to the test area, associated trench excavation safety protection, and backfilling of the test areas at the Contractor's expense.

The Owner will determine in-place density and moisture content by any one or combination of the following methods: The latest provisions of ASTM D2922 (density of soil and soil aggregate in-place by nuclear methods – shallow depth), D1556 (density and unit weight of soil in-place by sand cone method), D2216 (lab density of water content of soil and rock), D3017 (water content of soil and rock – shallow depth in-place by nuclear methods) or most applicable approved equal provisions.

8049 **MEASUREMENT:** Excavation, Trenching and Backfill will not be measured for payment.

80410 **PAYMENT:** No direct payment shall be made for incidental costs associated with quality control testing, excavation, trenching and backfilling for water mains

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and sanitary sewers, and all costs in connection therewith shall be included in the applicable contract price for the item to which the work pertains.

TABLE 1
BEDDING AND INITIAL BACKFILL REQUIREMENTS

	UNSTABLE		STABLE*		ROCK	
	Bedding	Initial Backfill	Bedding	Initial Backfill	Bedding	Initial Backfill
WATER	6" or D/8	1.0' above pipe	6" or D/8	1.0' above pipe	6" or D/8	1.0' above pipe
CSC	Modified Grade 5	Modified Grade 5	Modified Grade 5	Modified Grade 5	Modified Grade 5	Modified Grade 5
DI	Modified Grade 5	Modified Grade 5	Modified Grade 5	Modified Grade 5	Modified Grade 5	Modified Grade 5
PVC	Modified Grade 5	Modified Grade 5	Modified Grade 5	Modified Grade 5	Modified Grade 5	Modified Grade 5
HDPE	Modified Grade 5	Modified Grade 5	Modified Grade 5	Modified Grade 5	Modified Grade 5	Modified Grade 5
WSP	Modified Grade 5	Modified Grade 5	Modified Grade 5	Modified Grade 5	Modified Grade 5	Modified Grade 5
SEWER	6"	1.0' above pipe	6"	1.0' above pipe	6"	1.0' above pipe
RIGID	sewer gravel	sewer gravel	sewer gravel	sewer gravel	sewer gravel	sewer gravel
FLEXIBLE	sewer gravel	sewer gravel	Sewer gravel	sewer gravel	sewer gravel	sewer gravel

Fair Oaks Ranch Standard Specifications for Construction

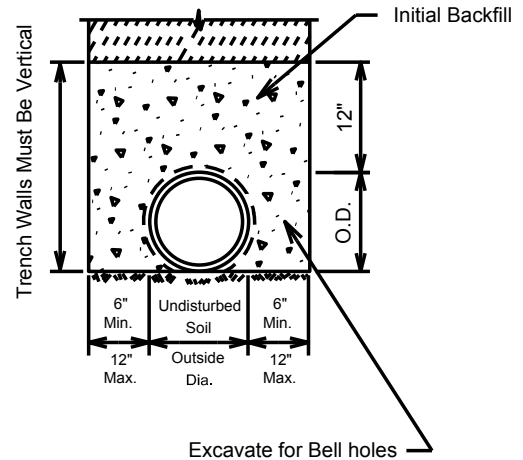
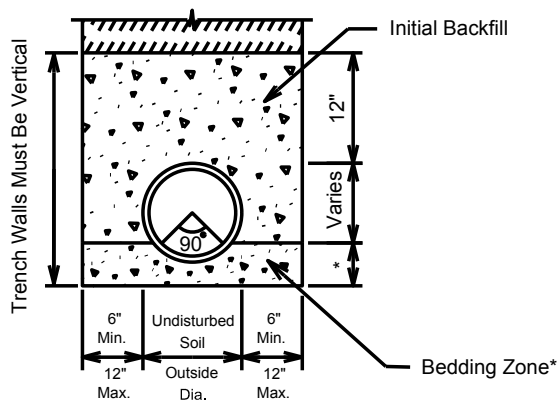
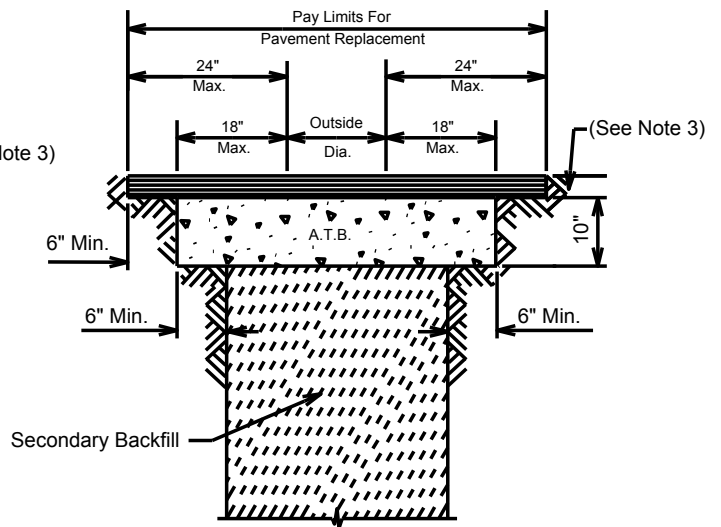
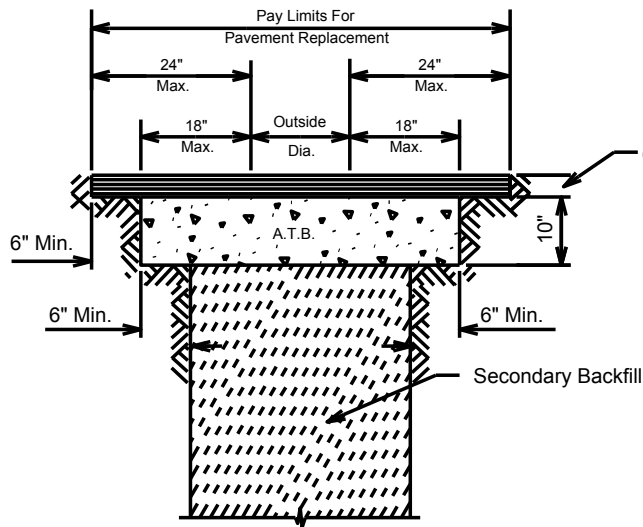
* When the native material encountered is clean sand, this material may be utilized for bedding and initial backfill at the Engineer's direction.

HDPE = High Density Polyethylene Pipe. WSP = Tape Wrapped Steel Pipe.

D = Outside Diameter of Pipe.

Modified Grade 5	---	rounded rock
	---	See Item No. 804.6.1 for gradation
Sewer Gravel	---	See Item No. 804.5.2. a (3)

- End of Specification -



* Sewer Gravel 6" Min. or 1/8 O.D. of the pipe, whichever is greater as directed by the Inspector

* In areas of over excavation, encasement shall extend from trench wall to trench wall. Pay Limits shall not exceed 12" max. as shown on detail. Additional encasement shall be incidental.

- 1) RIGID PIPE - UNSTABLE OR UNACCEPTABLE CONDITIONS
FLEXIBLE PIPE - ALL CONDITIONS

- 2) RIGID PIPE - EXISTING STABLE BEDDING CONDITIONS
- 3) REPLACEMENT AC SURFACE LAYER SHALL BE OF THE TYPE AND THICKNESS BASED ON FUNCTIONAL CLASSIFICATION.
 - a. Min 2" HMAC Type "D" for trench repair in Local / Residential streets.
 - b. Min 3" HMAC Type "C" for trench repair in Collector / Arterial streets.

PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

SANITARY SEWER PIPE
LAID IN TRENCH

APPROVED
JANUARY 2019

REVISED

DD-804-01

SHEET
1 OF 1

Backfill around manhole or structures shall be flowable fill up to 1 foot above cone section. See Note 2

Slope $\frac{1}{2}$ " per ft

Test Only When Necessary

For Bedding Material Refer to Fair Oaks Ranch Specification DD-804-01

Random Test Points

+/- 400 L.F.

Pipe Size Varies

12" Loose Lift

Backfill around manhole or structures shall be flowable fill up to 1 foot above cone section. See Note 2

For Manhole Refer To Fair Oaks Ranch Specification DD-852-01

Initial Backfill

2. When Contractor opts to backfill with approved secondary material, all work will be subject to section 804.5.1 and 804.5.2.C & 2.D.

NOTES:

1. The Compaction Report will indicate the station and the depth of each test point

PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

TRENCH COMPACTION
DETAIL

APPROVED
JANUARY 2019

REVISED

DD-804-02

SHEET
1 OF 1

ITEM NO. 808

REINFORCED CONCRETE VAULTS

808.1 DESCRIPTION: Reinforced concrete vaults shall be cast-in-place and shall include reinforcing steel, forms, finishing, curing, and all other appurtenant work required to provide a complete and functional structure.

All cast-in-place concrete shall be accurately formed and properly placed and finished as shown in the contract documents.

The Contractor shall inform the Engineer at least 24 hours in advance, of time and location at which he/she intends to place concrete in order for inspection of forms, reinforcing steel placement, and other preparatory work.

Precast vaults conforming to the Standard Drawings and Specifications shall be acceptable as a substitute to the cast-in-place vaults or as approved by the Engineer.

Contractor must provide Geographic Information Systems (GIS) point .shp file for any installed concrete structure. The GIS .shp file must include information on the location of the structure at a minimum. Confirm the information to be included in the .shp file with Fair Oaks Ranch prior to submission. Additional information to be included in the shapefile may be requested by Fair Oaks Ranch.

808.2 MATERIALS: Concrete used shall be transit mix and shall have a 28-day compressive strength of 3,000 psi with a maximum slump of 6 inches and a minimum slump of 3 inches. The use of admixtures shall not be permitted unless approved by the Engineer. Cement shall be Type I or Type III and shall conform to the general requirements contained in the Materials Specifications Item 100-10 and the latest provision of ASTM Specifications C150 and C156 or most applicable approved equal provision.

808.3 CONSTRUCTION:

1. Forms: Forms shall be designed to produce hardened concrete having the shape, lines, and dimensions shown in the contract documents.

Surfaces which will be exposed to view when construction is completed shall be prefabricated plywood panel forms, job-built plywood forms, or forms that are lined with plywood or fiberboard. The forms shall produce finished surfaces that are free from off-sets, ridges, waves, and concave or convex areas.

Fair Oaks Ranch Standard Specifications for Construction

Plywood or lined forms will not be required for surfaces which are normally submerged or not ordinarily exposed to view. Other types of forms, such as steel or unlined wooden forms, may be used for surfaces which are not restricted to plywood or lined forms and may be used as backing for form linings.

Before concrete is placed, a film of light form oil shall be applied to the forms.

Forms shall be substantial and sufficiently tight to prevent leakage of mortar. Forms shall be thoroughly cleaned, braced, or tied to maintain the desired position, shape, and alignment during and after concrete placement.

Form ties shall be corrosion resistant and shall have sufficient strength and rigidity to support and maintain the form in proper position and alignment.

2. Form Removal: Forms shall be removed after 24 hours, provided that the exposed surfaces can be immediately and effectively sealed to prevent loss of moisture. Otherwise, the forms shall remain in place for 48 hours. Precautions shall be taken in form removal to avoid surface gouging, corner or edge breaking, and other damage to the concrete.
3. Reinforcing Steel: Reinforcing steel shall be accurately formed and shall be free from loose rust, scale, and contaminants which reduce bond. Unless otherwise shown in the contract documents, bar reinforcement shall be deformed and conform to the general requirements contained in Item No. 301, "Reinforcing Steel."
4. Reinforcing Steel Placement: Reinforcing steel shall be accurately positioned on supports, spaces, hangers, or other reinforcements and shall be secured in place with wire ties or suitable clips. All bars shall be shop fabricated and bent cold.
5. Concrete Placement: Concrete shall be placed as nearly as practicable in its final position to avoid segregation due to rehandling. When the concrete pour has commenced, it shall be carried on as a continuous operation until the placing of the panel or section is completed as a whole. All concrete shall be thoroughly compacted by suitable means during pouring operations and shall be thoroughly worked around reinforcement bars and into the corners of the forms. Mechanical vibration or other acceptable means shall be used to completely embed the reinforcement and eliminate honeycomb. Finished surfaces shall be brought to proper grade, struck off, and completed in a workmanlike manner. No honeycombing, rough spots or protruding stones shall be left exposed.

Fair Oaks Ranch Standard Specifications for Construction

6. Curing: Concrete shall be protected from loss of moisture for at least 7 days after placement. Curing of concrete shall be by methods which will keep the concrete surfaces adequately wet during the specified curing period.
 - a. Water Curing: Water saturation of concrete surfaces shall begin as quickly as possible after the initial set of the concrete. The rate of water application shall be regulated to provide complete surface coverage with a minimum of runoff.
 - b. Membrane Curing: Chlorinated, rubber-type, membrane curing compound may be used in lieu of water curing on concrete which will not be covered later with mortar or additional concrete.

Membrane curing compound shall be spray applied at coverage of not more than 300 square feet per gallon. If forms are removed before the end of the specified curing period, curing compound shall be immediately applied to the formed surfaces before they dry out.

Curing compound shall be suitably protected against abrasion during the curing period.

7. Finishing Surfaces: Fins and other surface projections shall be removed from all formed surfaces. All exposed exterior surfaces shall have a rubbed finish. The floor surface shall be brush finished, unless otherwise specified.
8. Repairing Defective Concrete: Defects in formed concrete surfaces shall be repaired to the satisfaction of the Engineer within 24 hours, and defective concrete shall be replaced within 48 hours after the forms have been removed. All concrete which is honeycombed or otherwise defective shall be cut out and removed to sound concrete with edges square cut to avoid feathering.

Concrete repair work shall be performed in a manner that will not interfere with thorough curing of surrounding concrete. Repair work shall be adequately cured.

9. Painting: All exposed metallic surfaces such as the cover plate, hinges, handles, and other exposed hardware, shall be primed and painted with one coat of primer and one coat of aluminum paint of approved and compatible quality.

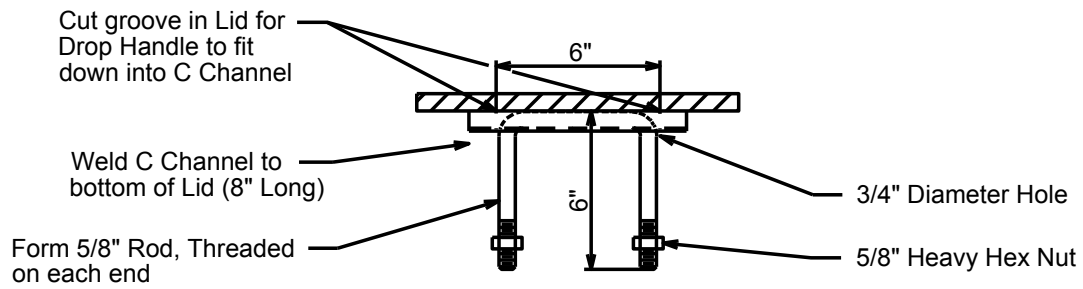
Fair Oaks Ranch Standard Specifications for Construction

10. **Backfill:** The Contractor shall cover the openings at each end of the vault with ¼ inch plywood placed outside the vault. Selected backfill (consisting of job excavated materials, finely divided and free from debris, organic material and stones larger than two inches in greatest dimension) shall be placed in uniform layers not exceeding eight inches in un- compacted thickness and shall be carefully compacted around the sides of the vault until level with the surrounding ground.

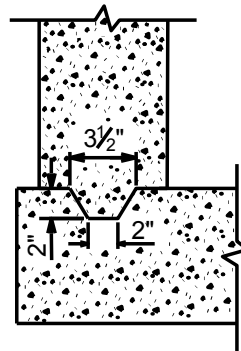
808.4 **MEASUREMENT:** Reinforced concrete vaults shall be measured by the unit of the various sizes.

808.5 **PAYMENT:** Payment for reinforced concrete vaults will be made at the unit price for each size vault installed.

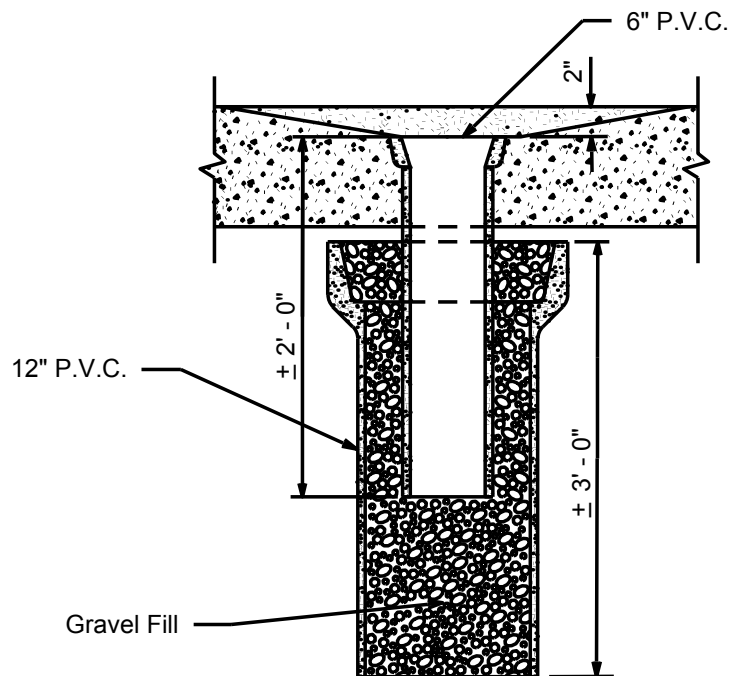
- End of Specification -



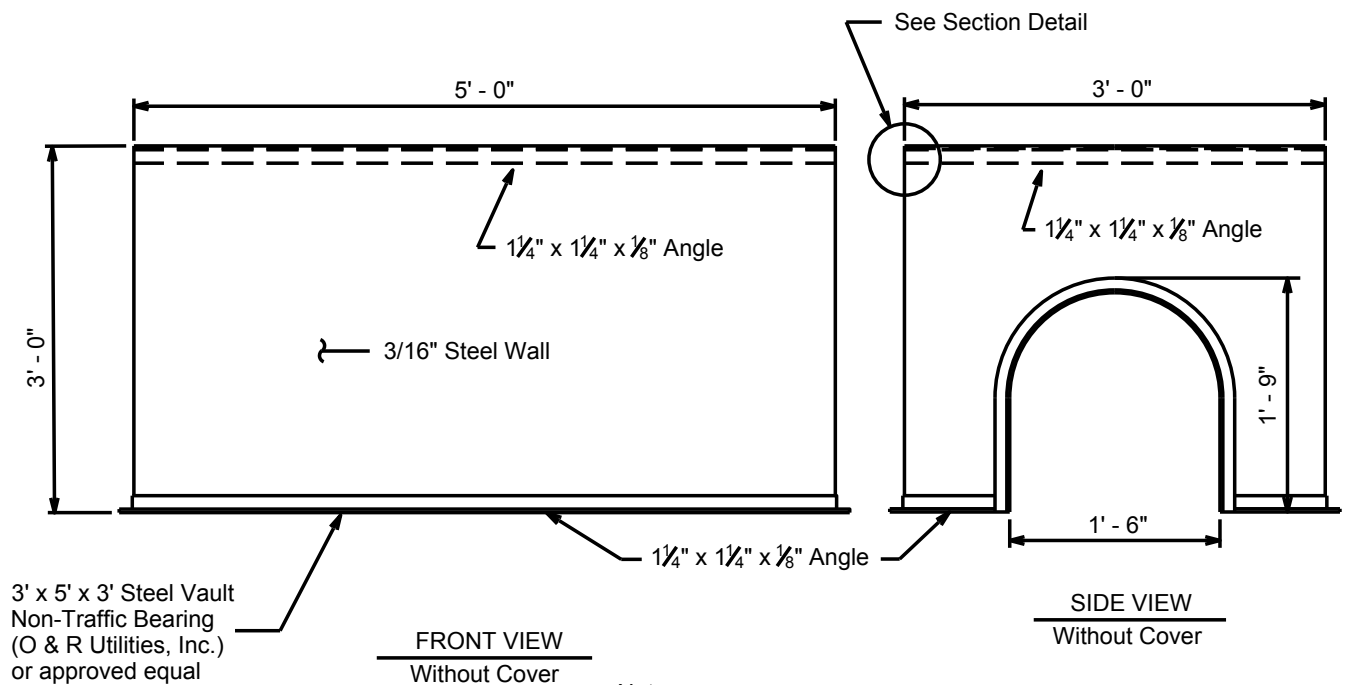
DROP HANDLE DETAIL



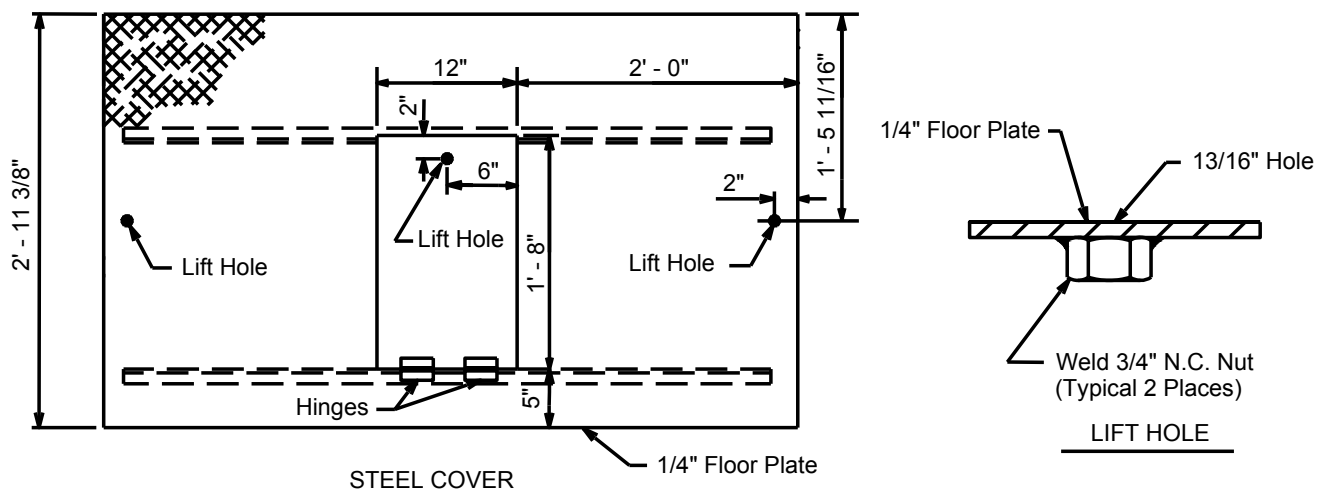
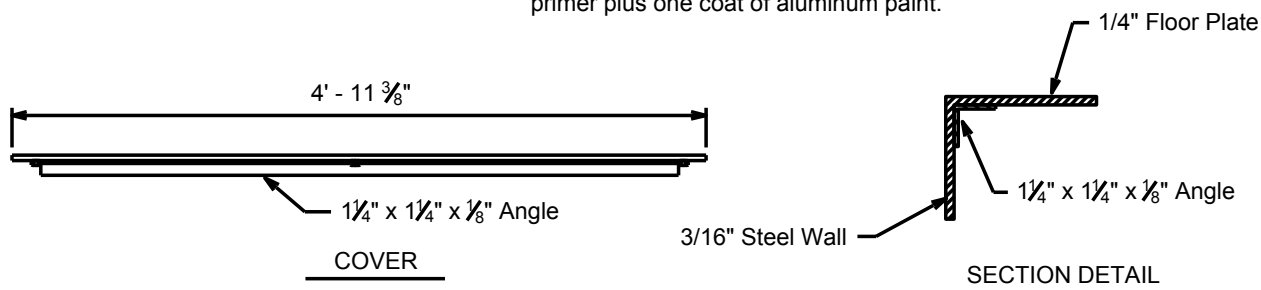
KEYWAY DETAIL



DRAIN DETAIL



Note:
Paint inside of vault with one coat of rust-inhibitive
primer and outside with one coat of rust-inhibitive
primer plus one coat of aluminum paint.



3' x 5' x 3' RECTANGULAR STEEL VAULT
(NON-TRAFFIC BEARING LOCATION)

PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

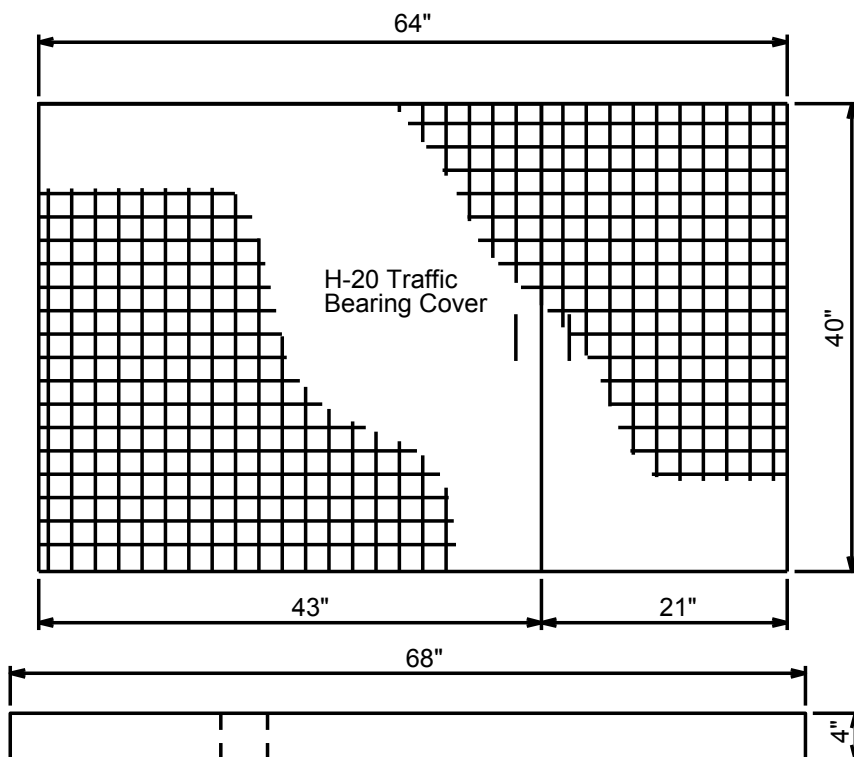
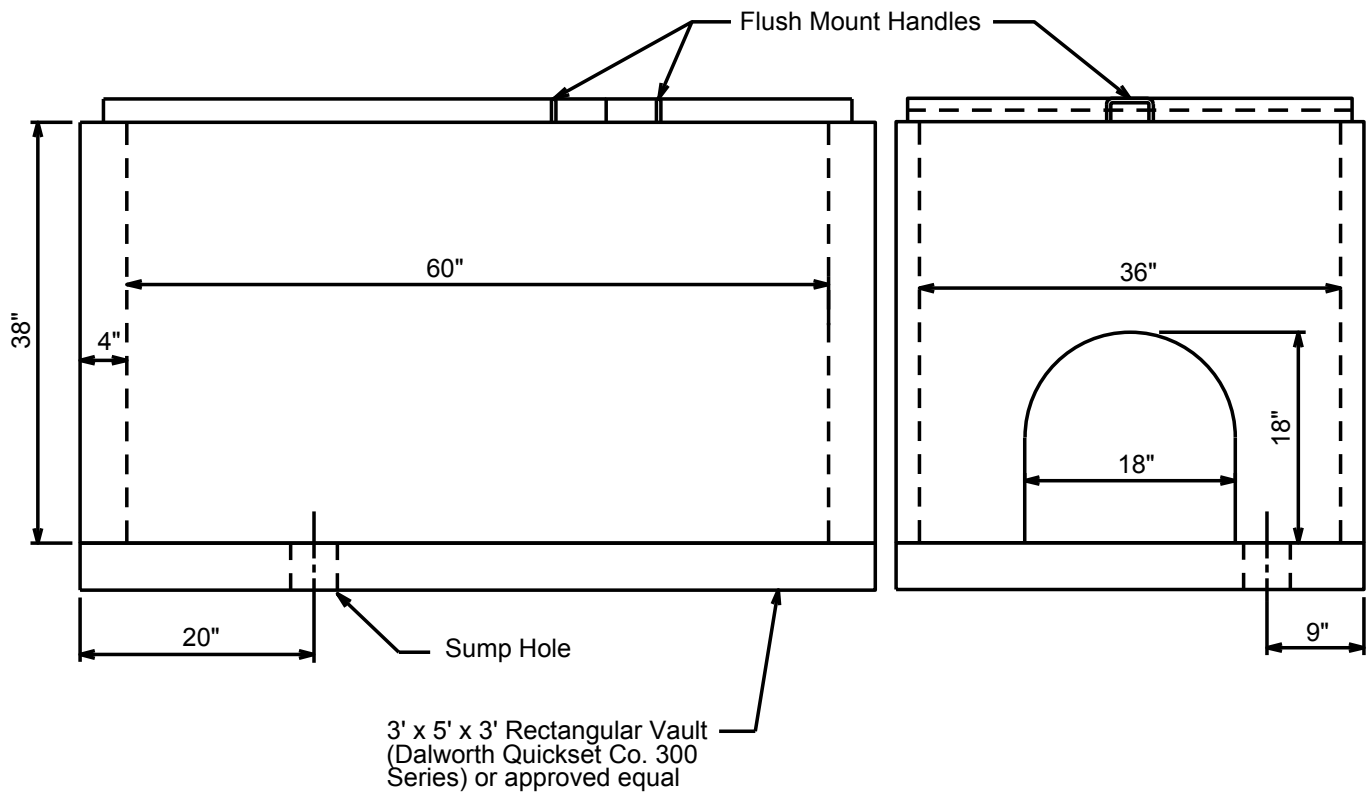
VAULT FOR 3", 4", 6" & 8"
TURBINE METER AND 6" & 8"
DETECTOR CHECK
INSTALLATION

APPROVED
JANUARY 2019

REVISED

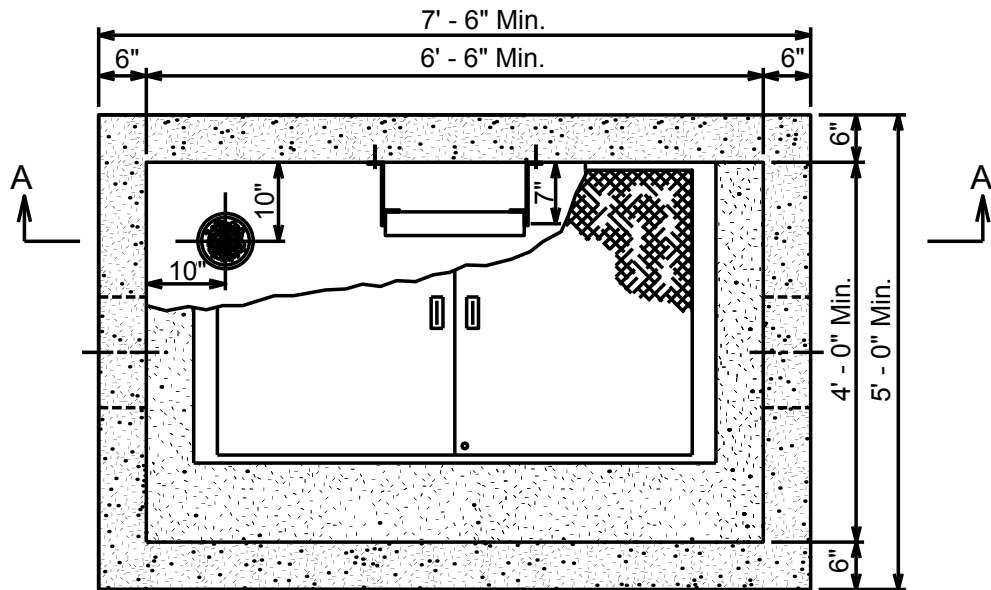
DD-808-02

SHEET
1 OF 2



**3' x 5' x 3' RECTANGULAR CONCRETE VAULT
(TRAFFIC BEARING LOCATION)**

PROPERTY OF THE CITY OF FAIR OAKS RANCH	VAULT FOR 3", 4", 6" & 8" TURBINE METER INSTALLATION	APPROVED	REVISED
		JANUARY 2019	
		DD-808-02	SHEET 2 OF 2



PLAN

Cover Latch is to be located on the opposite side of where the ladder is positioned

Bolt Down Mechanism
See DD-808-09 Sheet 1 of 1
3' x 5' H-20 Traffic bearing frame and cover cast in flush with top of Concrete Lid. Lid is to be Spring-assisted for easy opening and painted aluminum

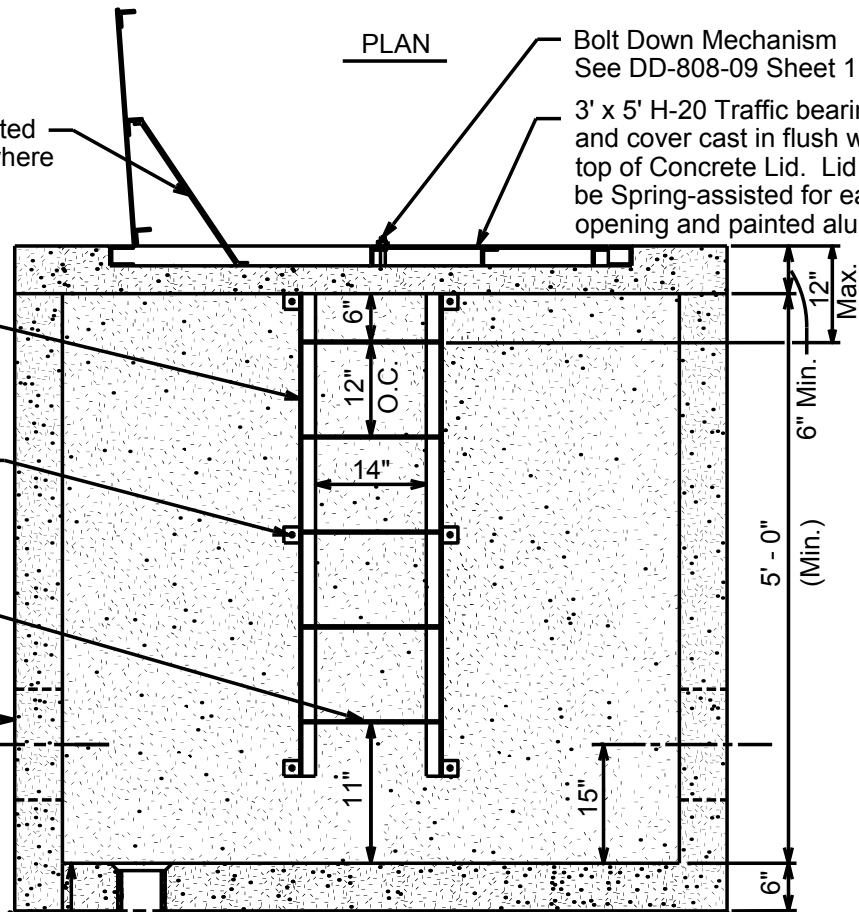
Ladder made of 2" x 2" x 1/4" Angle Steel

2" x 1/4" Steel ladder supported with 3/8" wedge anchor bolts

3" x 1/4" Steel Steps welded to ladder coated with skid resistant material

14" x 14" Side Openings

6" of 3/4" to 1-1/2" Gravel

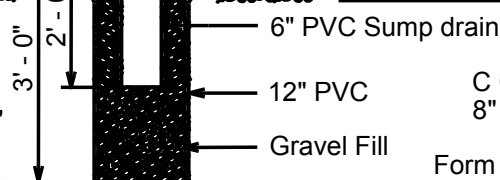


SECTION A-A

Cut groove in Lid for Drop Handle to fit down into C channel.

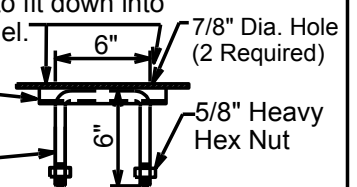
OPTION FOR DRAIN

- 1) Install 6" of 3/4" to 1-1/2" gravel under vault
- 2) Provide 6" PVC Sleeve through vault floor



C Channel 8" Long
Form 5/8" Rods, Threaded on each end (2 Required)

DROP HANDLE DETAIL



PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

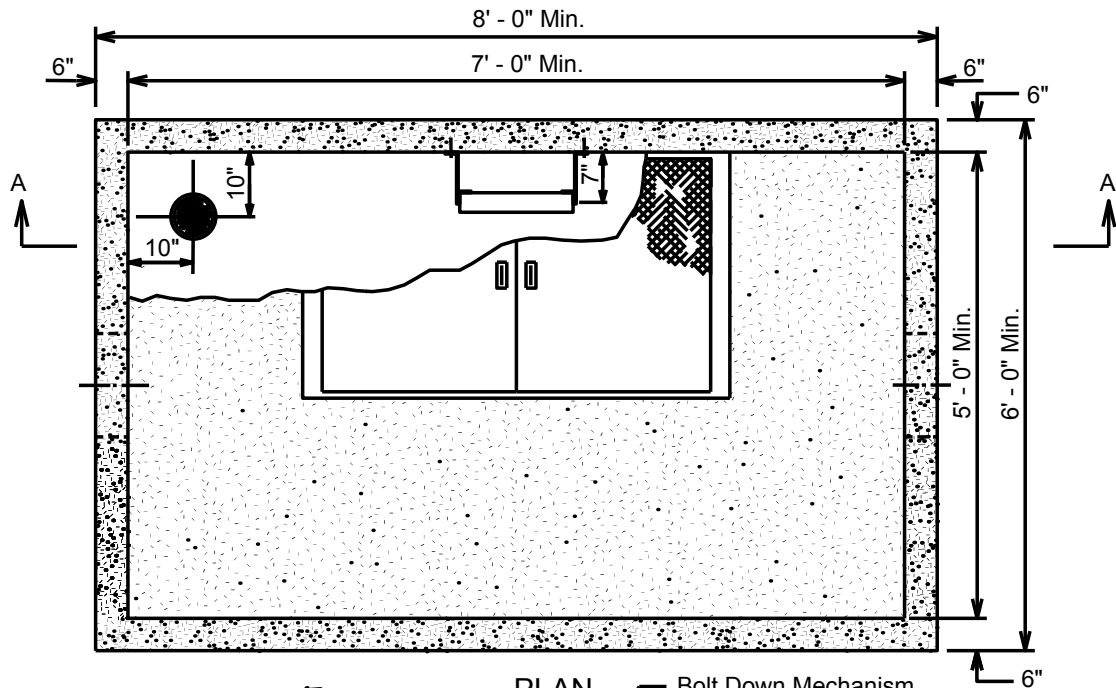
CONCRETE VAULT FOR
6" & 8" DOUBLE DETECTOR
CHECK INSTALLATION

APPROVED
JANUARY 2019

REVISED

DD-808-03

SHEET
1 OF 1



Cover latch is to be located on the opposite side of where the ladder is positioned.

PLAN

Bolt Down Mechanism
See DD-808-09 Sheet 1 of 1

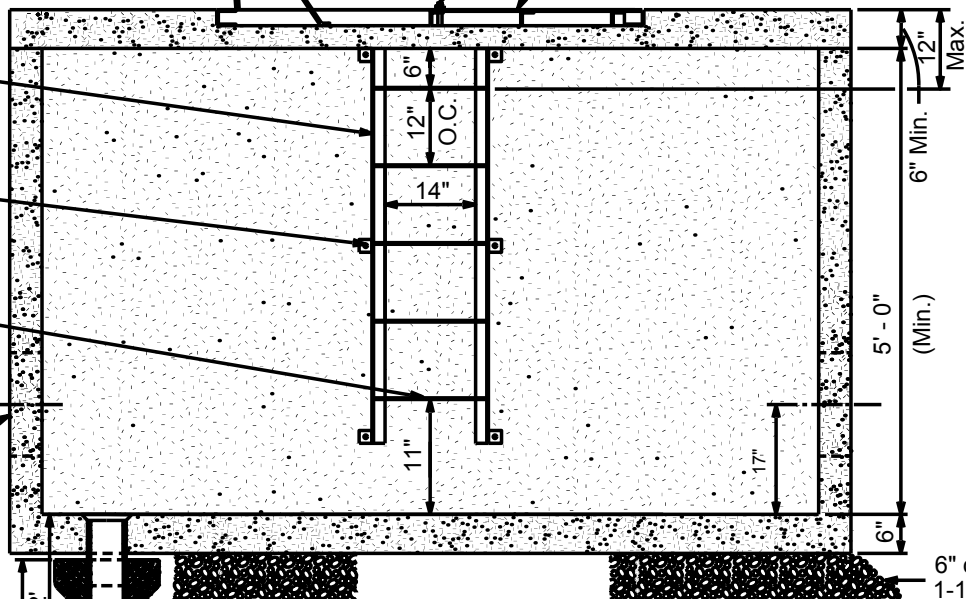
3' x 5' H-20 Traffic bearing frame and cover cast in flush with top of Concrete Lid. Lid is to be spring-assisted for easy opening and painted aluminum.

Ladder made of
2"x 2" x 1/4" Angle
Steel

2" x 1/4" Steel ladder
supports with 3/8"
wedge anchor bolts

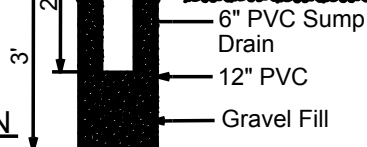
3" x 1/4" Steel Steps
welded to ladder
coated with skid
resistant material

16" x 16" Side
Opening

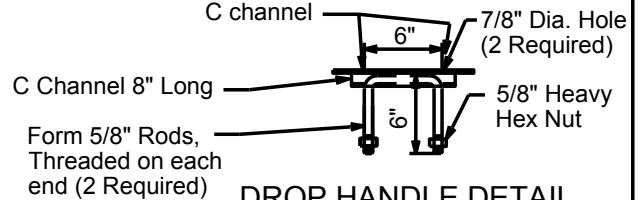


OPTION FOR DRAIN

- 1) Install 6" of 3/4" to 1-1/2" gravel under vault
- 2) Provide 6" PVC Sleeve through vault floor



Cut groove in Lid for Drop
Handle to fit down into
C channel



PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

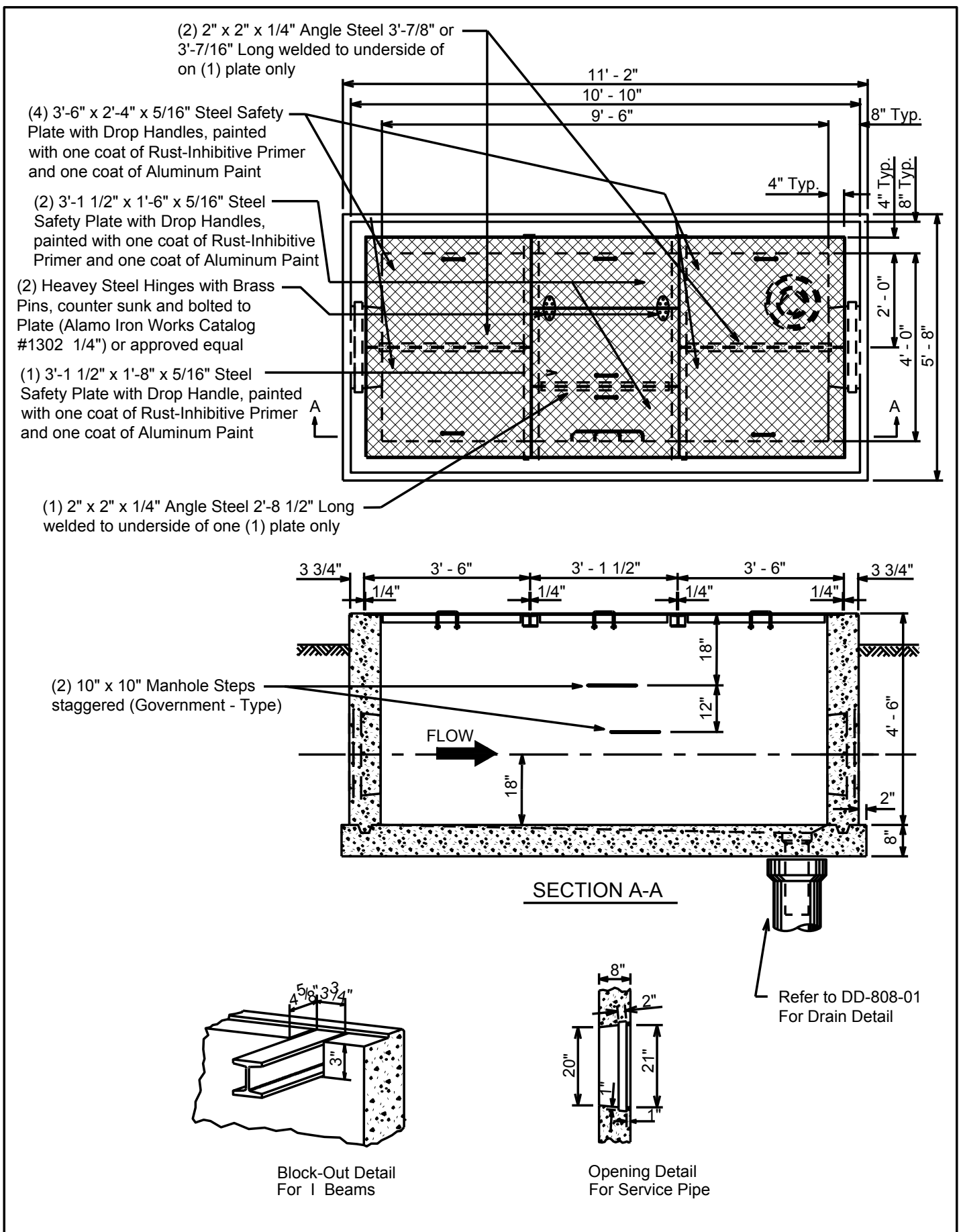
CONCRETE VAULT FOR
10" DOUBLE DETECTOR
CHECK INSTALLATION

APPROVED
JANUARY 2019

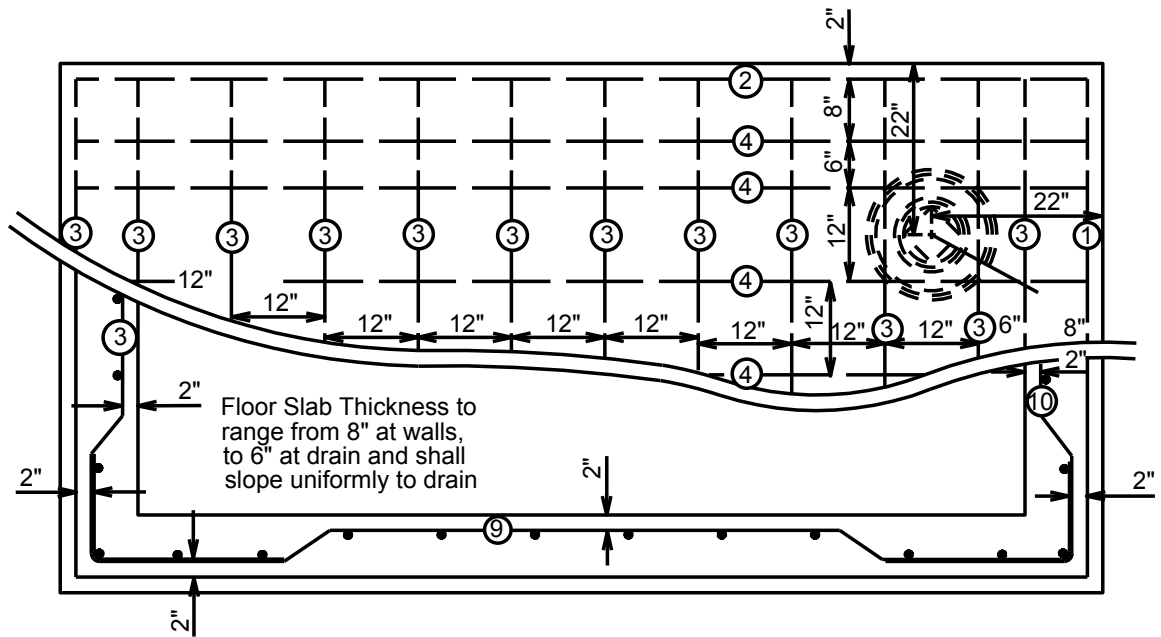
REVISED

DD-808-04

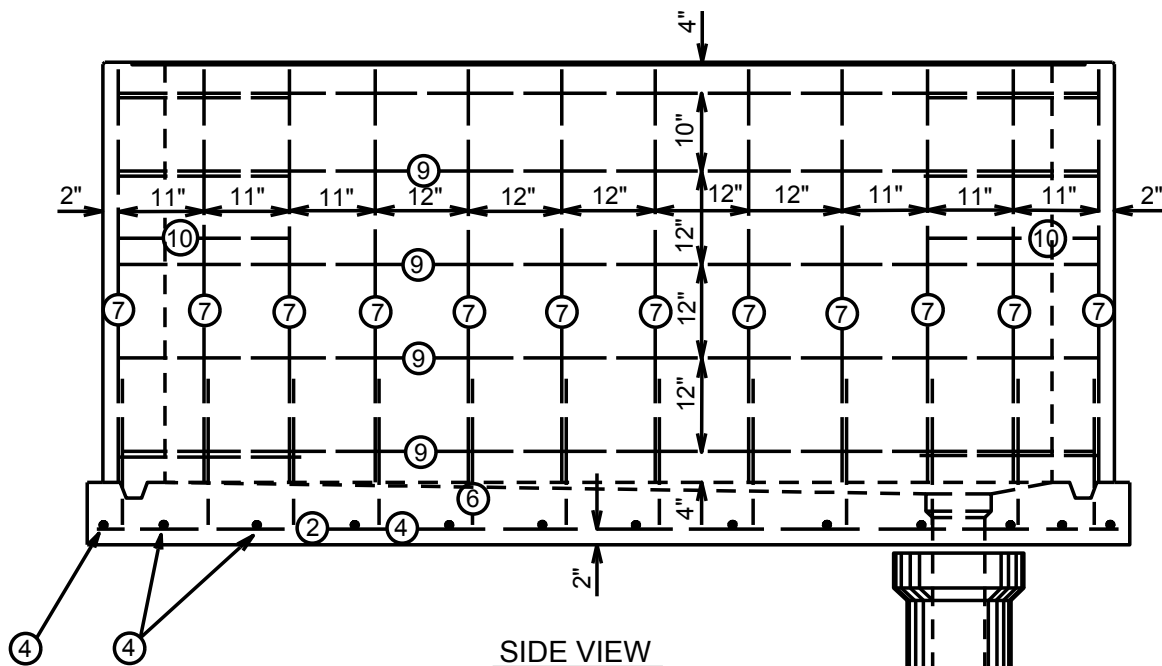
SHEET
1 OF 1



PROPERTY OF THE CITY OF FAIR OAKS RANCH	CONCRETE VAULT FOR 12" SERVICE WITH 10" TURBINE METER	APPROVED	REVISED
		JANUARY 2019	
		DD-808-05	SHEET 1 OF 3

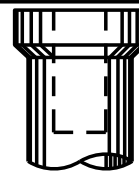


PLAN VIEW



SIDE VIEW

STEEL DETAIL FOR CONCRETE VAULT

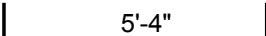
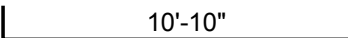
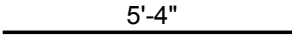
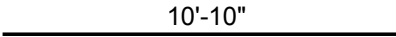
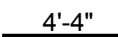
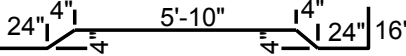
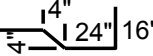
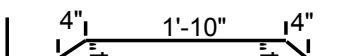


Refer to DD-808-01
For Drain Detail

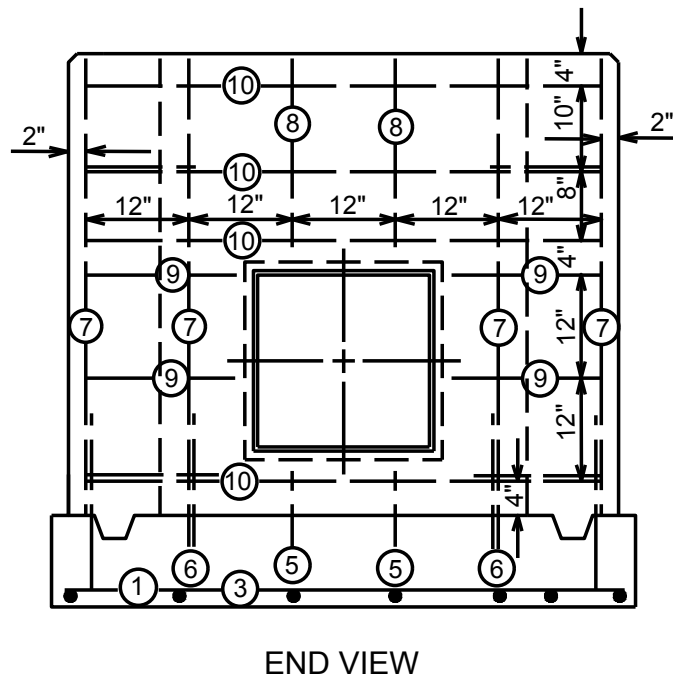
Note:

1. See DD-808-05 Sheet 3 of 3 for Steel Schedule

PROPERTY OF THE CITY OF FAIR OAKS RANCH	CONCRETE VAULT FOR 12" SERVICE WITH 10" TURBINE METER	APPROVED	REVISED
		JANUARY 2019	
		DD-808-05	SHEET 2 OF 3

STEEL SCHEDULE				
Mark	Req'd	Size	Bending Detail	Placement
1	2	5	20"  20"	Floor Slab
2	2	5	20"  20"	Floor Slab
3	11	5	 5'-4"	Floor Slab
4	6	5	 10'-10"	Floor Slab
5	4	4	10"  12"	Tie Bar - Floor Slab To Vertical Walls
6	28	4	18"  12"	Tie Bar - Floor Slab To Vertical Walls
7	28	4	 4'-4"	Vertical In Walls
8	4	4	 20"	Vertical In Walls (Above Openings)
9	10	4	16"  5'-10"  16"	Horizontal In Walls
10	8	4	15"  15"	Horizontal In Walls

STEEL SCHEDULE FOR CONCRETE VAULT



STEEL DETAIL FOR CONCRETE VAULT

PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

CONCRETE VAULT FOR
12" SERVICE WITH
10" TURBINE METER

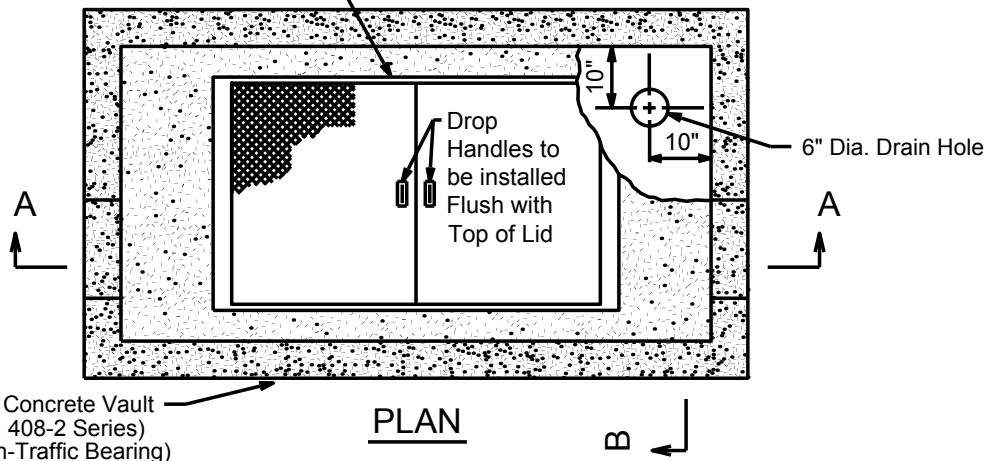
APPROVED
JANUARY 2019

REVISED

DD-808-05

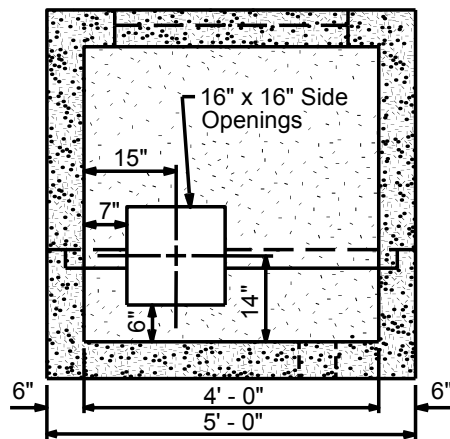
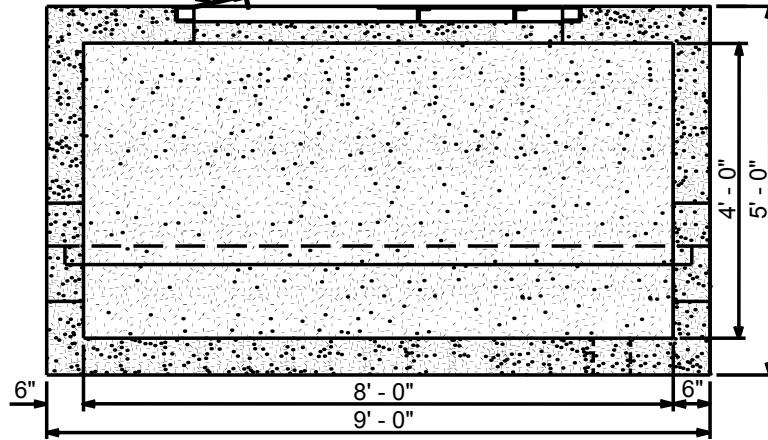
SHEET
3 OF 3

3'-0" x 5'-0" Parkway Frame
and Cover Cast-In Flush with
Top of Vault



4' x 8' x 4' Rectangular Concrete Vault
(Dalworth Quickset No. 408-2 Series)
or approved equal (Non-Traffic Bearing)

Bolt Down Spring-assisted Lid
See DD-808-03, sheet 1 of 1



PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

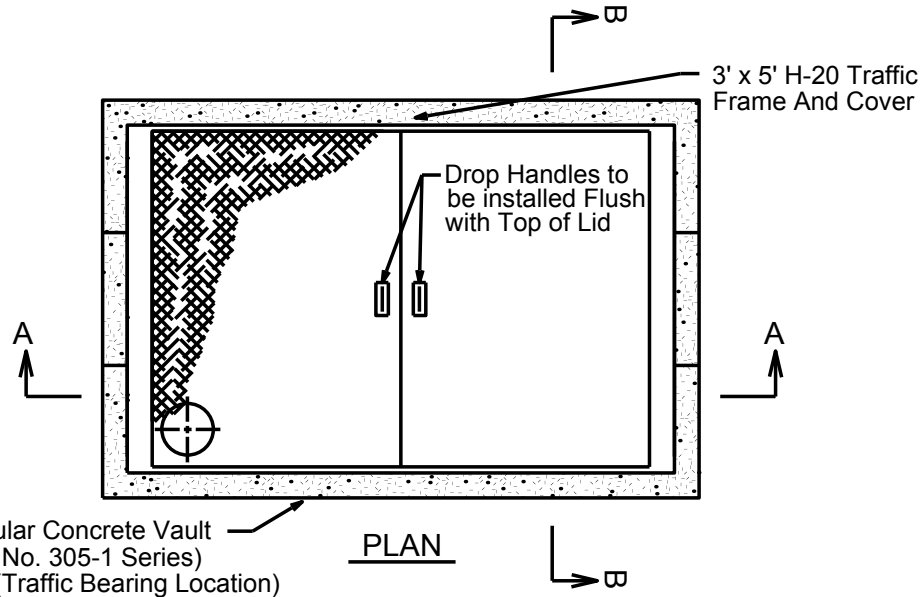
CONCRETE VAULT FOR
6" & 8" FIRE FLOW METER
INSTALLATION

APPROVED
JANUARY 2019

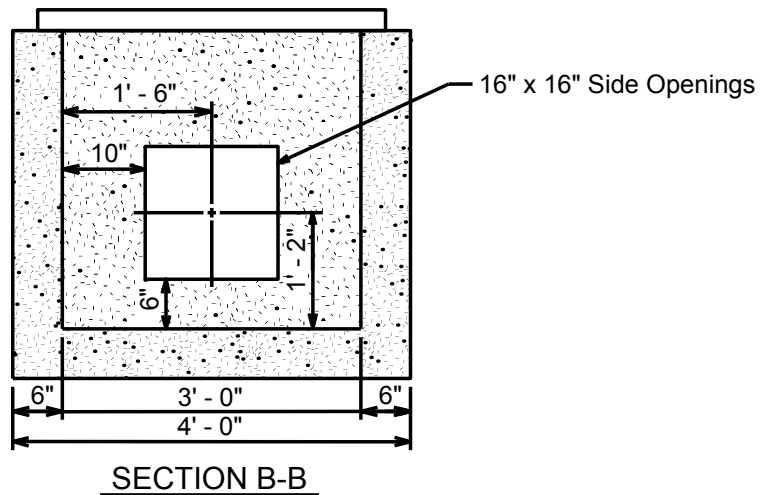
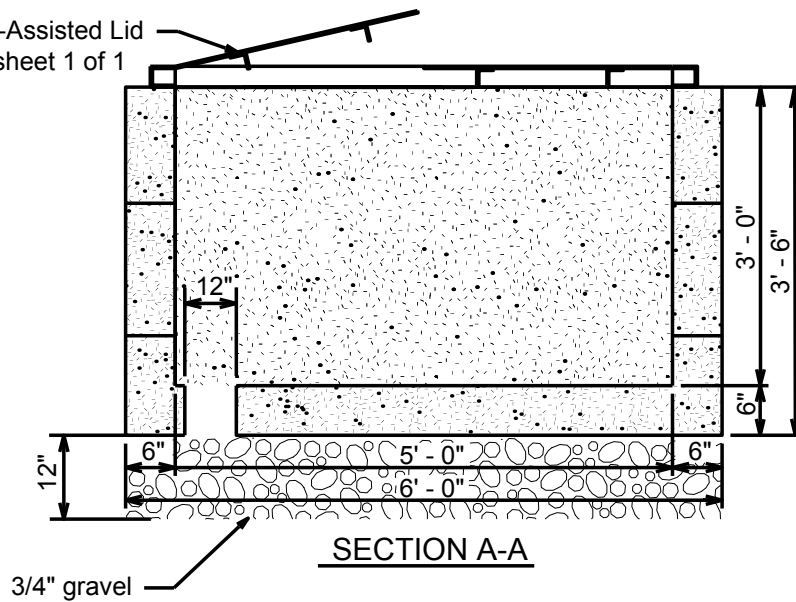
REVISED

DD-808-06

SHEET
1 OF 1



Bolt Down Spring-Assisted Lid
See DD-808-03, sheet 1 of 1



PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

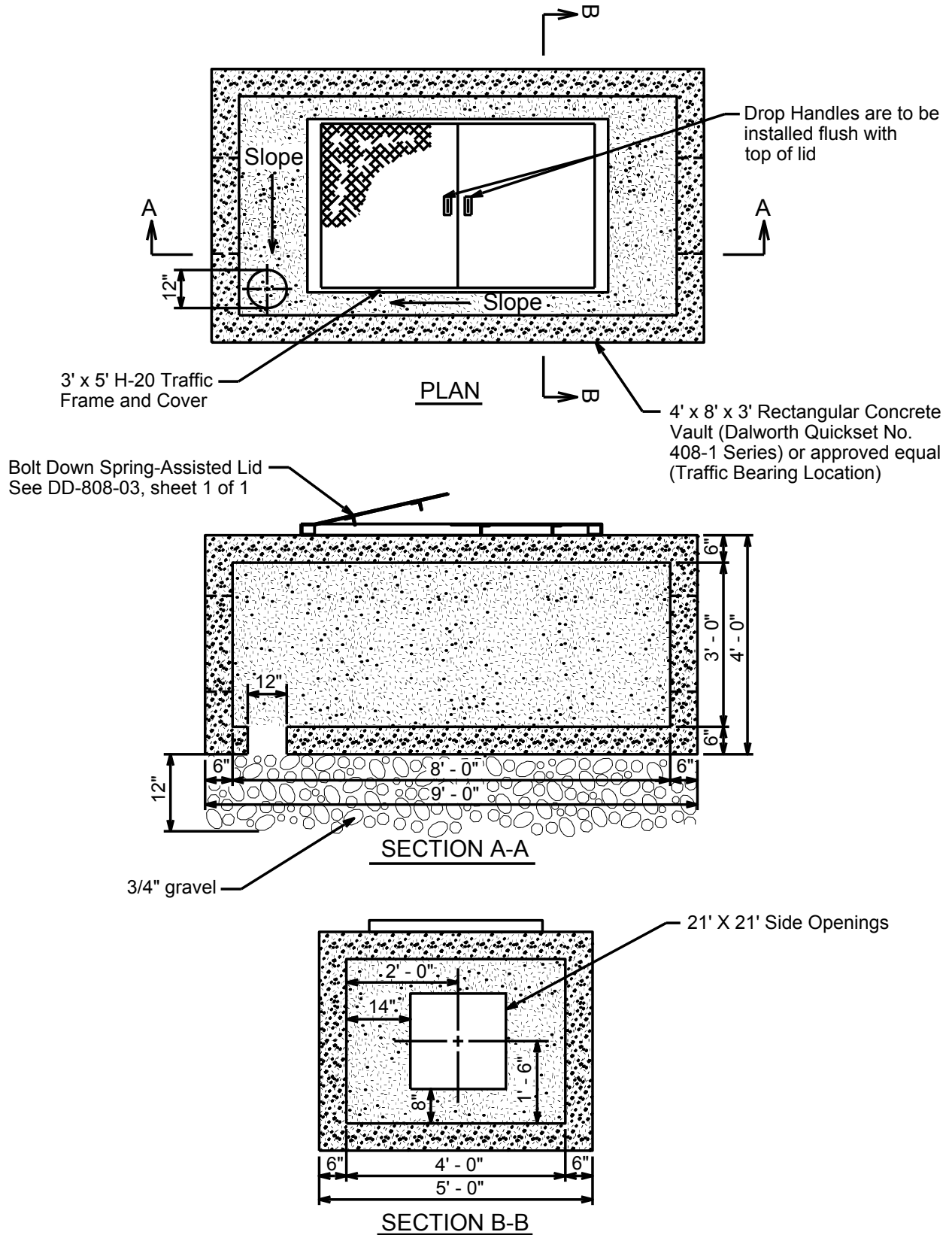
CONCRETE VAULT FOR
6" & 8" DETECTOR CHECK
INSTALLATION

APPROVED
JANUARY 2019

REVISED

DD-808-07

SHEET
1 OF 1



PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

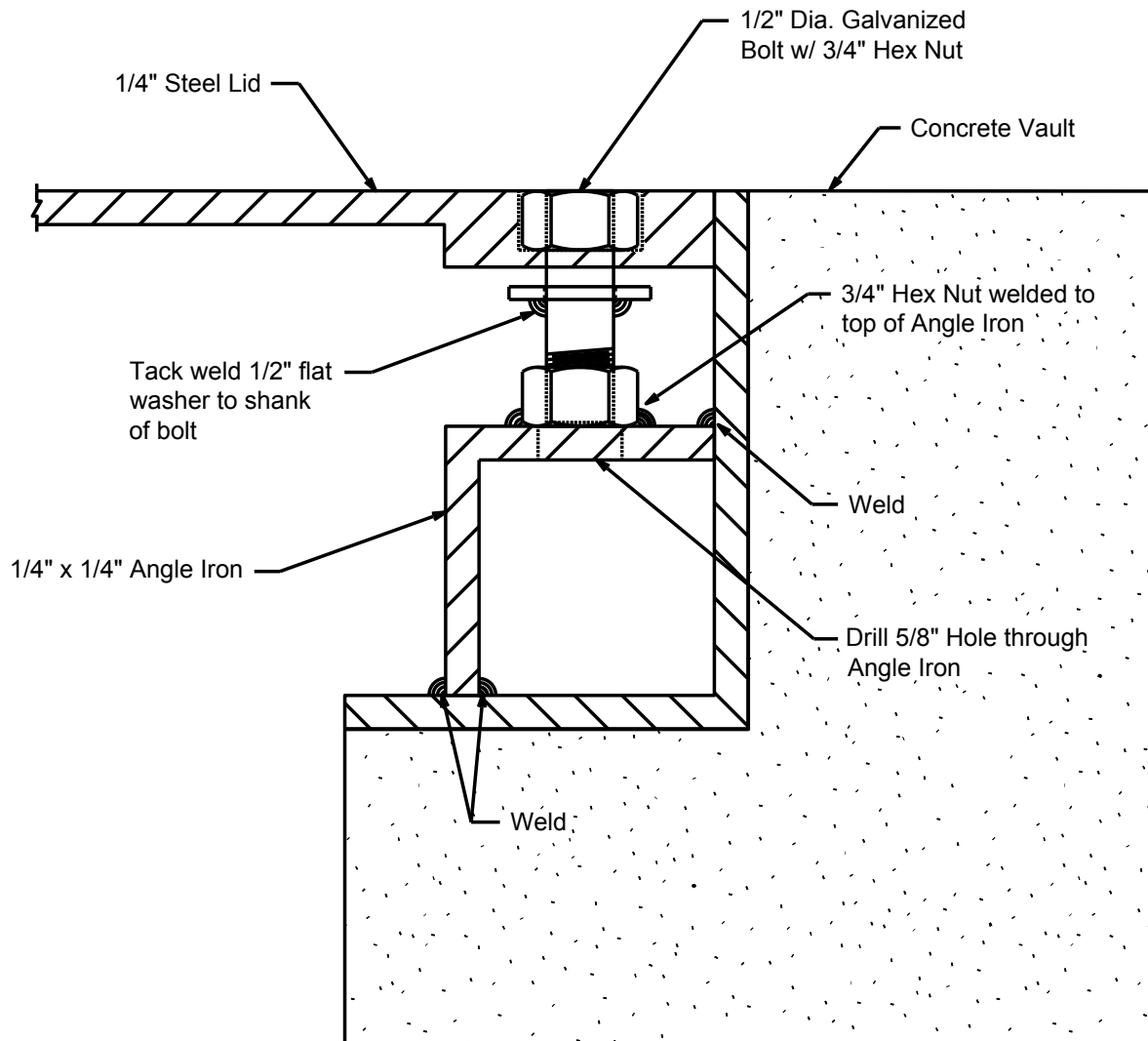
CONCRETE VAULT FOR
10" x 12" DETECTOR CHECK
INSTALLATION

APPROVED
JANUARY 2019

REVISED

DD-808-08

SHEET
1 OF 1



PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

RECESSED
BOLT DOWN MECHANISM

APPROVED
JANUARY 2019

REVISED

DD-808-09

SHEET
1 OF 1

ITEM NO. 809
REINFORCED CONCRETE VAULTS FOR METERED
FIRELINE SERVICES

809.1 **DESCRIPTION:** Reinforced concrete vaults shall be precast with reinforcing steel and include all other appurtenant work required to provide a complete and functional structure.

All precast concrete vaults shall be accurately formed and finished as shown in the contract documents.

Precast vaults conforming to the Standard Drawings and Specifications shall be acceptable as a substitute to the cast-in-place vaults or as approved by the Engineer. Contractor will give 24 hour notification to the Inspector assigned to the project before setting a metered fire line vault.

Contractor must provide Geographic Information Systems (GIS) point .shp file for any installed concrete structure. The GIS .shp file must include information on the location of the structure at a minimum. Confirm the information to be included in the .shp file with Fair Oaks Ranch prior to submission. Additional information to be included in the shapefile may be requested by Fair Oaks Ranch.

809.2 **MATERIALS:** Concrete used shall be transit mix and shall have a 28 day compressive strength of 3,000 psi with a maximum slump of 6 inches and a minimum slump of 3 inches. The use of admixtures shall not be permitted unless approved by the Engineer. Cement shall be Type I or Type III and shall conform to the general requirements contained in the Materials Specifications Item 100-10 and the latest provision of ASTM Specifications C150 and C156 or most applicable approved equal provision.

809.3 **CONSTRUCTION:**

1. Forms: Forms shall be designed to produce hardened concrete having the shape, lines, and dimensions shown in the contract documents.

Surfaces which will be exposed to view when construction is completed shall be prefabricated plywood panel forms, job-built plywood forms, or forms that are lined with plywood or fiberboard. The forms shall produce finished surfaces that are free from off-sets, ridges, waves, and concave or convex areas.

Plywood or lined forms will not be required for surfaces which are normally submerged or not ordinarily exposed to view. Other types of forms, such as

Fair Oaks Ranch Standard Specifications for Construction

steel or unlined wooden forms, may be used for surfaces which are not restricted to plywood or lined forms and may be used as backing for form linings.

Before concrete is placed, a film of light form oil shall be applied to the forms.

Forms shall be substantial and sufficiently tight to prevent leakage of mortar. Forms shall be thoroughly cleaned, braced, or tied to maintain the desired position, shape, and alignment during and after concrete placement.

Form ties shall be corrosion resistant and shall have sufficient strength and rigidity to support and maintain the form in proper position and alignment.

2. Form Removal: Forms shall be removed after 24 hours provided that the exposed surfaces can be immediately and effectively sealed to prevent loss of moisture. Otherwise, the forms shall remain in place for 48 hours. Precautions shall be taken in form removal to avoid surface gouging, corner or edge breaking, and other damage to the concrete.
3. Reinforcing Steel: Reinforcing steel shall be accurately formed and shall be free from loose rust, scale, and contaminants which reduce bond. Unless otherwise shown on the drawings or specified herein, bar reinforcement shall be deformed and conform to the general requirements contained in Item No. 301, "Reinforcing Steel."
4. Reinforcing Steel Placement: Reinforcing steel shall be accurately positioned on supports, spaces, hangers, or other reinforcements and shall be secured in place with wire ties or suitable clips. All bars shall be shop fabricated and bent cold.
5. Concrete Placement: Concrete shall be placed as nearly as practical in its final position to avoid segregation due to rehandling. When the concrete pour has commenced, it shall be carried on as a continuous operation until the placing of the panel or section is completed as a whole. All concrete shall be thoroughly compacted by suitable means during pouring operations and shall be thoroughly worked around reinforcement bars and into the corners of the forms. Mechanical vibration or other acceptable means shall be used to completely embed the reinforcement and eliminate honeycomb. Finished surfaces shall be brought to proper grade, struck off, and completed in a workmanlike manner. No honeycombing, rough spots or protruding stones shall be left exposed.
6. Curing: Concrete shall be protected from loss of moisture for at least 7 days

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after placement. Curing of concrete shall be by methods which will keep the concrete surfaces adequately wet during the specified curing period.

- a. Water Curing: Water saturation of concrete surfaces shall begin as quickly as possible after the initial set of the concrete. The rate of water application shall be regulated to provide complete surface coverage with a minimum of runoff.
- b. Membrane Curing: Chlorinated, rubber-type, membrane curing compound may be used in lieu of water curing on concrete which will not be covered later with mortar or additional concrete.

Membrane curing compound shall be spray applied at coverage of not more than 300 square feet per gallon. If forms are removed before the end of the specified curing period, curing compound shall be immediately applied to the formed surfaces before they dry out.

Curing compound shall be suitably protected against abrasion during the curing period.

7. Finishing Surfaces: Fins and other surface projections shall be removed from all formed surfaces. All exposed exterior surfaces shall have a rubbed finish. The floor surface shall be brush finished, unless otherwise specified.
8. Repairing Defective Concrete: Defects in formed concrete surfaces shall be repaired to the satisfaction of the Engineer within 24 hours, and defective concrete shall be replaced within 48 hours after the forms have been removed. All concrete which is honeycombed or otherwise defective shall be cut out and removed to sound concrete with edges square cut to avoid feathering.

Concrete repair work shall be performed in a manner that will not interfere with thorough curing of surrounding concrete. Repair work shall be adequately cured.

9. Painting: All exposed metallic surfaces such as the cover plates, hinges, handles, and other exposed hardware shall be primed and painted with one coat of primer and one coat of aluminum paint of approved and compatible quality.
10. Backfill: The Contractor shall cover the openings at each end of the vault with grout placed around the pipe penetration inside and outside of the

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vault. Selected backfill (consisting of job excavated materials, finely divided and free from debris, organic material and stones larger than 2 inches in greatest dimension) shall be placed in uniform layers not exceeding 8 inches in un-compacted thickness and shall be carefully compacted around the sides of the vault until level with the surrounding ground.

8094 **MEASUREMENT:** Reinforced concrete vaults shall be measured by the unit of the various sizes.

8095 **PAYMENT:** Payment for reinforced concrete vaults will be made at the unit price for each size vault installed.

- End of Specification -

ITEM NO. 812
WATER MAIN INSTALLATION

812.1 DESCRIPTION: This item shall consist of water main installation in accordance with these specifications and as directed by the Inspector.

812.2 SUBMITTALS: Contractor shall submit manufacturer's product data, installation instructions, recommendations, shop drawings, and any required installer certification(s).

Contractor must provide Geographic Information Systems (GIS) line .shp file for any installed water main, and a point .shp file for any installed valves. The GIS .shp file must include information on the pipe diameter, location, and material at a minimum. Confirm the information to be included in the .shp file with Fair Oaks Ranch prior to submission. Additional information to be included in the shapefile may be requested by Fair Oaks Ranch.

812.3 MATERIALS: The materials for water main installation shall conform to the specifications contained within the latest revision of Fair Oaks Ranch Material Specifications "Ductile Iron Pipe," Item No. 05-11, "Steel Water Pipe," Item No. 05-30, "PVC C-900 Water Pipe," Item No. 05-12, "PVC C-905 Water Pipe," Item No. 819-01, "PVC C-909 Water Pipe," Item No. 05-13, and "Reinforced Concrete Water Pipe Steel Cylinder Type", Item No. 05-20. The pressure rating for pipe materials apply to any work performed in Fair Oaks Ranch high pressure zones shall be in accordance with city guidelines for location and parameters of high pressure zones. Refer to city for location of high pressure zones. Minimum pressure rating for all pipes in high pressure zones shall be 200 psi.

1. PVC water pipe shall be blue in color. PVC pipe markings shall include:
 - a. Manufacturer's name or trademark;
 - b. Standard to which it conforms;
 - c. Pipe size;
 - d. Material designation code;
 - e. Pressure rating;
 - f. SDR number or schedule number;
 - g. Potable water laboratory seal or mark attesting to suitability for

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potable water;

- h. A certifier's mark may be added; and
- i. Manufactured date (installation shall not exceed one year from this date)

- 2. White-colored PVC pipe is acceptable if labeled in accordance with item 1.

812.4

CONSTRUCTION:

- 1. Start of Work: The Contractor shall start his work at a tie-in or point designated by the Inspector. Pipe shall be laid with bell ends facing in the direction of pipe laying, unless otherwise authorized or directed by the Inspector. All valves and fire hydrants must be installed as soon as pipe laying reaches their established location. All pipe shall be installed to the required lines and grades with fittings, valves, and hydrants placed at the required locations. Spigots shall be centered in bells or collars, all valves and hydrant stems shall be set plumb, and fire hydrant nozzles shall face as per Fair Oaks Ranch standard details or as directed by the Engineer. No valve or other control on the existing system shall be operated for any purpose by the Contractor unless a representative of Fair Oaks Ranch is present.
- 2. Crossing Other Underground Lines: New water mains crossing any other utility shall have a minimum of 30 inches of cover over the top of the pipe, unless otherwise waived or modified by the Engineer. Excavation around other utilities shall be done by hand for at least 12 inches all around. Any damage to the protective wrap on gas lines or electrodes shall be reported immediately to the CPS Energy, phone (210) 353-4357. Any damage to other utilities shall be reported to their proper governing entity. In both these cases of utility damage, Contractor shall also promptly notify the Inspector.
- 3. Pipe Separation - Parallel Lines:
 - a. Where a new potable waterline parallels an existing, non-pressure or pressure-rated wastewater main or lateral and the licensed professional engineer licensed in the State of Texas is able to determine that the existing wastewater main or lateral is not leaking, the new potable waterline shall be located at least two feet above the existing wastewater main or lateral, measured vertically, and at least four feet away, measured horizontally, from the existing wastewater main or lateral. Every effort shall be exerted not to disturb the

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bedding and backfill of the existing wastewater main or lateral.

- b. Where a new potable waterline parallels an existing pressure-rated wastewater main or lateral and it cannot be determined by the licensed professional engineer if the existing line is leaking, the existing wastewater main or lateral shall be replaced with at least 150 psi pressure-rated pipe. The new potable waterline shall be located at least two feet above the new wastewater line, measured vertically, and at least four feet away, measured horizontally, from the replaced wastewater main or lateral.
- c. Where a new potable waterline parallels a new wastewater main, the wastewater main or lateral shall be constructed of at least 150 psi pressure-rated pipe. The new potable waterline shall be located at least two feet above the wastewater main or lateral, measured vertically, and at least four feet away, measured horizontally, from the wastewater main or lateral.

4. Pipe Separation - Crossing Lines:

- a. Where a new potable waterline crosses an existing, non-pressure-rated wastewater main or lateral, one segment of the waterline pipe shall be centered over the wastewater main or lateral such that the joints of the waterline pipe are equidistant and at least nine feet horizontally from the centerline of the wastewater main or lateral. The potable waterline shall be at least two feet above the wastewater main or lateral. Whenever possible, the crossing shall be centered between the joints of the wastewater main or lateral. If the existing wastewater main or lateral is disturbed or shows signs of leaking, it shall be replaced for at least nine feet in both directions (18 feet total) with at least 150 psi pressure-rated pipe.
- b. Where a new potable waterline crosses an existing, pressure-rated wastewater main or lateral, one segment of the waterline pipe shall be centered over the wastewater main or lateral such that the joints of the waterline pipe are equidistant and at least nine feet horizontally from the centerline of the wastewater main or lateral. The potable waterline shall be at least six inches above the wastewater main or lateral. Whenever possible, the crossing shall be centered between the joints of the wastewater main or lateral. If the existing wastewater main or lateral shows signs of leaking, it shall be replaced for at least nine feet in both directions (18 feet total) with at least 150 psi pressure-rated pipe.

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- c. Where a new potable waterline crosses a new, non-pressure-rated wastewater main or lateral and the standard pipe segment length of the wastewater main or lateral is at least 18 feet, one segment of the waterline pipe shall be centered over the wastewater main or lateral such that the joints of the waterline pipe are equidistant and at least nine feet horizontally from the centerline of the wastewater main or lateral. The potable waterline shall be at least two feet above the wastewater main or lateral. Whenever possible, the crossing shall be centered between the joints of the wastewater main or lateral. The wastewater pipe shall have a minimum pipe stiffness of 115 psi at 5.0% deflection. The wastewater main or lateral shall be embedded in cement stabilized sand for the total length of one pipe segment plus 12 inches beyond the joint on each end.
- d. Where a new potable waterline crosses a new, non-pressure-rated wastewater main or lateral and a standard length of the wastewater pipe is less than 18 feet in length, the potable water pipe segment shall be centered over the wastewater line. The materials and method of installation shall conform with one of the following options:
 - (1) Within nine feet horizontally of either side of the waterline, the wastewater pipe and joints shall be constructed with pipe material having a minimum pressure-rating of at least 150 psi. An absolute minimum vertical separation distance of two feet shall be provided. The wastewater main or lateral shall be located below the waterline.
 - (2) All sections of wastewater main or lateral within nine feet horizontally of the waterline shall be encased in an 18-foot (or longer) section of pipe. Flexible encasing pipe shall have a minimum pipe stiffness of 115 psi at 5.0% deflection. The encasing pipe shall be centered on the waterline and shall be at least two nominal pipe diameters larger than the wastewater main or lateral. The space around the carrier pipe shall be supported at five-foot (or less) intervals with spacers or be filled to the springline with washed sand. Each end of the casing shall be sealed with watertight non-shrink cement grout or a manufactured watertight seal. An absolute minimum separation distance of six inches between the encasement pipe and the waterline shall be provided. The wastewater line shall be located below the waterline.
- 5. Pipe Grade: Water mains 16" or smaller shall have a minimum of 48 inches of cover from the proposed final finish ground/street/elevation and 60 inches of cover when the main is installed in an unpaved area or under the pavement

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where there are no existing/proposed curb or existing drainage facilities. Water mains 20" and above shall have a minimum of 60 inches of cover over the top of the pipe from the proposed final finish ground/street/elevation unless otherwise waived or modified by the Engineer. Pipe grades shall be as required by the plans or as directed by the Engineer. Grades shall be met as specified by Item No. 804 "Excavation, Trenching and Backfilling." Precaution shall be taken to ensure that the pipe barrel has uniform contact with the cushion material for its full length except at couplings. The couplings shall not be in contact with the original trench bottom prior to backfilling. Cushion material shall be placed under the coupling and compacted by hand prior to backfilling so as to provide an even bearing surface under the coupling and pipe. Changes in grade shall be made only at joints.

6. Cushion and Cushion Materials: Prior to placing pipe in a trench, the trench shall have been excavated to the proper depth as required in Item No. 804 "Excavation, Trenching, and Backfilling." Approved imported materials or Engineer-approved materials selected from suitable fines derived from the excavation shall be smoothly worked across the entire width of the trench bottom to provide a supporting cushion.
7. Structures to Support Pipe: When either the Inspector or Engineer note that the material at the bottom of a trench is unstable or unsuitable, it shall be removed and replaced with approved material which may be properly compacted in place to support the pipe. The Contractor shall also construct a foundation for the pipe consisting of piling, concrete beams, or other supports in accordance with plans prepared by the Engineer. Extra compensation will be allowed for the Contractor for the additional work done. All claims for extra compensation must first be agreed to by Fair Oaks Ranch, prior to any such work occurring. In this event it shall be paid for in accordance with the provisions of ARTICLE VI. CONTRACT CHANGES of the General Conditions of the Contract.
8. Lowering Pipe and Appurtenances into Trench: Proper implements, tools, and facilities satisfactory to the Inspector shall be provided and used by the Contractor for the safe and convenient completion of work. All pipe, fittings, valves, and hydrants shall be carefully lowered into the trench piece by piece, by means of a derrick, ropes, or other suitable tools or equipment in such a manner as to prevent damage to water main materials and protective coatings, polywrap sleeving, and linings. Under no circumstances shall water main materials, pipes, fittings, etc., be dropped or dumped into the trench. Extreme care shall be taken to avoid damaging polywrap films. No chains or slings shall be allowed unless the entire sling is wrapped with a protective nylon web sock.

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9. Distribution System Layout: Generally, new potable water distribution systems shall be designed as looped systems to avoid dead ends. If changes in design during construction results in dead ends to any new or relocated water mains, such dead ends shall be connected to the nearest water main. In cases where no nearby water main is available, a City approved automatic flushing device shall be provided at each dead end of a water main and, if applicable, also near the mid-point of a looped water main unless the design engineer can provide information to confirm that the minimum residual chlorine will be maintained based on the predicted water consumption at the time of City acceptance of the water main. For phased projects, temporary automatic flushing devices can be relocated for future phases, if not conveyed to City. Installation of the automatic flushing devices shall design so as to prevent erosion of nearby areas as well as prevent silt and sediment transport. Refer to DD-812-02.

10. Pipe Laying: Every precaution shall be taken to prevent foreign material from entering the pipe during installation. Under adverse trenching conditions, work stoppage for more than 24 hours and/or as otherwise required by the Engineer, a manufactured cap/plug is to be used to prevent any foreign type material entering the pipe. The cap/plug shall be left in place until it is connection to an adjacent pipe. The interior of each pipe shall be inspected for foreign material or defects, and the pipe shall be cleaned or rejected if any defects are found, respectively.

After placing a length of pipe in the trench, the jointed end shall be centered on the pipe already in place, forced into place, brought to correct line and grade, and completed in accordance with these requirements. The pipe shall be secured in place with approved backfill material tamped around it. Pipe and fittings which do not allow a sufficient and uniform space for joints shall be rejected by the Engineer and/or Inspector and shall be replaced with pipe and fittings of proper dimensions. Precautions shall be taken to prevent dirt or other foreign matter from entering the joint space.

At times when pipe laying is halted, the open end of pipe in the trench shall be closed by a watertight plug or other means approved by the Inspector. Pipe in the trench which cannot temporarily be jointed shall be capped or plugged at each end to make it watertight. This provision shall apply during all periods when pipe laying is not in progress. Should water enter the trench, the seal shall remain in place until the trench is pumped completely dry. The Contractor shall provide all plugs and caps of the various sizes required.

11. Deviations in Line or Grade: Wherever obstructions not shown in the contract documents are encountered during the progress of the work and interfere to an extent that an alteration in the plan is required, the Engineer shall have the authority to change the plans and direct a deviation from the

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line and grade or to arrange with the owners of the structures for the removal, relocation, or reconstruction of the obstructions. Any deviation from the line shall be accomplished by the use of appropriate bends unless such requirement is specifically waived by the Engineer. These deviations shall clearly and accurately be reflected in the Contractor's submittal of their redline drawings for permanent recording purposes.

Whenever it is necessary to deflect pipe from a straight line, the deflection shall be as directed by the Engineer and as described herein. In no case shall the amounts shown in Table 812-1, "Maximum Deflections of Ductile Iron Pipe" and Table 812-2, "Maximum Deflections of Concrete Steel Cylinder Pipe," be exceeded.

12. Cutting Pipe: The cutting of pipe for inserting valves, fittings, or closure pieces shall be accomplished in a neat and workmanlike manner so as to produce a smooth end at right angles to the axis of the pipe. The recommendations of the pipe manufacturer shall be strictly followed by the Contractor. Only qualified and experienced workmen shall be used and, under no circumstances, shall a workman not equipped with proper safety goggles, helmet and all other required safety attire be permitted to engage in this work.

Asbestos Cement (AC): No field cutting, breaking, or crushing will be allowed on AC pipe. Repairs to AC pipe shall be accomplished by removing one full joint of AC pipe and replacing with appropriate PVC or Ductile Iron pipe and fittings. All work associated with removing and disposing of AC pipe shall conform to the provisions of Item No. 3000, "Handling of Asbestos Cement Pipe."

All cuts made on ductile-iron pipe shall be done with a power saw. The cuts shall be made at right angles to the pipe axis and shall be smooth. The edges of the cut shall be finished smoothly with a hand or machine tool to remove all rough edges. The outside edge of pipe should be finished with a small taper at an angle of about 30 degrees. Solid sleeves or cast couplings shall be allowed on precast/prefab vaults only. All other fire line services shall be installed with full joints of pipe.

To facilitate future repair work on water mains, no sections less than 3 feet in length between fittings shall be allowed.

13. Joint Assembly:
 - a. Rubber Gasketed Joints: The installation of pipe and the assembly of rubber gasketed joints for ductile iron pipe, concrete and steel cylinder pipe shall conform to the pipe manufacturer's assembly instructions. The method of inserting spigot ends of pipe in bells or collars known

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as "stabbing" shall not be permitted with pipe larger than 6 inches in size. Spigot ends of pipe larger than 6 inches in size must be properly inserted in the joint by means of suitable pushing/pulling devices or an approved manufacture's method.

- b. Mechanical Couplings: Mechanical couplings shall be assembled and installed according to the standards recommended by the manufacturer.

Mechanical coupling consists of a cylindrical steel middle ring, two steel follower rings, two rubber compound gaskets, and a set of steel bolts. The middle ring is flared at each end to receive the wedge-shaped gasket which is compressed between the middle ring flare and the outer surface of the pipe by pressure exerted on the follower rings through the bolt circle.

Prior to the installation of the mechanical coupling, the pipe ends shall be cleaned by wire brush or other acceptable method to provide a smooth bearing surface for the rubber compression gasket. The pipe shall be marked to align the end of the coupling which will center it over the joint. After positioning, the nuts shall be drawn up finger tight. Uniform pressure on the gaskets shall be applied by tightening alternate bolts on the opposite side of the circle in incremental amounts. Final tensioning shall be accomplished with a torque wrench and in a manner similar to the tightening procedure. The coupling shall then be left undisturbed for 24 hours to allow the gaskets to "pack in." Final torque check shall then be made prior to coating and wrapping the joint. Table 812-3 ("Torque for Mechanical Couplings)," sets forth the proper torque for various sized mechanical couplings and is included for the convenience of the Contractor.

- c. Restraint Joints: Restraint Joints shall be installed as shown on the plans or as directed by the Engineer. Installation shall conform to the manufacturer's recommendation.

- 14. Abandonment/Removal of Old Mains: Regarding planned main abandonment, the Contractor shall accomplish all cutting, capping, plugging, and blocking necessary to isolate those existing mains retained in service from those abandoned. The open ends of abandoned mains and all other openings or holes in such mains occasioned by cutting or removal of outlets shall be blocked off by manually forcing cement grout or concrete into and around the openings in sufficient quantity to provide a permanent substantially watertight seal. Abandonment of old, existing water mains will be considered subsidiary to the work required, and no direct payment will be made.

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When specified or shown otherwise in the contract documents, Contractor shall remove the main and all related appurtenances that are to be replaced, or will no longer be in service, and all effort to accomplish this requirement will be considered subsidiary to the work required, and no direct payment will be made.

15. Abandoned Valves: Valves abandoned in the execution of the work shall have the valve box and extension packed with sand to within 8 inches of the street surface. The remaining 8 inches shall be filled with 2,500 psi concrete or an equivalent sand-cement mix and finished flush with the adjacent pavement or ground surface. The valve covers shall be salvaged and returned to the Owner.
16. New/Existing Valves: At no time during the project work shall any valves be covered or rendered inaccessible for operation due to any activities by the Contractor. Any work during construction activities will be suspended until this requirement is met. No claims for cost or schedule delays will be accepted.

812.5 MEASUREMENT: Water main installed will be measured by the linear foot for each size and type as follows:

Measurements will be from the center line intersection of runs and branches of tees to the end of the valve of a dead end run.

Measurements will also be between the center line intersection of runs and branches of tees. Where the branch is plugged for future connection, the measurement will include the entire laying length of the branch or branches of the fitting.

The measurement of each line of pipe of each size will be continuous and shall include the full laying lengths of all fittings and valves installed between the ends of such line except that the laying length of reducers will be divided equally between the connected pipe sizes. Lines leading to a tapping connection with an existing main will be measured to the center of the main tapped.

812.6 PAYMENT: Payment for water main installed will be made at the unit price bid per linear foot of pipe of the various sizes installed by the open cut method. Such payment shall also include excavation, selected embedment material, backfill, compaction, polyethylene sleeve, hauling and disposition of surplus excavated material, including all existing pipe, fittings, appurtenances to be abandoned or removed (where specified or shown in the contract documents)

Removed AC pipe shall be manifested and disposed of in accordance with Item No. 3000, "Handling Asbestos Cement Pipe."

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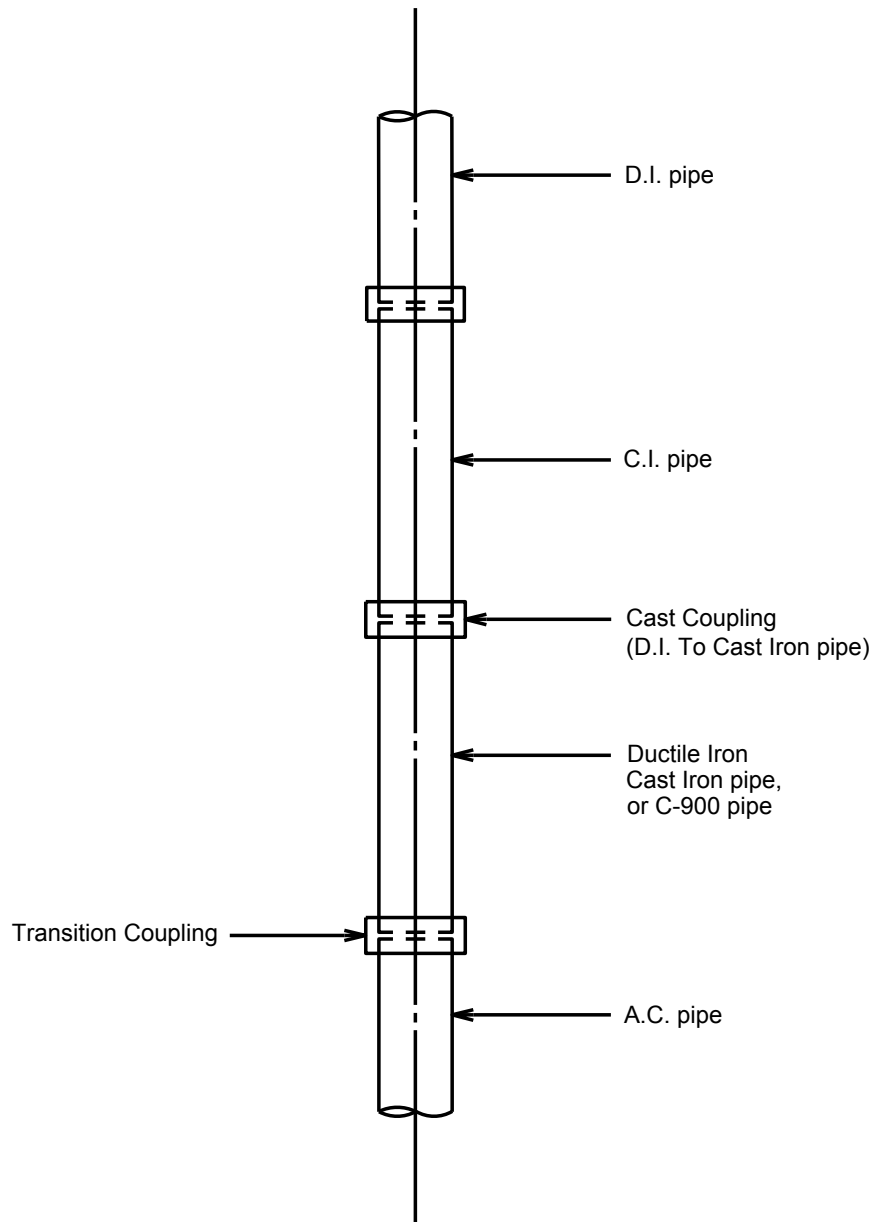
TABLE 812-1					
MAXIMUM DEFLECTIONS OF DUCTILE-IRON					
Nominal Pipe Diameter	Maximum Deflection Angle	Maximum Deflection In Inches		Approximate Radius Of Curve In Inches	
		18 Ft.	20 Ft.	18 Ft.	20 Ft.
6"	4°25'	16.7	18.5	234	260
8"	3°51'	14.6	16.2	268	297
10"	3°42'	14.0	15.5	279	310
12"	3°08'	11.9	13.2	327	363
16"	2°21'	8.8	9.7	440	488
20"	1°55'	7.2	8.0	540	600
	1°35'	6.0	6.7	648	720

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TABLE 812-2					
MAXIMUM DEFLECTIONS OF CONCRETE STEEL CYLINDER					
Nominal Pipe Diameter	Maximum Deflection Angle	Maximum Deflection In Inches		Approximate Radius Of Curve In Inches	
		16 Ft.	20 Ft.	16 Ft.	20 Ft.
16"	2°20'	--	9.8	--	500
20"	1°52'	--	7.8	--	600
24"	1°34'	--	6.6	--	750
30"	1°16'	--	5.3	--	900
36"	1°02'	--	4.3	--	1100
42"	0°54'	--	3.8	--	1300
48"	0°47'	2.6	--	1170	--
54"	0°44'	2.5	----	1237	--
60"	0°54'	3.0		1024	-

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TABLE 812-3		
TORQUE FOR MECHANICAL COUPLINGS		
Coupling Size	Bolt Diameter	Torque
2" to 24"	5/8"	75 ft-lb
2" to 24"	3/4"	90 ft-lb
30" & 36" (1/4" x 7" Middle Rings)	5/8"	65 ft-lb
30" thru 36" (3/8" & heavier Middle Rings)	5/8"	70 ft-lb
30" to 48"	3/4"	80 ft-lb
48" to 72"	3/4"	70 ft-lb



PROPERTY OF
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RANCH

PIPE COUPLINGS

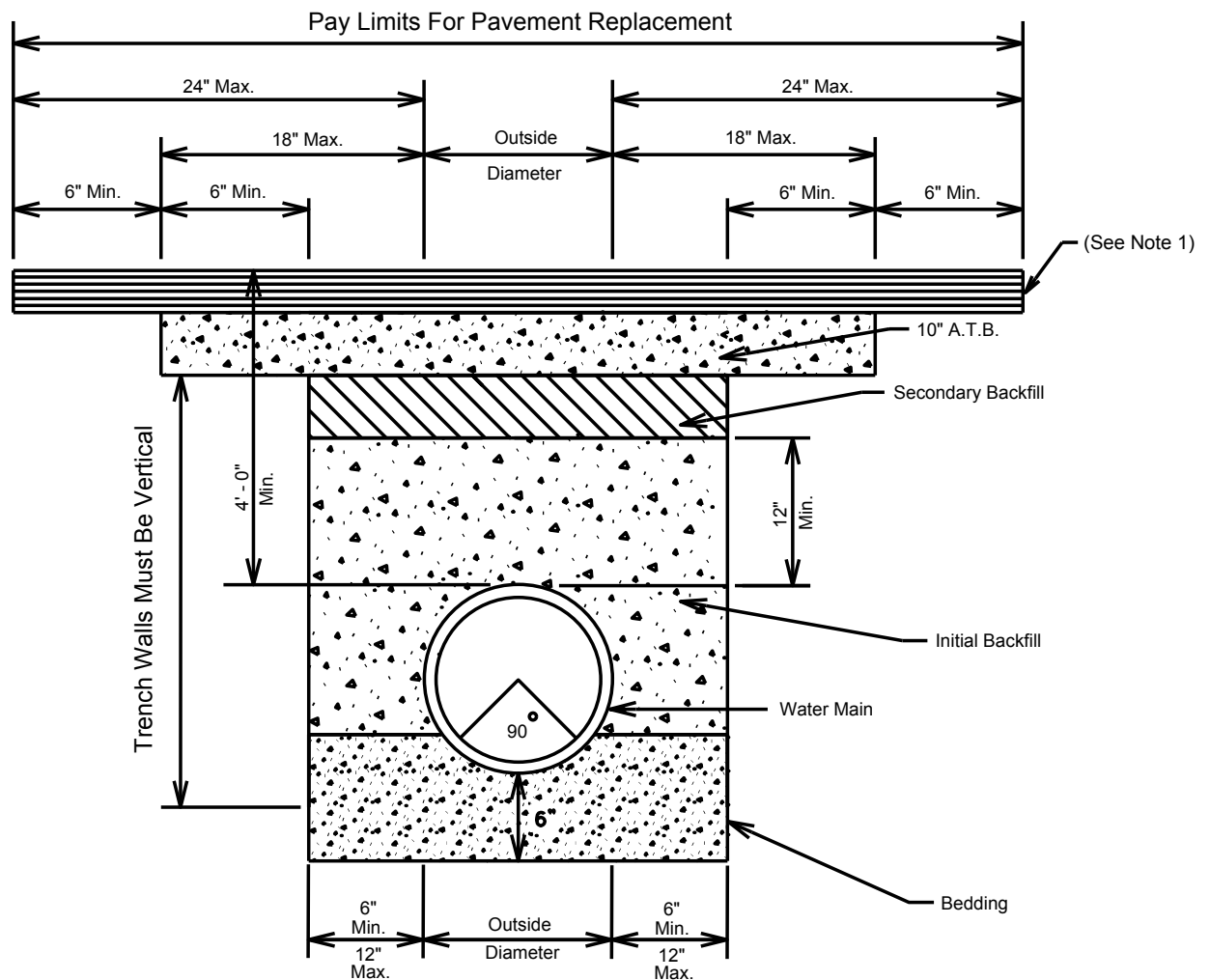
APPROVED

JANUARY 2019

REVISED

DD-812-00

SHEET
1 OF 1



1) REPLACEMENT AC SURFACE LAYER SHALL BE OF THE TYPE AND THICKNESS BASED ON FUNCTIONAL CLASSIFICATION.

- a. Min 2" HMAC Type "D" for trench repair in Local / Residential streets.
- b. Min 3" HMAC Type "C" for trench repair in Collector / Arterial streets.

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RANCH

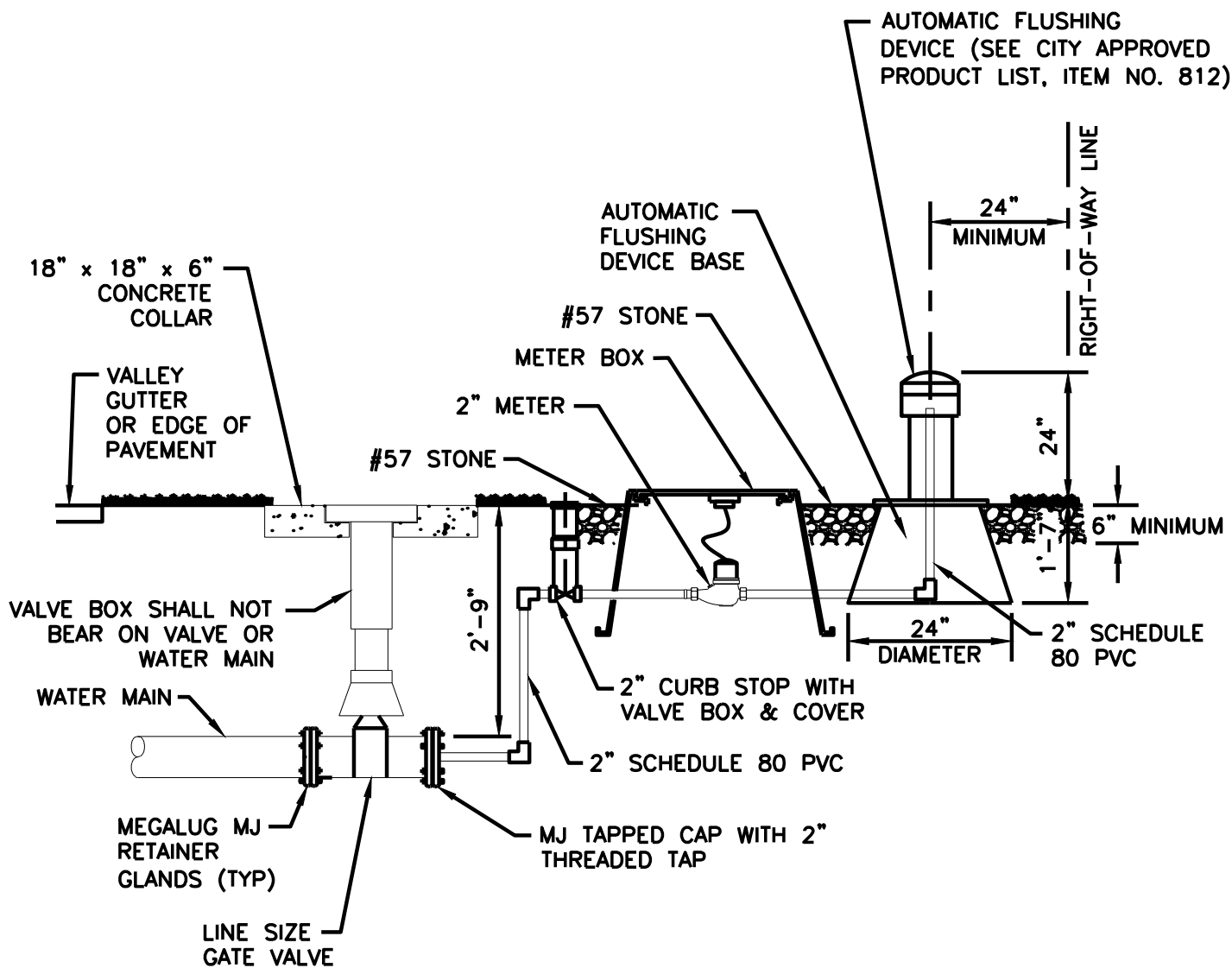
POTABLE AND RECYCLED
WATER MAIN DETAIL

APPROVED
JANUARY 2019

REVISED

DD-812-01

SHEET
1 OF 1



NOTES:

1. PIPING SHALL BE INSTALLED UP TO 2" CURB STOP WITH VALVE BOX AND COVER AT TIME OF MAIN INSTALLATION.
2. AUTOMATIC FLUSHING DEVICE SHALL BE SHUT OFF UNTIL MAIN LINE HAS BEEN BACTERIOLOGICALLY TESTED.
3. SEE ITEM NO. 828 FOR GATE VALVE AND VALVE BOX REQUIREMENTS.
4. ALL COMPONENTS THAT COME INTO CONTACT WITH DRINKING WATER SHALL CONFORM TO NSF STANDARD 61.
5. ALL VALVES SHALL OPEN LEFT (COUNTER-CLOCKWISE).

PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

AUTOMATIC WATER MAIN
FLUSHING DEVICE DETAIL

APPROVED
JANUARY 2019

REVISED

DD-812-02

SHEET
1 OF 1

**ITEM NO. 813
WATER SERVICE FOR
FIRELINES**

813.1 DESCRIPTION: This item shall consist of water service for fire line installations in accordance with these specifications and as directed by the Engineer.

813.2 MATERIALS: The materials for water service for fire lines shall conform to the specifications contained within the latest revision of Fair Oaks Ranch' Material Specification Item Nos. 05-11, "Ductile Iron Pipe," 05-12, "PVC C-900 Water Pipe," Item No. 819, "PVC C-905 Water Pipe." The pressure rating for pipe materials shall be in accordance with the City of Fair Oaks Ranch guidelines for locations of high pressure zones. Minimum pressure rating for all pipes in these high pressure zones shall be to DR 18 standards.

Contractor must provide Geographic Information Systems (GIS) line .shp file for any installed water service, and a point .shp file for any installed valves. The GIS .shp file must include information on the pipe diameter, location, and material at a minimum. Confirm the information to be included in the .shp file with Fair Oaks Ranch prior to submission. Additional information to be included in the shapefile may be requested by Fair Oaks Ranch.

813.3 CONSTRUCTION:

1. Start of Work: Three working days notice will be given to the Inspector prior to start of a project after the permit has been issued. The Contractor shall start his work at a tie-in or at a point designated by the Engineer. All pipe shall be laid with bell ends facing in the direction of laying, unless otherwise authorized or directed by the Engineer. All valves and fire hydrants must be installed as soon as pipe laying reaches their established location. Pipe shall be installed to the required lines and grades with fittings, valves, and hydrants placed at the required locations. Spigots shall be centered in bells or collars, all valves and hydrant stems shall be set plumb, and fire hydrant nozzles shall face as shown in the contract documents or as directed by the Engineer. No valve or other operational control mechanism on the existing system shall be operated for any purpose by the Contractor unless a representative of the Fair Oaks Ranch is present.
2. Crossing Other Underground Lines: New fire line services crossing any other utility shall have a minimum of 48 inches of cover over the top of the pipe unless otherwise waived or modified by the Engineer.

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Excavation around other utilities shall be done by hand for at least 12 inches in all directions. Any damage to other utilities shall be reported to the governing entity/owner of said utility as well as the Inspector.

3. Pipe Grade: Fire line services shall have a minimum of 48 inches of cover for mains 16" and below, and 60 inches for mains 20" and above, over the top of the pipe, unless otherwise waived or modified by the Engineer.

Pipe grades shall be as required by the contract documents or as directed by the Engineer. Grades shall be met as specified by Item No. 804, "Excavation, Trenching and Backfilling." Precautions shall be taken to insure that the pipe barrel has uniform contact with the Modified Grade 5 for its full length, except at couplings. Couplings shall not be in contact with the original trench bottom prior to backfilling. Modified Grade 5 material shall be placed under the coupling and compacted by hand prior to backfilling so as to provide an even bearing surface under the coupling and pipe. Changes in grade shall be made only at joints.

4. Modified Grade 5 Materials: Prior to placing pipe in a trench, the trench shall have been excavated to the proper depth as required in Item No. 804, "Excavation, Trenching, and Backfilling" of these specifications. Approved imported materials or Engineer-approved materials selected from suitable fines derived from the excavation shall be smoothly worked across the entire width of the trench bottom to provide a supporting cushion.
5. Structures to Support Pipe: When either the Inspector or Engineer note that the material at the bottom of a trench is unstable or unsuitable, it shall be removed and replaced with approved material may be properly compacted in place to support the pipe. The Contractor shall also construct a foundation for the pipe consisting of piling, concrete beams, or other supports in accordance with plans prepared by the Engineer.
6. Lowering Pipe and Appurtenances into Trench: Proper implements, tools, and facilities satisfactory to the Inspector shall be provided and used by the Contractor for the safe and convenient completion of work. All pipe, fittings, valves, and hydrants shall be carefully lowered into the trench piece by piece, by means of a derrick, ropes, or other suitable tools or equipment in such a manner as to prevent damage to water service materials and protective coatings, polywrap sleeving, and linings. Under no circumstances shall water service materials, pipes, fittings, etc., be dropped or dumped into the trench. Extreme care shall be taken to avoid damaging polywrap films. No chains or slings shall be allowed unless the entire sling is wrapped with a protective nylon web sock.

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7. Pipe Laying: Every precaution shall be taken to prevent foreign material from entering the pipe during its installation. Under adverse trench conditions, work stoppage for more than 24 hours and/or as otherwise required by the Engineer, a manufactured cap/plug is to be used to prevent any foreign type material entering the pipe. The cap/plug shall be left in place until it is connection to an adjacent pipe. The interior of each pipe shall be inspected for foreign material or defects, and the pipe shall be cleaned or rejected if any defects are found, respectively.

After placing a length of pipe in the trench, the jointed end shall be centered on the pipe already in place, forced into place, brought to correct line and grade, and completed in accordance with these requirements. The pipe shall be secured in place with approved backfill material tamped around it. Pipe and fittings which do not allow a sufficient and uniform space for joints shall be rejected by the Engineer and/or Inspector and shall be replaced with pipe and fittings of proper dimensions. Precautions shall be taken to prevent dirt or other foreign matter from entering the joint space.

At times when pipe laying is halted, the open end of pipe in the trench shall be closed by a watertight plug or other means approved by the Inspector. Pipe in the trench which cannot temporarily be joined shall be capped or plugged at each end to make it watertight. This provision shall apply during all periods when pipe laying is not in progress. Should water enter the trench, the seal shall remain in place until the trench is pumped completely dry. The Contractor shall provide all plugs and caps of the various sizes required.

8. Deviations in Line or Grade: Wherever obstructions not shown on the plans are encountered during the progress of the work and interfere to an extent that an alteration in the plan is required, the Construction Inspector shall have the authority to change the plans and direct a deviation from the line and grade or to arrange with the owners of the structures for the removal, relocation, or reconstruction of the obstructions. Any deviation from the line shall be accomplished by the use of appropriate bends unless such requirement is specifically waived by Engineer. These deviations shall be clearly and accurately be reflected in the Contractor's submittal of their redline drawings for permanent recording purposes.

Whenever it is necessary to deflect pipe from a straight line, the deflection shall be as directed by the Construction Inspector and as described herein. In no case shall the amounts exceed those shown in Table 813-1, "Maximum Deflections of Ductile Iron Pipe" for ductile iron pipe or the manufacturer's recommendations for PVC pipe.

9. Cutting Pipe: The cutting of pipe for inserting valves, fittings, or closure

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pieces shall be accomplished in a neat and workmanlike manner so as to produce a smooth end at right angles to the axis of the pipe. The recommendations of the pipe manufacturer shall be strictly followed by the Contractor. Only qualified and experienced workmen shall be used and, under no circumstances, shall a workman not equipped with proper safety goggles, helmet and all other required safety attire be permitted to engage in this work.

Asbestos Cement (AC): No field cutting, breaking, or crushing will be allowed on AC pipe. Installation of fire line services to AC pipe mains shall be accomplished by removing one full joint of AC pipe and replacing with appropriate PVC or Ductile Iron pipe and fittings. All work associated with removing and disposing of AC pipe shall conform to the provisions of Item 3000, "Handling of Asbestos Cement Pipe."

All cuts made on ductile-iron pipe shall be done with a power saw. The cuts shall be made at right angles to the pipe axis and shall be smooth. The edges of the cut shall be finished smoothly with a hand or machine tool to remove all rough edges. The outside edge of pipe should be finished with a small taper at an angle of about 30 degrees. Solid sleeves or cast couplings shall be allowed on precast/prefab vaults only. All other fire line services shall be installed with full joints of pipe.

To facilitate future repair work on water mains, no sections less than 3 feet in length between fittings shall be allowed.

10. Joint Assembly:

- a. Rubber Gasketed Joints: The installation of pipe and the assembly of rubber gasketed joints for ductile iron pipe shall conform to the pipe manufacturer's assembly instructions. The method of inserting spigot ends of pipe in bells or collars known as "stabbing" shall not be permitted with pipe larger than 6 inches in size. Spigot ends of pipe larger than 6 inches in size must be properly inserted in the joint by means of suitable pushing/pulling devices or an approved manufacture's method.
- b. Mechanical Couplings: Mechanical couplings shall be assembled and installed according to the standards recommended by the manufacturer.

Mechanical coupling consists of a cylindrical steel middle ring, two steel follower rings, two rubber compound gaskets, and a set of steel bolts. The middle ring is flared at each end to receive the wedge-shaped gasket which is compressed between the middle ring flare

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and the outer surface of the pipe by pressure exerted on the follower rings through the bolt circle.

Prior to the installation of the mechanical coupling, the pipe ends shall be cleaned by wire brush or other acceptable method to provide a smooth bearing surface for the rubber compression gasket. The pipe shall be marked to align the end of the coupling which will center it over the joint. After positioning, the nuts shall be drawn up finger tight. Uniform pressure on the gaskets shall be applied by tightening alternate bolts on the opposite side of the circle in incremental amounts. Soap and final tensioning shall be accomplished with a torque wrench and in a manner similar to the tightening procedure after 15 minutes.

- c. Restrained Joints: Restrained Joints shall be installed as shown in the contract documents or as directed by the Construction Inspector. Installation shall conform to the manufacture's recommendation.

813.4 MEASUREMENT: Fire lines installed will be measured by the linear foot for each size and type as follows:

Measurements will be from the center line intersection of fire line with the main distribution line to the property line.

The measurement of each line of pipe of each size will be continuous and shall include the full laying lengths of all fittings and valves installed between the ends of such line. Lines leading to a tapping connection with an existing main will be measured to the center of the main tapped.

813.5 PAYMENT: Payment for fire lines main installed will be made at the unit price bid per linear foot of pipe of the various sizes installed by the open cut method. Such payment shall also include excavation, selected embedment material, backfill, compaction of trench backfill, testing of compaction, tie-in, polyethylene sleeve, hauling, disposition of surplus excavated material, and restoration of the surface, including asphalt, concrete, curbing, sidewalks, sod, grass, landscaping, etc. All replacement mains shall include tie-in costs for existing fire lines.

Removed AC pipe shall be manifested and disposed of in accordance with Item No. 3000, "Handling Asbestos Cement Pipe."

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TABLE 813-1					
MAXIMUM DEFLECTIONS OF DUCTILE-IRON					
Nominal Pipe Diameter	Maximum Deflection Angle	Maximum Deflection In Inches		Approximate Radius Of Curve In Inches	
		18 Ft.	20 Ft.	18 Ft.	20 Ft.
6"	4°25'	16.7	18.5	234	260
8"	3°51'	14.6	16.2	268	297
10"	3°42'	14.0	15.5	279	310
12"	3°08'	11.9	13.2	327	363
16"	2°21'	8.8	9.7	440	488
20"	1°55'	7.2	8.0	540	600
	1°35'	6.0	6.7	648	720

- End of Specification -

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ITEM NO. 814
DUCTILE IRON PIPE

814.1 DESCRIPTION: This item shall consist of ductile iron pipe installation in accordance with these specifications and as directed by the Engineer.

814.2 SUBMITTALS: Contractor shall submit manufacturer's product data, installation recommendations, shop drawings, and certifications.

Contractor must provide Geographic Information Systems (GIS) line .shp file for any installed pipe, and a point .shp file for any installed valves. The GIS .shp file must include information on the pipe diameter, location, and material at a minimum. Confirm the information to be included in the .shp file with Fair Oaks Ranch prior to submission. Additional information to be included in the shapefile may be requested by Fair Oaks Ranch.

814.3 MATERIALS: The materials for ductile iron pipe shall conform to the specifications contained within the latest revision of Fair Oaks Ranch Material Specification Item Nos. 05-11, "Ductile-Iron Pipe," 10-10, "Gray-Iron and Ductile-Iron Fittings," and 100-34, "Ductile-Iron Couplings."

814.4 CONSTRUCTION METHOD:

1. Excavations at Bells and Collars: Ductile iron pipe shall be installed as specified within Item No. 812, "Water Main Installation." Bell holes of sufficient size shall be provided at each joint to permit the joints to be made properly. For mechanical type joints, the minimum clearance between the bell and natural ground shall be 6 inches in all directions. Subject to the above provisions, the length of excavation for bell holes below grade of the trench bottom shall be kept to a minimum.
2. Corrosion Protection for Ferrous Pipe, Fittings, and Valves: Except as otherwise shown in the contract documents or as directed by the Engineer, anti-corrosion embedment shall be provided for all ductile iron pipe, fittings, and valves and at all valves, fittings, or outlets for nonferrous or reinforced concrete steel cylinder pipe. The embedding material shall be Modified Grade 5 gravel washed sand which conforms to the requirements as set forth in the Item No. 804, subsection 804.4.2.

The preparation of the trench shall be in accordance with applicable provisions of Item 804, "Excavation, Trenching and Backfilling." After the subgrade has been prepared, the pipe shall be laid to grade. The pipe, fitting, or valve shall be firmly embedded in and surrounded by an insulating blanket of the embedding material. The minimum thickness of this blanket

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shall be 6 inches in all directions.

3. Coating and Wrapping of Underground Pipe:

- a. Ductile Iron Pipe In Casing: Where ductile iron pipe is to be installed in a bore, the pipe shall be thoroughly cleaned down to the coal-tar enamel pipe coating by approved methods. Where damaged, a prime coat, compatible to the polyvinyl tape to be used, shall then be applied to the pipe. Following the application of the prime coat, the pipe shall be wrapped with Scotchrap, Trantex V-10 polyvinyl tape, or other approved equal product. The tape shall not be applied until the prime coat is completely dry.

The tape shall be spirally and tightly wrapped on each section of the pipe with a 50% lap. The wrap shall be made to the bell on the bell end and to a point 6 inches from the spigot end. The joint shall be protected with tape 6 inches in width on pipe 12 inches or less in size and with tape 8 inches in width on pipe greater than 12 inches in size.

- b. Open Trench: Ductile iron pipe to be installed in a trench shall be protected in the following manner. Each pipe joint shall be covered with a 4 mil thick polyethylene sleeve that is 2 feet longer than the pipe joint. The sleeve shall cover the full length of the pipe joint, lap over 1 foot on each end of the adjoining pipe joints, and be secured with a minimum of two circumferential turns of pressure sensitive polyvinyl tape. Excess material should be neatly drawn up around the pipe barrel, folded into an overlap on top of the pipe, and held in place by means of pieces of pressure sensitive tape at approximately 5 foot intervals. After assembling the joint, the polywrap tube from the previously installed pipe shall be pulled over the joint and secured by the Contractor. The polywrap tube from the new joint shall be pulled over the first tube and secured by the Contractor to provide a double seal.

Cast iron and ductile iron fittings and valves shall be completely wrapped in 8 mil thick polyethylene film with a minimum of a 1 foot overlap on each end and appropriately taped. Laps shall cover joints with adjoining pipe joints or fittings when installed. Also, the fire Hydrant barrel, from the surface to the valve, shall be wrapped as specified herein.

Any damaged areas in the polyethylene film shall be repaired by covering the area with a sheet of polyethylene film large enough to lap over the damaged area 1 foot minimum in any direction and appropriately taped. Extreme care shall be taken at service tap

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locations to ensure that the tape extends beyond the corporation and onto the service line pipe by a minimum of 1 foot.

Prior to placing pipe in the trench, a cushion of approved materials shall be placed in the trench as required by Item No. 804, "Excavation, Trenching and Backfill." Backfill material shall be carefully placed on the pipe so as to avoid any damage to the polyethylene sleeve.

The Contractor shall use care to protect and preserve the polyethylene wrap around ductile iron water mains when installing service corporations. The required method is to wrap pipe tape around the pipe over the polywrap in the area to be tapped. The tap is to be made through the tape and polywrap. It is not necessary to remove and replace poly wrap. All exposed pipe, the corporation, and the first 3 feet of the service shall be wrapped and taped to achieve a complete seal. In addition, a sand envelope shall extend over and around the connection to a depth of eight inches above the main.

- c. **Protective Coating on Joints:** All bolts and nuts destined for underground service on valves, fire hydrants, cast-iron mechanical joint fittings, pipe joints, and other ferrous metal appurtenances shall be packed in an approved protective coating material after installation. After the joint has been made and bolts drawn to the proper tension, the joint including glands, flanges, bolt heads, and nuts shall be covered with an approved Fair Oaks Ranch coating. Such protective coating shall be supplemental to anti-corrosive sand embedment as set forth in Item No. 804, "Excavation, Trenching and Backfill." Coating and wrapping of joints will be considered incidental to the installation, and no separate payment will be made for this item. Asphaltic material such as Talcote shall not be used.

- 4. **Cutting Ductile Iron Pipe:** All cuts made on ductile-iron pipe shall be done with a power saw or approved mechanical cutter. The cuts shall be made at right angles to the pipe axis and shall be smooth. The edges of the cut shall be finished smoothly with a hand or machine tool to remove all rough edges.

The outside edge of pipe should be finished with a small taper at an angle of about 30 degrees.

To facilitate future repair work on water mains, no sections less than 3 feet in length between fittings shall be allowed.

814.5

MEASUREMENT: Ductile iron pipe will be measured by the linear foot for each size and type as follows:

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Measurements will be from the center line intersection of runs and branches of tees to the end of the valve of a dead end run.

Measurements will also be between the center line intersection of runs and branches of tees. Where the branch is plugged for future connection, the measurement will include the entire laying length of the branch or branches of the fitting.

The measurement of each line of pipe of each size will be continuous and shall include the full laying lengths of all fittings and valves installed between the ends of such line except that the laying length of reducers will be divided equally between the connected pipe sizes. Lines leading to a tapping connection with an existing main will be measured to the center of the main tapped.

814.6 PAYMENT: Payment for water main installed will be made at the unit price bid per linear foot of pipe of the various sizes installed by the open cut method. Such payment shall also include excavation, selected embedment material, backfill, compaction, polyethylene sleeve, hauling and disposition of surplus excavated material, including all existing pipe, fittings, appurtenances to be abandoned (where specified or shown in the contract documents).

- End of Specification -

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**ITEM NO. 816
STEEL PIPE INSTALLATION**

816.1 DESCRIPTION: This item shall consist of steel pipe installation in accordance with these specifications and as directed by the Engineer.

816.2 SUBMITTALS: Contractor shall submit manufacturer's product data, instructions, recommendations, shop drawings, and certifications.

Contractor must provide Geographic Information Systems (GIS) line .shp file for any installed pipe, and a point .shp file for any installed valves. The GIS .shp file must include information on the pipe diameter, location, and material at a minimum. Confirm the information to be included in the .shp file with Fair Oaks Ranch prior to submission. Additional information to be included in the shapefile may be requested by Fair Oaks Ranch.

816.3 MATERIALS: The materials for steel pipe shall conform to the specifications contained within the latest revision of Fair Oaks Ranch Material Specification Item No. 05- 30, "Steel Pipe."

816.4 CONSTRUCTION:

1. General: Steel pipe shall be installed as specified within Item No. 812, "Water Main Installation" of these specifications. The Contractor shall furnish all steel piping including fittings, couplings, specials, pipe supports, eyebolts, nuts, and accessories which are shown in the contract documents and as required for proper connection to existing piping. The Contractor's attention is directed to the fact that the exact location and elevation of existing piping must be determined in the field prior to fabrication of connecting piping.

All steel pipe and specials may be either milled pipe or fabricated pipe and, in either case, shall be fabricated to the sizes, dimensions and shapes as indicated in the contract documents. Unless otherwise indicated in the contract documents, all steel pipe, bends, or specials, shall have an outside diameter minimum wall thickness and unit weights as shown in Standard Drawing DD-856-01.

Any pipe section, fitting, or special which shows dents, kinks, abrupt changes of curvature other than specified, or any other damage will be rejected. Any pipe section, fittings, or special section that has been dropped from a truck or crane will be rejected. The Contractor shall, at his own expense, replace or recondition each rejected section. All reconditioning procedures must first be presented to the Engineer for review and approval.

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2. Ends of Sections: Ends of pipe sections, bends, and specials shall be beveled for field welding, unless shown otherwise in the contract documents.
3. Seams: All piping shall be made from steel plate rolled into cylinders or sections thereof, with not more than two longitudinal butt welds, or shall be spirally formed and butt welded. Girth seams shall be butt welded and shall not be closer than 6 feet apart except in specials and bends.
4. Length Tolerance: Standard and special sections shall be within 1/16 inch (plus or minus) of the specified or theoretical lengths.
5. Welded Joints: Except where ends are shown in the contract documents to be joined by mechanical couplings, all joints for steel pipe installed on the bridge structure and in open trench shall be welded.

Welders appointed to do welding on steel pipe shall present to the Inspector and Engineer all applicable 4F and 5G certifications. All welds shall be sound; free from embedded scale and slag; shall have a tensile strength across the weld not less than that of the thinner of the connected sections and shall be watertight. Butt welds shall be used for all welded joints in line- pipe assemblies and in the fabrication of bends and other specials. All welds shall be subject to pre-manufacturing inspection and available to the Inspector and Engineer upon request.

Welding for field joints shall conform to the latest provision of AWWA "Standard Specifications for Field Welding of Steel Water Pipe Joints, C206" or most applicable approved equal provision. Parties involved in the construction of main(s) shall pay special attention to the latest provision of AWWA "Standard Specifications for Field Welding of Steel Water Pipe Joints, C206, "Control of Temperature Stresses" or most applicable approved equal provision. After welding, the joints shall be prepared, primed, and painted, or wrapped in accordance with Item No. 816.4.6 "Protective Coating," of these Specifications. Joint preparation shall include mechanical grinding in order to remove all slag, splatter, rough edges, and surface irregularities.

Leaks in welds shall be repaired by chipping out the defective material and re-welded. No hammering will be permitted.

6. Protective Coatings: All steel pipe, bends, and specials shall be prepared, primed, painted, or wrapped in the field as specified herein.
 - a. Exterior Surfaces Above Ground: Exterior surfaces of all new pipe and appurtenances installed shall be thoroughly cleaned to bare metal

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by high speed wire brushing, scraping, or other suitable methods approved by the Engineer, given a single coat of industrial grade, rust inhibitive primer, and two finish coats of aluminum paint.

- b. Exterior Surfaces Underground: Exterior surfaces of all steel pipe, bends, and specials which are to be installed in open trench shall be thoroughly cleaned to bare metal by high speed wire brushing, scraping, or other suitable methods approved by the Engineer, given a single coat of rust inhibitive primer, and wrapped with polyvinyl tape in accordance with the latest provision of AWWA C203-91, "Protective Coatings for Steel Water Pipelines, (Appendix C)" or most applicable approved equal provision.
- c. Buried Couplings: Mechanical couplings which are to be installed underground shall be protected in accordance with Item No. 816.4.6, "Protective Coatings," of these Specifications.
- d. Field Welded Joints: After installation of pipe, bends, and specials, all ends of pipe adjacent to welded field joints, including the weld proper, shall be cleaned, primed, painted or wrapped as specified for the pipe adjacent to the weld.
- e. Interior Surfaces: The interior surfaces of all steel pipe, fittings and specials shall be cleaned by sandblasting and then primed and coated with a cement mortar lining. Cement mortar-lined and coated steel pipe shall be used for mains 4 inches and larger.
- f. All cement-lined steel pipe shall be prepared with the following processes:
 - (1) Steel pipe shall not be tested until the factory-applied mortar lining and coatings on all piping and specials have been in place for a minimum of 14 days. Steel piping with cement mortar field applied to the interior of the pipe shall not be filled with water until a minimum of 8 hours has elapsed after the final placement of cement mortar, unless otherwise approved by the Engineer.
 - (2) Contractor to submit details of all specials, and of the lining and coating.
 - (3) Use lining conforming to the latest provision of AWWA C205 or most applicable approved equal provision, except as be noted otherwise in the contract documents.

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- (4) Cement used in mortar lining shall be Portland Cement, per the latest provision of ASTM C150 or most applicable approved equal provision, Type II or V for lining.
- (5) Pipe shall be cement mortar lined in the shop by the centrifugal process, in accordance with the latest provision of AWWA C205 or most applicable approved equal provision.

Cement mortar-lined pipe shall be braced as required to maintain roundness during the shipping and handling activities and shall have ends capped prior to shipment. For pipe 14 inch nominal diameter and larger, the finished ID after lining shall be the nominal size. For pipe 12 inch nominal diameter and smaller, standard OD pipe sizes shall be furnished.

- 7. Trench, Bedding and Backfilling: All trenching, bedding and backfilling for steel piping to be laid in open trench shall be in accordance with the requirements specified in Item No. 804, "Excavation, Trenching and Backfill."

816.5 MEASUREMENT: Steel pipe will be measured by the linear foot for each size and type as follows:

Measurements will be from the center line intersection of runs and branches of tees to the end of the valve of a dead end run.

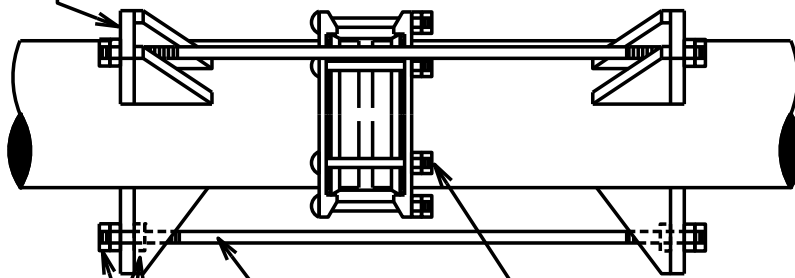
Measurements will also be between the center line intersection of runs and branches of tees. Where the branch is plugged for future connection, the measurement will include the entire laying length of the branch or branches of the fitting.

The measurement of each line of pipe of each size will be continuous and shall include the full laying lengths of all fittings and valves installed between the ends of such line except that the laying length of reducers will be divided equally between the connected pipe sizes. Lines leading to a tapping connection with an existing main will be measured to the center of the main tapped.

816.6 PAYMENT: Payment for Steel Pipe installed will be made at the unit price bid per linear foot of pipe of the various sizes installed by the open cut method. Such payment shall also include excavation, selected embedment material, backfill, compaction, polyethylene sleeve, hauling and disposition of surplus excavated material, including all existing pipe, fittings, appurtenances to be abandoned (where specified or shown in the contract documents).

- End of Specification -

Harness Clips welded to pipe 120° apart

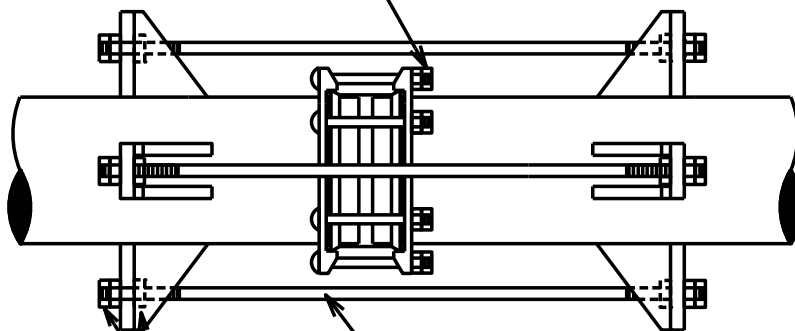


3 - A Hex Nuts (everywhere)

A x E Steel Rod Thd. 4" each end

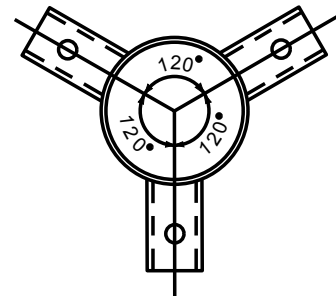
2 - A Hex Nuts

Harness Clips welded to pipe 90° apart

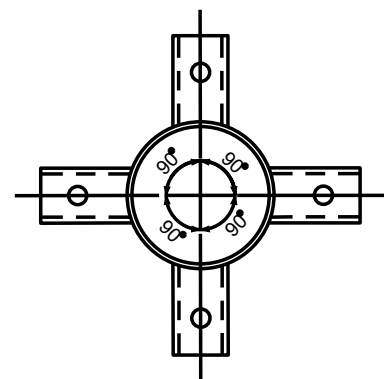


3 - A Hex Nuts (everywhere)

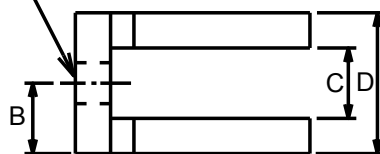
A x E Steel Rod Thd. 4" each end



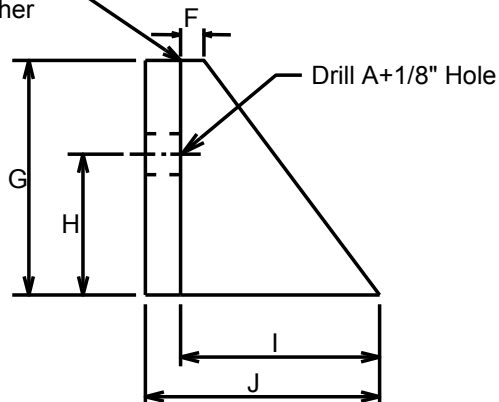
A = Rod Diameter
E = Rod Length



Drill A+1/8" Hole



3/4" Steel Plates welded together



Dimension Schedule In Inches

Dim:	Pipe Size									
	8	12	16	20	24	30	36	42	48	54
A	5/8	3/4	7/8	1	1-1/8	1-1/8	1-1/8	1-1/4	1-3/8	1-1/2
B	1-1/2	1-1/2	1-1/2	1-3/4	2	2	2	2	2-1/4	2-1/4
C	1-1/2	1-1/2	1-1/2	2	2-1/2	2-1/2	2-1/2	2-1/2	3	3
D	3	3	3	3-1/2	4	4	4	4	4-1/2	4-1/2
E	32	32	34	35	37	45	49	51	56	56
F	1/2	1/2	1	1	1	1	1-1/4	1-1/4	1-1/4	1-1/4
G	5	5	5	5-1/2	5-1/2	5-1/2	6	6	6	6
H	3	3	3	4	4	4	4	4	4	4
I	4-1/4	4-1/4	5-1/4	5-1/4	6	6	8	8	10	10
J	5	5	6	6	6-3/4	6-3/4	8-3/4	8-3/4	10-3/4	10-3/4

PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

COUPLING HARNESS
STEEL PIPE

APPROVED
JANUARY 2019

REVISED

DD-816-01

SHEET
1 OF 1

ITEM NO. 818
PVC (C-900 and C-909) PIPE INSTALLATION

8181 **DESCRIPTION:** This item shall consist of PVC (C-900 and C-909) pipe installation in accordance with these specifications and as directed by the Engineer. Deflection of PVC (C-900 and C-909) pipe shall not be allowed.

8182 **SUBMITTALS:** Contractor shall submit manufacturer's product data instructions, recommendations, shop drawings, and certifications.

Contractor must provide Geographic Information Systems (GIS) line .shp file for any installed pipe, and a point .shp file for any installed valves. The GIS .shp file must include information on the pipe diameter, location, and material at a minimum. Confirm the information to be included in the .shp file with Fair Oaks Ranch prior to submission. Additional information to be included in the shapefile may be requested by Fair Oaks Ranch.

8183 **MATERIALS:** The materials for PVC pipe installation shall conform to the specifications contained within the latest revision of Fair Oaks Ranch Material Specification Item Nos. 05-12, 819-01, and 05-13, "Polyvinyl Chloride (PVC) Pipe."

8184 **CONSTRUCTION METHOD:** PVC (C-900 and C-909) pipe shall be installed as specified within Item No. 812, "Water Main Installation" of these specifications. PVC (C-900 and C-909) mains shall be laid to the depth and grades shown in the contract documents. The pipe shall be laid by inserting the spigot end into the bell flush with the insertion line or as recommended by the manufacturer. At no time shall the bell end be allowed to go past the "insertion line." A gap between the end of the spigot, and the adjoining pipe is necessary to allow for expansion and contraction.

Joint Restraints: For all mains consisting of PVC (C-900 and C-909) joint restraints as specified in Fair Oaks Ranch' Material Specification Item No. 95-10, "Pipe Joint Restraint Systems," and shall be installed in accordance with manufacturer's recommendations. Joint restraints shall be bi-directional and installed to fully restrain the system as shown in Standard Drawing Details DD-839-04 through DD-839-8, or indicated in the contract documents.

PVC (C-900 and C-909) pipe shall be field cut using a power saw with a steel blade or abrasive disc, depending on the size of pipe. If a bevel is needed after field cutting, it should be in accordance with the latest applicable recommendations of: Uni-Bell or ASTM/AWWA standards. Such work will be subject to approval by the Inspector.

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Tracer Wire: Tracer wire shall be utilized for location purposes and taped directly to the pipe. Tracer wire shall be of solid core (14 gauge insulated), and shall be taped to the main in minimum of 10 inch increments. Wire shall also come up to the top of valve extensions and fire hydrant stems, as directed by the Inspector.

8185 **MEASUREMENT:** PVC pipe will be measured by the linear foot for each size and type as follows:

Measurements will be from the center line intersection of runs and branches of tees to the end of the valve of a dead end run.

Measurements will also be between the center line intersection of runs and branches of tees. Where the branch is plugged for future connection, the measurement will include the entire laying length of the branch or branches of the fitting.

The measurement of each line of pipe of each size will be continuous and shall include the full laying lengths of all fittings and valves installed between the ends of such line except that the laying length of reducers will be divided equally between the connected pipe sizes. Lines leading to a tapping connection with an existing main will be measured to the center of the main tapped.

8186 **PAYMENT:** Payment for PVC Pipe installed will be made at the unit price bid per linear foot of pipe of the various sizes installed by the open cut method. Such payment shall also include excavation, selected embedment material, backfill, compaction, polyethylene sleeve, hauling and disposition of surplus excavated material, including all existing pipe, fittings, appurtenances to be abandoned (where specified or shown in the contract documents).

- End of Specification -

**ITEM NO. 821
HIGH PRESSURE ZONE DISTRIBUTION
SYSTEM**

821.1 DESCRIPTION: This item shall govern all construction work performed in Fair Oaks Ranch' high pressure water distribution system, including water mains, services, fire hydrants, and all related appurtenances, and shall be performed in accordance with current Fair Oaks Ranch standard specifications. This specification shall apply solely to the construction of high pressure water systems and shall govern when in conflict with other sections of the Fair Oaks Ranch standard specifications.

1. High Pressure Systems: The static water pressure in each of the high pressure system Service Levels shall be not less than 35 psi nor exceed 175 psi with no fire hydrants in use.
2. Locations of High Pressure Levels: Geographically, the boundaries of high pressure zones conform to the surface contour tabulation determined by the City of Fair Oaks Ranch. Refer to city guidelines for location of high pressure zones.

Contractor must provide Geographic Information Systems (GIS) line .shp file for any installed water line, and a point .shp file for any installed valves. The GIS .shp file must include information on the pipe diameter, location, and material at a minimum. Confirm the information to be included in the .shp file with Fair Oaks Ranch prior to submission. Additional information to be included in the shapefile may be requested by Fair Oaks Ranch.

821.2 MATERIAL AND SUPPLIES:

1. General: Construction materials and supplies shall be furnished in accordance with all applicable provisions outlined in the Fair Oaks Ranch' Material Specifications and as supplemented or revised by conditions noted in this specification.
2. Pipe Materials: Ductile Iron, Concrete Steel Cylinder, PVC class 200 (DR14), and Steel pipe shall be used for water main construction in the High Pressure Distribution System.

821.3 TRENCH EXCAVATION: All excavation shall be performed in accordance with Item No. 804, "Excavations, Trenching and Backfill."

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821.4 **PIPE LAYING:** Pipe installation shall be performed in accordance with Item No. 812, "Water Main Installation."

821.5 **SETTING VALVES, FITTINGS, AND FIRE HYDRANTS:**

1. General: Valves, fittings, fire hydrants, plugs, and caps shall be set in accordance with Item Nos. 826, 830, 832, and 836 of these specifications.
2. Valves: All valves shall be supported on a concrete pad in accordance with Standard Drawing Nos. DD-828-01 through DD-828-03.
3. Fire Hydrants: All fittings for fire hydrant installations such as ties, bends, nipples, valves, and hydrants shall have anchored or flange type joints. The bowl of each hydrant and valve shall rest on a concrete pad as shown on Standard Drawing DD-834-01. The main line fire hydrant tee shall be an anchored tee that is properly blocked.
4. Thrust Blocking: All thrust blocking placed in conjunction with mains and appurtenances constructed in high pressure zones shall be in accordance with Standard Drawings DD-839-01 and DD-839-02. In all cases, the design of thrust blocking shall be of sufficient size, based upon an assumed soil lateral load bearing capacity of 3,000 psi unless specified otherwise in the contract documents. The maximum soil pressure value that will be allowed for the design of thrust blocking shall be 5,000 psi when specifically requested by the Contractor and approved by the Engineer. When soil pressure bearing values of 4,000 psi or 5,000 psi are recorded for design of thrust blocks, copies of soil test made for determining the bearing value of the subject soil in question shall be submitted to the Engineer for approval.

821.6 **TRENCH BACKFILL:** All backfill material shall be placed in accordance with item No. 804, "Excavation, Trenching, and Backfill" of these specifications.

821.7 **CLEANUP:** Cleanup of the area of the construction operations shall be in accordance with these specifications.

821.8 **FLUSHING AND TESTING MAINS:** All flushing and hydrostatic testing shall be conducted in accordance with Item No. 841, "Hydrostatic Testing Operations" of these specifications, with the exception that the maximum test pressure shall be established at 200 psi.

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- 821.9 DISINFECTION OF NEW MAINS UTILIZING MACHINE CHLORINATION:** Disinfection of new mains by machine chlorination shall be accomplished in accordance with Item No. 847, "Disinfection" of these specifications.
- 821.10 DISINFECTION OF NEW MAINS UTILIZING CALCIUM HYPOCHLORITE:** Disinfection of new mains with calcium hypochlorite shall be accomplished in accordance with Item No. 847 "Disinfection" of these specifications.
- 821.11 SERVICE SUPPLY LINES:**
1. General: Service lines and fittings, meter boxes, and appurtenances shall be installed in accordance with Item No. 824, "Service Supply Line (Water)," and item No. 833, "Meter and Meter Box Installation" of these specifications.
 2. Service Line Installation: All service lines shall be installed in accordance with Fair Oaks Ranch Standard Drawing 824 Series, with the exception that two strap service saddle clamps shall be installed for all tap connections made on water mains located within boundaries of high pressure zones.

Polyethylene tubing shall be installed for service lines $\frac{3}{4}$ through 2 inches in size.

Ductile iron pipe shall be installed for service lines 4 inches and larger in size.
- 821.12 MEASUREMENT:** High pressure zone distribution system will not be measured for payment.
- 821.13 PAYMENT:** No direct payment shall be made for incidental costs of material or effort associated with this specification.

- End of Specification -

ITEM NO. 822

CUSTOMER'S WATER YARD PIPE

822.1 DESCRIPTION: This item shall consist of customer yard piping adjustments and installation in accordance with these specifications and as directed by the Engineer.

822.2 MATERIALS: The materials for customer yard piping adjustments and installation shall conform to the specifications contained within the latest revision of Fair Oaks Ranch' Material Specification Item Nos. 15-15, "High Density Polyethylene Pipe" and 15-40, "Brass Goods."

Contractor must provide Geographic Information Systems (GIS) line .shp file for any installed service connection, and a point .shp file for any installed valves. The GIS .shp file must include information on the pipe diameter, location, and material at a minimum. Confirm the information to be included in the .shp file with Fair Oaks Ranch prior to submission. Additional information to be included in the shapefile may be requested by Fair Oaks Ranch.

822.3 CONSTRUCTION:

1. Designation of Yard Piping: New polyethylene yard piping shall be installed within the limits of the Customer's property in conjunction with all small service lines relocated from existing mains in the alleyways behind Customer residences to street rights-of-ways fronting Customer residences. See Standard Drawing DD-822.

Customer yard piping begins from the outlet meter connection to the point of connection within the limits of the Customer's lot or property.

"Short yard piping," shall be described as consisting of customer's yard piping that does not exceed one-half the depth of the lot.

"Long yard piping," shall be described as consisting of customer's yard piping that, when installed, exceeds one-half depth of the lot.

2. Materials: All $\frac{3}{4}$ inch through 2 inch yard piping shall be furnished by the Contractor and shall be polyethylene flexible pipe with CC3 resin. Plastic round Customer cut-off valve boxes furnished by the Contractor shall consist of a box and cover, shall accommodate cut-off valves up to 2 inches, and shall be by a Fair Oaks Ranch-approved manufacturer.

The Contractor shall also furnish all materials to include pipes, nipples, unions, couplings, tees, elbows, street ells, hose bibs, insulation for riser pipe, caps, plugs and appurtenances required to complete the tie of

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Customer's new yard piping at the new point of connection and the abandonment of the Customer's old yard piping at the old point of connection, as no separate pay item. Where dissimilar materials are to be connected, the Contractor shall install a PVC Schedule 80 insulator coupling.

3. Installation: Work involved with replacing existing yard piping shall consist of several key components as listed:
 - a. Excavation of miscellaneous material encountered;
 - b. Installation of the new polyethylene yard piping with 12 inches of cover minimum and in the most direct and practicable alignment;
 - c. Brass fittings;
 - d. Customer's cut-off valve and the Customer's cut-off valve meter box;
 - e. Reconnection of the Customer's service at the relocated meter and the new point of connection within the limits of the Customer's property;
 - f. Abandoning the Customer's old yard piping by cutting and plugging the old yard piping at the old point of connection within the limits of the Customer's property;
 - g. Backfilling the trench with approved selected material and disposal of surplus excavated material;
 - h. Replacement of surfaces of all types over the completed yard piping trench with approved selected material and disposal of surplus excavation material;
 - i. Restoration of the site. Existing trees, plants or shrubbery within the Customer's property shall not be disturbed. Any existing landscape that necessitates removal, in order for the scope of work to be completed, shall be replaced to the satisfaction of the inspector and customer;
 - j. Acquiring any permits to do this scoped work on the customer's property.

When the presences of manifold systems are encountered, the Contractor shall install and tie-in Customer yard piping at the existing point of connection. Lawn sprinklers are a possible indication

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of existing manifold systems. All exposed risers shall be protected from freezing temperatures by means of keeping them no less than 6 inches below ground surface to the tie-in. Trench excavation may be accomplished either manually, mechanically (such as usage by a "Ditch Witch"), or by other similar mechanical trenching equipment. If mechanical trenching equipment is utilized, depressions or damage to lawn areas caused by crawler track pads or pneumatic tires shall be repaired and restored to their original condition.

Lawn turf over the trench shall be removed squarely to a depth of 2 inches and in lengths not to exceed 36 inches. Lawn turf removed and material excavated from the trench area shall not be placed directly upon existing lawn turf areas, but rather, they shall be separated and placed on building paper or plastic membrane. Building paper or plastic membrane shall cover the existing lawn turf adjacent and parallel to the alignment followed by the trench. After the installation of the yard piping, the trench shall be backfilled and adequately tamped in two compacted lifts of 5 inches and watered. The lawn turf shall be replaced, adequately tamped, and thoroughly watered after surplus soil is removed. Customer's yard piping shall be flushed prior to final tie-in at the existing point of connection.

8224 **MEASUREMENT:** "Customer's Yard Piping" will be measured by the linear foot of the various types and sizes of Customer's yard piping installed.

8225 **PAYMENT:** Payment for "Customer's Yard Piping" will be made at the unit price bid per each linear foot of Customer's new yard piping installed. Payment shall be made under item "Short yard piping" or "Long yard piping."

Such payment shall also include: excavation, hauling and disposition of surplus material, approved backfill material, removal and replacement of Customer's lawn turf, permits, and whatever other surface vegetation/landscaping and surface structure encountered, polyethylene tubing, and brass fittings of necessary size to complete the tie at the Customer's point of connection.

- End of Specification -

**ITEM NO. 823
DIRECTIONAL BORING
FOR
CUSTOMER'S WATER YARD
PIPE**

823.1 DESCRIPTION: This item shall govern the furnishing and installation of customer yard piping and conduit by the method of directional boring as shown in the contract documents and as directed by the Engineer.

823.2 MATERIALS:

1. The materials for customer yard piping installation and adjustment shall conform to the specifications contained within the latest revision of Fair Oaks Ranch' Material Specification Item Nos. 15-15, "High Density Polyethylene Pipe" and 15-40, "Brass Goods."
2. The polyvinyl chloride (PVC) conduit shall be Schedule 80 or Certa T-Lock PVC, where applicable, and shall conform to the latest provision of ASTM D1785 or most applicable approved equal provision. The fittings for the PVC pipe shall be Schedule 80 and shall be in accordance with the latest provision of ASTM D2467 or most applicable approved equal provision.

823.3 CONSTRUCTION:

1. Determination for Directional Boring Method: Directional boring method shall be used for installations of customer's "short yard piping" or "long yard piping" when open-cut method is not feasible. Refer to Item No. 822.3.1, "Designation of Yard Piping." Directional boring method should be used to avoid disruption to items such as, but not limited to, substantial landscaping, trees, driveways, retaining walls, privacy walls, structures, or sprinkler systems that cannot be economically be replaced, or as directed by the Inspector. The yard piping shall be placed in 2 inch or 4 inch inside diameter (I.D.) PVC conduit as appropriate when directed by the Inspector.
2. Designation of Yard Piping: Refer to Item No. 822.3.1.
3. Materials: Refer to Item No. 822.3.2.
4. Installation: Directional Boring Method machine as manufactured by "Ditch Witch," "Vermeer," or other approved equal, capable of drilling a minimum of a 300 feet continuous bore.

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Refer to Item No. 822.3.3 for installation procedures for customer yard piping.

Directional boring shall be completed with the use of a directional boring machine, as manufactured by “Ditch Witch”, “Vermeer,” or other approved equal. The directional boring machine shall be supplied with an output signal inside the housing of the drill bit. The output signal shall have a constant output signal to allow a person to track the location of the beacon at all times. The drill bit shall be located a maximum of every 5 feet for exact location of the service line to be pulled in. When bore is completed, contractor shall provide Fair Oaks Ranch with a pilot of the bore path.

The drilling machine shall be set up at such a location to avoid disruption of private yard and landscaping. The operator of the drilling unit shall check the bore path and position of boring pit at every five feet and make necessary correction to stay along the alignment. The pilot hole shall not be greater than 4 inches in diameter, except when a 4inch PVC conduit is installed. The Contractor shall make necessary provisions to keep water and soil out of the installed yard piping.

The drilling machine shall be equipped with a drilling fluid compatible for the onsite conditions. The fluid, such as bentonite, shall be used for lubricating the pipe during pull-back, forcing spoils out of the pipe pit, assisting in holding the hole open during pull back, and hardening into a clay substance around the outside of the conduit, preventing settlement of the ground. Adequate drilling fluids shall be used to avoid a “hydra-lock” condition. The directional head shall be capable of accepting a variety of cutting bits for varied soil conditions.

Any damage to customer’s property, landscaping or trees caused by the Contractor’s activities of installing yard piping, shall be replaced to both the inspector’s and customer’s satisfaction, at no additional cost to Fair Oaks Ranch.

Contractor shall take a video DVD recording of the entire project area prior to commencing any work in the area. A DVD video shall be turned into Fair Oaks Ranch for review and approval before starting any work, including mobilization and preparation of right-of-way.

823.4 MEASUREMENT: Directional Boring for Customer’s Yard Piping” will be measured by the linear foot of the various types and sizes of customer’s yard piping or conduit installed.

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823.5 **PAYMENT:** Payment for “Directional Boring for Customer’s Yard Piping” will be made at the unit price bid for each linear foot of customer’s new yard piping or conduit installed. Payment for customer yard piping shall be made under item “Yard piping – directional bore method”. When the yard piping is installed in conduit it shall be paid under items 2 inch I.D. PVC conduit – directional bore method, and “yard piping installed in conduit”, or items 4 inch I.D. PVC conduit – directional bore method” and yard piping installed in conduit

Such payment shall include excavation, hauling and disposition or surplus material, approved backfill material, removal and replacement of customer’s lawn turf and whatever other surface vegetation and surface structure encountered, polyethylene tubing, PVC conduit, and brass fittings or whatever size necessary to complete the tie at the customer’s point of connection.

- End of Specification -

ITEM NO. 824
WATER SERVICE SUPPLY LINES

824.1 **DESCRIPTION:** This item shall consist of water service supply lines adjustment and installation in accordance with these specifications and as directed by the Engineer.

824.2 **MATERIALS:** The materials for water service supply lines installation and adjustment shall conform to the specifications contained within the latest revision of Fair Oaks Ranch' Material Specification Item Nos. 21-10, "Brass Gate Valves," 15-40, "Brass Goods," 05-15, "Schedule 80 Polyvinyl Chloride (PVC) Pipe and Fittings," and 100-30, "Service Saddles."

Contractor must provide Geographic Information Systems (GIS) line .shp file for any water service line, and a point .shp file for any installed valves. The GIS .shp file must include information on the pipe diameter, location, and material at a minimum. Confirm the information to be included in the .shp file with Fair Oaks Ranch prior to submission. Additional information to be included in the shapefile may be requested by Fair Oaks Ranch.

824.3 **CONSTRUCTION:**

1. General: Service supply lines and fittings, meter boxes and appurtenances shall conform to the Material Specifications and shall be installed by the Contractor as specified herein, or as directed by the Engineer and in accordance with the DD-824 Standard Drawing Series.
2. Designation of Service Supply Lines: A service supply line located between the water main and the inlet side of the water meter is designated as a "water service line." A service supply line located between the outlet side of the water meter to the point of connection within the limits of the Customer's lot or property is designated as the "Customer's yard piping" and is covered under Item No. 822 of these specifications. Services 2 inches and smaller are designated "small services." Services 4 inches and larger are designated "large services."
3. Service Relays: New transfer main(s) to which services are to be relayed and are on the same side of the streets as the Customer's meter, are defined as "short relays." New transfer main(s) to which services are to be relayed, and are on the opposite side of the street from the Customer's meter, are defined as "long relays."

Service Reconnects: New transfer main(s) to which services are to be reconnected, and on the same side of the street as the old main, are

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defined as "short reconnects." Existing services on the opposite side of the street to the new main shall be defined as a "long reconnects."

4. Service Relocates: Service Relocates are defined as services that are relocated from an alley or street to a side or front street. New transfer main(s) to which services are to be relocated and are on the same side of the street as the Customer's new meter box location, are designated as "short relocates." New transfer main(s) to which services are to be relocated and are on the opposite side of the street from the Customer's new meter box location, are designated as "long relocates."
5. New Services: If a new main is required to be extended to provide water service for new Customers, the service lines laid to the new main shall be designated as "new services." New laid main(s) to which new services are on the same side of the street as the Customer's new meter box location, are designated as "new short services." New laid main(s) to which new services on the opposite side of the street from the Customer's new meter box location, are designated as "new long services."
6. New Unmetered Services: New unmetered services are defined as services that are installed on existing or new mains to provide service to platted vacant lots. Where the new or existing main to which new unmetered services are being installed, is on the same side of the street as the Customer's new or existing meter box location (Inspector is to set location of new meter box if no existing meter box is set), the services to be laid are designated "new unmetered short services." Where the new or existing water main to which new unmetered services are installed, is on the opposite side of the street from the Customer's new or existing meter box location (Inspector is to set location of new meter box if no existing meter box is set), the services to be laid are designated "new unmetered long service." New unmetered long services and new unmetered short services will not include "Customer's yard piping," and no meter will be set.
7. Tap Holes: Tap holes are defined as excavations at existing mains, which are required in association with replacements of water service lines by pulling, boring or jacking operations.

All backfill material shall be as specified for all associated main and service line trench excavation.

For service lines and tap holes, payment for bedding, initial backfill and secondary backfill shall be included in the various sizes of each service placed.

8. Service Line Installation: Unless otherwise notified, service relays, service reconnects, service relocates and new services shall be installed as described

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herein, and in the DD-824 Standard Drawing Series. Unless otherwise indicated, existing meter and meter box relocation shall be included in the service line installation.

All service line installation shall include a dielectric union to be installed within the meter box on the outlet side of the meter, as shown in the DD-824 Standard Drawing Series.

Cutting, excavation, backfill and replacement of pavement shall be done as specified herein and in accordance with applicable sections of the City of Fair Oaks Ranch Specification Item No. 511, "Cutting and Replacing Pavements (Trench Repair), and Item No. 804, "Excavation, Trenching, and Backfill." The minimum trench width for small service lines shall be 8 inches, while the minimum trench width for large service lines shall be the nominal pipe diameter plus 16 inches, except when specified otherwise by the Engineer. For $\frac{3}{4}$ inch to 2 inch Service lines, the minimum bury depth shall be 3 feet. For services greater than 2 inches, the minimum depth of bury shall be 4 feet.

All service lines shall be installed in accordance with the DD-824 Standard Drawing Series, Fair Oaks Ranch' Standard Material Specification Item No. 100-30, except that two strap service saddle clamps shall be installed for all tap connections made on water mains located within boundaries of high pressure zones.

The Contractor shall use precaution to protect and preserve the polyethylene wrap around ductile-iron water mains when installing service corporations. The required method is: wrap pipe tape around the pipe, over the polywrap, in the area to be tapped. The tap shall be made through the tape and polywrap. It is not necessary to remove and replace polywrap. All exposed pipe, corporation, and the first three feet of the service, shall be wrapped and taped to achieve a complete seal. In addition, a sand envelope shall extend over and around the connection to a depth of 8 inches above the main.

Small service lines shall be embedded in sand in accordance with Item No. 804, "Excavation, Trenching and Backfill."

When approved by the Inspector, the Contractor may lay the new service line from the corporation stop to the curb stop or angle valve. Upon completion, the Contractor shall isolate the new service line by closing the curb stop or angle valve until the meter box is set.

9. Splicing: A long service line single slice may be permitted by means of a 3-part compression or flared coupling only when approved in advance by the Inspector, provided the location of the splice is not under pavement or

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concrete. The segment added is required to be the same material as the existing service line, unless otherwise directed by the Inspector. Splicing short service lines will not be permitted.

10. Boring or Jacking Service Lines: Service lines which cross paved streets may be installed at the Contractor's option by boring or jacking operations. Where it becomes necessary to widen the main trench section to accommodate a bore pit, such widening shall not extend more than one additional foot into the traffic side of the street.
11. Tapping Asbestos Cement (AC) Pipe: All necessary service line tapping of AC pipe shall be completed during the period immediately before or after hydrostatic pressure testing operations so that subsequent flushing will maximize the elimination of contaminants associated with the tapping process. Direct tapping will not be allowed. Service saddles must be used when tapping AC pipe. Drill tools shall be used for services less than 2 inches. Shell type drills shall be used for all services 2 inches and greater.

The tapping of AC pipe must be done in accordance with manufacturers' recommendations and done only with tap machine having a built in flush valve and the flush valve must be open during the entire procedure.

12. Abandonment of Service Lines: The Contractor shall accomplish all cutting, capping, and plugging necessary to isolate new service lines transferred to new and existing mains from those abandoned, including service lines designated in the contract documents as "tap plug" and "tap kill." The corporation stop for an abandoned service line tapped on a ferrous main shall be removed, and the tap at the main shall be plugged with an appropriately sized brass plug. For a non-ferrous main, the corporation stop shall not be removed from the main. Instead, the corporation stop shall be closed and the flared nut shall be removed from the corporation stop. After the appropriately sized copper disc is inserted inside the flared nut, replace the flared nut on the corporation stop. The Contractor shall salvage service line tubing, brass fittings, and other materials as directed by the Inspector and return them to the Owner.
13. Tapping PVC (C-900) Pipe: Tapping of PVC pipe must be done in accordance with Uni-Bell procedures. Direct tapping will not be allowed. All drill cutting tools must be the "shell type" with internal teeth or double slots which will retain the coupon. The shell cutters must be designed for C-900 pipe, thus having sufficient root depth to handle the heavier walled pipe.

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14. Small Service Lines: All service lines from the water main corporation stop to the meter angle stop shall be Type 1, Grade 1, rigid, unplasticized Schedule 80 PVC Pipe, in accordance with ASTM D1785. All pipe for water service lines shall bear the NSF seal. Brass fittings for $\frac{3}{4}$ inch through 2-inch service lines shall be of the flared or compression type. Fitting shall be in accordance with ASTM D2464, D2465, or D2467, or AWWA C110 or C153.
15. Small Service Lines on New Mains: Installation of new Schedule 80 PVC service lines shall consist of all excavation through miscellaneous material encountered; trench excavation protection; drilling and tapping the new main with an approved tapping machine; setting the curb stop or angle valve at the meter; laying the new polyethylene service line at the specified depth between the main and the meter and its tie-in at the corporation and the curb stop or the angle valve; relocating the existing meter and installing a new meter box in accordance with Item No. 833, "Meter and Meter Box Installation."; backfilling the trench with approved selected material and disposal of surplus excavated material; capping the tap hole with asphalt treated base, including the outer limits of the main trench line with service line trench; cutting and replacing pavements, curbing and sidewalks of all types over the limits of the main line trench and the completed service line trench.
16. Reconnecting Service Lines: Both old and new water mains at existing service line connections, as shown in the contract documents, shall be exposed. The old main shall be exposed for the purpose of gaining access to the existing service corporation stop and the new main for the purpose of installing the new corporation stop. The new main shall be exposed for the purpose of being drilled and tapped with an approved tapping machine, a new corporation stop installed under pressure, and the trench extended laterally to expose a sufficient length of the existing service line to provide slack to bend it into position for tying to the new corporation stop. After suitable notification to the Customer, the Contractor shall "kill" the existing service by closing the corporation stop, removing the existing flare nut, inserting inside the existing flared nut an appropriately-sized copper disc and replacing the existing flared nut on the corporation stop if the main is non-ferrous, or plugging the existing service line at the main if the main is ferrous. The Contractor shall then immediately open the stop and restore water service to the Customer. Where it is not possible to obtain sufficient length in the existing service to tie directly to the new main, at the direction of the Inspector, the Contractor shall splice the necessary length of new tubing and tie it to the existing service by means of a compression coupling at a point as close as practicable to the new main.

Where old and new mains are on opposite sides of the street, service lines may be installed under the street pavement by boring rather than trenching.
17. Relaying Service Lines: The existing or new mains shown in the contract documents shall be exposed and opposite location stakes placed onsite at the

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direction of the Inspector. The existing or new main shall: be drilled and tapped with an approved tapping machine, a new corporation stop installed, and the trench extended laterally to the location specified for the meter box. The existing meter shall be reset and the meter box and base shall be installed at its staked location and perpendicular to the corporation stop in the water main. The meter box location shall not vary more than 24 inches in any direction from its staked location. Where the location of the existing meter is not changed, the new service line shall be extended from the main to the existing meter, a new curb stop installed at the end of the service line, and connected to the inlet side of the meter. If disturbed, the existing meter box shall be reset to correct grade. Long service relays may be placed under the street pavement by boring or jacking rather than trenching. Long service lines in cul-de sac in roads must have curb stop off of main with valve cap and cover in road.

18. Single Service Line - Dual Meters: The single service line - dual meter installation shall consist of a 1" Schedule 80 PVC service line reducing to two $\frac{3}{4}$ inch Schedule 80 PVC service lines at a tee which shall be set in line with the front edge of meter boxes for $\frac{5}{8}$ inch and $\frac{3}{4}$ inch meters. A single service line with dual meters shall be installed in those new residential developments where new $\frac{5}{8}$ inch and $\frac{3}{4}$ inch meters are required and in main replacement work, where it is necessary to change the location of existing $\frac{5}{8}$ inch and $\frac{3}{4}$ inch meters. Single service line - dual meter materials and installation requirements shall conform to requirements established herein See DD824-05 Standard Drawing Series.
19. Small Service Lines on Existing Mains: The work involved in the installation of new schedule 80 PVC service lines on existing mains shall consist of jacking, boring, tunneling, and, where authorized, open trench operations; all excavation through whatever material encountered; trench excavation protection; using the existing corporation when approved by the Inspector; tapping the existing main and installing the new corporation and setting the curb stop or angle valve at the meter; relocating the existing meter and installing a new meter box in accordance with Item No. 833, "Meter and Meter Box Installation;" abandoning the existing corporation stop, removing the existing flared nut, inserting inside the existing flared nut an appropriately-sized copper disc and replacing the existing flared nut on the corporation stop, if the main is non-ferrous, or plugging the existing service line at the main if the main is ferrous; installing the new service line at the same grade as the existing service line or at the specified grade between the main and the existing meter and its tie-in at the corporation and the curb stop; disposal of surplus excavated material; capping the tap hole with asphalt treated base including the outer limits of the main line trench and the service line trench; cutting and replacing all surfaces of whatever type encountered over the completed service line trench; restoration of the site.
20. Large Service Lines: Ductile iron pipe and cast iron fittings used for metered

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service lines and non-metered fire service lines larger than 2-inch shall be installed in accordance with the applicable provisions of Item No. 812, "Water Main Installation," except where otherwise approved by the Engineer.

21. Large Service Lines on New Mains: Work involved in the installation of a new metered service lines and non-metered fire service lines shall consist of all excavation through whatever material encountered, trench excavation protection, installing tees, pipe and fittings of various sizes including main line and service line valves, valve boxes, ductile iron pipe, fittings, in accordance with the associated DD-824 Standard Drawing Series, and reaction block, backfilling with approved selected material, cutting and replacing pavements, curbing, and sidewalks of all types over the limits of the main line trench and the completed ductile iron service line.
22. Large Service Lines on Existing Mains: The work involved in the installation of the new metered service lines and non-metered fire service lines shall consist of all excavation through whatever material encountered, trench excavation protection, cutting-in tees and installing tapping sleeves and valves, pipe and fittings of various sizes including main line and service valves, valves boxes, ductile iron pipe, fittings and reaction block required, backfilling with approved selected material, cutting and replacing pavements, curbing, and sidewalks of all types over the limits of the main line trench and the completed ductile iron service line.

824.4

MEASUREMENT:

1. Reconnect Short Service will be measured by the unit of the various types and sizes of each service line reconnected.
2. Relay Short Service will be measured by the unit of the various types and sizes of each service line relayed.
3. Relay Long Service will be measured by the unit of the various types and sizes of each service line relayed.
4. Relocate Short Service will be measured by the unit of the various types and sizes of each service line relocated.
5. Relocate Long Service will be measured by the unit of the various types and sizes of each service line relocated.
6. New Short Service will be measured by the unit of the various types and sizes of each new service line installed.
7. New Long Service will be measured by the unit of the various types and sizes of each new service line installed.

Fair Oaks Ranch Standard Specifications for Construction

8. New Un-metered Short Service will be measured by the unit of the various type and sizes of each new un-metered service line installed.
9. New Un-metered Long Service will be measured by the unit of the various type and sizes of each new un-metered service line installed.

824.5

PAYMENT: Payment for a Reconnect will be made at the unit price for each service line of the various sizes reconnected. Such payment shall also include excavation, trench excavation protection, hauling and disposition of surplus excavated materials, sand backfill, cutting pavement and surface structures of whatever type encountered and replacement with whatever type specified, and polyethylene tubing and fittings of the various sizes used in the service line reconnection.

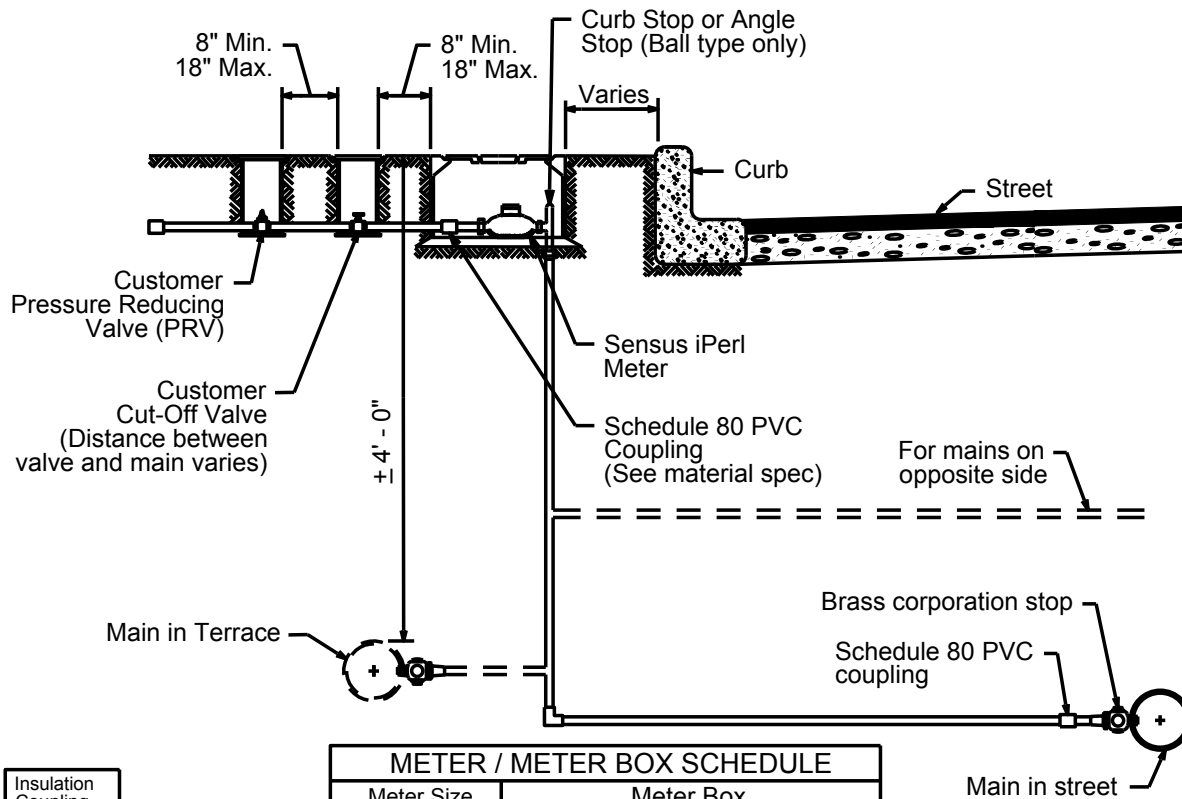
Payment for a Relay Short and Long Service will be made at the unit price for each service line of the various sizes relayed. Payment shall include reconnection of new service to the existing meter and the adjustment of the meter, meter box, and Customer valve. Such payment shall also include excavation, trench excavation protection, hauling and disposition of surplus excavated materials, sand backfill, cutting pavement and surface structures of whatever type encountered and replacement with whatever type specified, and polyethylene tubing and fittings of the various sizes used in the service line relay.

Payment for a Relocate Short and Long Service will be made at the unit price bid for each service line of the various sizes relocated. Such payment shall also include excavation, trench excavation protection, hauling and disposition of surplus excavated materials, sand backfill, meter box relocation, cutting pavement and surface structures of whatever type encountered and replacement with whatever type specified, and polyethylene tubing and fittings of the various sizes used in the service line relocation.

Payment for a New Short and Long Service will be made at the unit price bid for each new service line of the various sizes installed. Such payment shall also include excavated materials, trench excavation protection, sand backfill, cutting pavement and surface structures of whatever type encountered and replacement with whatever type specified, meter box, meter template, polyethylene tubing and fittings of the various sizes used in the new service line installation.

Payment for a New Unmetered Short and New Unmetered Long Service will be made at the unit price bid for each new unmetered service line of the various sizes installed. Such payment shall also include excavated materials, trench excavation protection, sand backfill, cutting in pavement and surface structures of whatever type encountered and replacement with whatever type specified, meter box, meter template, polyethylene tubing and fittings, of the various sizes used in the new unmetered service line installation.

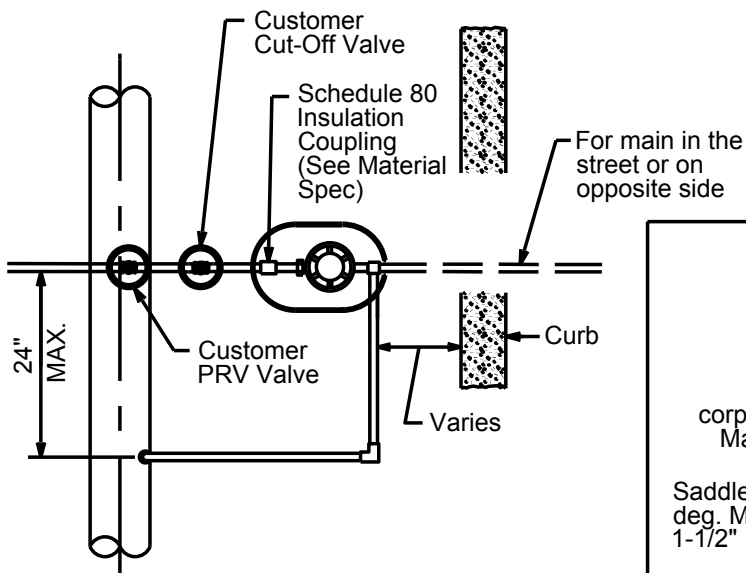
- End of Specification -



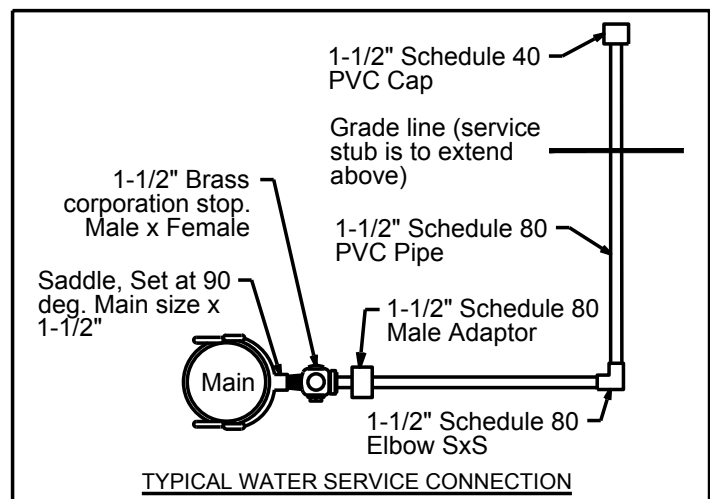
Insulation
Coupling
Component
1579 - 3/4"
1580 - 1"

METER / METER BOX SCHEDULE	
Meter Size	Meter Box
5/8", 3/4" & 1"	C.I. Oval, SAWS Material Specification 10-30

- Notes:
1. See Tapping Schedule DD-824-01 Sheet 3 of 3
 2. All valves shall open left (counter-clockwise)



**IMPROVED STREET
5/8" THRU 1" SERVICE**



TYPICAL WATER SERVICE CONNECTION

PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

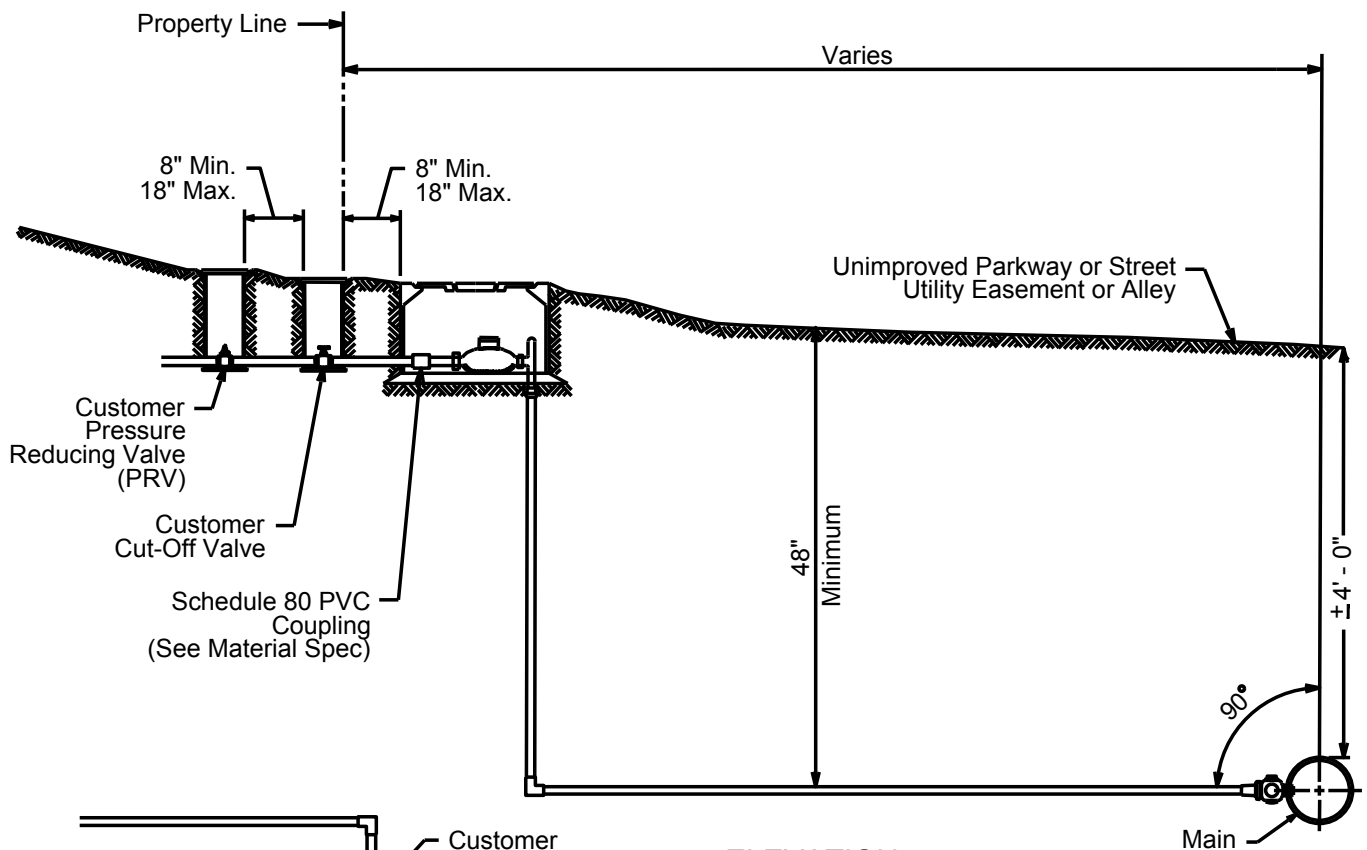
SCHEDULE 80 PVC
INSTALLATION

APPROVED
JANUARY 2019

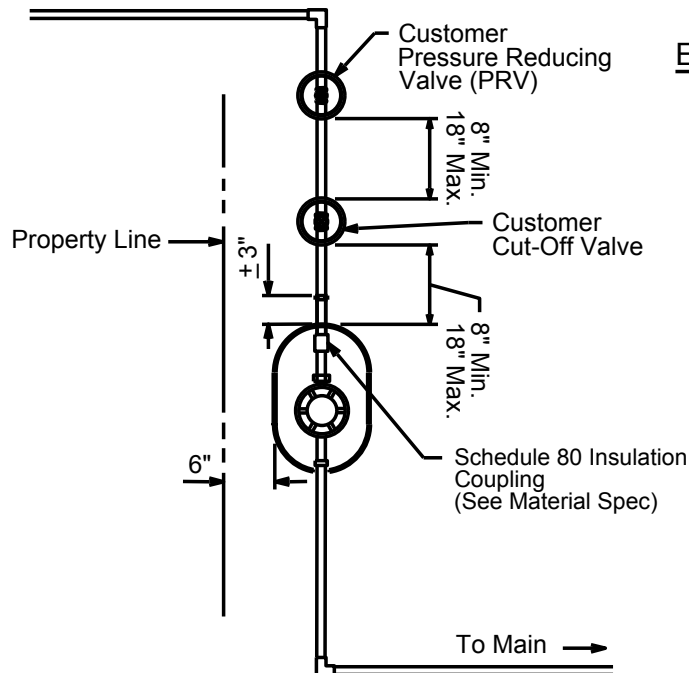
REVISED

DD-824-01

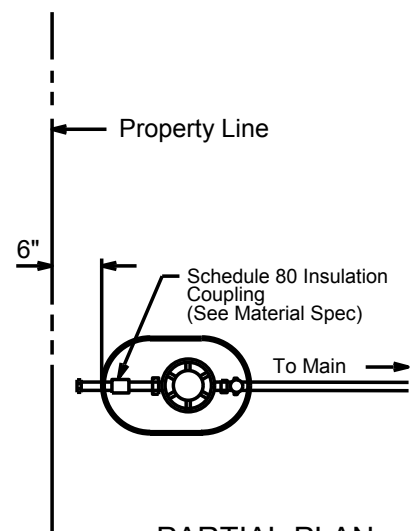
SHEET
1 OF 3



ELEVATION



PARTIAL PLAN



PARTIAL PLAN

Notes:

1. All valves shall open left (counter-clockwise)
2. If stubbing out for future service connection, bring PVC 6" above grade as shown on Sheet 1.

UNIMPROVED STREET
5/8" THRU 1" SERVICE

PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

SCHEDULE 80 PVC
SERVICE INSTALLATION
UNIMPROVED STREET

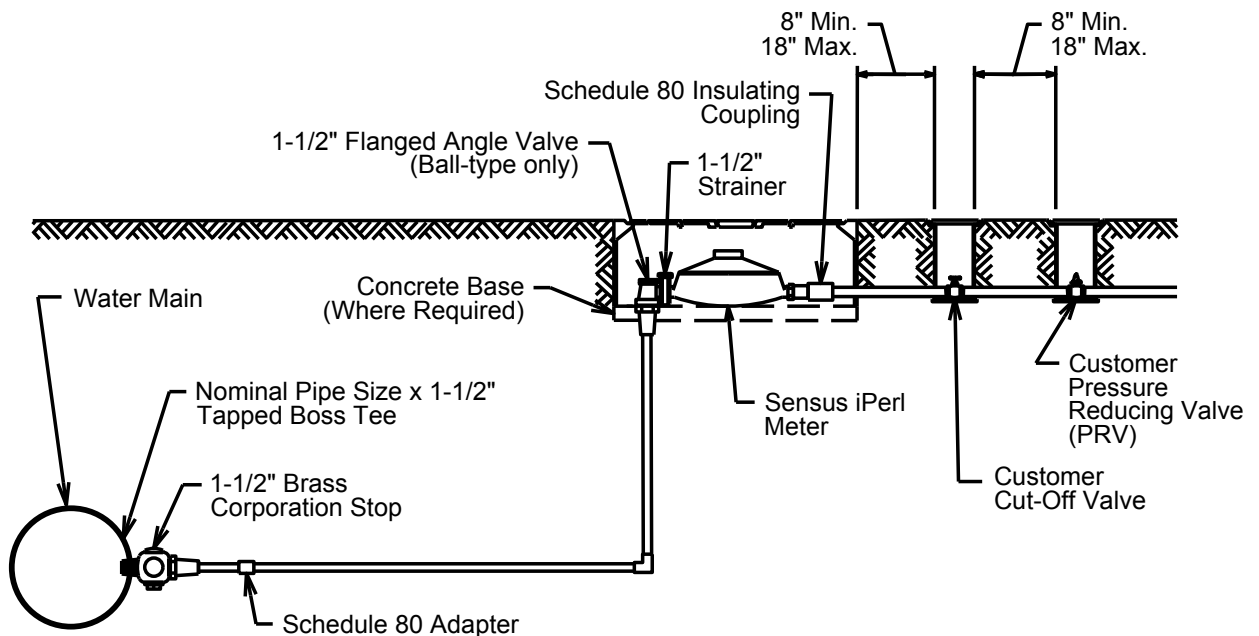
APPROVED
JANUARY 2019

REVISED

DD-824-01

SHEET
2 OF 3

PIPE TAPPING SCHEDULE				
PIPE DIAMETER	SERVICE SIZE			
	3/4"	1"	1 1/2"	2"
6" A.C.	Tap With Service Saddle	Tap With Service Saddle	Tap With Service Saddle	Tap With Service Saddle
6" C.I. or D.I.	Tap	Tap	Tap With Service Saddle	Tap With Service Saddle
8" A.C.	Tap With Service Saddle	Tap With Service Saddle	Tap With Service Saddle	Tap With Service Saddle
8" C.I. or D.I.	Tap	Tap	Tap With Service Saddle	Tap With Service Saddle
8" PVC	Tap With Service Saddle	Tap With Service Saddle	Tap With Service Saddle	Tap With Service Saddle
10" A.C.	Tap With Service Saddle	Tap With Service Saddle	Tap With Service Saddle	Tap With Service Saddle
10" C.I. or D.I.	Tap	Tap	Tap With Service Saddle	Tap With Service Saddle
10" PVC	Tap With Service Saddle	Tap With Service Saddle	Tap With Service Saddle	Tap With Service Saddle
12" A.C.	Tap With Service Saddle	Tap With Service Saddle	Tap With Service Saddle	Tap With Service Saddle
12" C.I. or D.I.	Tap	Tap	Tap With Service Saddle	Tap With Service Saddle
12" PVC	Tap With Service Saddle	Tap With Service Saddle	Tap With Service Saddle	Tap With Service Saddle
16" A.C.	Tap With Service Saddle	Tap With Service Saddle	Tap With Service Saddle	Tap With Service Saddle
16" C.I. or D.I.	Tap	Tap	Tap With Service Saddle	Tap With Service Saddle



Notes:

1. For direct tap to main, see Tapping Schedule.
2. All valves shall open left (counter- clockwise).

1 1/2" & 2" SERVICE TAPPED TEE

PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

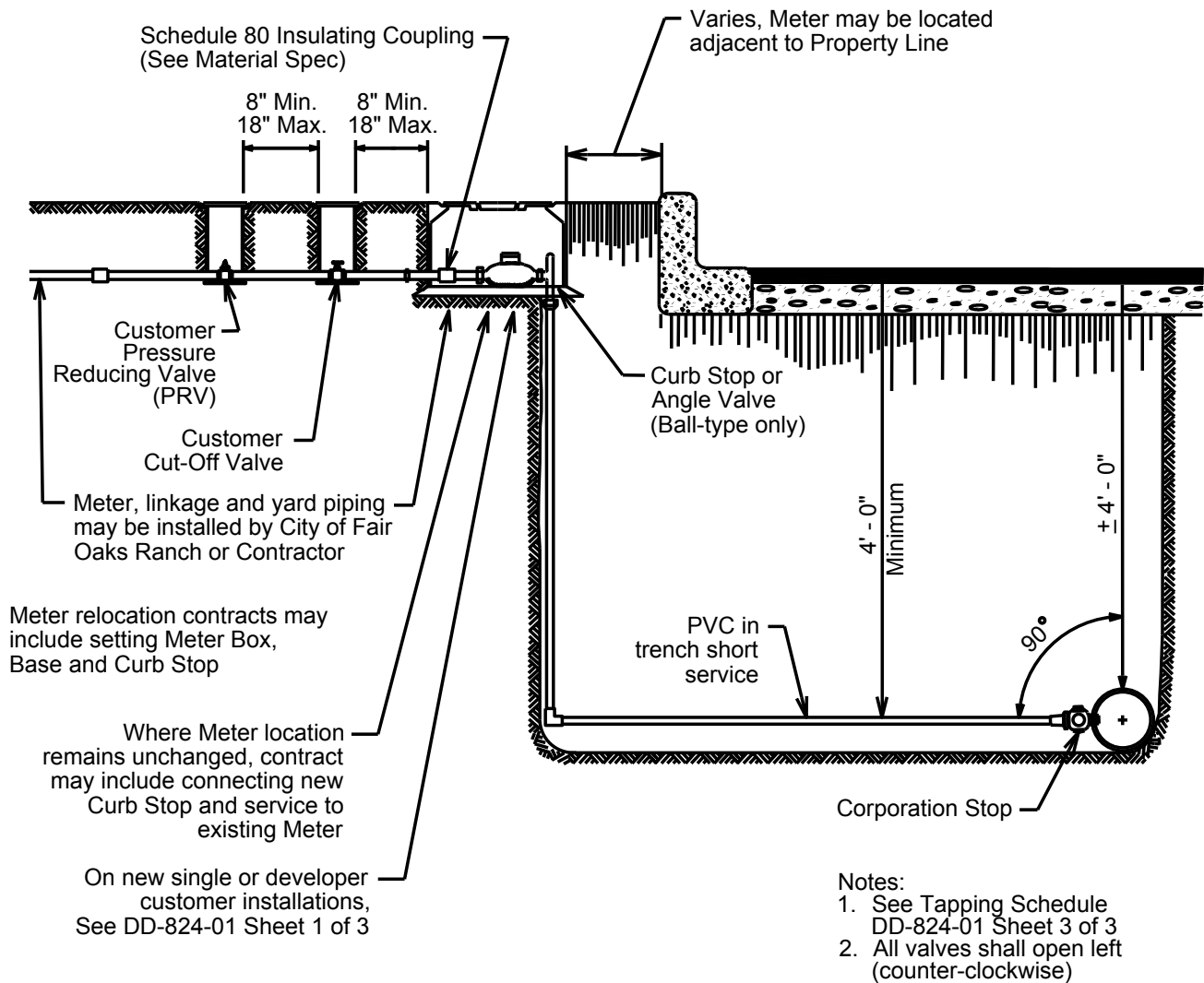
SCHEDULE 80 PVC
SERVICE INSTALLATION
TAPPING SCHEDULE

APPROVED
JANUARY 2019

REVISED

DD-824-01

SHEET
3 OF 3



SERVICE RELAY, SERVICE AND METER RELOCATION

PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

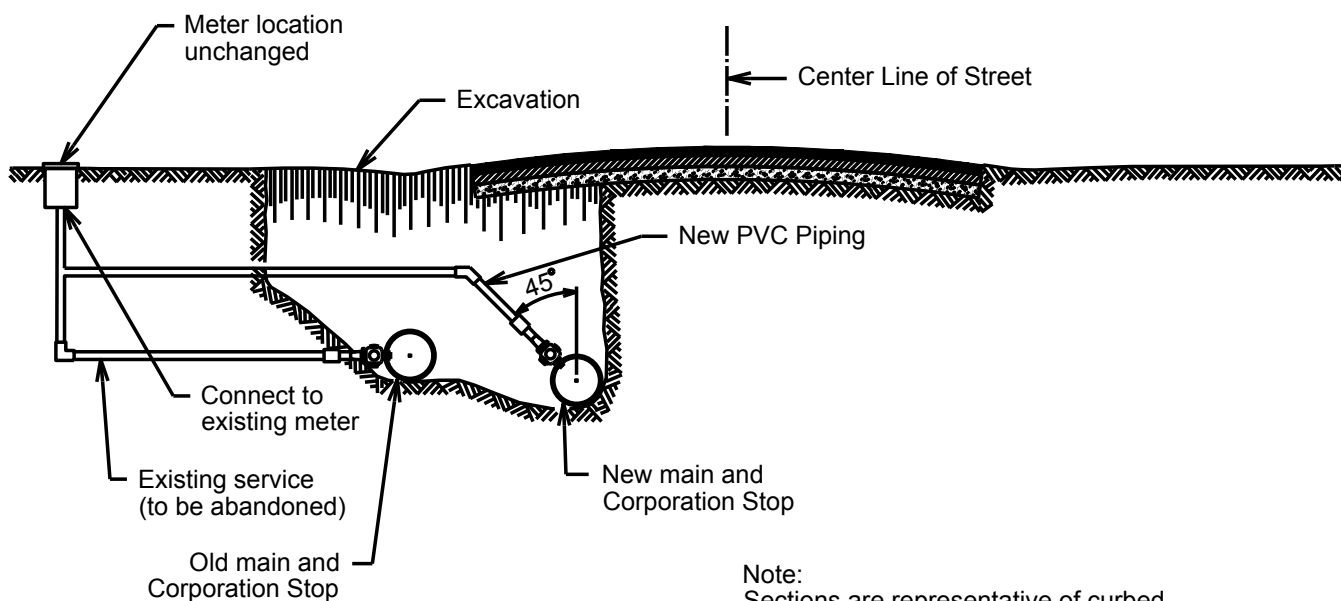
SERVICE RELAY,
SERVICE RELOCATION
3/4" THRU 2"

APPROVED
JANUARY 2019

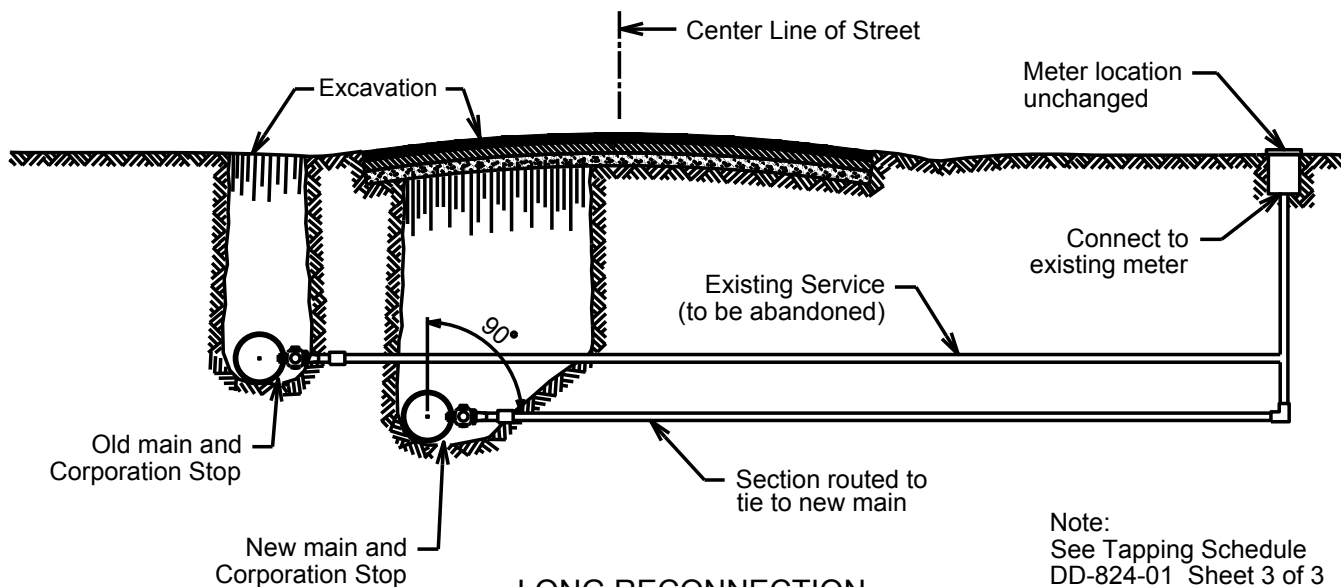
REVISED

DD-824-02

SHEET
1 OF 1

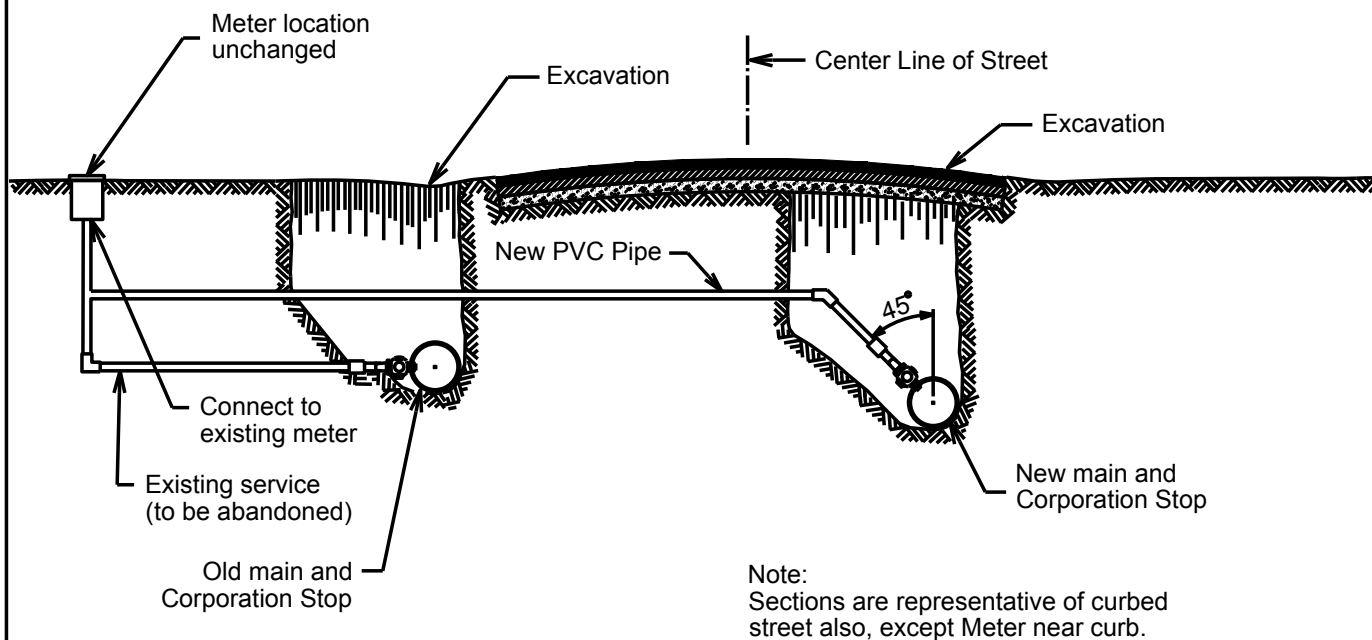


SHORT RECONNECTION
OLD AND NEW MAINS SAME SIDE
METER ON SAME SIDE

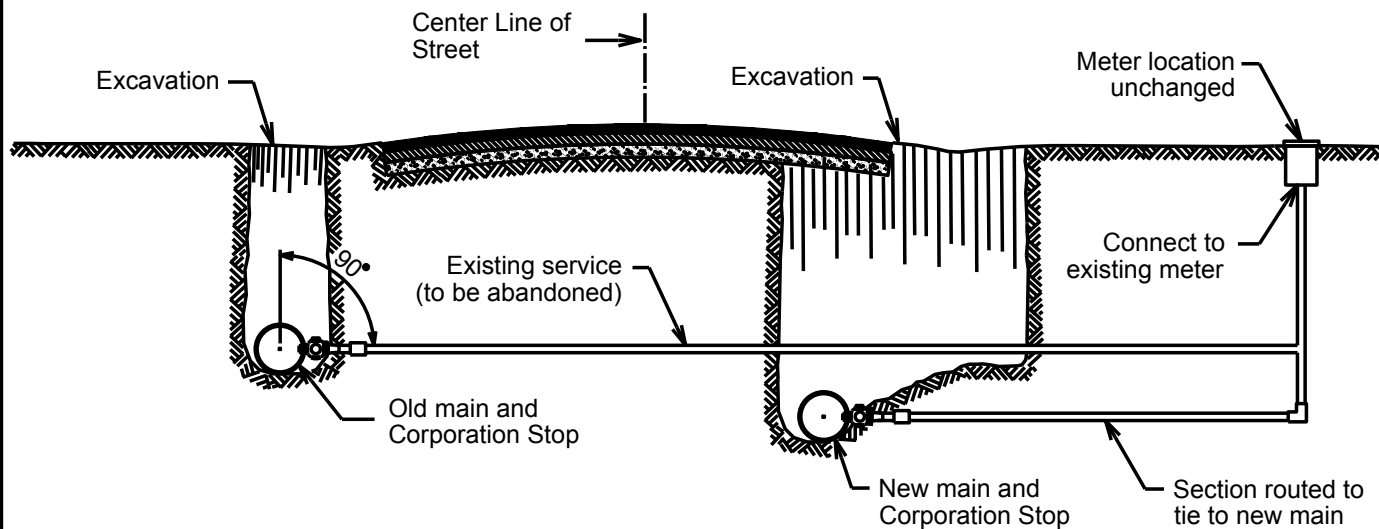


LONG RECONNECTION
OLD AND NEW MAINS SAME SIDE
METER ON OPPOSITE SIDE

PROPERTY OF THE CITY OF FAIR OAKS RANCH	SERVICE RECONNECTION 3/4" THRU 2"	APPROVED	REVISED
		JANUARY 2019	
		DD-824-03	SHEET 1 OF 2

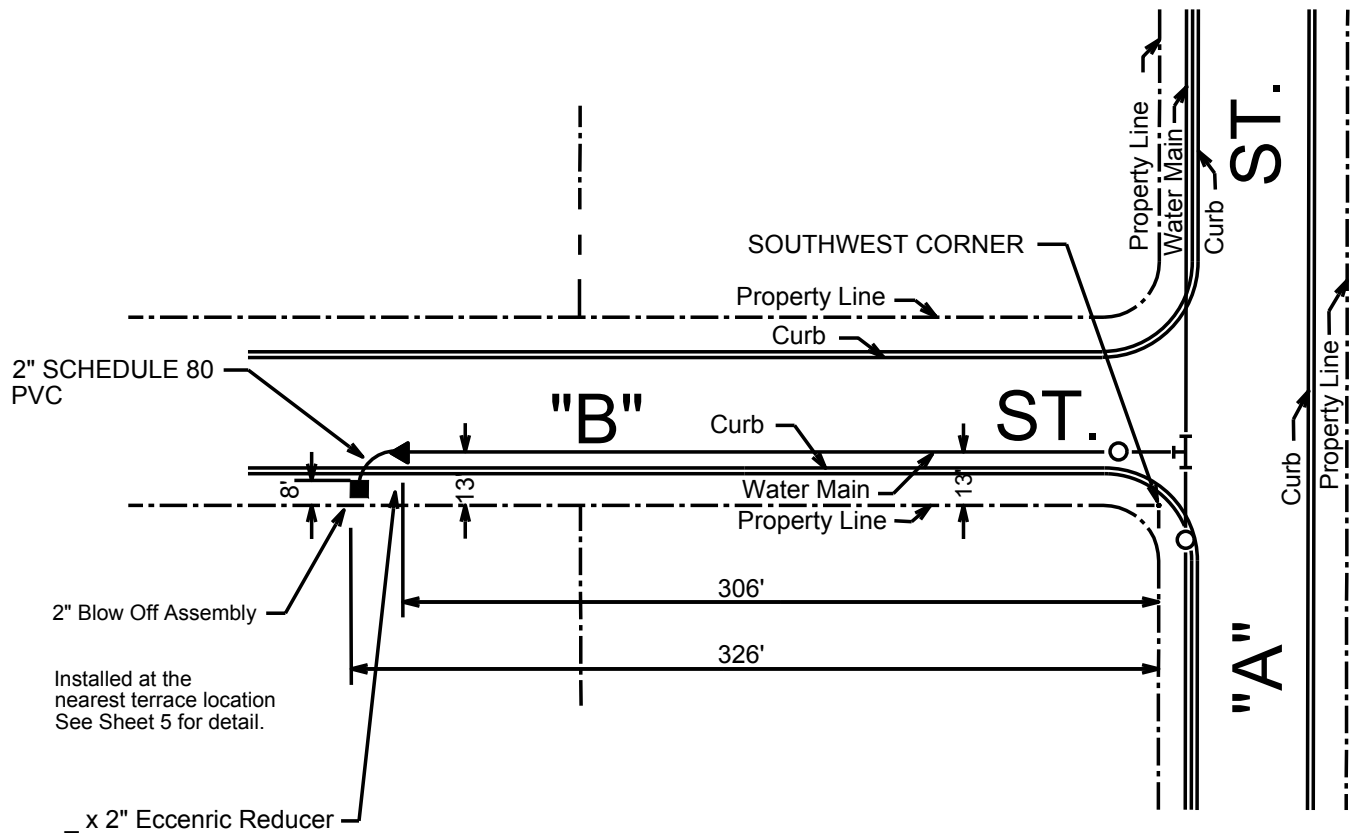


LONG RECONNECTION
OLD MAIN AND METER ON OPPOSITE SIDE
OF STREET FROM NEW MAIN



SHORT RECONNECTION
NEW MAIN AND METER ON OPPOSITE
SIDE OF STREET FROM OLD MAIN

PROPERTY OF THE CITY OF FAIR OAKS RANCH	SERVICE RECONNECTION 3/4" THRU 2"	APPROVED	REVISED
		JANUARY 2019	
		DD-824-03	SHEET 2 OF 2

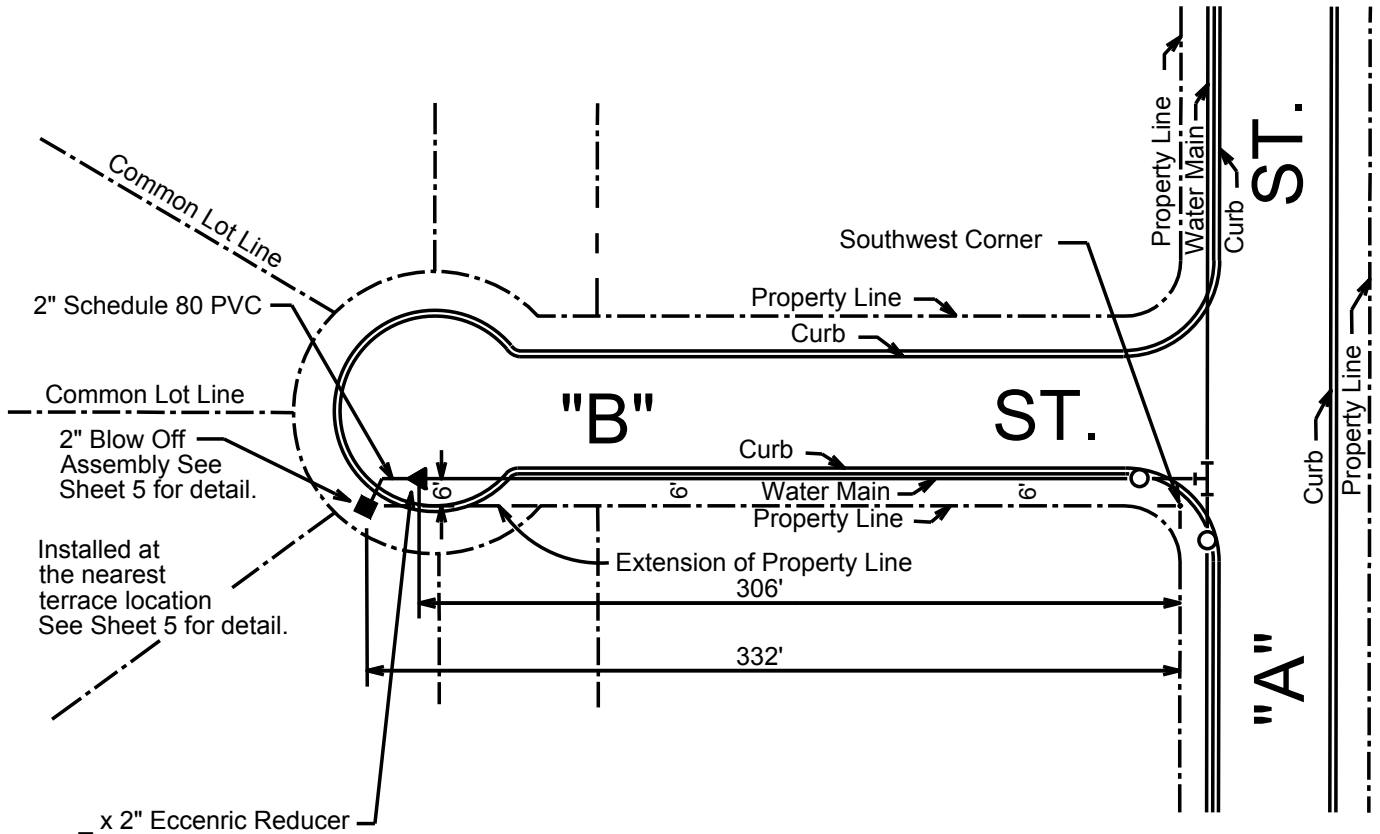


BLOW OFF MEASUREMENT: From the Southwest Corner of "A" St. and "B" St. West 306' and North 13' to Eccentric Reducer, and West 326' and South 8' to Blow Off Assembly Box.

Note:

1. New developments must follow dead end auto flushing terms.
Refer to Item No. 812 and detail DD-812-02.

PROPERTY OF THE CITY OF FAIR OAKS RANCH	TYPICAL BLOW OFF ARRANGEMENT ON DEAD END MAINS	APPROVED	REVISED
		JANUARY 2019	
		DD-824-04	SHEET 1 OF 5



BLOW OFF MEASUREMENT: From the Southwest Corner of "A" St. and "B" St. West 306' and North 6' to Eccentric Reducer, and West 332' and South 0' to Blow Off Assembly Box.

Note:

1. New developments must follow dead end auto flushing terms. Refer to Item No. 812 and detail DD-812-02.

PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

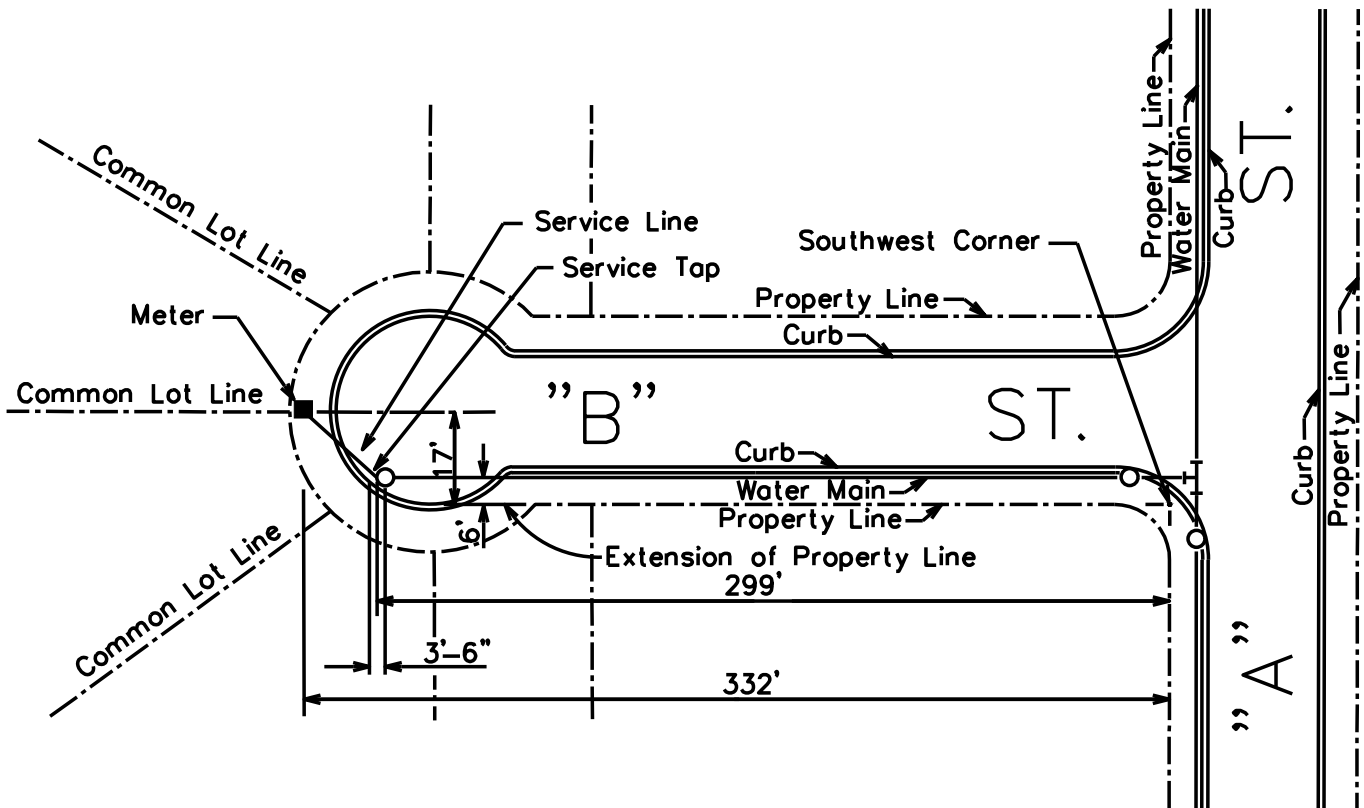
TYPICAL BLOW OFF
ARRANGEMENT
IN CUL-DE-SAC

APPROVED
JANUARY 2019

REVISED

DD-824-04

SHEET
2 OF 5

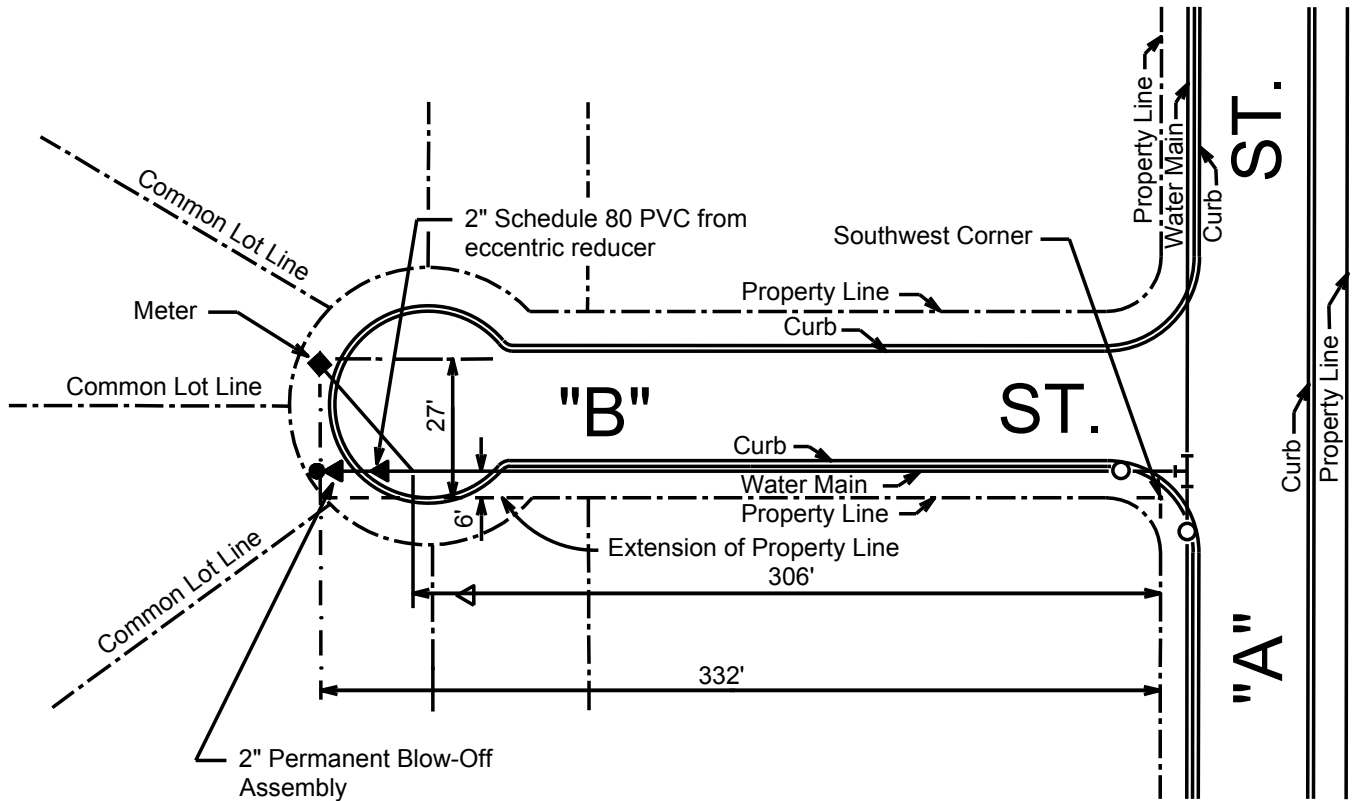


SERVICE MEASUREMENT: From the Southwest Corner of "A" St. and "B" St. West 299' and North 6' to Tap, and West 332' and North 17' to Meter.

Note:

1. Long service lines in cul-de-sac in roads must have curb stop off of main valve with valve cap and cover in road.

PROPERTY OF THE CITY OF FAIR OAKS RANCH	TYPICAL SERVICE ARRANGEMENT IN CUL-DE-SAC	APPROVED	REVISED
		JANUARY 2019	
		DD-824-04	SHEET 3 OF 5



BLOW OFF MEASUREMENT: From the Southwest Corner of "A" St. and "B" St. West 306' and North 6' to end, of eccentric reducer, and West 332' and North 27' to assembly box.

Note:

1. New developments must follow dead end auto flushing terms.
Refer to Item No. 812 and detail DD-812-02.

PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

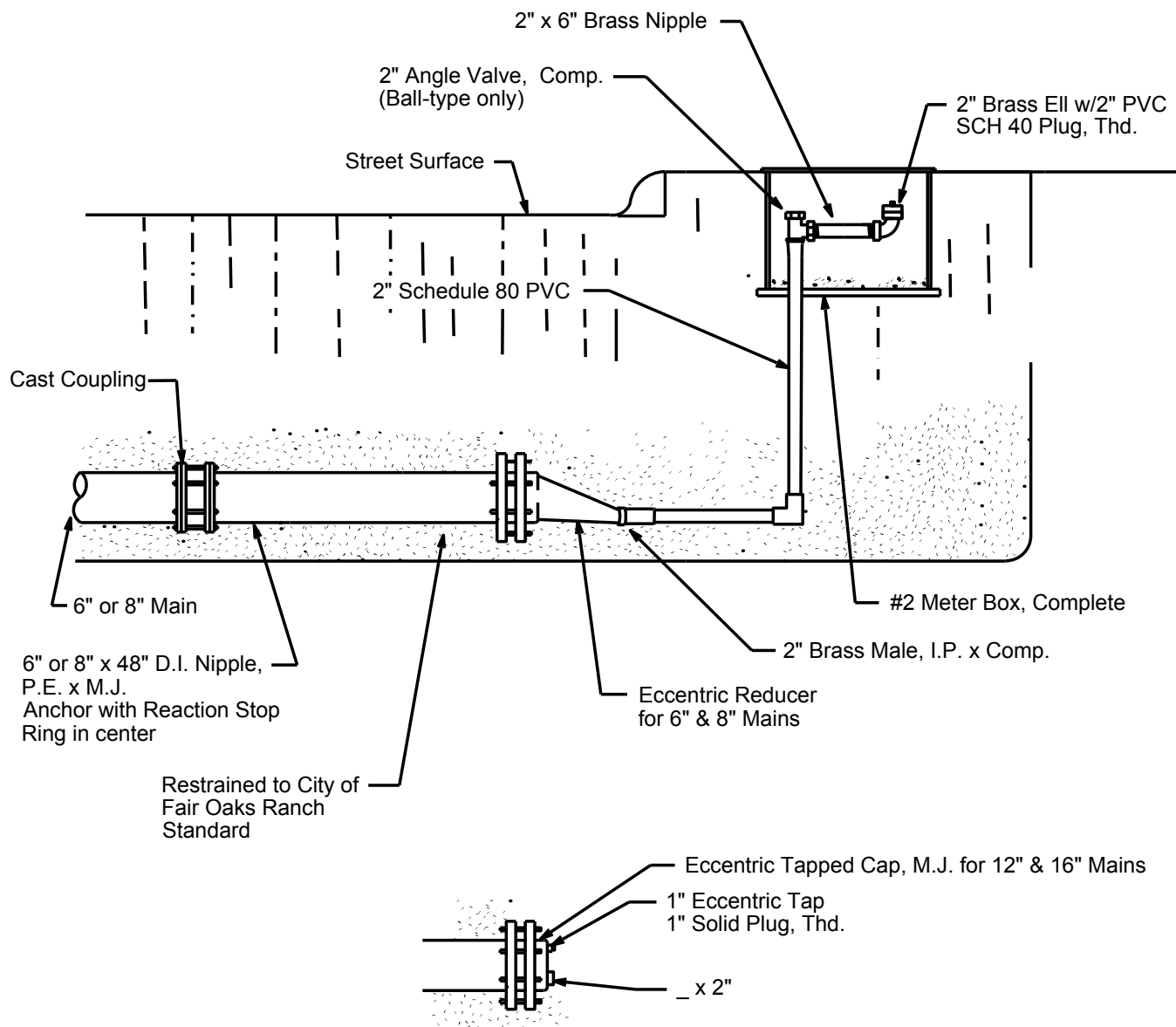
TYPICAL 2" BLOW OFF
ARRANGEMENT ON
DEAD END MAINS

APPROVED
JANUARY 2019

REVISED

DD-824-04

SHEET
4 OF 5



Note:

1. All ferrous metal surfaces in accordance with 814.3 Specification.

PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

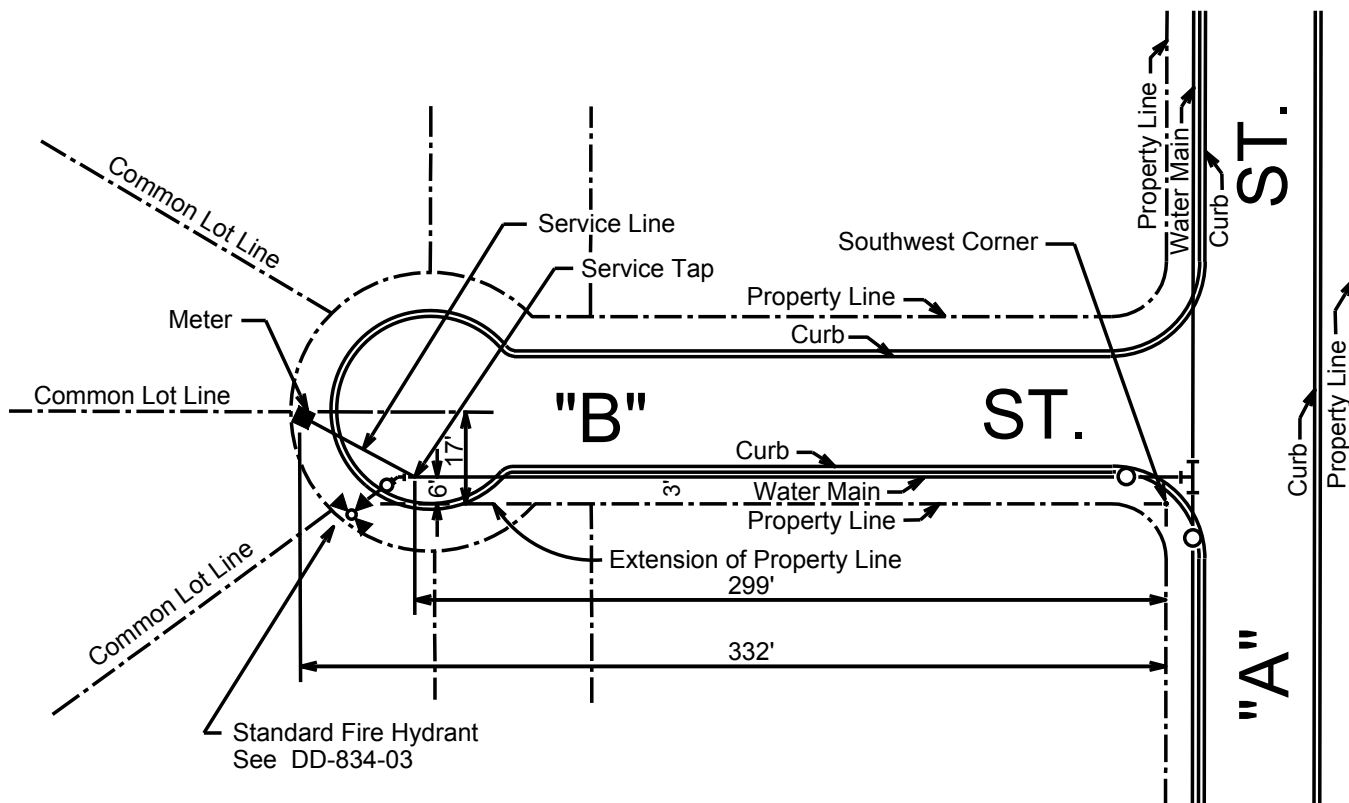
2" PERMANENT
BLOW-OFF ASSEMBLY

APPROVED
JANUARY 2019

REVISED

DD-824-04

SHEET
5 OF 5



SERVICE MEASUREMENT: From the Southwest Corner of "A" St. and "B" St. West 299' and North 6' to Tap, and West 332' and North 17' to Meter

Note:

1. Install Fire Hydrant near common lot line to avoid future driveway construction.
2. Long service lines in cul-de-sac in roads must have curb stop off of main valve with valve cap and cover in road.
3. The fire hydrant shall open left (counter-clockwise)

PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

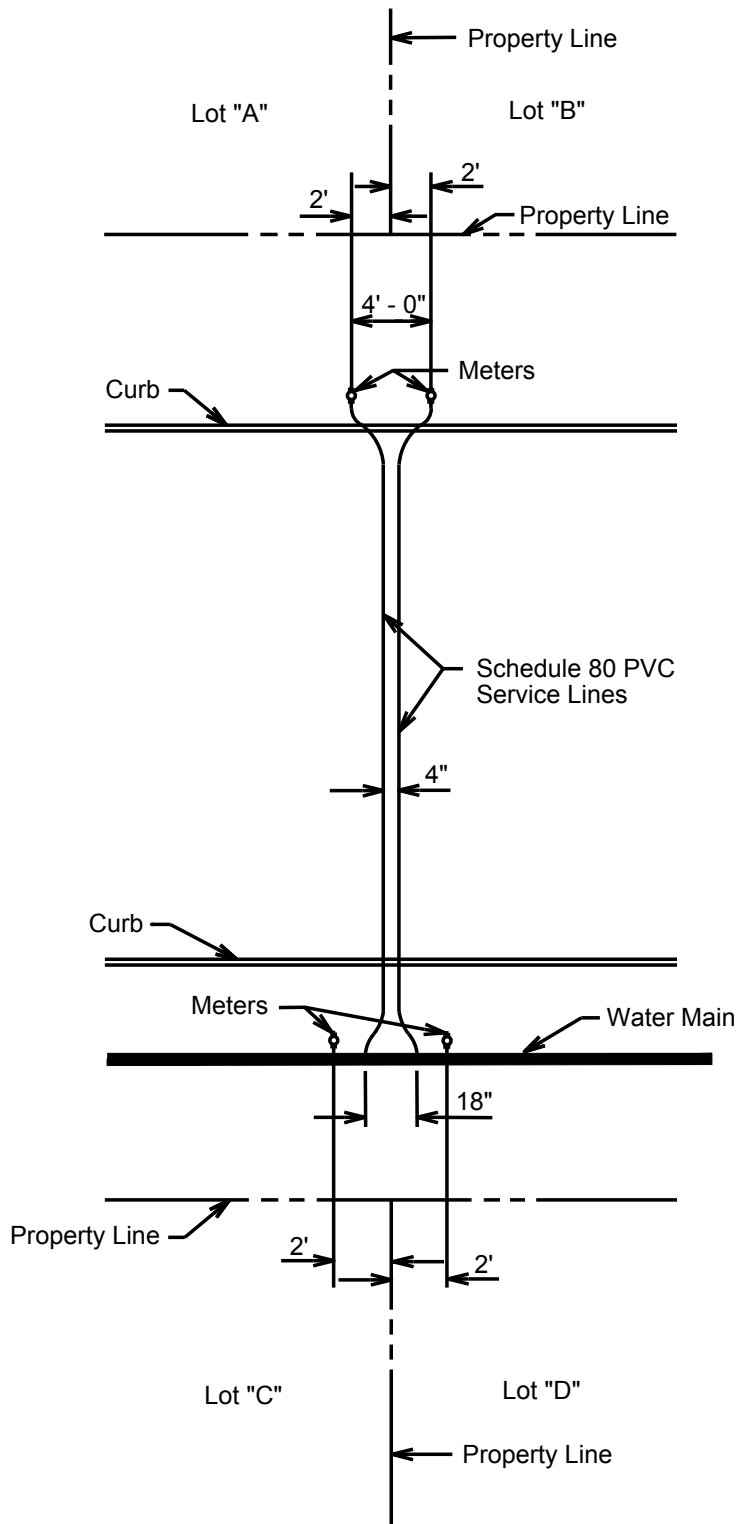
TYPICAL SERVICE
ARRANGEMENT
IN CUL-DE-SAC
WITH FIRE HYDRANT

APPROVED
JANUARY 2019

REVISED

DD-824-04

SHEET
2 OF 5



SINGLE SERVICE LINE - SINGLE METER

PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

TYPICAL
SERVICE ARRANGEMENT

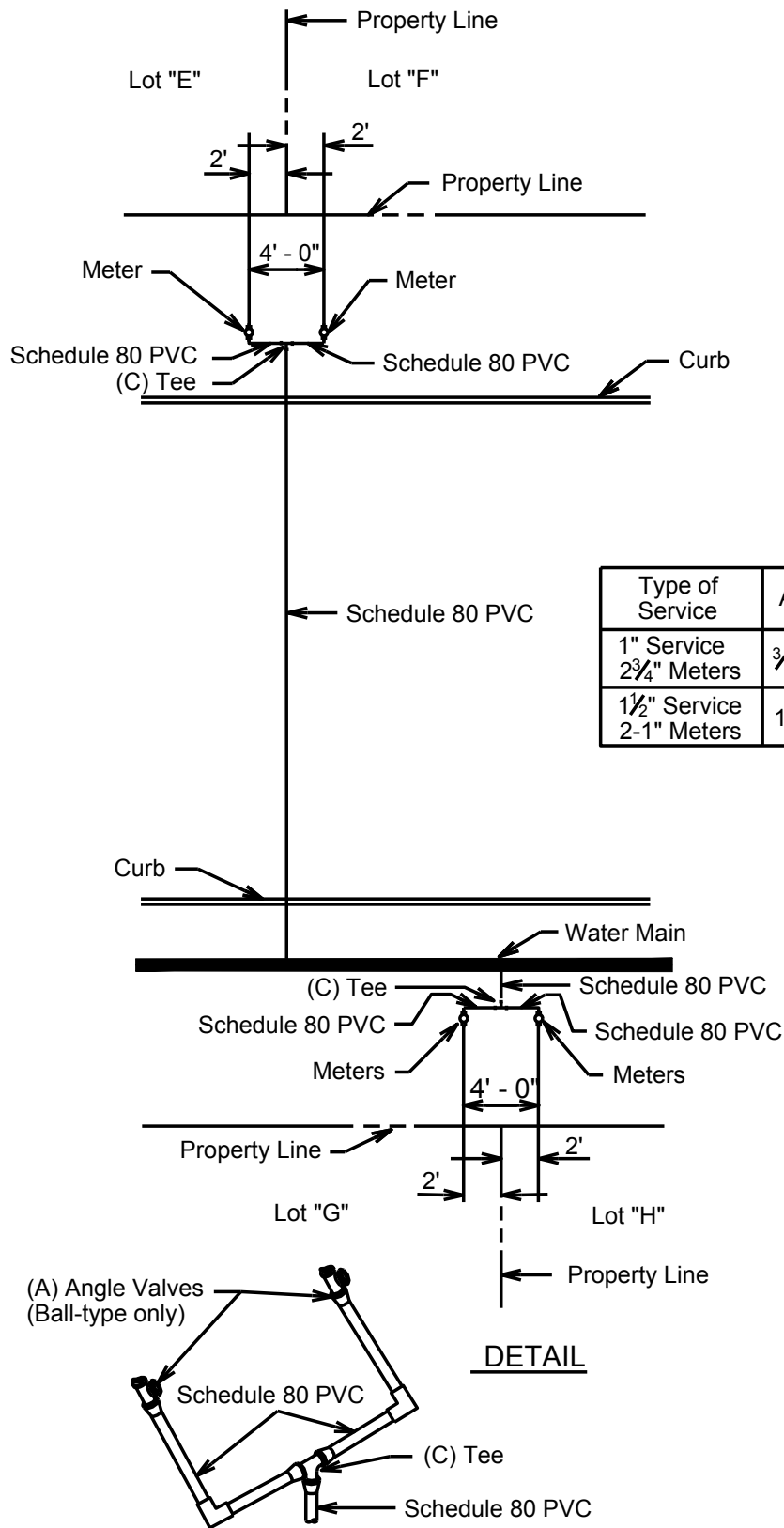
APPROVED

JANUARY 2019

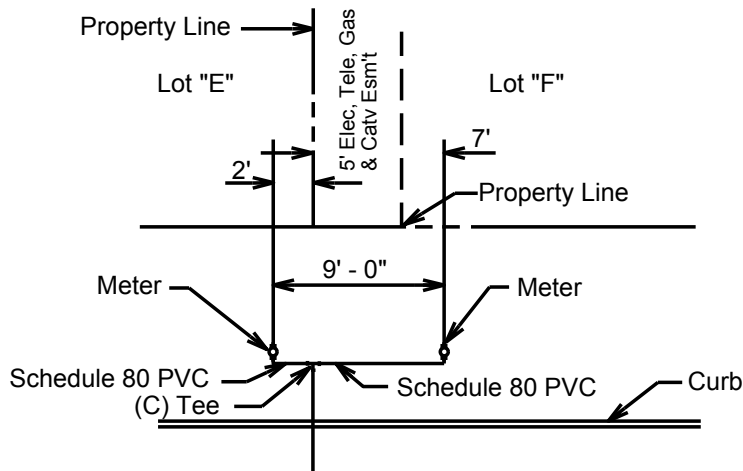
REVISED

DD-824-05

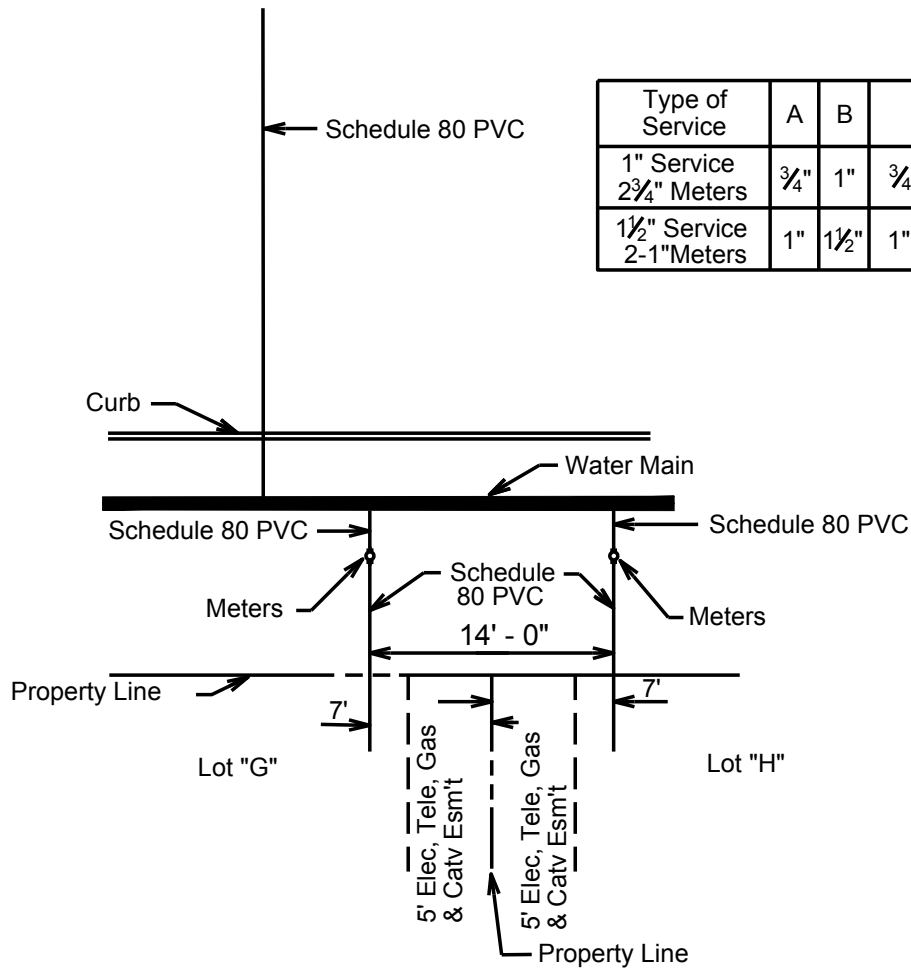
SHEET
1 OF 3



SINGLE SERVICE LINE - DUAL METER



SINGLE SERVICE LINE - DUAL METER W/ EASEMENT



SINGLE SERVICE LINE W/ EASEMENT

PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

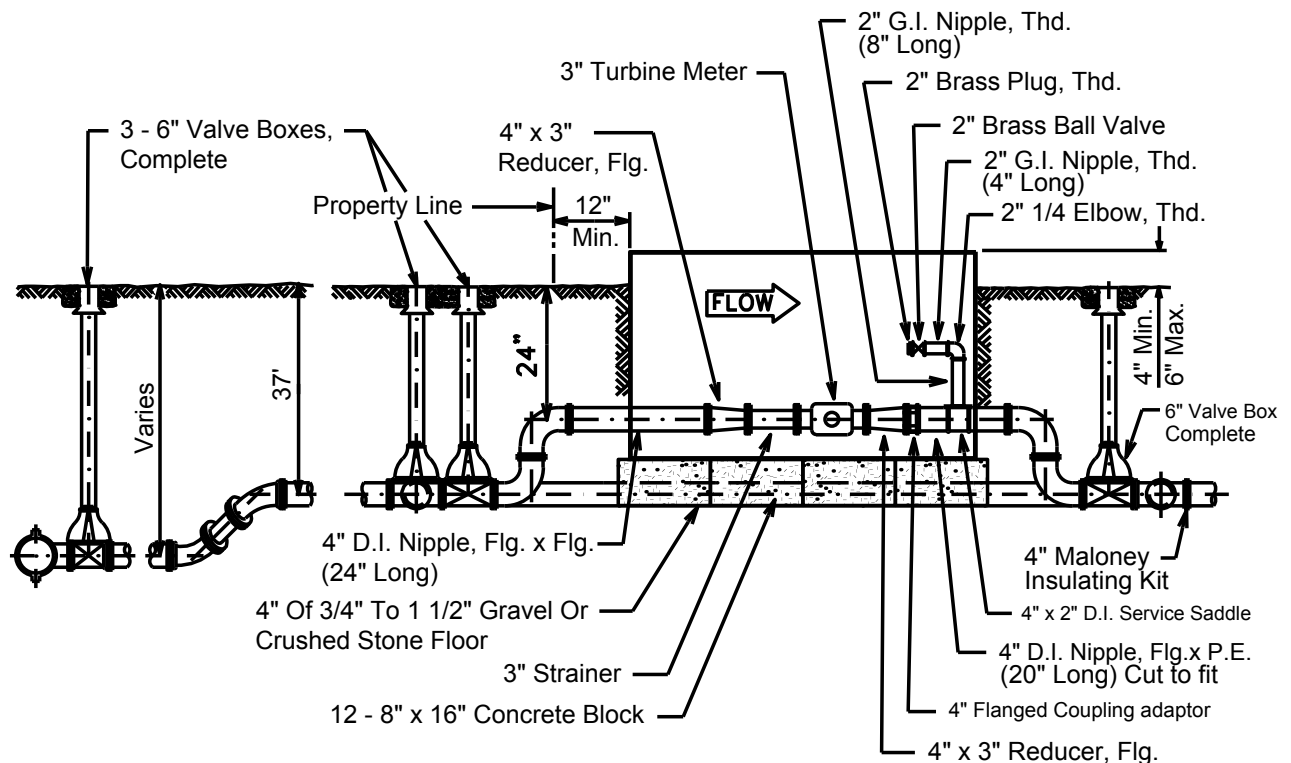
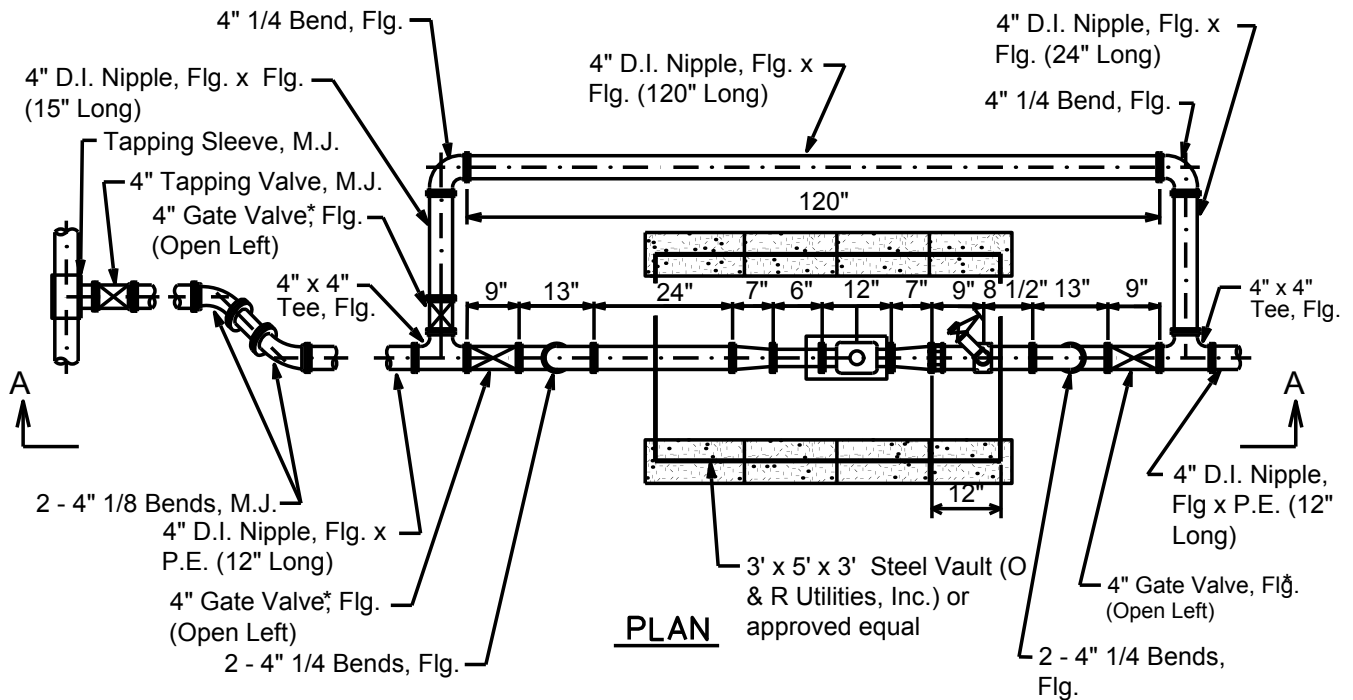
ALTERNATE
SERVICE ARRANGEMENT

APPROVED
JANUARY 2019

REVISED

DD-824-05

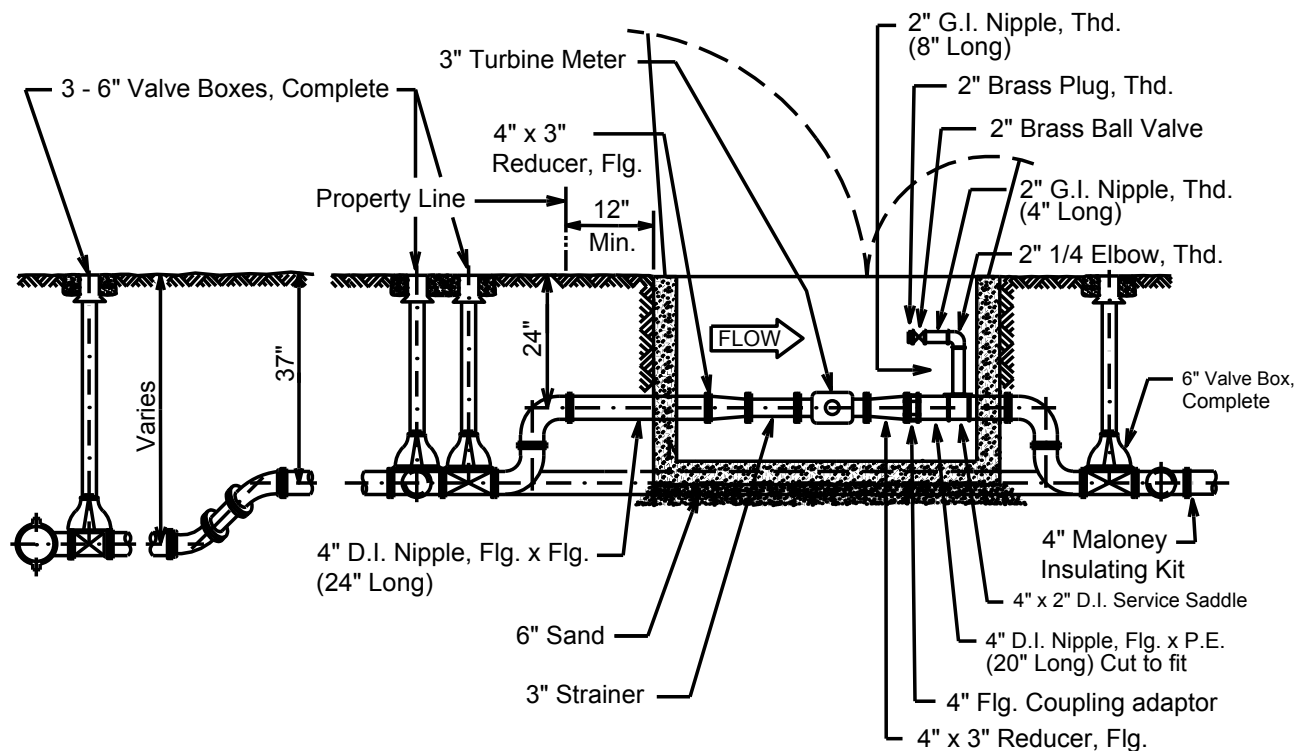
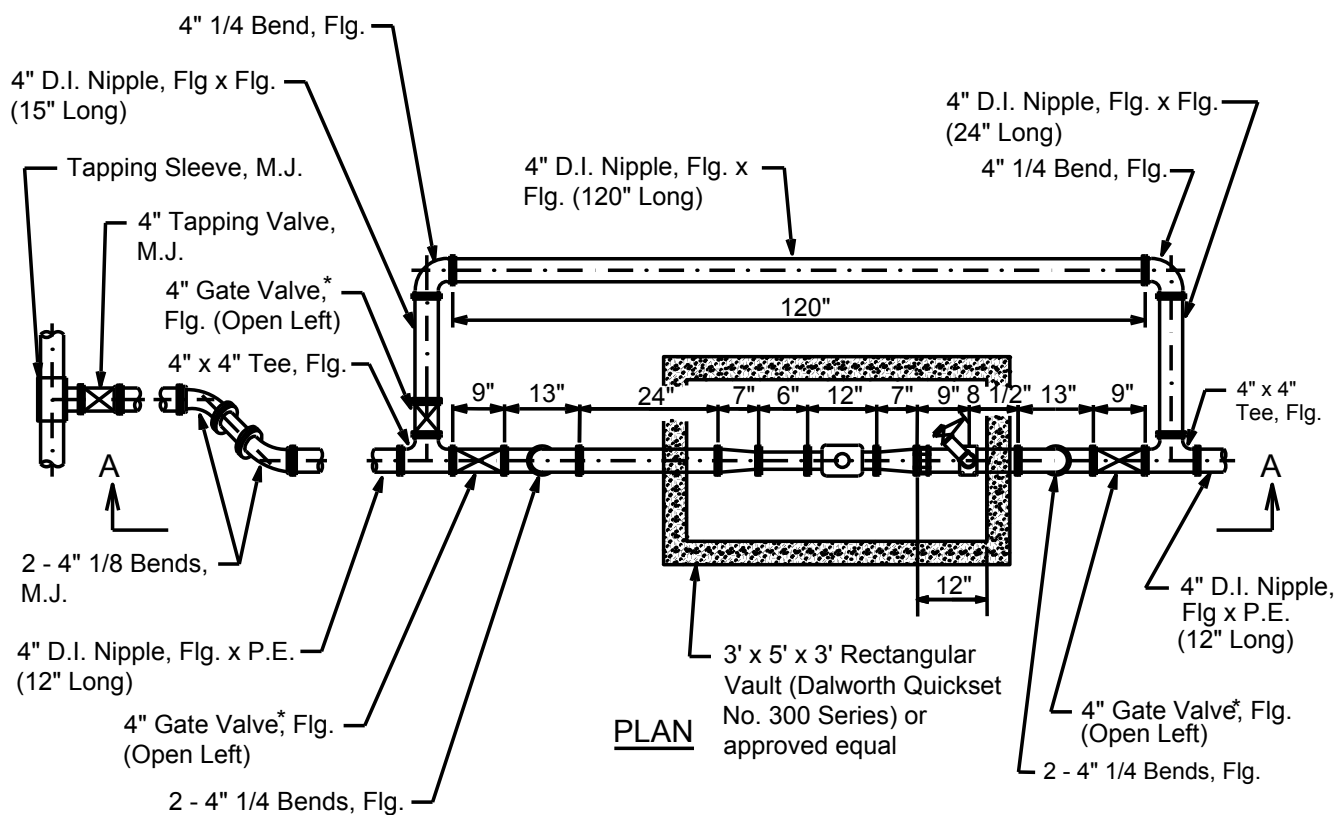
SHEET
3 OF 3



**3' x 5' x 3' STEEL VAULT
(NON-TRAFFIC BEARING LOCATION)**

* Resilient Seat

PROPERTY OF THE CITY OF FAIR OAKS RANCH	3" TURBINE METER INSTALLATION	APPROVED	REVISED
		JANUARY 2019	
		DD-824-06	SHEET 1 OF 2



* Resilient Seat

PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

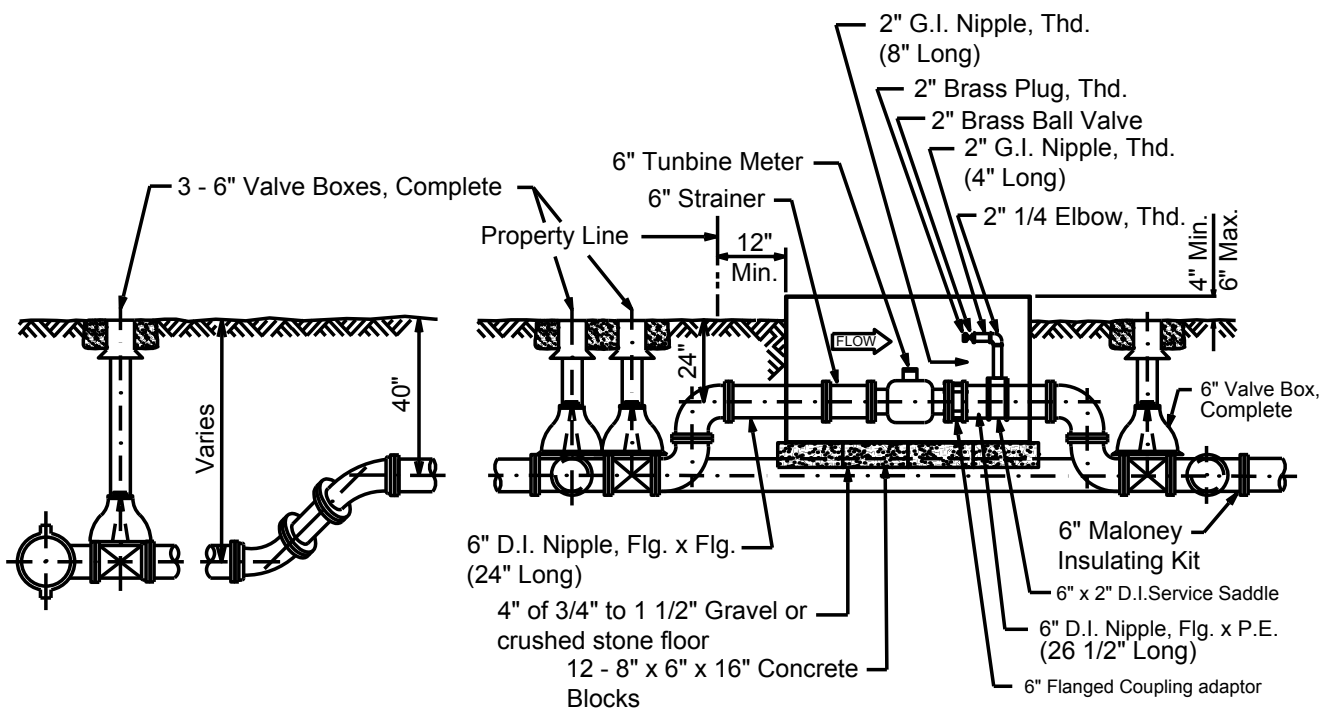
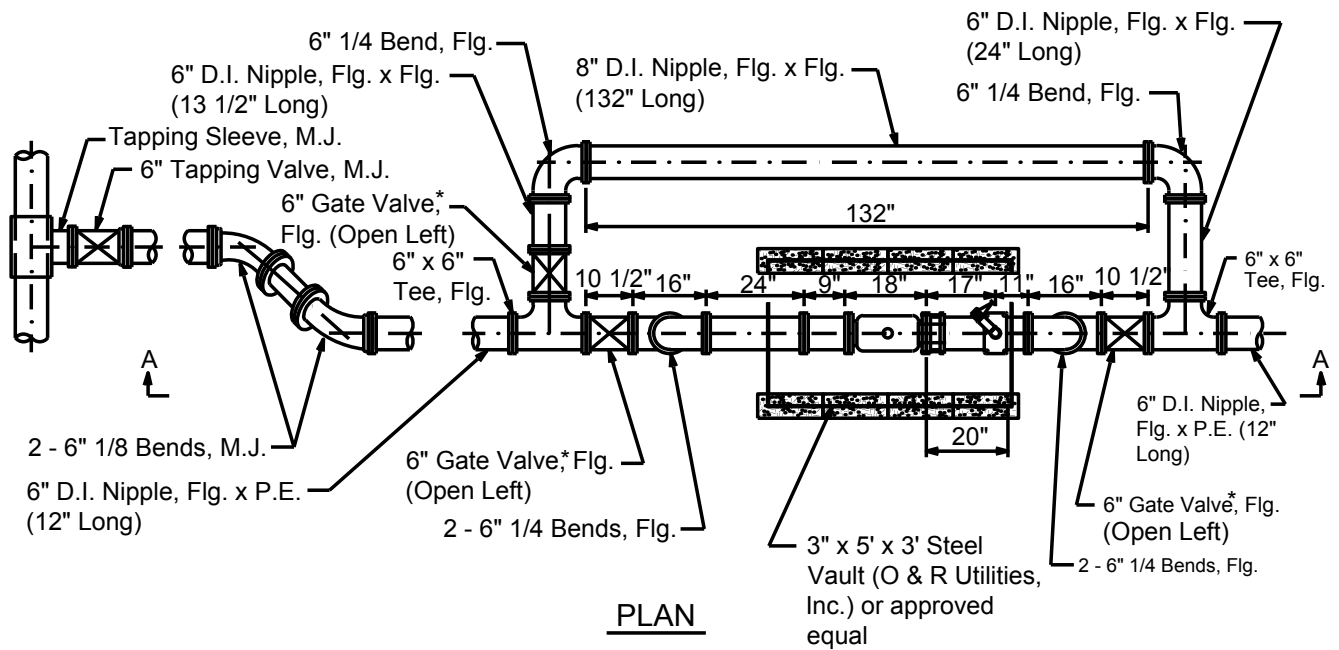
3" TURBINE METER
INSTALLATION

APPROVED
JANUARY 2019

REVISED

DD-824-06

SHEET
2 OF 2



* Resilient Seat

**3' x 5' x 3' STEEL VAULT
(NON-TRAFFIC BEARING LOCATION)**

PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

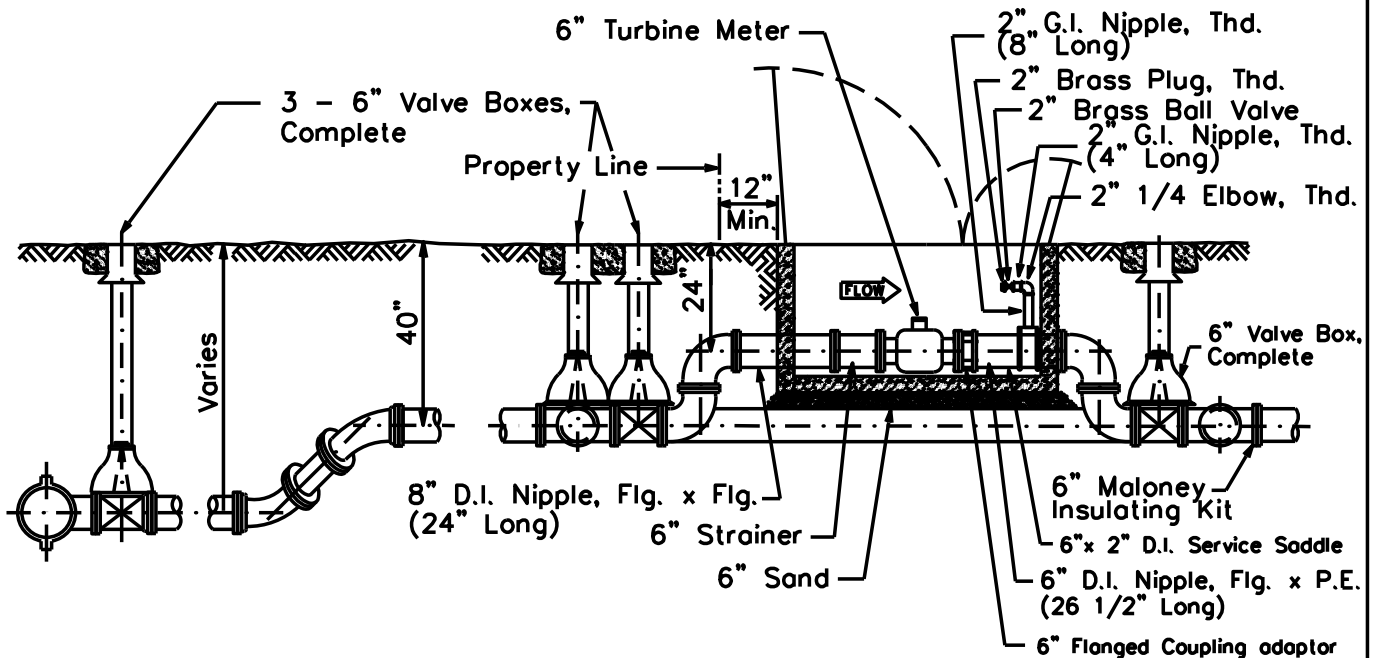
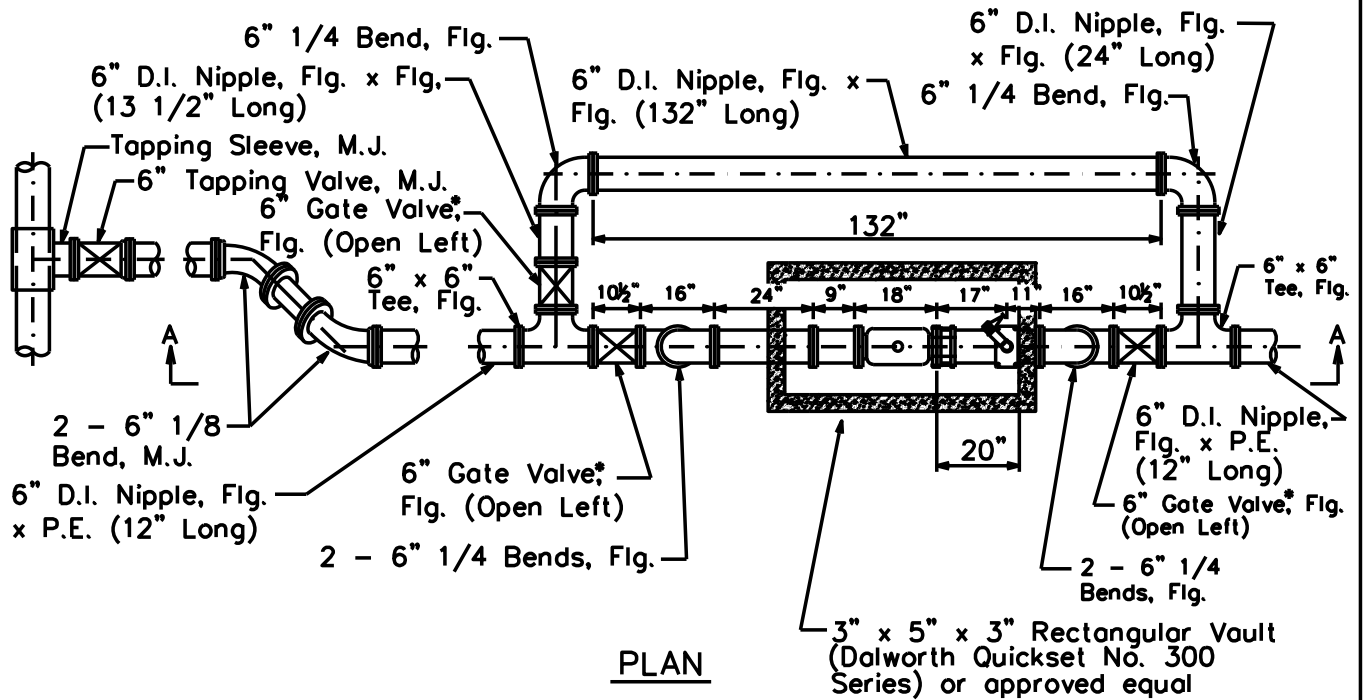
6" TURBINE METER
INSTALLATION

APPROVED
JANUARY 2019

REVISED

DD-824-09

SHEET
1 OF 2



*Resilient Seat

3' x 5' x 3' RECTANGULAR CONCRETE VAULT
(TRAFFIC BEARING LOCATION)

PROPERTY OF
THE CITY OF
FAIR OAKS RANCH

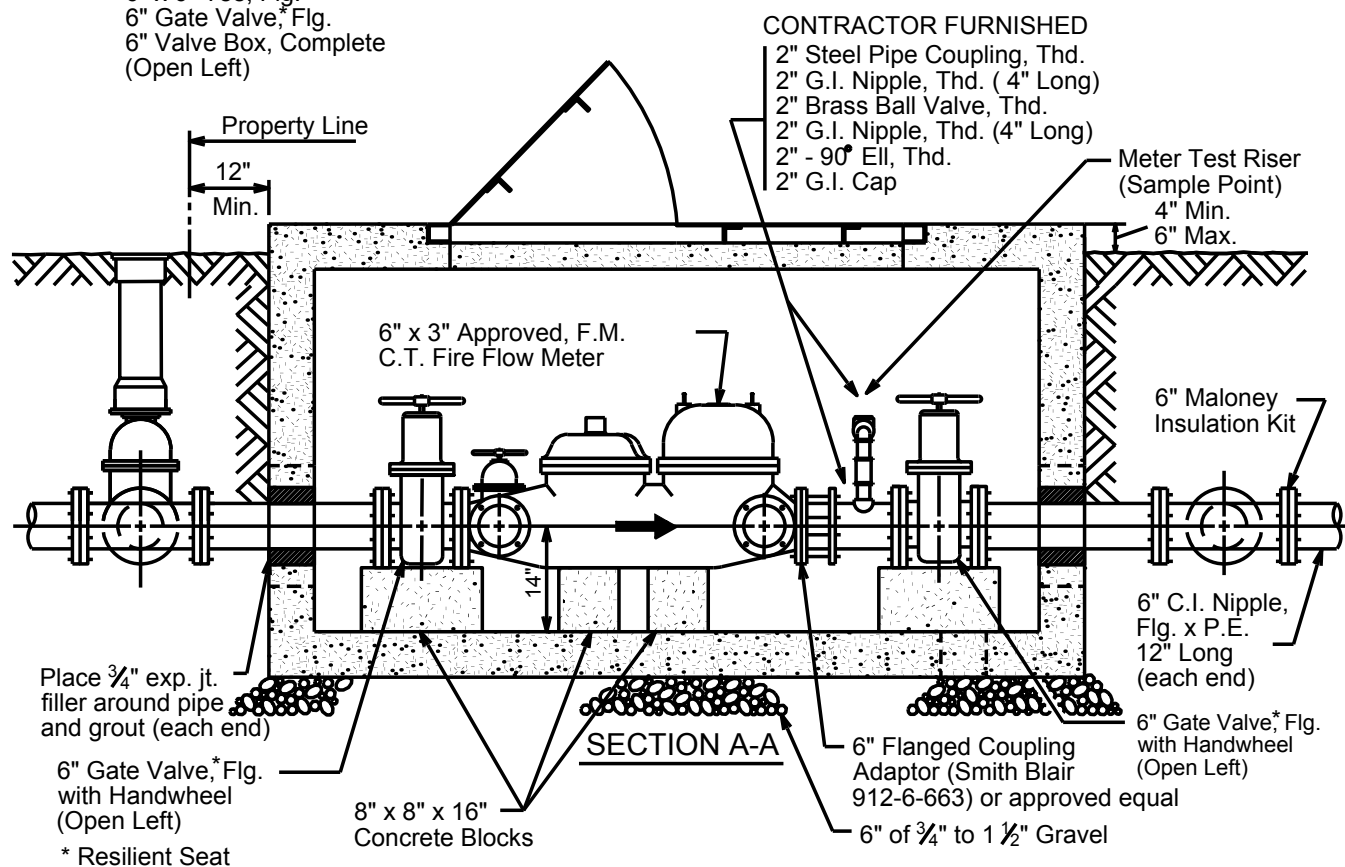
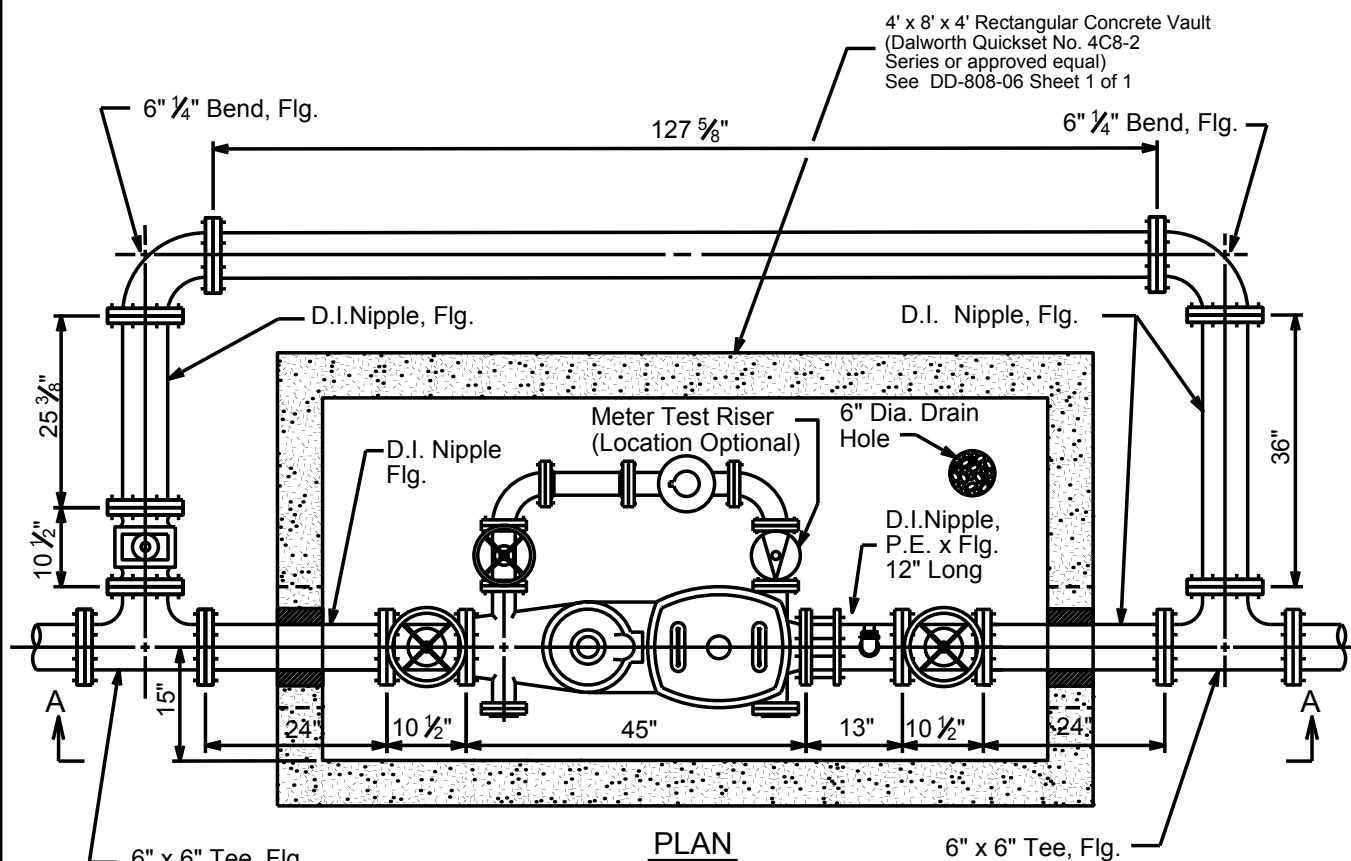
6" TURBINE
METER INSTALLATION

APPROVED
JANUARY 2019

REVISED

DD-824-09

SHEET
2 OF 2



PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

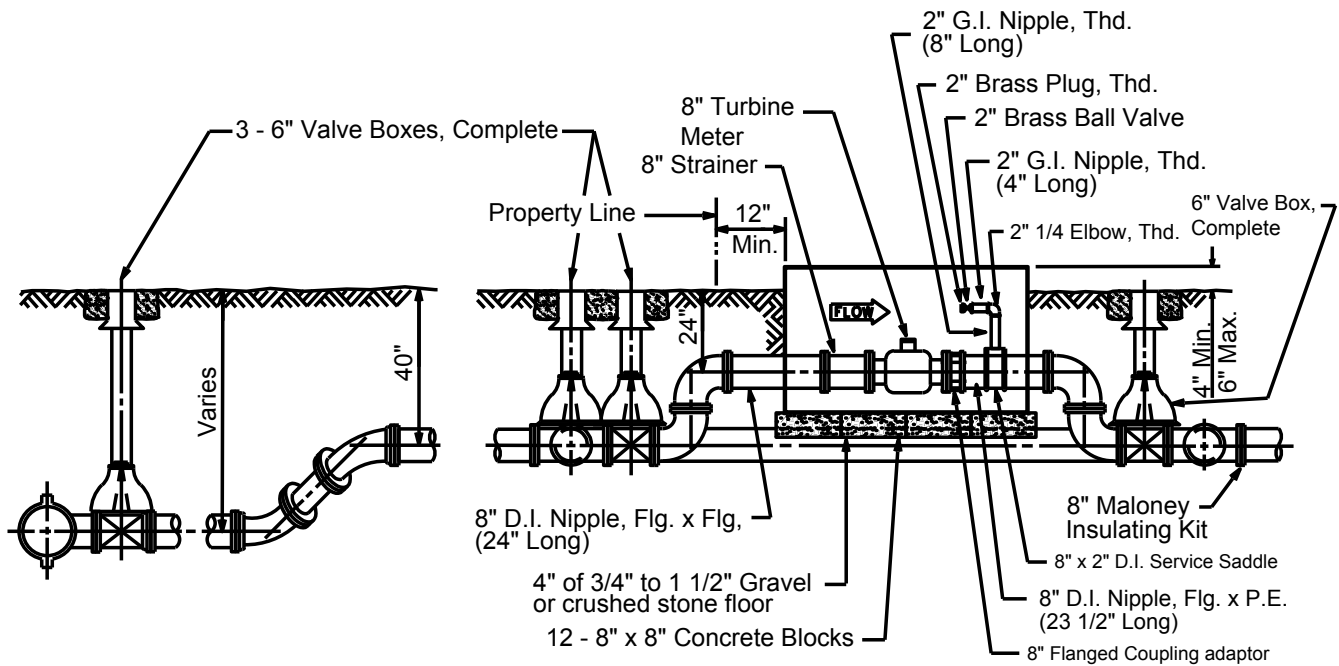
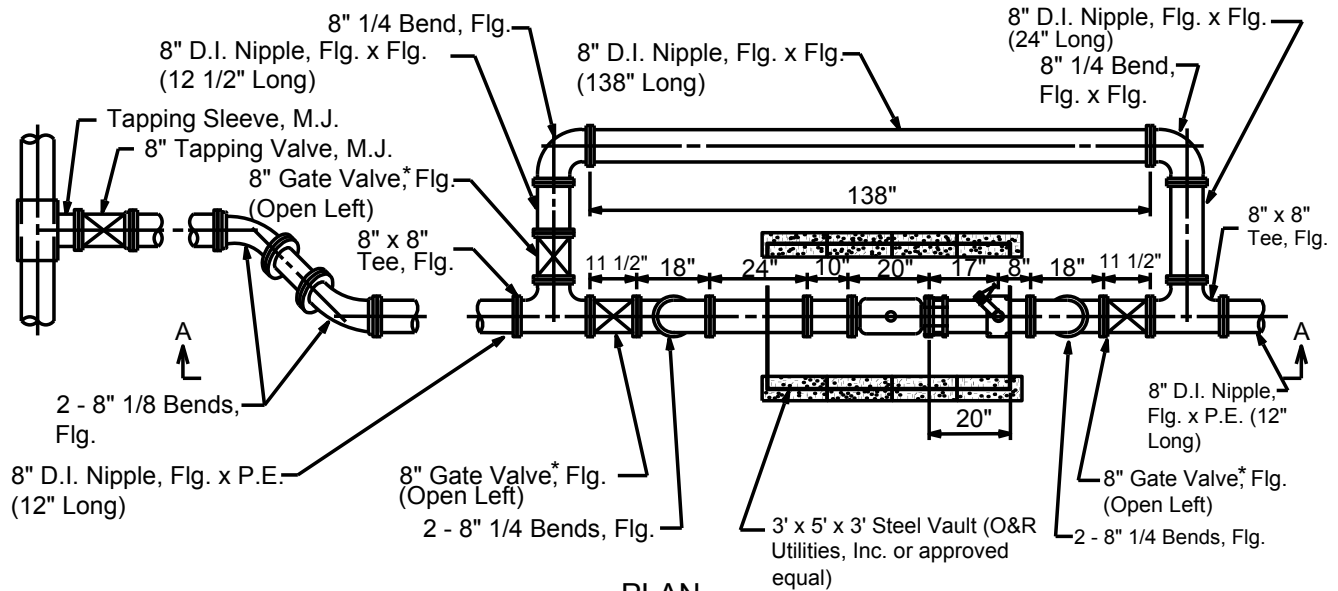
6" X 3" FIRE FLOW METER INSTALLATION

APPROVED
JANUARY 2019

REVISÉD

DD-824-10

SHEET
1 OF 1



* Resilient Seat

**3' x 5' x 3' STEEL VAULT
(NON-TRAFFIC BEARING LOCATION)**

PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

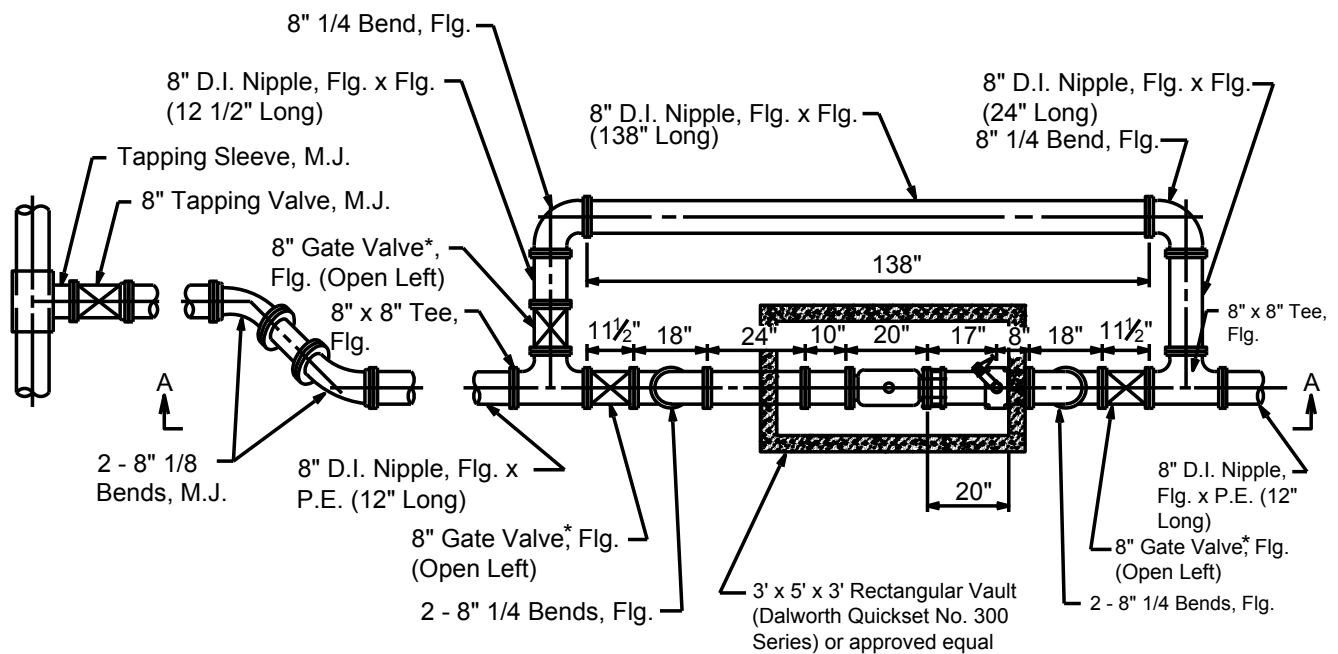
8" SERVICE WITH AN 8"
TURBINE METER

APPROVED
JANUARY 2019

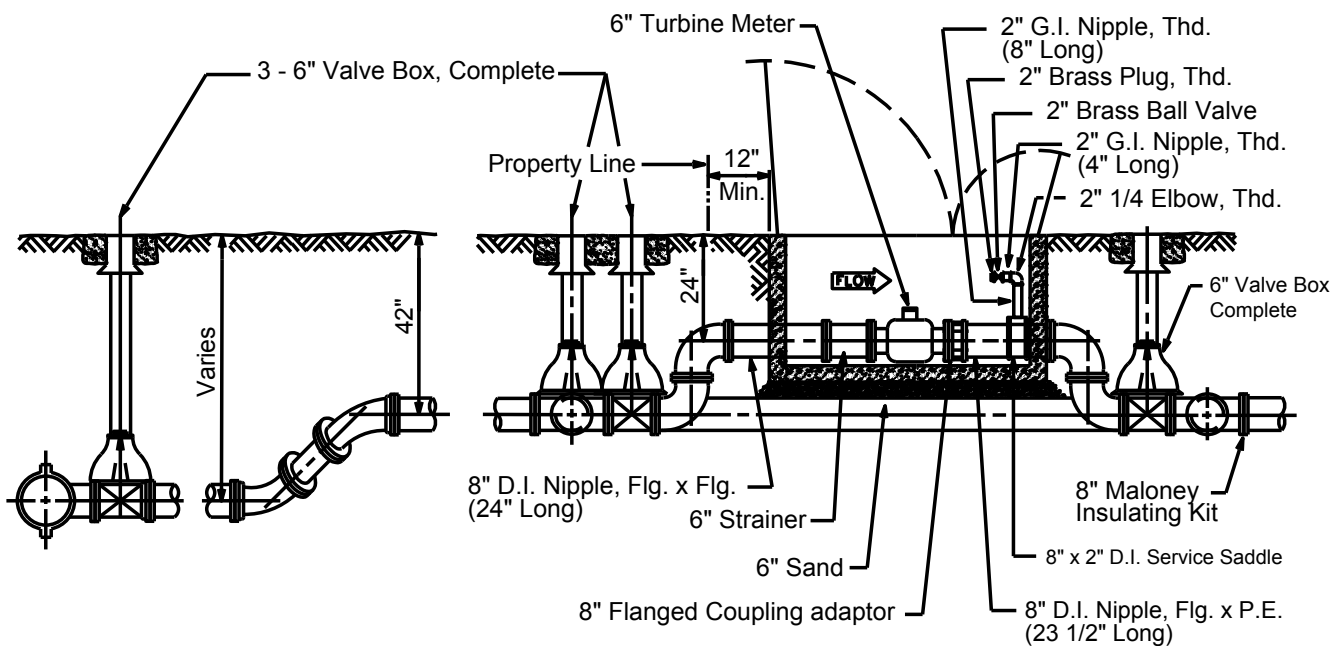
REVISED

DD-824-12

SHEET
1 OF 2



PLAN



SECTION A-A

* Resilient Seat

3' x 5' x 3' RECTANGULAR CONCRETE VAULT
(TRAFFIC BEARING LOCATION)

PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

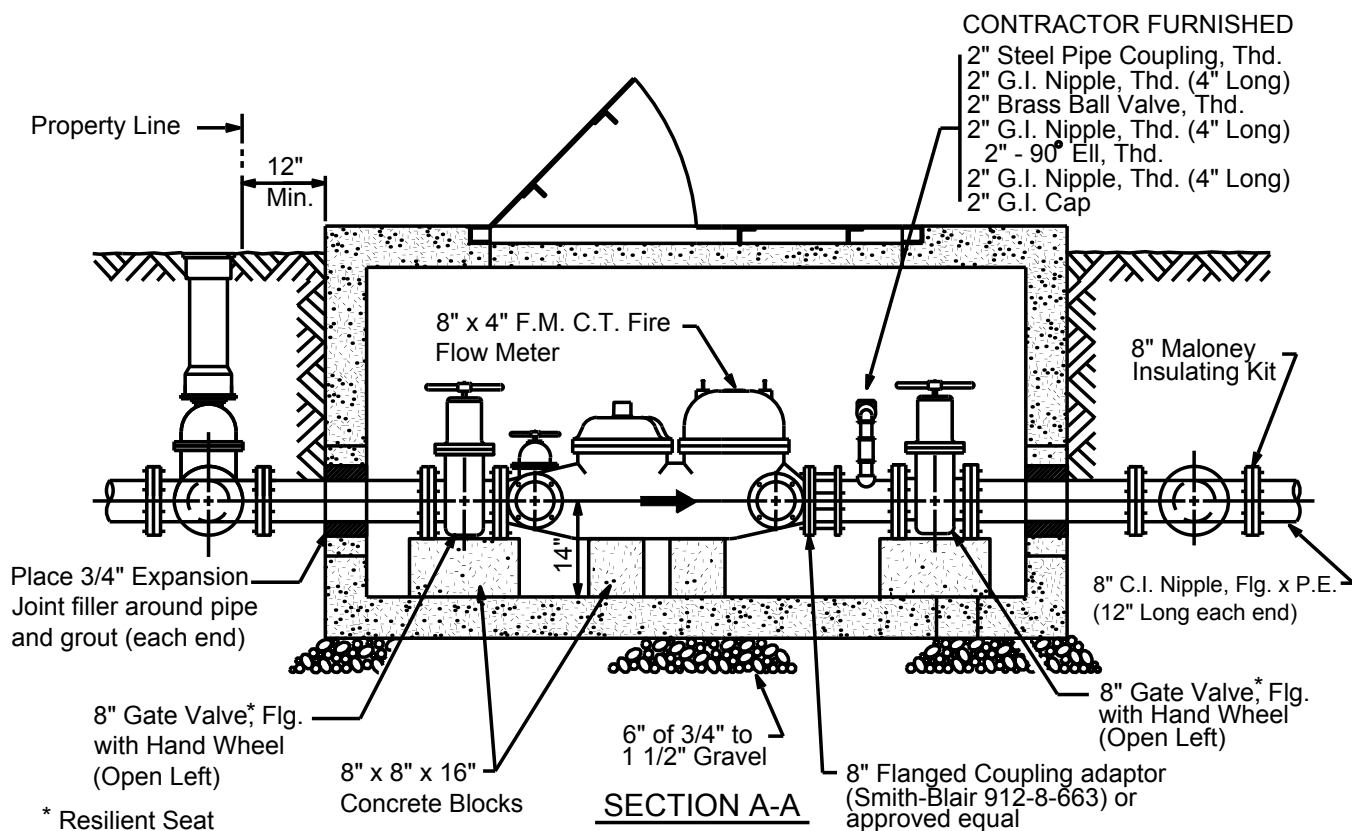
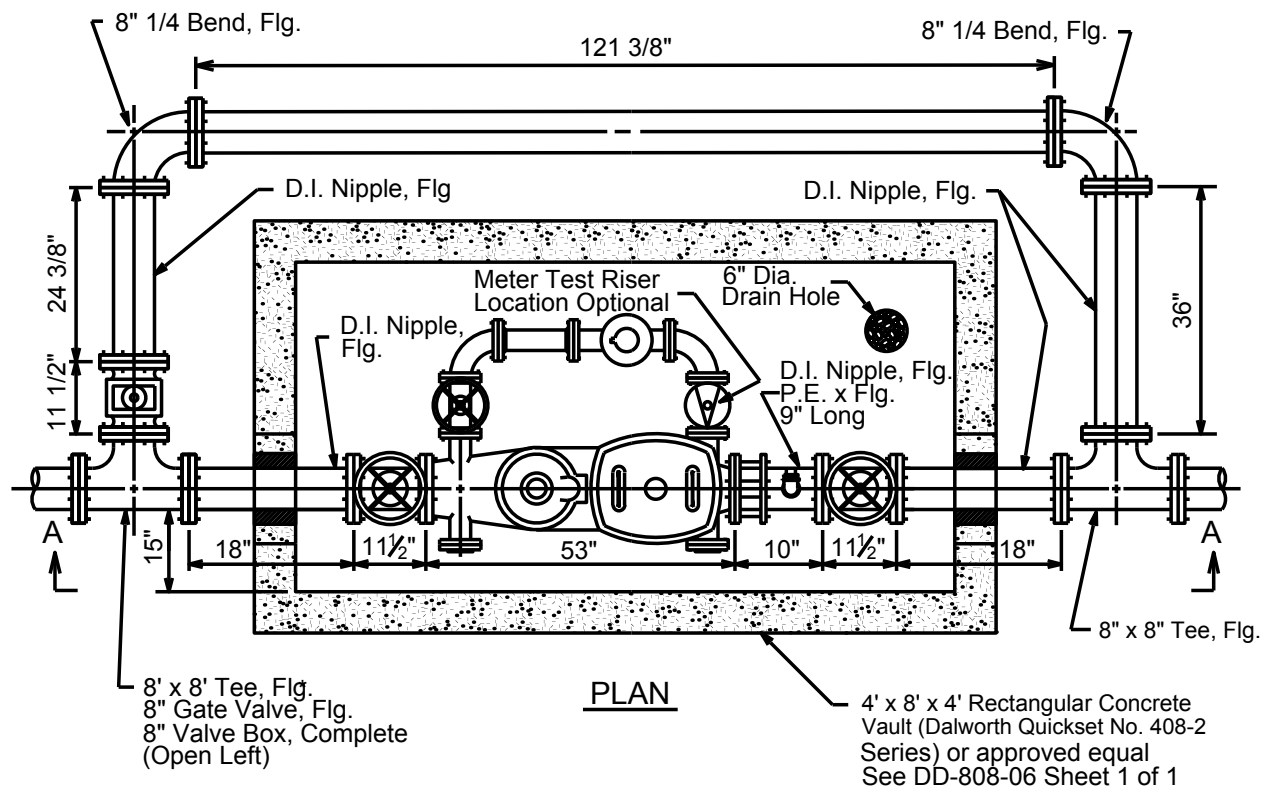
8" SERVICE WITH AN 8"
TURBINE METER

APPROVED
JANUARY 2019

REVISED

DD-824-12

SHEET
2 OF 2



PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

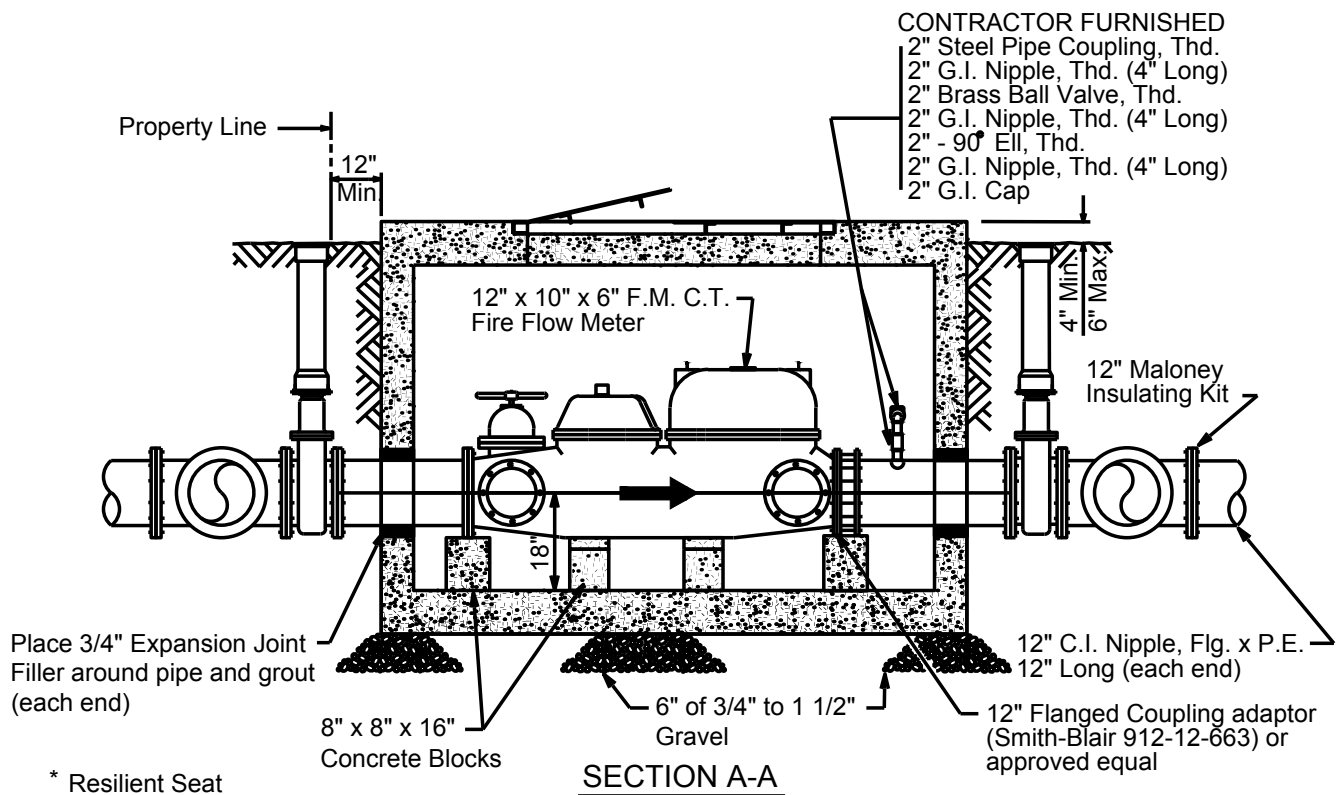
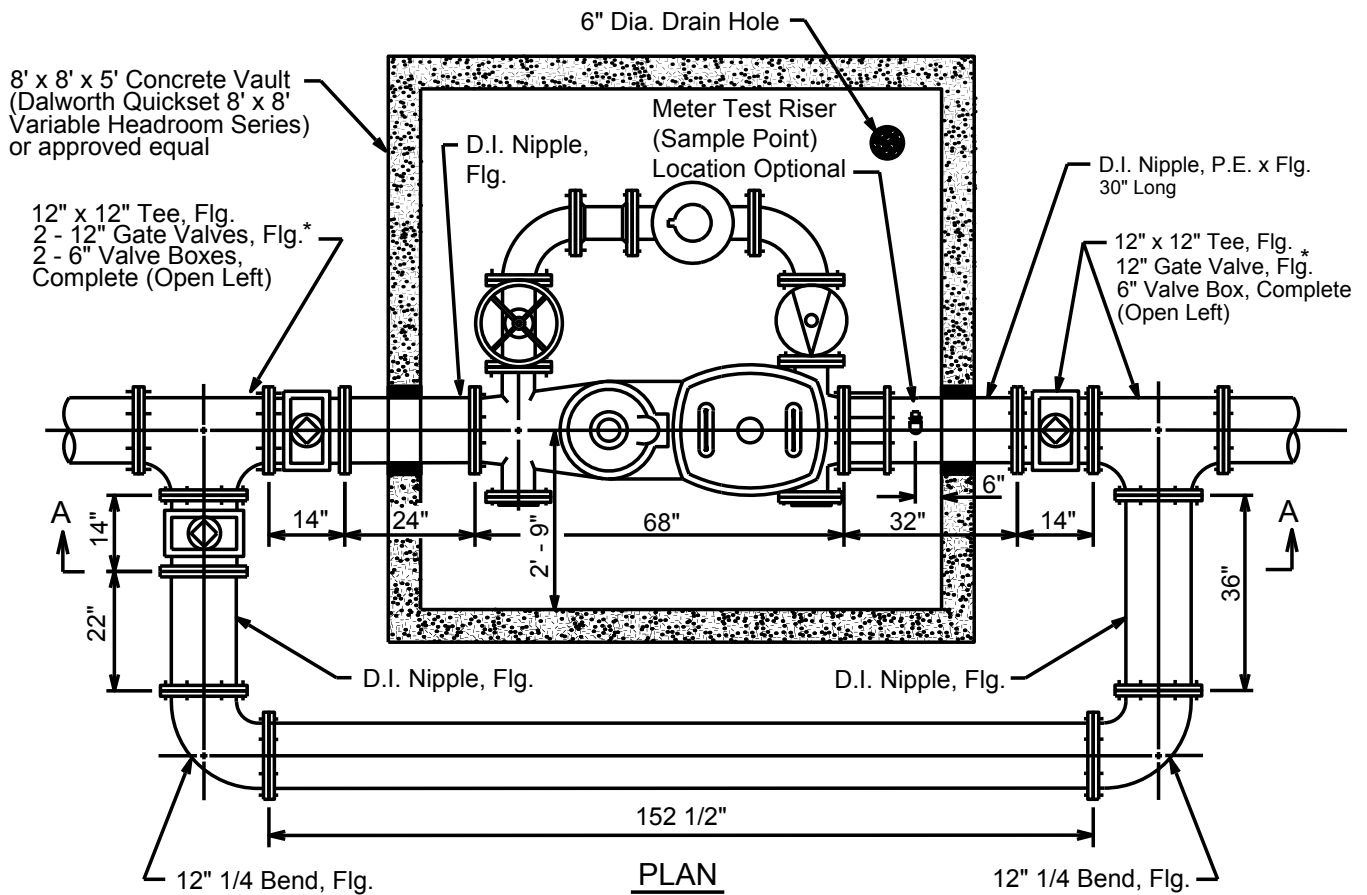
8" X 4" FIRE FLOW METER INSTALLATION

APPROVED
JANUARY 2019

REVISED

DD-824-13

SHEET
1 OF 1



PROPERTY OF
THE CITY OF FAIR OAKS RANCH

12" X 10" X 6" FIRE FLOW
METER INSTALLATION

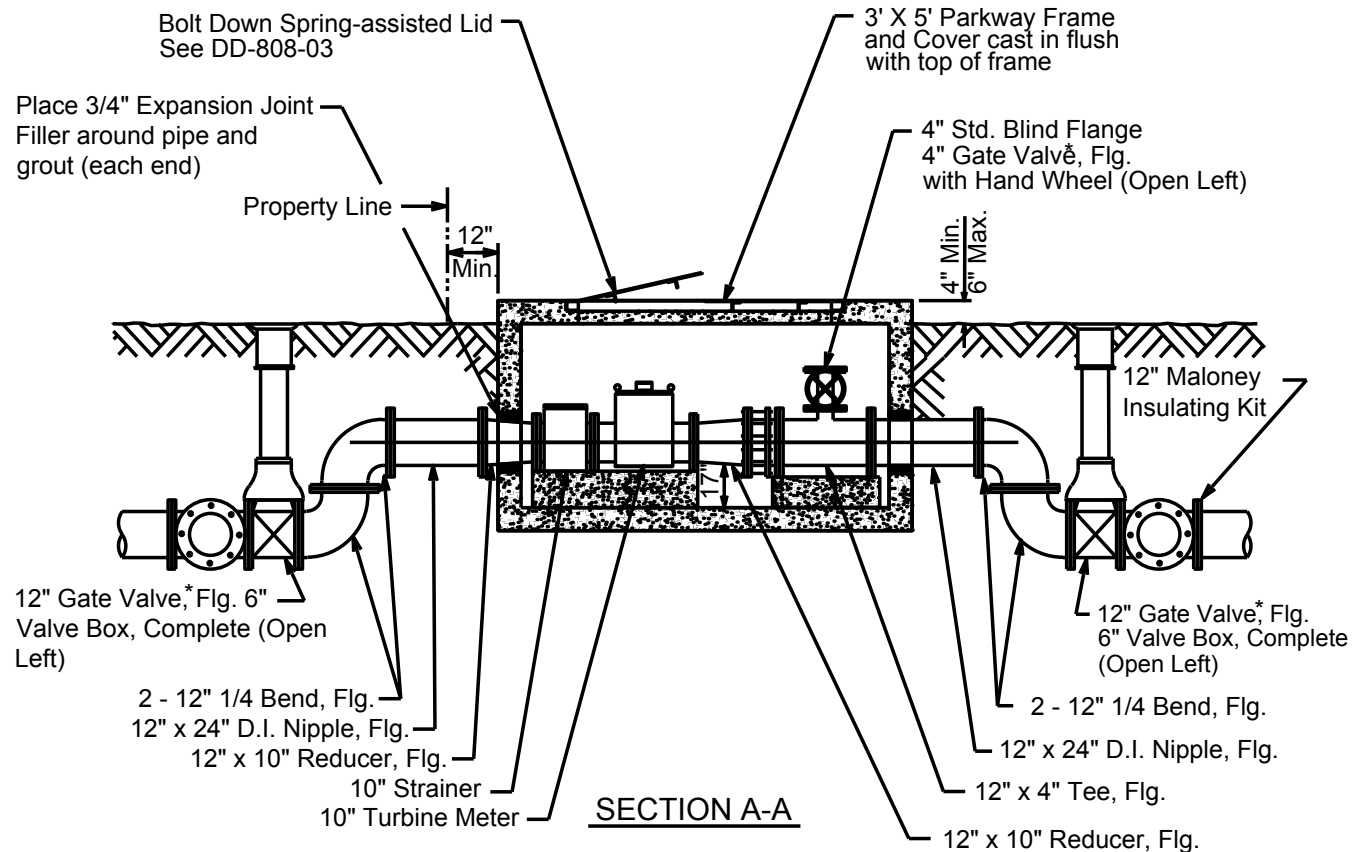
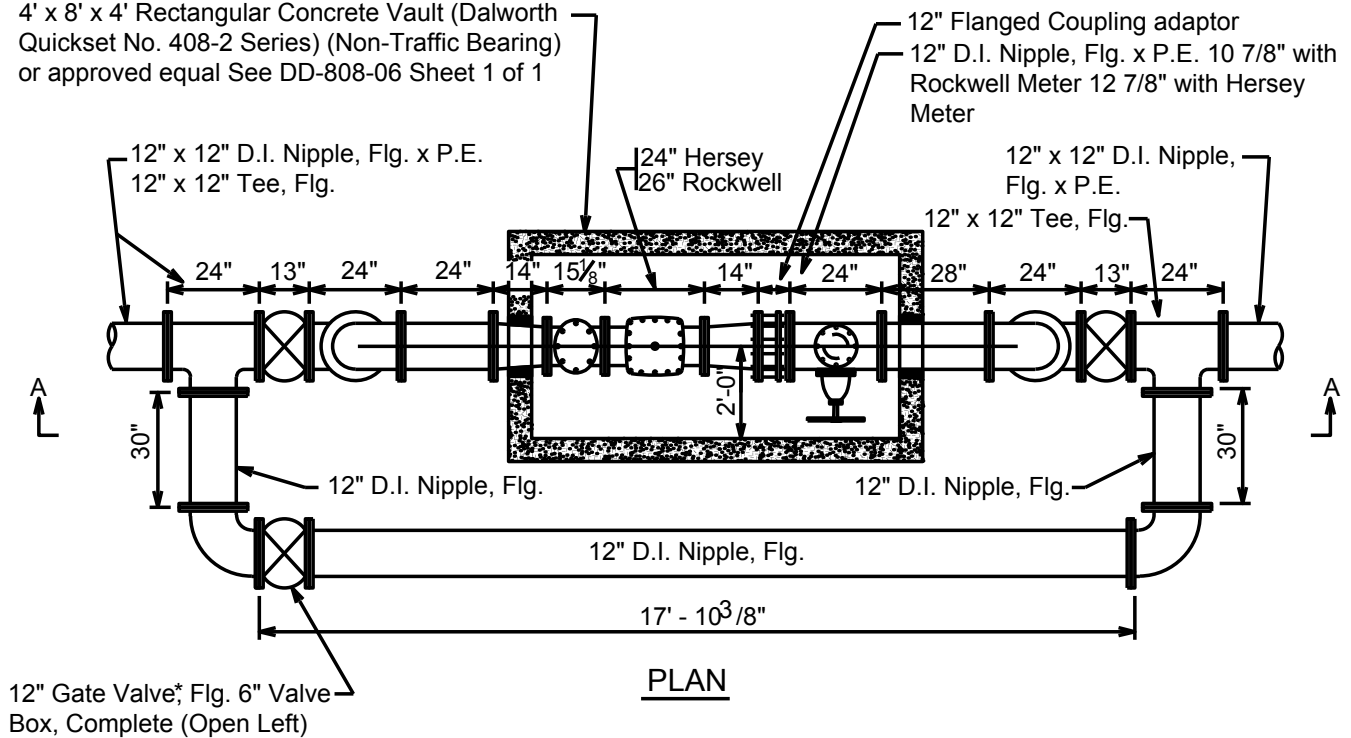
APPROVED
JANUARY 2019

REVISED

DD-824-14

SHEET
1 OF 1

4' x 8' x 4' Rectangular Concrete Vault (Dalworth Quickset No. 408-2 Series) (Non-Traffic Bearing) or approved equal See DD-808-06 Sheet 1 of 1



* Resilient Seat

PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

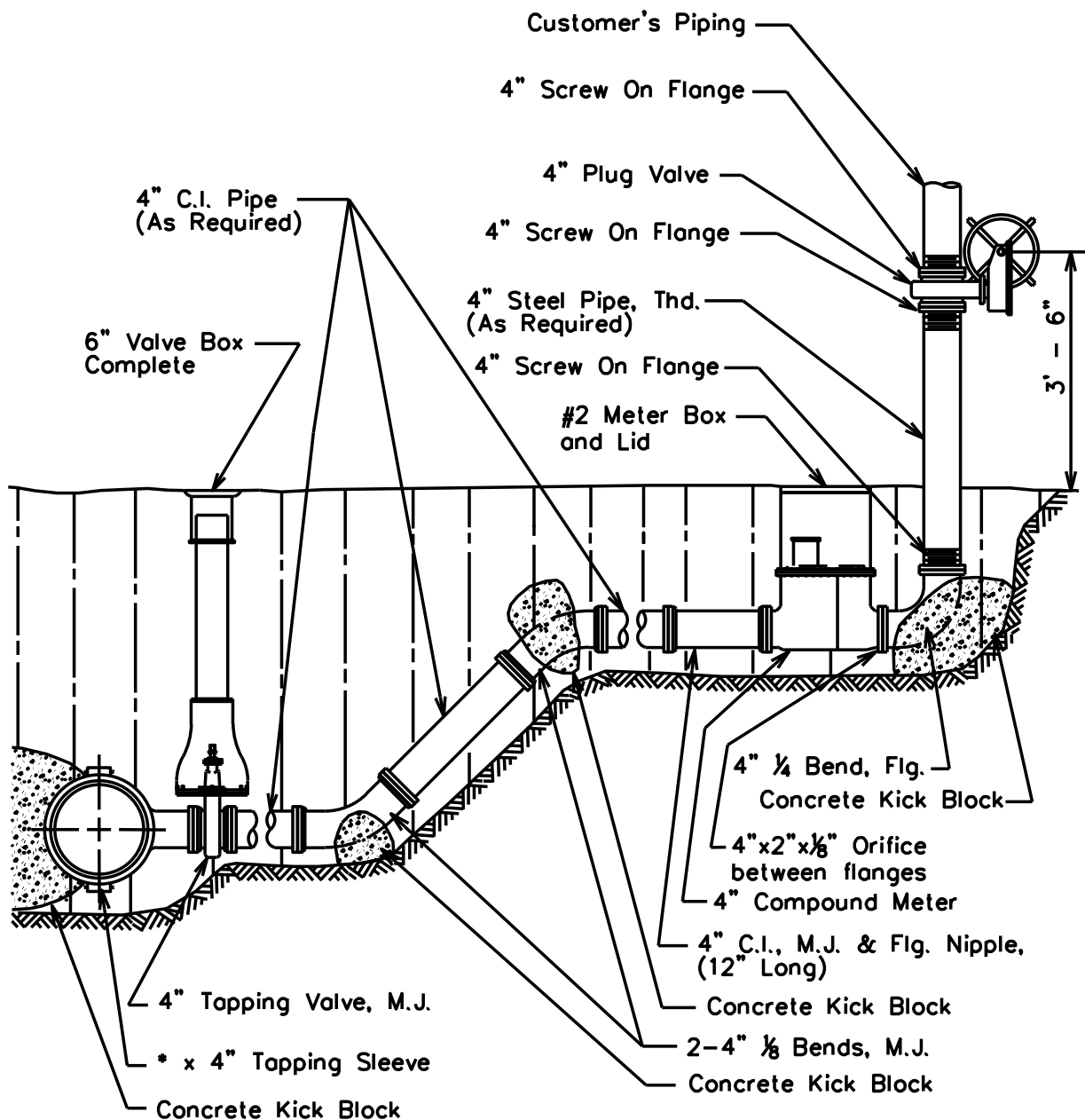
12" SERVICE WITH
10" TURBINE METER

APPROVED
JANUARY 2019

REVISED

DD-824-15

SHEET
1 OF 1



NOT TO SCALE

* Existing main size and type

Note:

1. All valves shall open left (counter-clockwise)

PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

TYPICAL TEMPORARY 4"
SERVICE WITH 4" METER
(WITH PLUG VALVE)

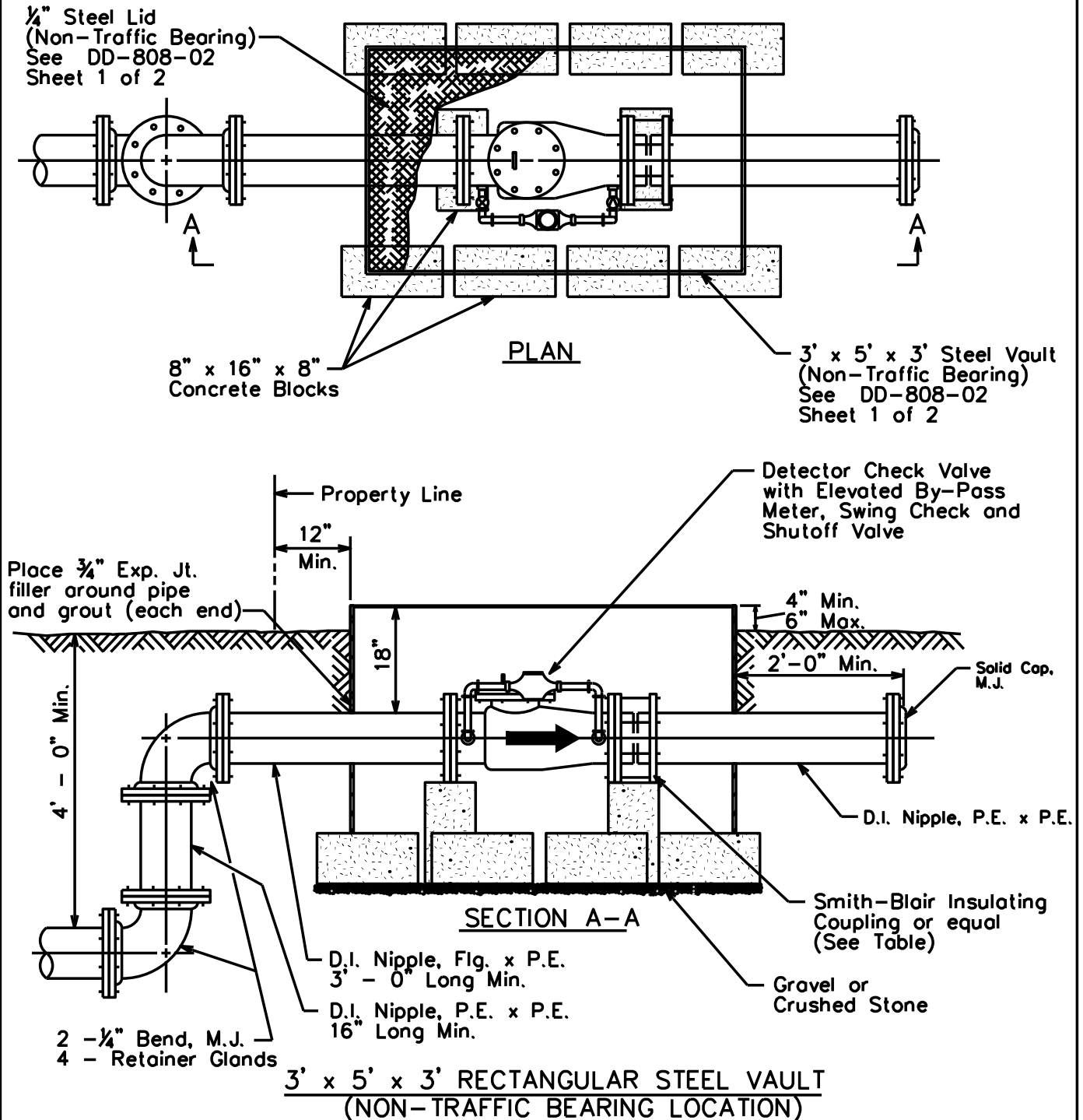
APPROVED
JANUARY 2019

REVISED

DD-824-16

SHEET
1 OF 1

PIPE DIAMETER	DETECTOR CHECK	BY-PASS METER	SMITH-BLAIR COUPLING
6"	6"	$\frac{3}{4}$ "	1932-6-690
8"	8"	1"	932-8-905



PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

6" & 8" DETECTOR CHECK
FOR FIRE LINE

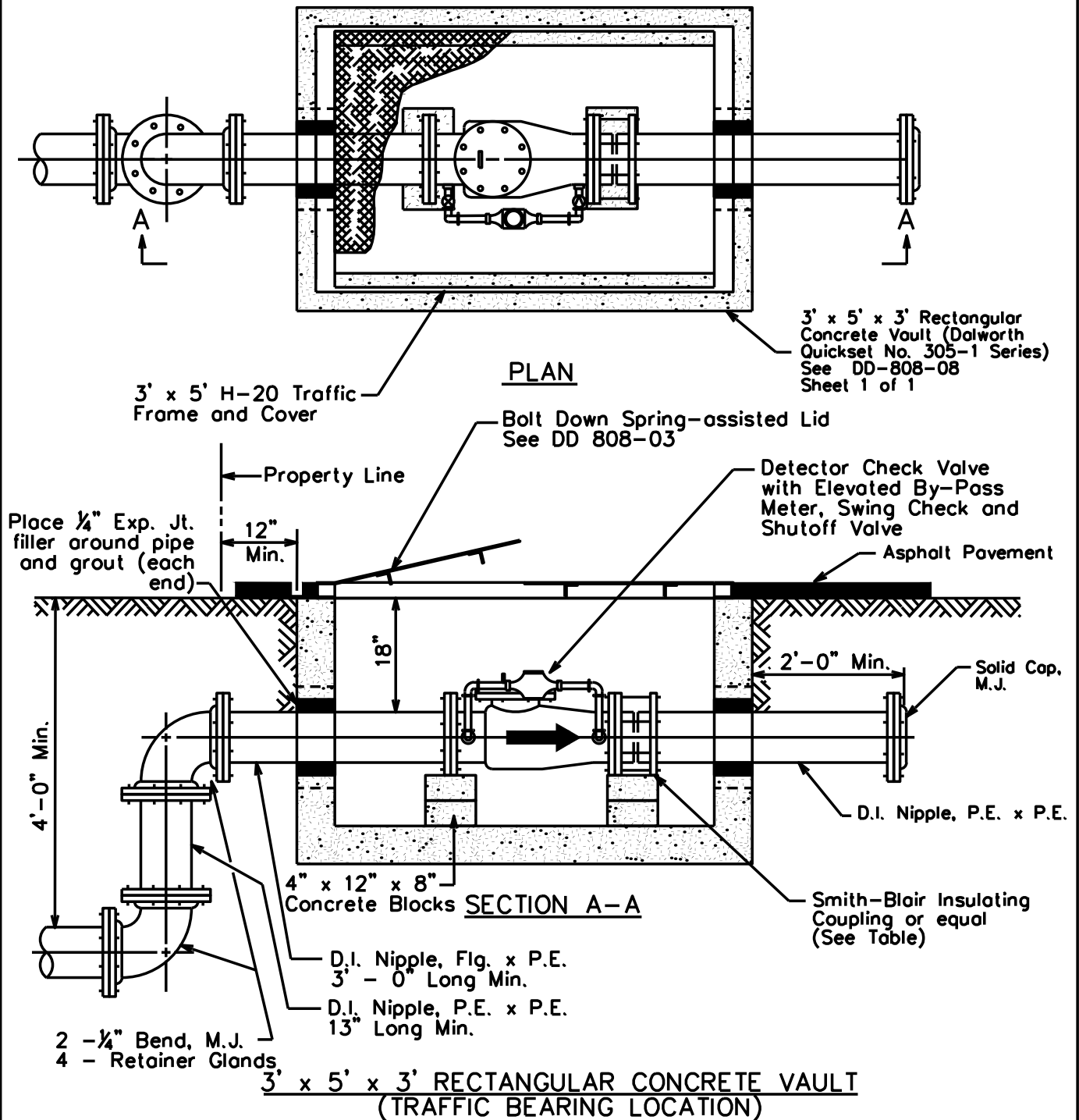
APPROVED
JANUARY 2019

REVISED

DD-824-17

SHEET
1 OF 2

PIPE DIAMETER	DETECTOR CHECK	BY-PASS METER	SMITH-BLAIR COUPLING
6"	6"	¾"	1932-6-690
8"	8"	1"	932-8-905



PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

6" & 8" DETECTOR
CHECK FOR FIRE LINE

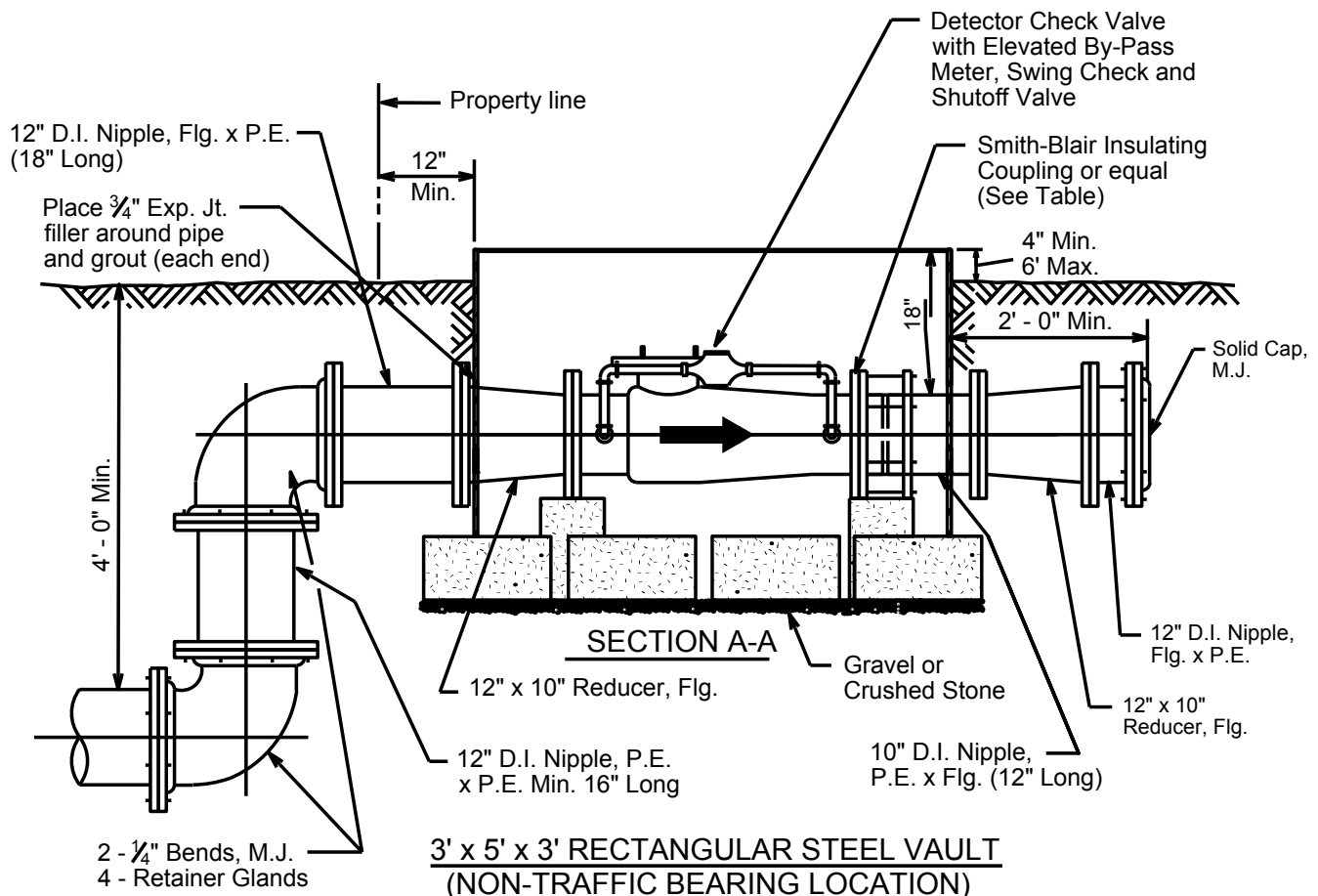
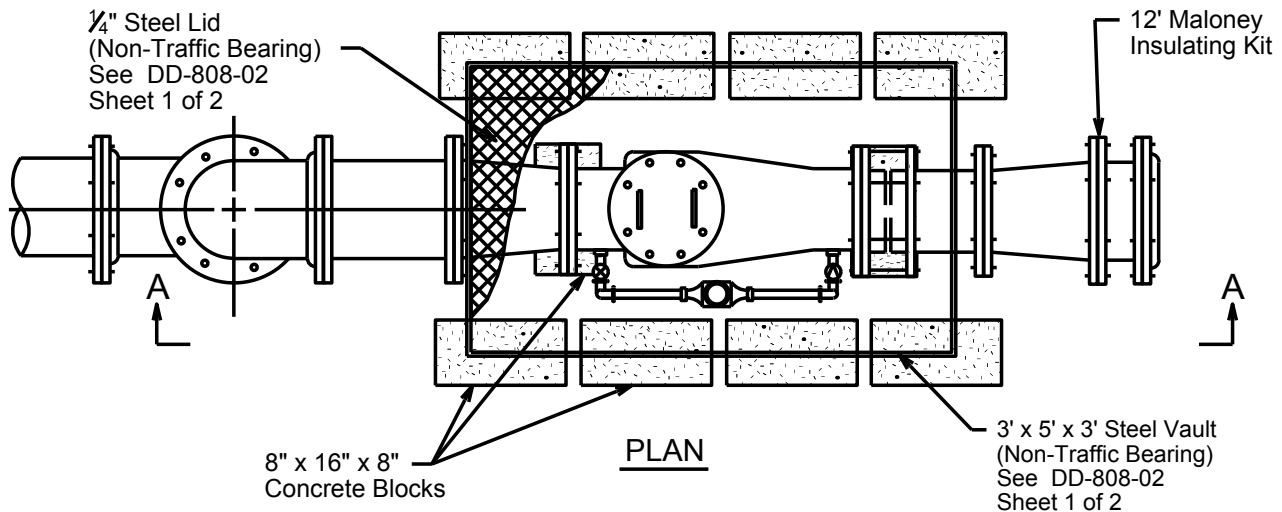
APPROVED
JANUARY 2019

REVISED

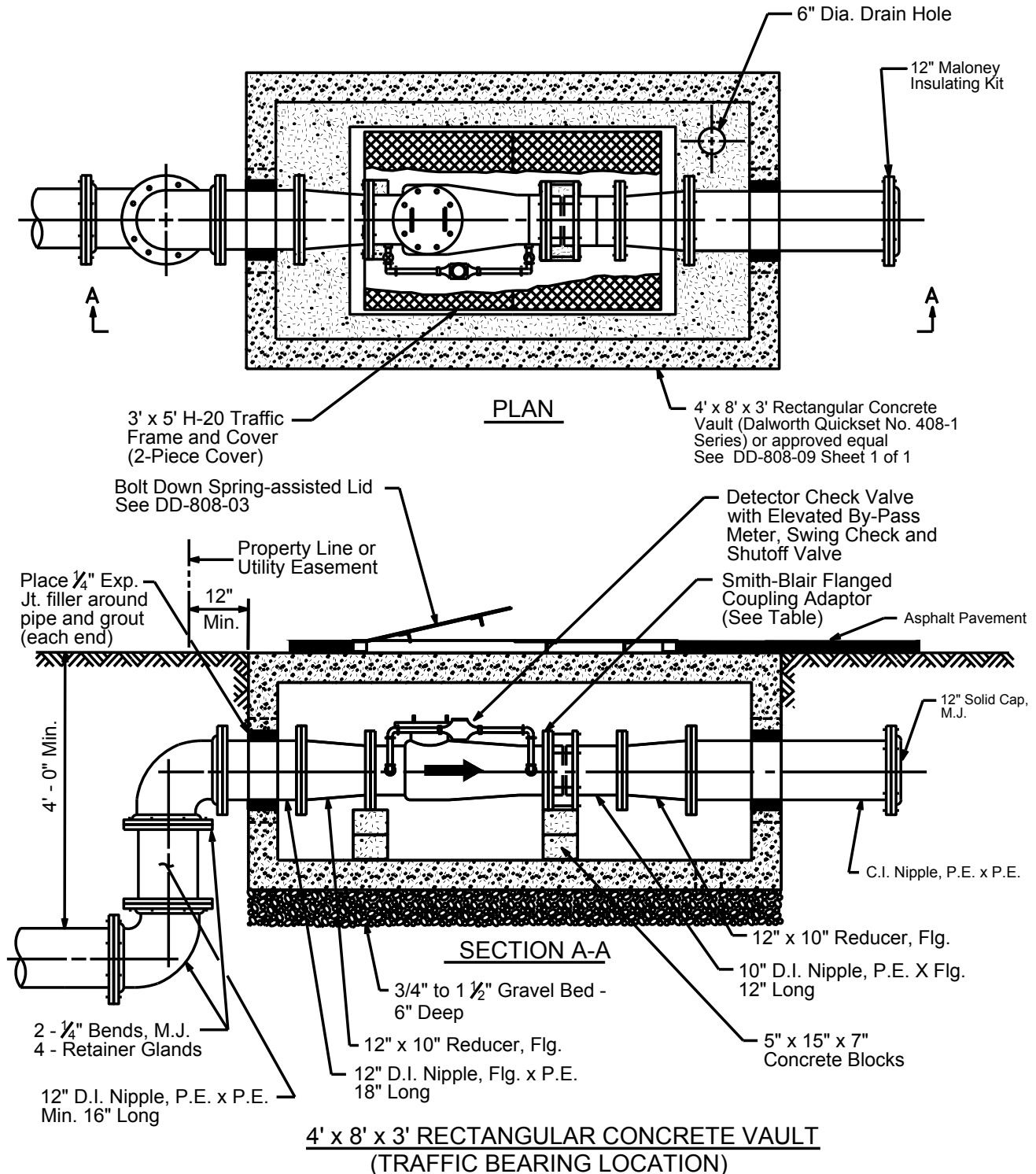
DD-824-17

SHEET
2 OF 2

PIPE DIAMETER	DETECTOR CHECK	BY-PASS METER	SMITH-BLAIR COUPLING
10"	10"	1"	912-10-663



PIPE DIAMETER	DETECTOR CHECK	BY-PASS METER	SMITH-BLAIR COUPLING
10"	10"	1"	912-10-663



PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

10" X 12" DETECTOR
CHECK FOR FIRE LINE

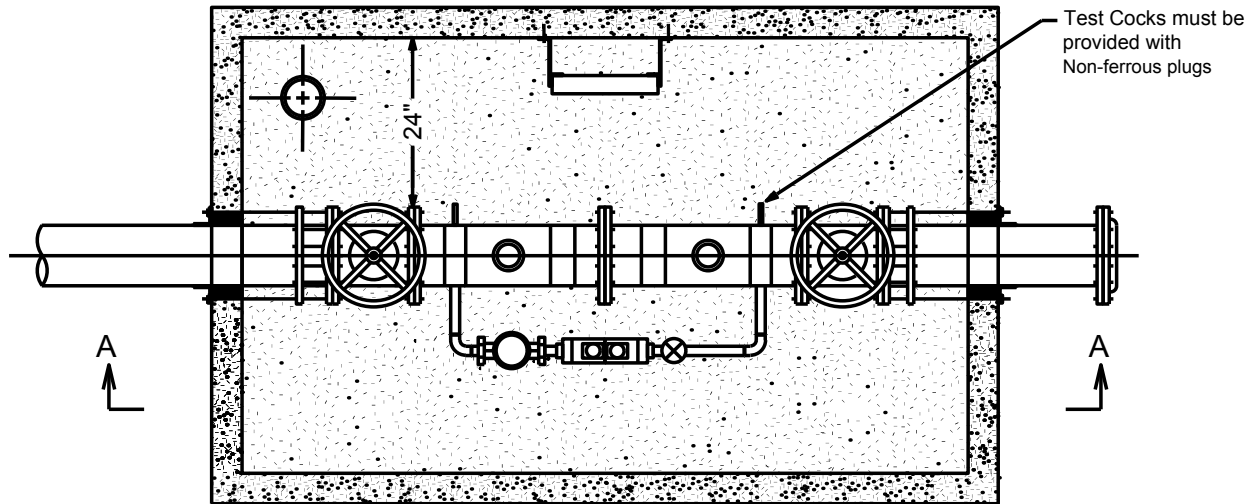
APPROVED
JANUARY 2019

REVISED

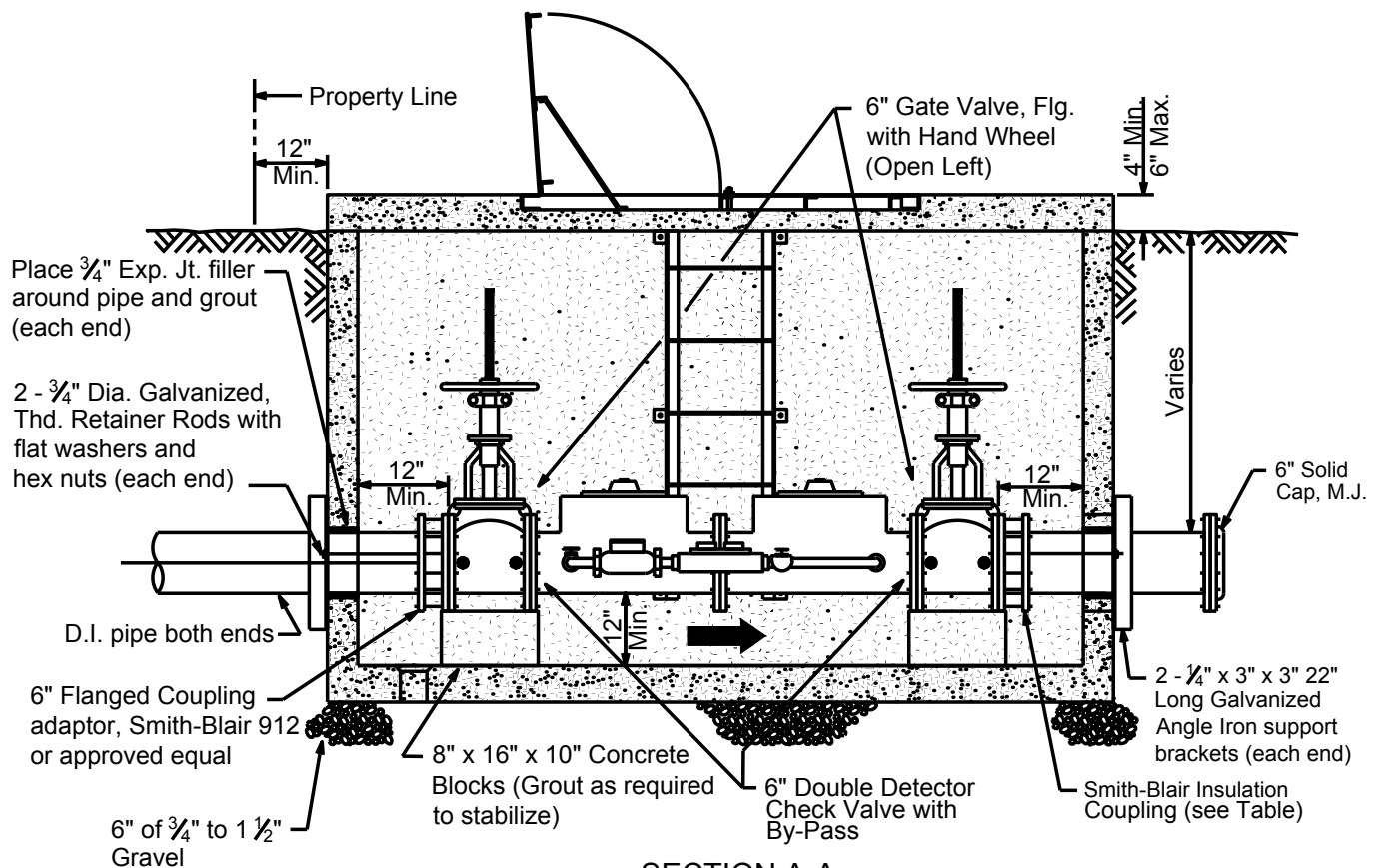
DD-824-18

SHEET
2 OF 2

Pipe Diameter	Double Detector Check	By-Pass Meter	Smith-Blair Coupling
6"	6"	$\frac{5}{8}$ " - $\frac{3}{4}$ "	1932-6-690
8"	8"	$\frac{5}{8}$ " - $\frac{3}{4}$ "	932-8-905



PLAN



SECTION A-A

Notes:

1. Tamper switches may be required by Fire Code.
2. Assemblies must be U.L. Listed for Fire Protection purposes.

PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

6" & 8" DOUBLE CHECK
(DCDA) DETECTOR
ASSEMBLY INSTALLATION

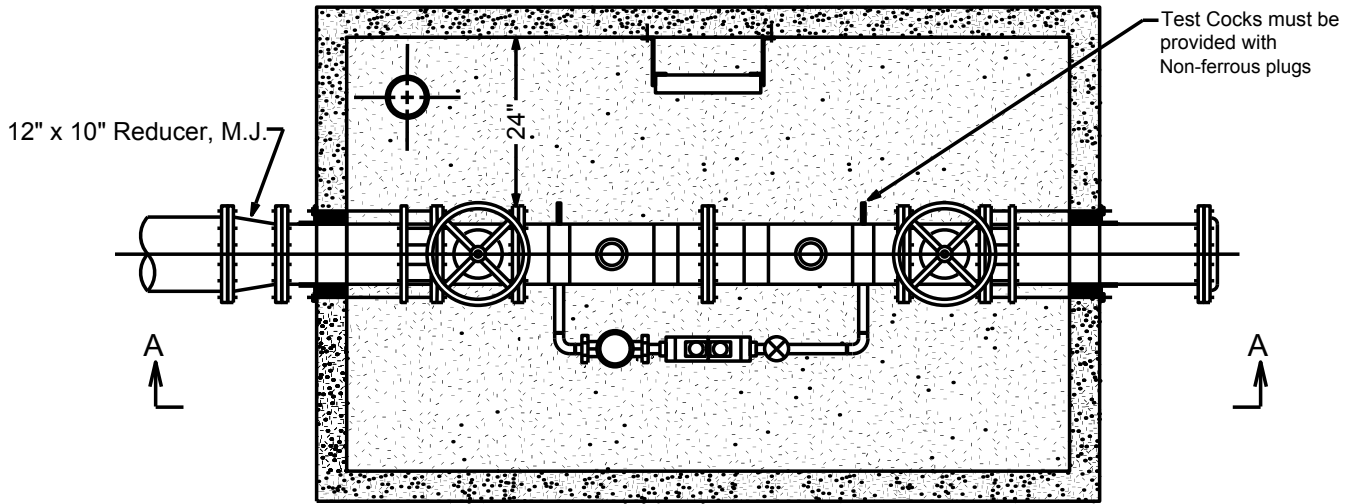
APPROVED
JANUARY 2019

REVISED

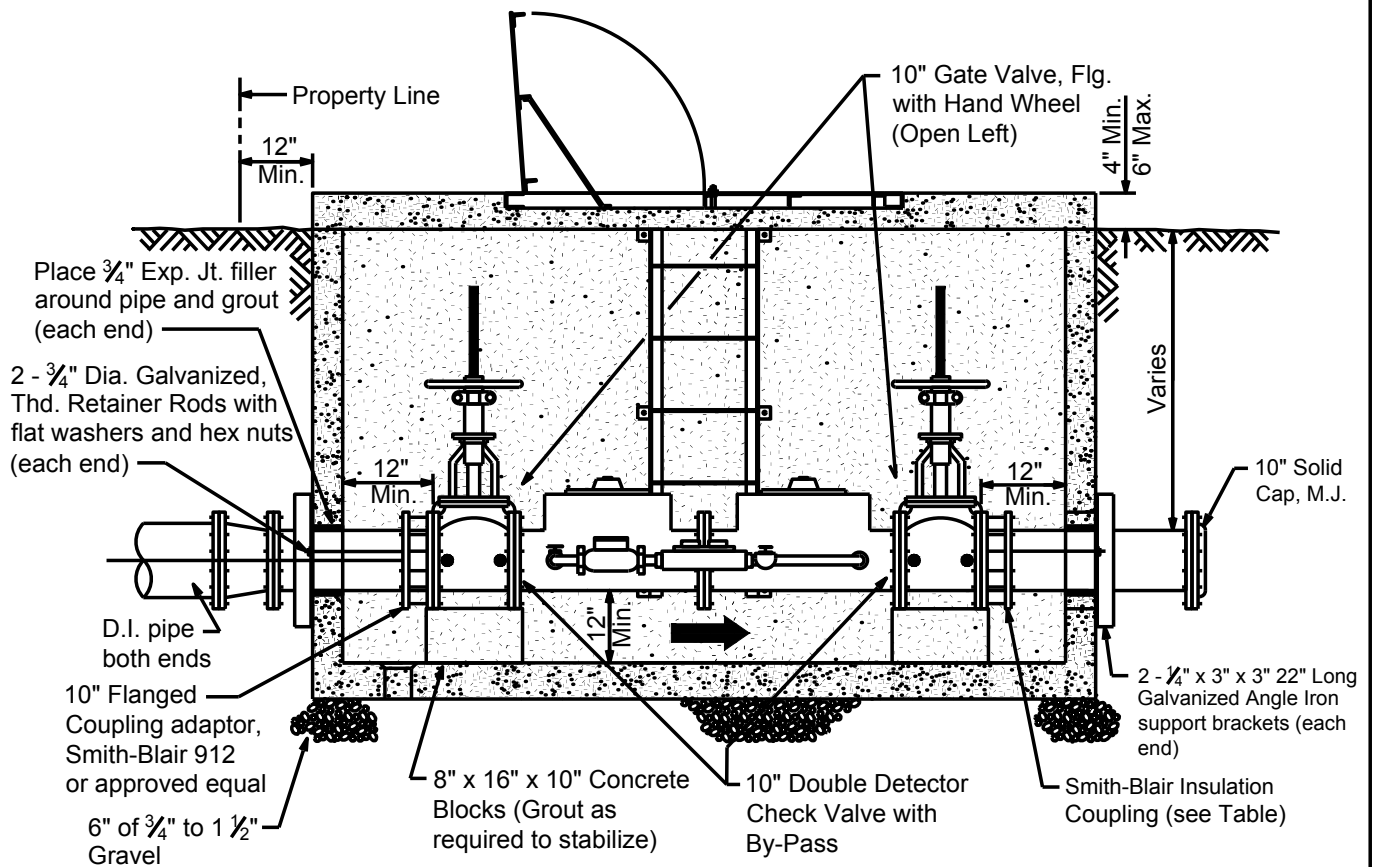
DD-824-19

SHEET
1 OF 1

Pipe Diameter	Double Detector Check	By-Pass Meter	Smith-Blair Coupling
12"	10"	$\frac{5}{8}$ " - $\frac{3}{4}$ "	932-10-1110



PLAN



SECTION A-A

Notes:

1. Tamper switches may be required by Fire Code.
2. Assemblies must be U.L. Listed for Fire Protection purposes.

PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

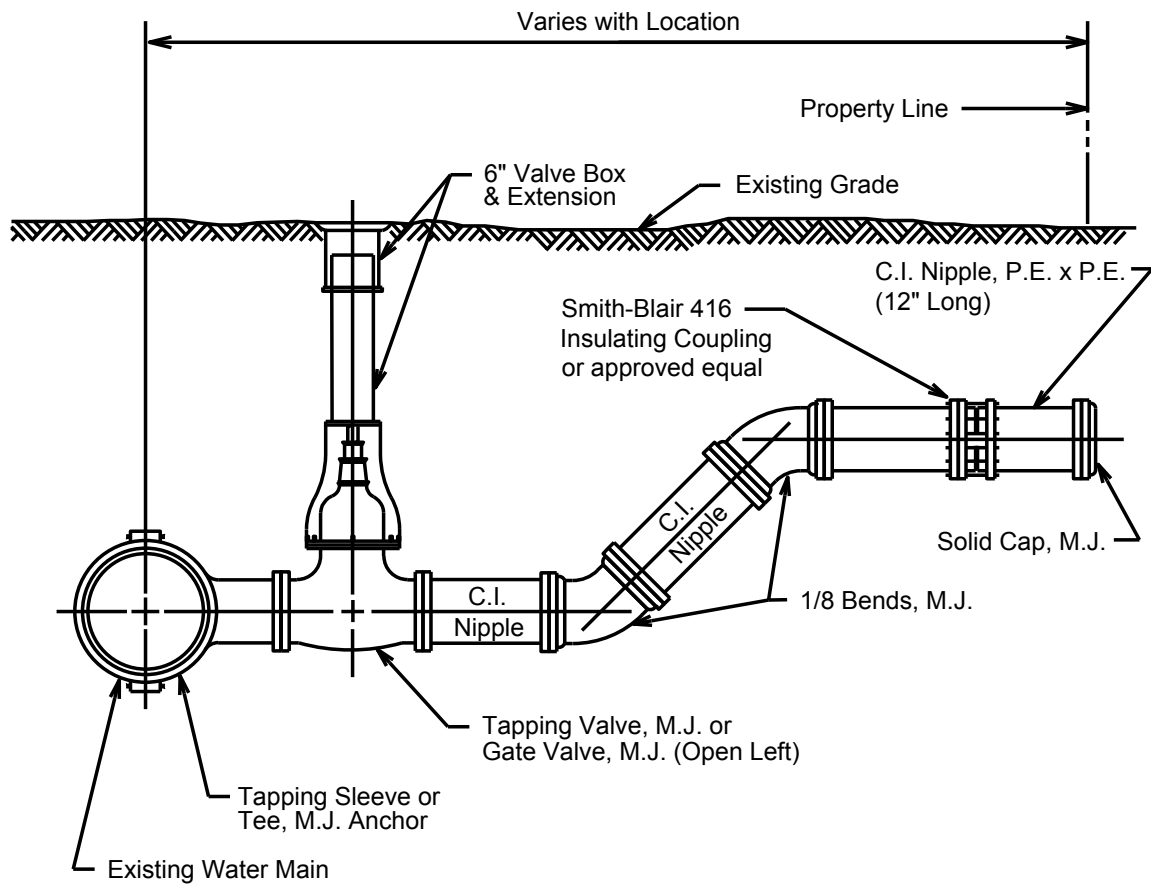
10" DOUBLE CHECK
(DCDA) DETECTOR
ASSEMBLY INSTALLATION

APPROVED
JANUARY 2019

REVISED

DD-824-20

SHEET
1 OF 1



Notes:

1. Thrust Blocking as per City of Fair Oaks Ranch Specifications.
C-900 pipe may be used on short services with no vertical change.
If C-900 pipe is used, Insulating Coupling is not required.

PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

4", 6" & 8" NON-METERED
FIRE SERVICE

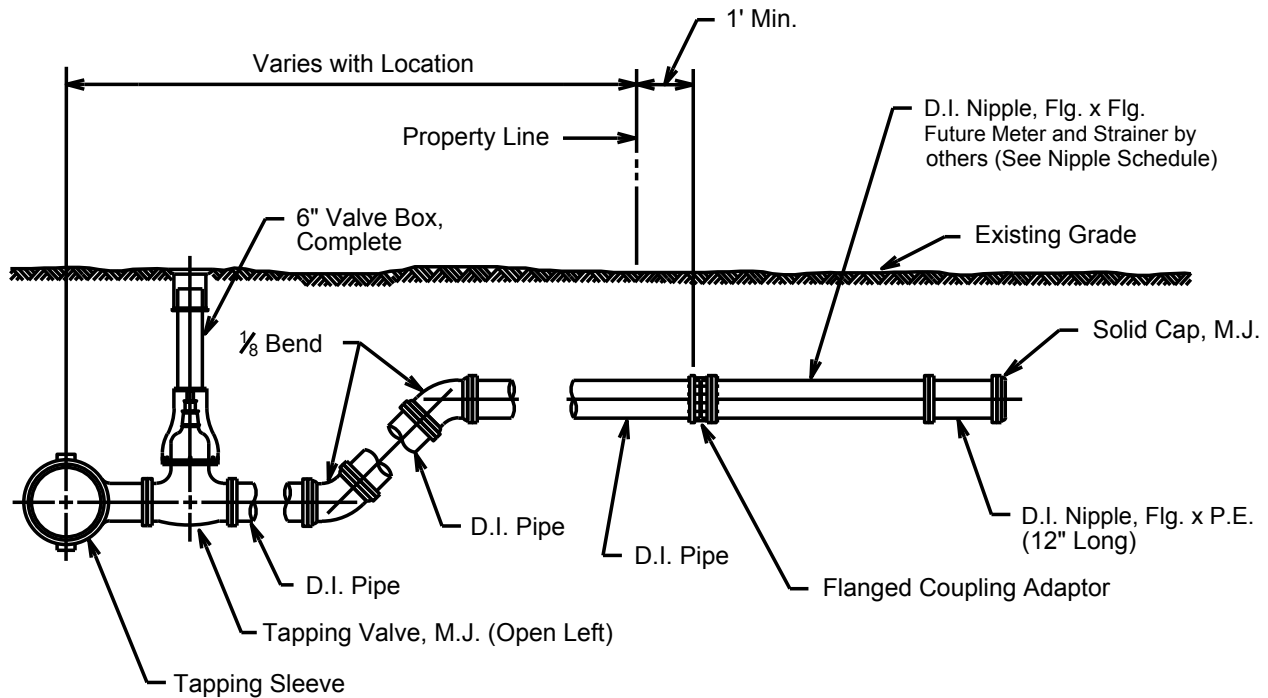
APPROVED
JANUARY 2019

REVISED

DD-824-21

SHEET
1 OF 1

NIPPLE SCHEDULE	
METER SIZE	NIPPLE LENGTH
4"	23 $\frac{1}{8}$ "
6"	27 $\frac{1}{8}$ "
8"	30 $\frac{1}{8}$ "

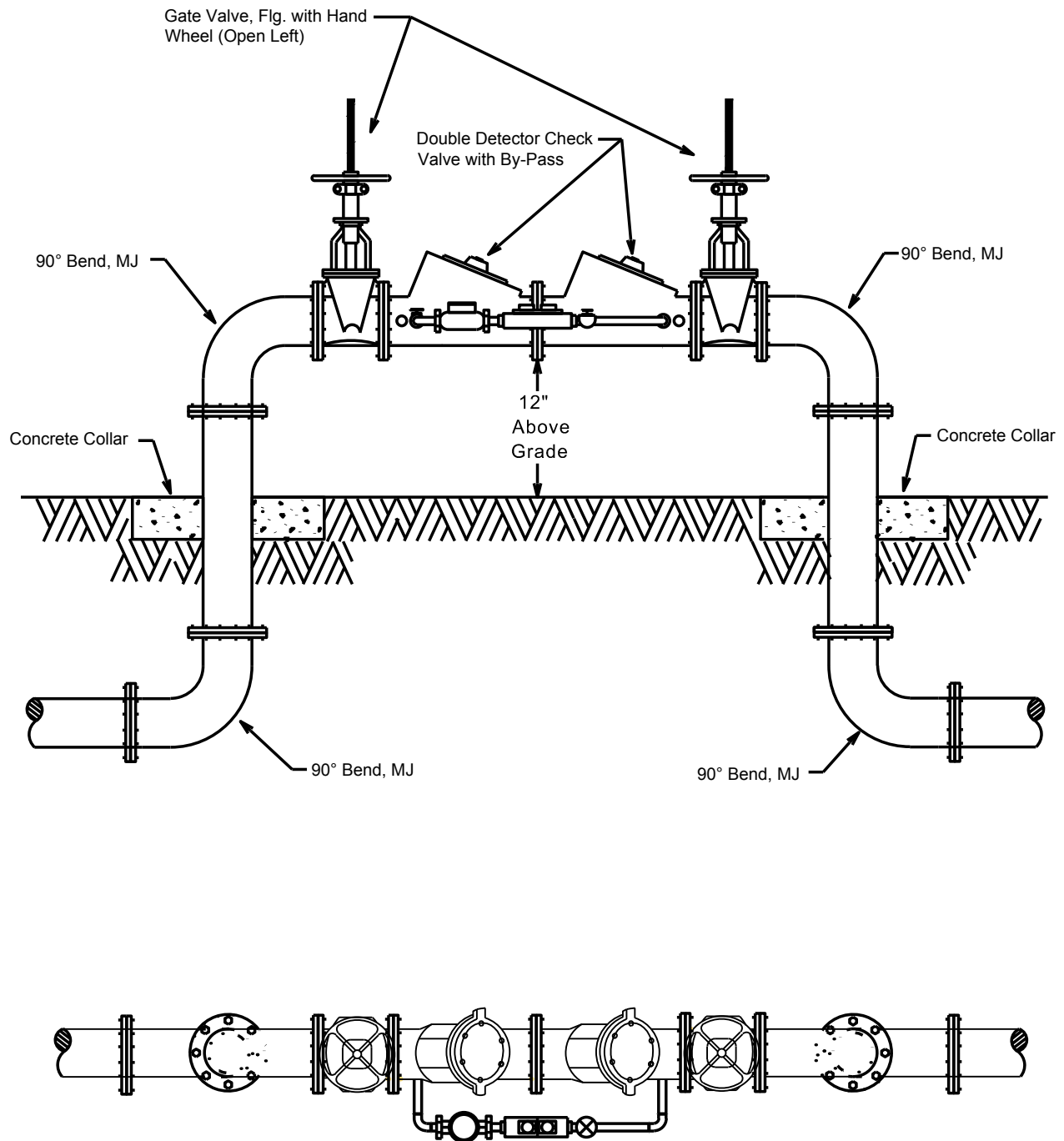


4", 6" & 8" NON-METERED SERVICE WITH
TEMPORARY METER ACCOMMODATION

Note:

1. Thrust Blocking as per City of Fair Oaks Ranch Specifications.

PROPERTY OF THE CITY OF FAIR OAKS RANCH	4", 6" & 8" NON-METERED SERVICE	APPROVED	REVISED
		JANUARY 2019	
		DD-824-22	SHEET 1 OF 1



PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

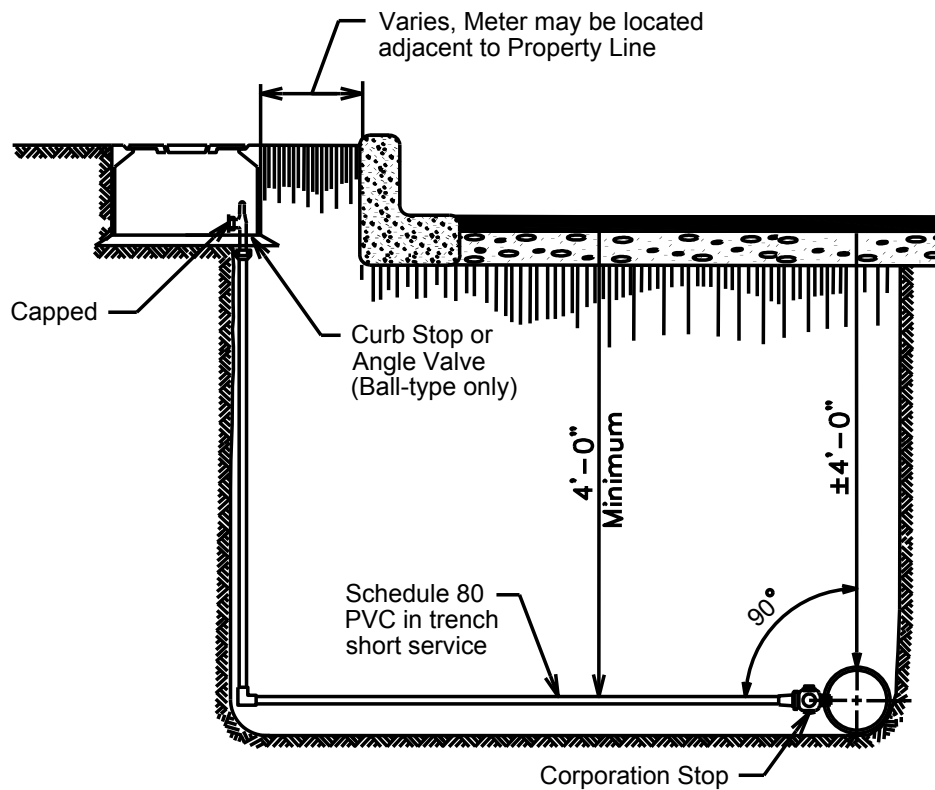
DOUBLE CHECK DETECTOR
(DCDA) ASSEMBLY ABOVE
GRADE INSTALLATION

APPROVED
JANUARY 2019

REVISED

DD-824-22

SHEET
1 OF 1



Notes:

1. See Tapping Schedule DD-824-01 Sheet 3 of 3
2. All valves open left (counter-clockwise)

NEW NON-METERED SERVICE

PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

SERVICE RELAY,
SERVICE RELOCATION
¾" THRU 2"

APPROVED
JANUARY 2019

REVISED

DD-824-23

SHEET
1 OF 1

Fair Oaks Ranch Standard Specifications for Construction

**ITEM NO. 826
VALVE BOX ADJUSTMENTS**

826.1 DESCRIPTION: This Item shall consist with the adjusting of existing valve boxes in accordance with these specifications and as directed by the Engineer.

826.2 MATERIALS: The materials for valve boxes shall conform to the specifications contained within the latest revision of Fair Oaks Ranch Material Specification Item No. 10- 20, "Valve Boxes."

1. Construction Method: The valve box shall be placed in such a manner to prevent shock or stress from being transmitted to the valve. It shall be centered and plumb over the operating nut of the valve with the box cover flush with the surface of the finished pavement or at such other level as may be directed by the Inspector. Valve boxes located in streets or other area subject to vehicular traffic shall be provided with concrete collars as shown in the DD-828 Standard Drawing Series. Collars around such valve boxes shall be formed and finished off neatly and in a workmanlike manner.

Valve box shall be located so that the valve operating nut is readily accessible for operation through the opening in the valve box. The valve box shall be set flush with the surface of the finished pavement or at such other elevations as may be specified. Pits shall be constructed so that it permits minor valve repairs and provides the valve and pipe protection from impact where they pass through the pit walls.

2. Existing valve box: Existing valve boxes shall be defined as boxes which are located within the right-of-way of the specified area of construction operations and are in conflict. These boxes shall be adjusted to match proposed finished grades.

Valve boxes installed as part of a new valve and mainline construction project are considered "new valves." Adjustments to "new valves" are incidental to the installation of the valve and are paid for as part of Item Nos. 828, 830 or 832 of these specifications. Separate pay shall not be given to adjust "new valves" to finished grade.

826.3 MEASUREMENT: Adjustment of valve boxes will be measured by the unit of valve boxes adjusted to the finished grade.

826.4 PAYMENT: Payment for "Valve Box Adjustment" shall be made at the contract unit price.

- End of Specification -

Fair Oaks Ranch Standard Specifications for Construction

**ITEM NO. 828
GATE VALVES**

828.1 DESCRIPTION: This item shall consist of gate valves installed in accordance with these specifications and as directed by the Engineer.

828.2 SUBMITTALS: Contractor shall submit manufacturer's product data, instructions, recommendations, shop drawings, and certifications.

Contractor must provide Geographic Information Systems (GIS) point .shp file for any installed valve. The GIS .shp file must include information on the location of the valve at a minimum. Confirm the information to be included in the .shp file with Fair Oaks Ranch prior to submission. Additional information to be included in the shapefile may be requested by Fair Oaks Ranch.

828.3 MATERIALS: The materials for all gate valves shall conform to the specifications contained within the latest revision of Fair Oaks Ranch Material Specification Item No. 21-02, "Resilient Seated Gate Valves and Tapping Valves."

828.4 CONSTRUCTION: Gate valve installation shall include: valve, reaction blocking (conforming to Standard Drawing DD-828-1), cast iron boot, valve box extension (having ductile iron riser pipe), valve box, concrete collar (where subjected to vehicular traffic), and valve box lid. Gate valves constructed in the terrace shall be constructed with No. 3 bars all around.

The valve box shall be placed in such a manner to prevent shock or stress being transmitted to the valve. All valves located 6 feet and deeper shall include valve key extensions inside the valve box. The Contractor has the option to install fully adjustable valve box and valve key extension systems, on all valves located between 6 feet and 13 feet. Adjustable valve box and valve key extension systems shall be centered over the valve's operating nut with the box cover flush with the finished pavement surface or located at another level as directed by the Engineer. Valve boxes located in streets or other area subject to vehicular traffic shall be provided with concrete collars as shown in these standard drawings. Collars around such valve boxes shall be formed and finished off neatly and in a sound workmanlike manner.

Valve pits shall be located so that the valve operating nut is readily accessible for operation through the opening in the valve box. The valve box shall be set flush with the finished pavement surface or at other finish elevations as may be specified. Pits shall be constructed in such a manner to permit minor valve repairs and provide protection to the valve and pipe from impact (where penetrating through pit walls).

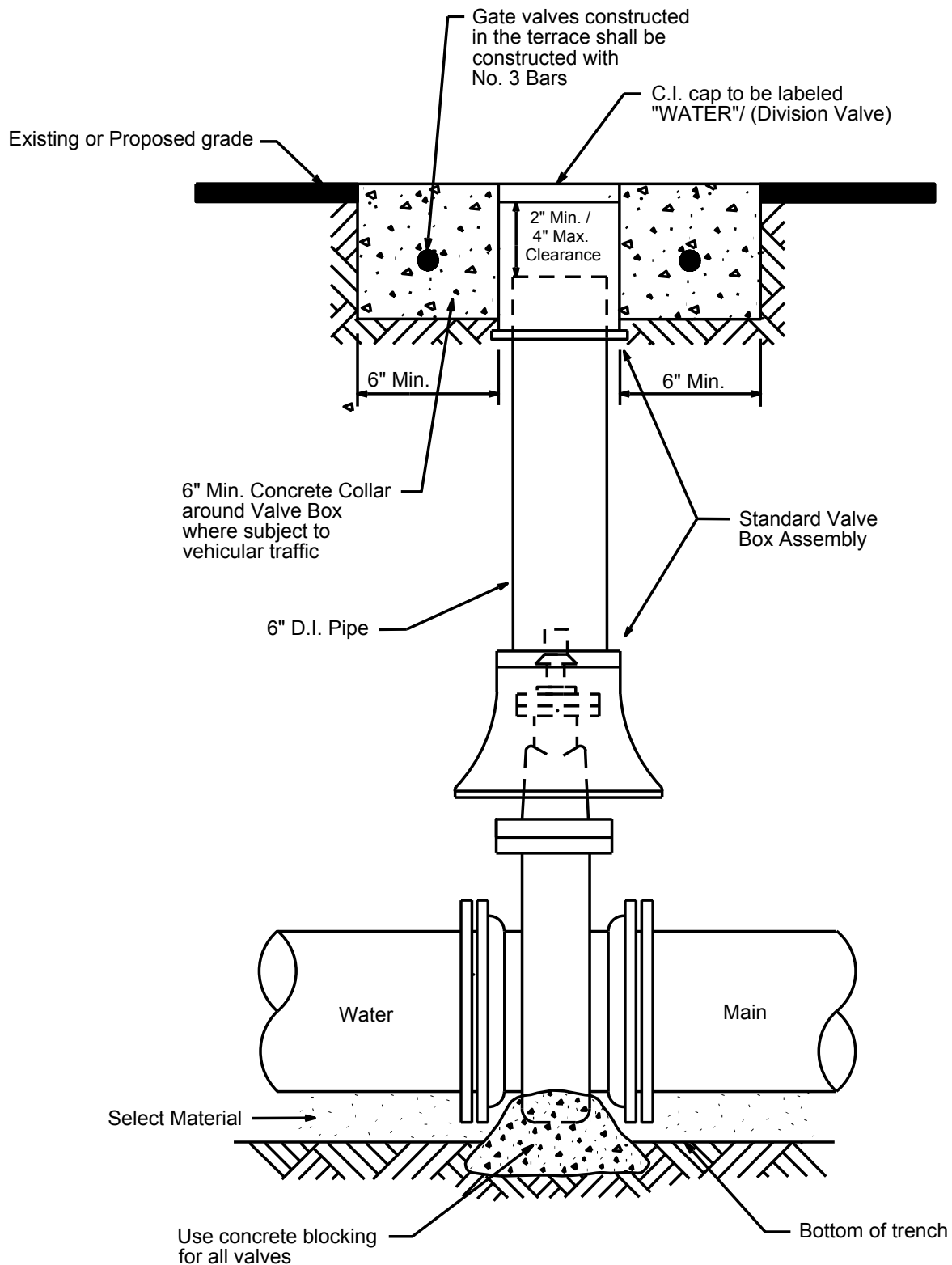
Fair Oaks Ranch Standard Specifications for Construction

In high pressure zones, all valves 6 inches and larger shall be supported on a concrete pad in accordance with Standard Drawings DD-828-2 and DD-828-3.

828.5 **MEASUREMENT:** Gate valves and valve boxes will be measured by the unit of each such assembly of the various sizes of gate valves and valve boxes installed to the finished grade.

828.6 **PAYMENT:** Payment for gate valves, complete with valve box, will be made at the unit price bid for each assembly of the various sizes of gate valves and valve boxes installed. Payment shall also include: excavation, selected embedment material, anti-corrosion embedment, hauling, and disposition of excavated surplus material, backfill, concrete collar at the valve box (where subjected to vehicular traffic), riser pipe, cast iron boot, packing, tar paper, concrete grout, concrete reaction blocking, protective coating material for bolts, nuts, and ferrous surfaces, and polyethylene sleeve.

- End of Specification -



NOTES:

1. All concrete to be 3,000 psi
2. All gate valves shall open left (counter-clockwise)

PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

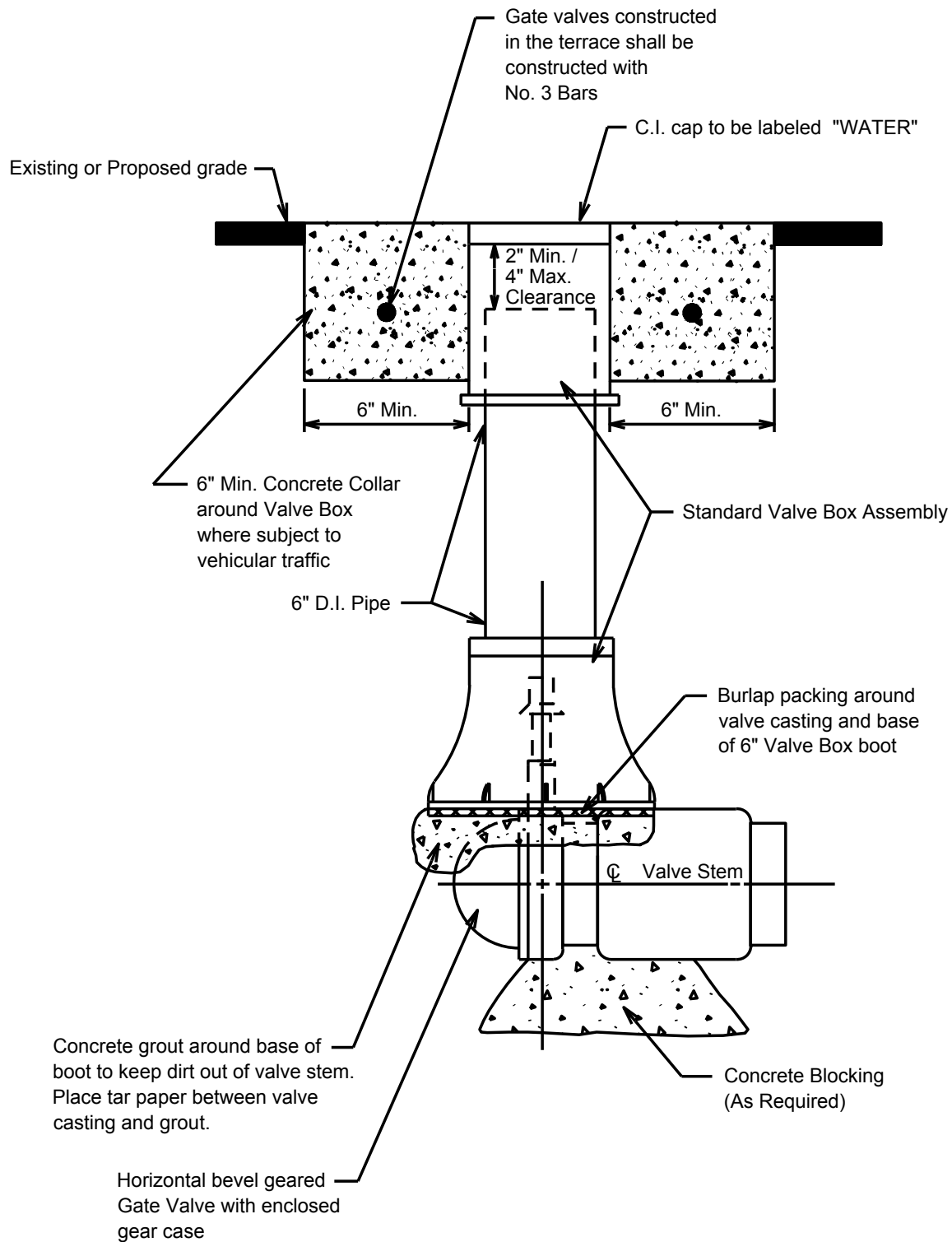
INSTALLATION OF NON-GEARED
GATE VALVE WITH VALVE BOX
AND EXTENSION

APPROVED
JANUARY 2019

REVISED

DD-828-01

SHEET
1 OF 1



NOTES:

1. All concrete to be 3,000 psi
2. All gate valves shall open left (counter-clockwise)

PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

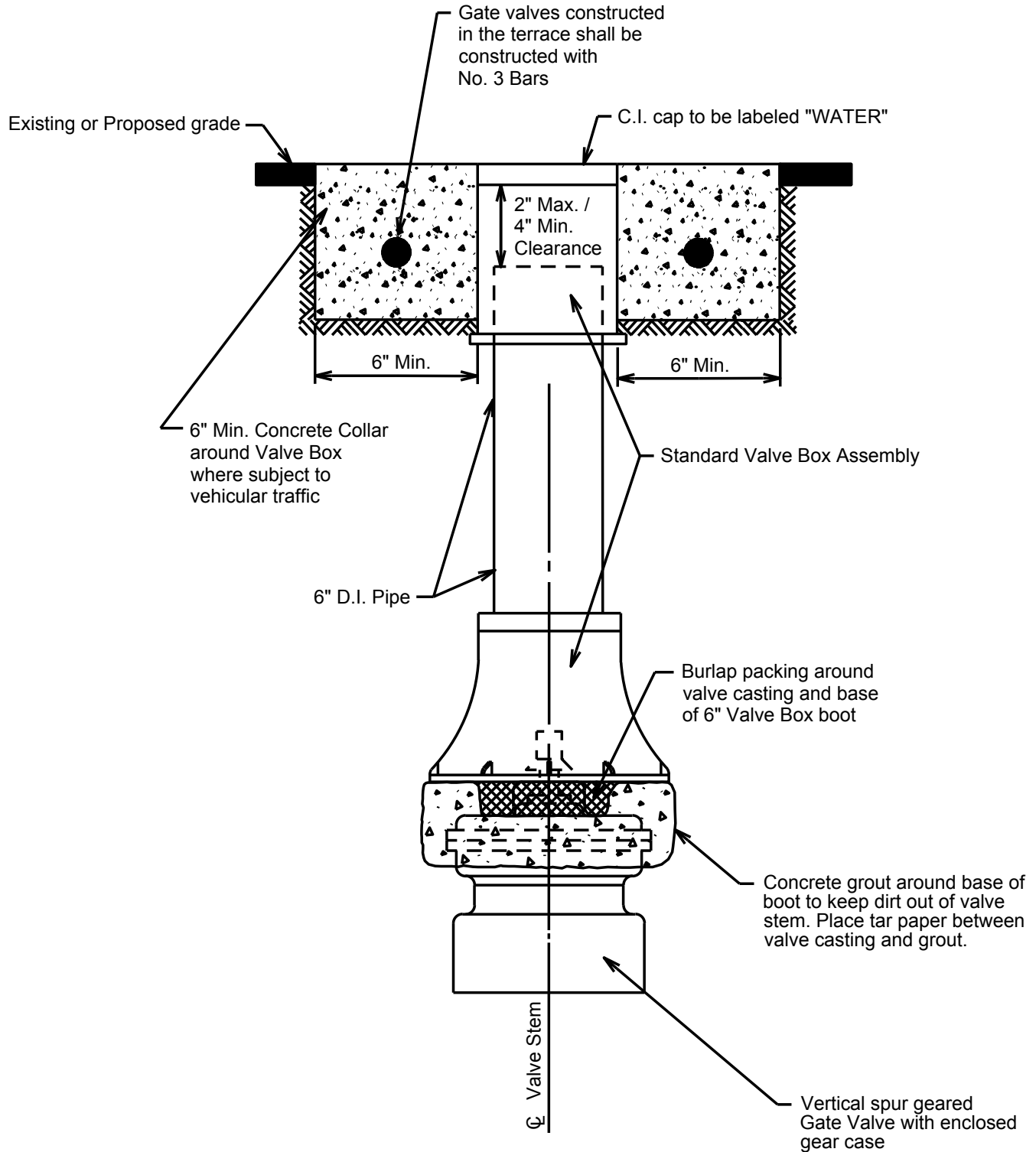
INSTALLATION OF GEARED
HORIZONTAL GATE VALVE
WITH VALVE BOX COMPLETE

APPROVED
JANUARY 2019

REVISED

DD-828-02

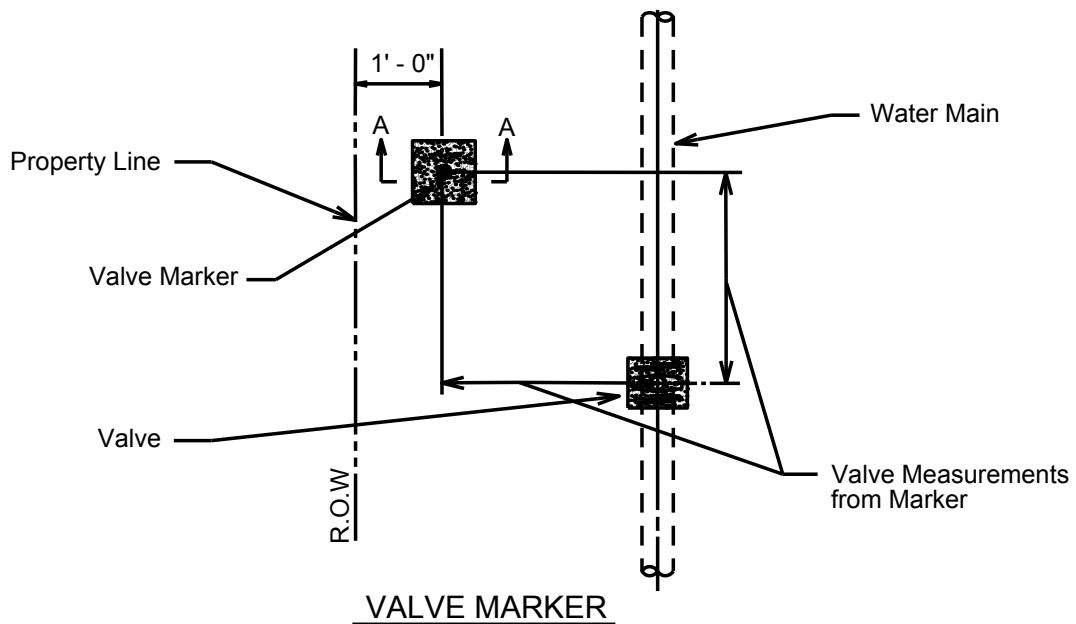
SHEET
1 OF 1



NOTES:

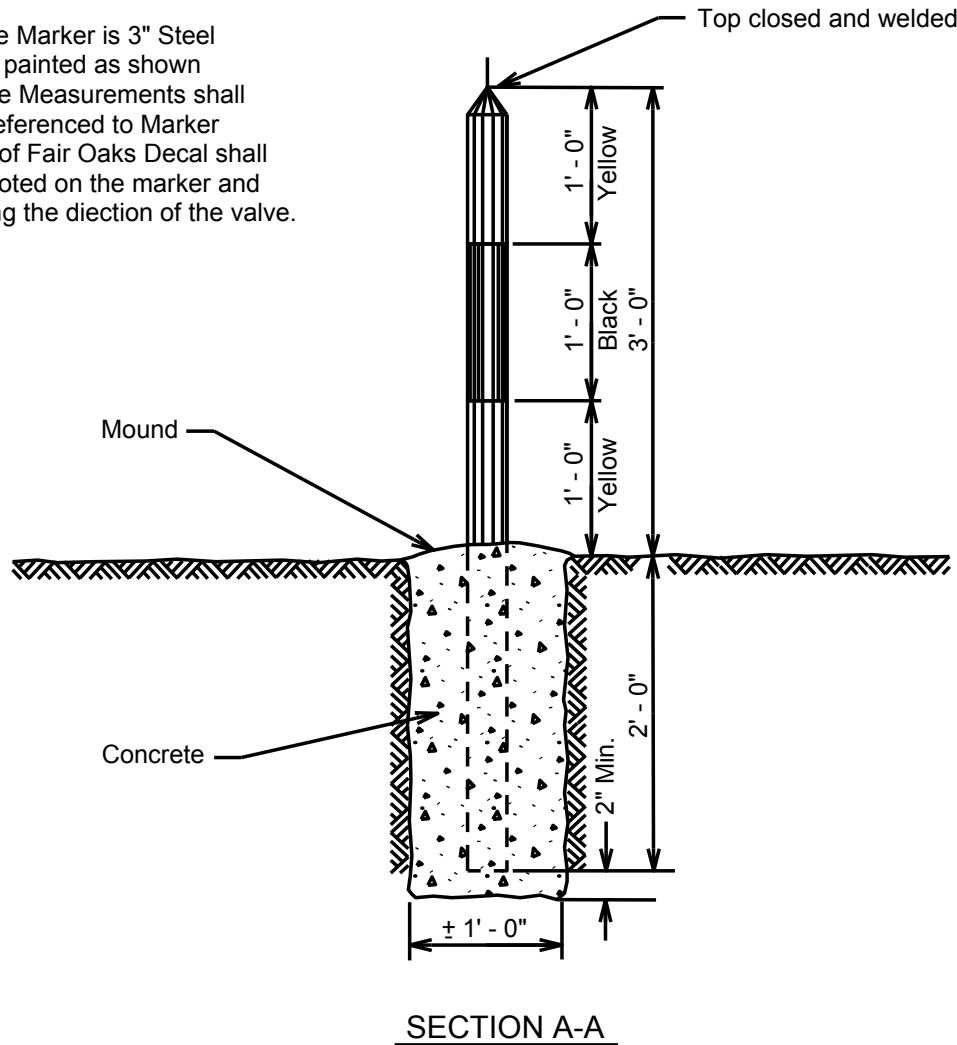
1. All concrete to be 3,000 psi
2. All gate valves shall open left (counter-clockwise)

PROPERTY OF THE CITY OF FAIR OAKS RANCH	INSTALLATION OF GEARED VERTICAL GATE VALVE WITH VALVE BOX COMPLETE	APPROVED	REVISED
		JANUARY 2019	
		DD-828-03	SHEET 1 OF 1



Notes:

1. Valve Marker is 3" Steel pipe painted as shown
2. Valve Measurements shall be referenced to Marker
3. City of Fair Oaks Decal shall be noted on the marker and facing the diection of the valve.



PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

VALVE MARKER

APPROVED
JANUARY 2019

REVISED

DD-828-04

SHEET
1 OF 1

Fair Oaks Ranch Standard Specifications for Construction

ITEM NO. 830
BUTTERFLY VALVES

830.1 DESCRIPTION: This item shall consist of butterfly valves installed in accordance with these specifications and as directed by the Engineer.

830.2 SUBMITTALS: Contractor shall submit manufacturer's product data, instructions, recommendations, shop drawings, and certifications.

Contractor must provide Geographic Information Systems (GIS) point .shp file for any installed valve. The GIS .shp file must include information on the location of the valve at a minimum. Confirm the information to be included in the .shp file with Fair Oaks Ranch prior to submission. Additional information to be included in the shapefile may be requested by Fair Oaks Ranch.

830.3 MATERIALS: The materials for all butterfly valves shall conform to the specifications contained within the latest revision of Fair Oaks Ranch' Material Specification Item No. 21-05 "Hand - Operated Butterfly Valves," and "Rubber- Seated Butterfly Valves 3 inches Through 72 inches.".

830.4 CONSTRUCTION: Butterfly valve installation shall include; butterfly valve, coated and wrapped steel pipe nipple with reaction stop ring, concrete reaction blocking, cast-iron boot, valve box extension (ductile iron riser pipe), valve box and lid, concrete collar (where subjected to vehicular traffic), all couplings and all coupling adapters required to complete the connection. The entire valve, except for the operating nut, shall be coated with an approved Fair Oaks Ranch sewer structural coating, and wrapped with Polywrap. Butterfly valves installed in the terrace shall be constructed with No. 3 bars all around.

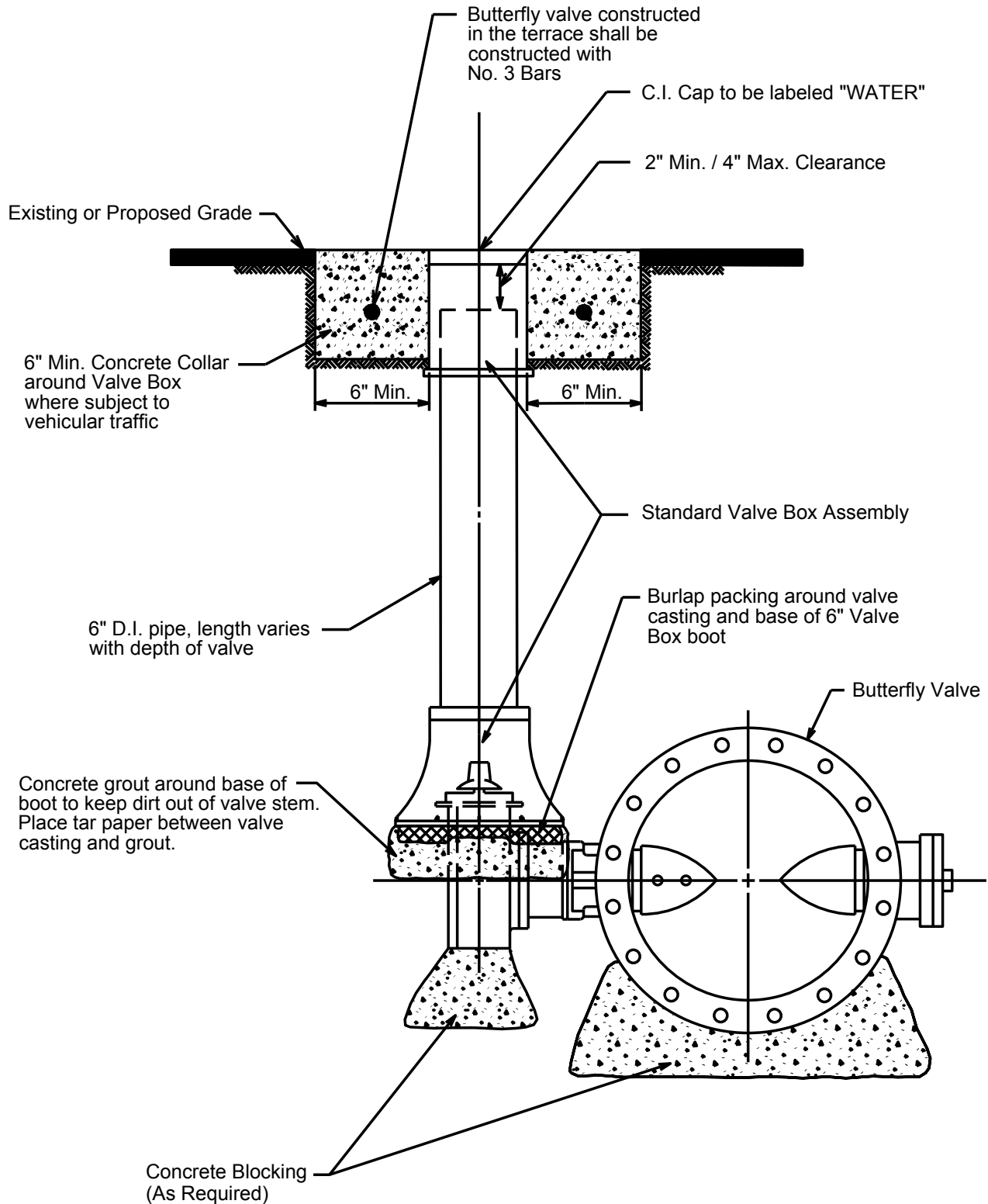
The valve box shall be placed in such a manner to prevent shock or stress being transmitted to the valve. All valves located 6 feet and deeper shall include valve key extensions inside the valve box. The Contractor has the option to install fully adjustable valve box and valve key extension systems on all valves located between 6 feet and 13 feet. Adjustable valve box and valve key extension systems shall be centered over the valve's operating nut with the box cover flush with the finished pavement surface or located at another level as directed by the Engineer. Valve boxes located in streets or other areas subject to vehicular traffic shall be provided with concrete collars as shown in the DD-830 Standard Drawing Series. Collars around such valve boxes shall be formed and finished off neatly and in a sound workmanlike manner.

Fair Oaks Ranch Standard Specifications for Construction

830.5 **MEASUREMENT:** Butterfly valves and boxes will be measured by the unit of each such assembly of the various sizes of butterfly valves and boxes approved and installed.

830.6 **PAYMENT:** Payment for butterfly valves, complete with box, will be made at the unit price bid for each assembly of the various types and sizes of valves and valve boxes installed. Payment shall also include: excavation, selected embedment material, anti-corrosion embedment, hauling, and disposition of excavated surplus material, backfill, concrete collar at the valve box (where subjected to vehicular traffic), ductile iron riser pipe, cast iron boot, packing, tar paper, concrete grout, concrete reaction blocking, protective coating material for bolts, nuts, and ferrous surfaces, and polyethylene sleeve. For butterfly valves only, in addition to the above, such payment shall also include mechanical and transition couplings, coated and wrapped steel pipe and nipples required to complete the connection.

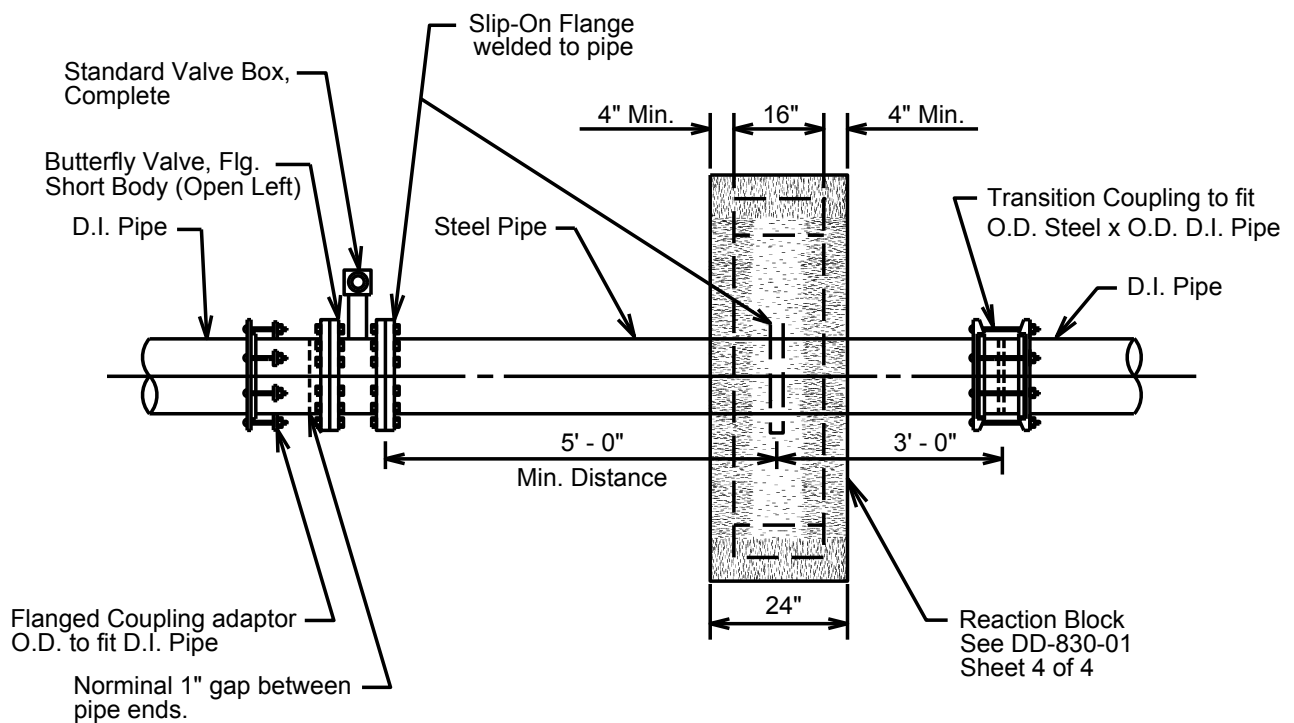
- End of Specification -



NOTES:

1. All concrete to be 3,000 psi
2. All gate valves shall open left (counter-clockwise)

PROPERTY OF THE CITY OF FAIR OAKS RANCH	INSTALLATION OF BURIED BUTTERFLY VALVE WITH VALVE BOX COMPLETE	APPROVED	REVISED
		JANUARY 2019	
		DD-830-01	SHEET 1 OF 4



PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

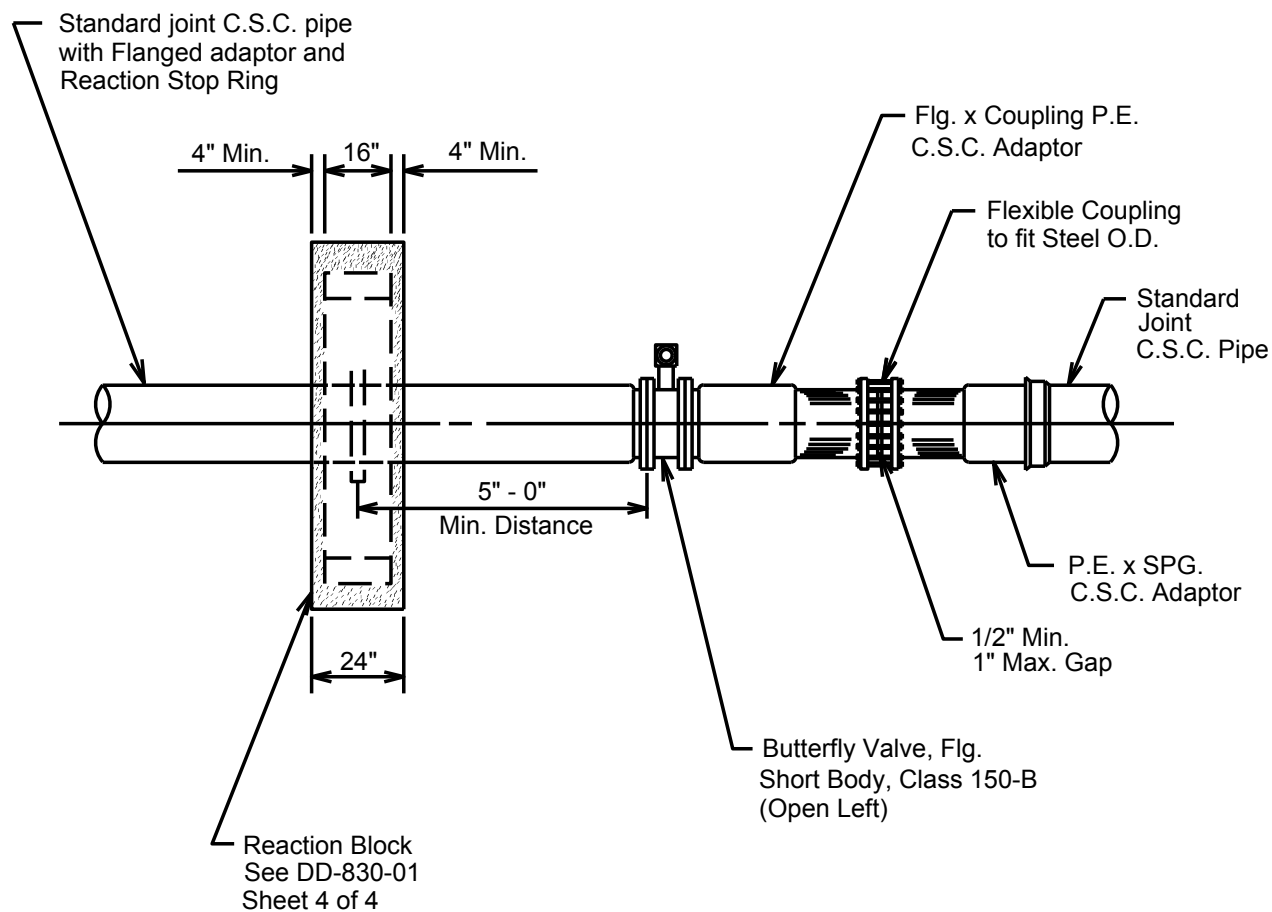
TYPICAL BUTTERFLY VALVE
ARRANGEMENT FOR
20' AND LARGER D.I. MAIN

APPROVED
JANUARY 2019

REVISED

DD-830-01

SHEET
2 OF 4



PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

TYPICAL BUTTERFLY VALVE
ARRANGEMENT FOR
C.S.C. PIPE

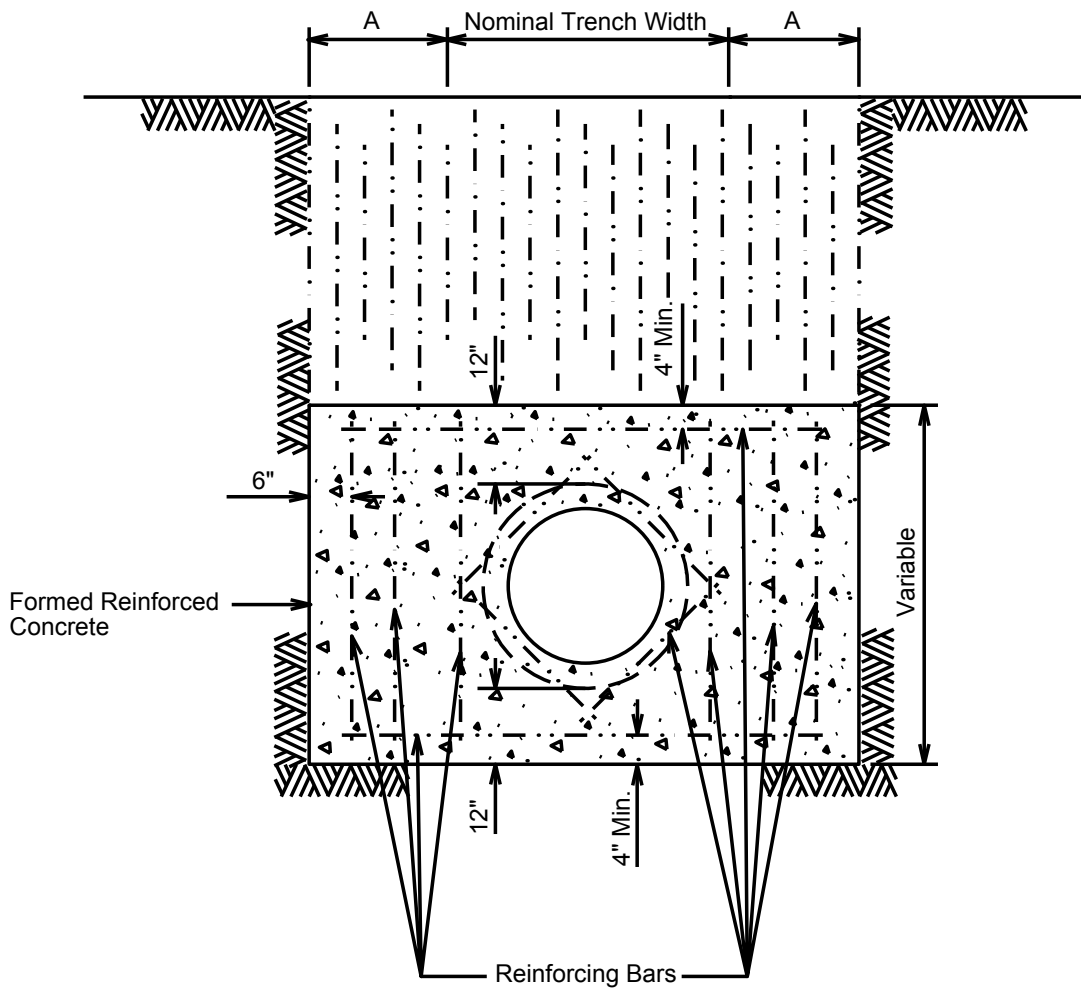
APPROVED

JANUARY 2019

REVISED

DD-830-01

SHEET
3 OF 4



END VIEW OF REACTION BLOCK

Main Size	A (Min.)	Reinforcing Bar Size	Bearing Surface Required (in Sq. Ft.)
6"	12"	#4	3
8"	12"	#4	5
12"	18"	#4	8
16"	18"	#4	12
20"	28"	#5	16
24"	28"	#5	23
30"	36"	#5	35
36"	36"	#5	50
42"	36"	#5	70

NOTE:

1. All concrete to be 3,000 psi

PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

CONCRETE REACTION BLOCK
FOR BUTTERFLY VALVES &
BLOW-OFF ASSEMBLIES ON
D.I. & C.S.C. MAINS

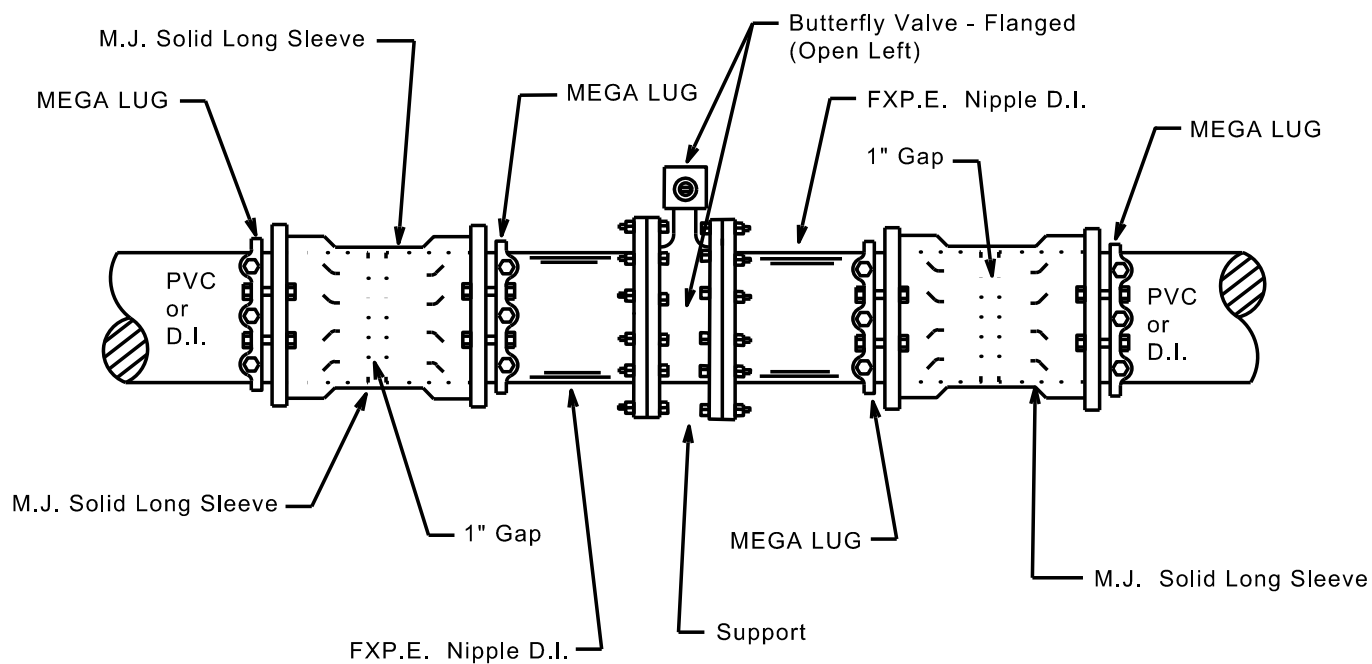
APPROVED

JANUARY 2019

REVISED

DD-830-01

SHEET
4 OF 4



PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

BUTTERFLY VALVE
ASSEMBLY
ON PVC OR D.I. PIPE
N.T.S.

APPROVED
JANUARY 2019

REVISED

DD-830-02

SHEET
1 OF 1

Fair Oaks Ranch Standard Specifications for Construction

ITEM NO. 831

CUT-IN TEE

- 831.1 DESCRIPTION:** This item shall consist of cut-in tees (various types and sizes) installed in accordance with these specifications and as directed by the Engineer.
- 831.2 SUBMITTALS:** Contractor shall submit manufacturer's product data, instructions, recommendations, shop drawings, and certifications.
- 831.3 MATERIALS:** The materials for cut-in tees shall conform to the specifications contained within the latest revision of Fair Oaks Ranch' Material Specification for all appropriate items.
- 831.4 CONSTRUCTION:** The work involved in cutting in a tee shall consist of the following: excavation, shutdown and isolation of existing main to which the new main is to be connected, cutting pipe for the connection, dewatering the excavation, customer notification of service interruption where required, installation of all pipe used to complete the connection, all necessary tie-ins (connections to existing or new main), fittings, approved reaction blocking required and backfilling the excavation with approved selected materials or flowable backfill, if required. Where the installation of a valve is required, payment will be made in accordance with, Item No. 828, "Gate Valves."
- The processes associated with disturbing and restoring pavements (any type), curbs, sidewalks, backfilling to final grade, flowable backfill (if required) and sodding for the installation of a cut-in tee will be considered subsidiary to the work and must comply with the applicable TxDOT Specification or City of Fair Oaks Ranch Specifications for Public Works Construction, any other governing entity's specifications, and applicable street cut policies, ordinances, or permits.
- 831.5 MEASUREMENT:** Cut-in tees will be measured by the unit of each such assembly of the various sizes of tee installed.
- 831.6 PAYMENT:** Payment for cut-in tees will be made at the unit price bid for each assembly of the various types and sizes of tees to be installed. Such payment shall also include; all necessary tie-ins, protective coating materials for bolts, nuts, ferrous surfaces, polyethylene sleeve, where required, and any necessary hauling and disposition of surplus excavated materials.

- End of Specification -

ITEM NO. 832
TAPPING SLEEVES AND VALVES

- 832.1 DESCRIPTION:** This item shall consist of tapping sleeves and valves installed in accordance with these specifications and as directed by the Engineer. The use of size on size taps shall not be permitted. Only cut-in tees shall be used within the system, unless otherwise approved.
- 832.2 SUBMITTALS:** Contractor shall submit manufacturer's product data, instructions, recommendations, shop drawings, and certifications.
- 832.3 MATERIALS:** The materials for tapping sleeves and valves shall conform to the specifications contained within the latest revision of Fair Oaks Ranch' Material Specification Item Nos. 100-35, "Tapping Sleeves," and 21-02, "Resilient Seated Gate Valves and Tapping Valves."
- 832.4 CONSTRUCTION:** The installation work involved in tapping sleeves and valves shall consist of: excavation, backfilling the excavation with approved selected material, tapping sleeve, approved reaction blocking conforming to Standard Drawing DD-839, tapping valve, valve box assembly, concrete collar (where subjected to street traffic), and cast iron lid. New taps will not be permitted closer than 2 feet of a joint or existing tap. The use of a shell-type cutter shall be required when tapping sleeves and valves. Whenever working on potable or recycle water systems, the shell cutter shall be disinfected with bleach prior to the start of work. The cutting edge shall be sharp and round. Any defective cutters shall be rejected by the Inspector.
- All the tapping sleeves shall be air tested to 50 psi prior to tapping the main line.
- The valve box shall be placed in such a manner to prevent shock or stress from being transmitted to the valve. Valve boxes shall be centered over the valve's operating nut with the box cover flush with the finished pavement surface or located at another level as directed by the Inspector. Valve boxes located in streets or other areas subject to vehicular traffic shall be provided with concrete collars as shown in the accompanying standard drawings. Collars around such valve boxes shall be formed and finished off neatly and in a sound workmanlike manner.
- 832.5 MEASUREMENT:** Tapping Sleeves, Valves, and Boxes will be measured by the unit of each such assembly of the various sizes of tapping sleeves, valves and boxes approved and installed.
- 832.6 PAYMENT:** Payment for Tapping Sleeves and Valves, complete with boxes, will be made at the unit price bid for each such assembly of the various types and sizes of valves and valve boxes installed and approved. Such payment shall also include: excavation, selected embedment material, anti-corrosion embedment

Fair Oaks Ranch Standard Specifications for Construction

when specified, hauling, and disposition of surplus excavated material, backfill, concrete collar at the valve box where subjected to vehicular traffic, ductile iron riser pipe, cast iron boot, packing, tar paper, concrete grout, concrete reaction blocking, protective coating material for bolts, nuts, and ferrous surfaces, and polyethylene sleeve, where required.

- End of Specification -

ITEM NO. 833
METER AND METER BOX INSTALLATION

- 833.1 DESCRIPTION:** This item shall consist of meter and meter box installation and adjustment installed in accordance with these specifications and as directed by the Engineer.
- 833.2 SUBMITTALS:** Contractor shall submit manufacturer's product data, instructions, recommendations, shop drawings, and certifications.
- 833.3 MATERIALS:** The materials for meter and meter box installation and adjustment shall conform to the specifications contained within the latest revision of Fair Oaks Ranch' Material Specification Item No. 10-30, "Meter Boxes."
- 833.4 CONSTRUCTION:**

1. Physical movement of existing meters and meter boxes to new locations may be required where service lines are transferred to new mains in conjunction with main replacement work. Unless specified otherwise, the Contractor shall move existing meters and meter boxes and reconnect and adjust customer's yard piping as part of transferring service lines. A dielectric coupling (PVC schedule 80) shall be installed within the meter box between the meter and the customer's yard piping.

Round and oval meter boxes with round covers shall be salvaged and returned to the Owner by the Contractor. The Contractor shall also replace the salvaged meter boxes with the new, appropriately styled oval plastic meter box with oval cover, or rectangular meter box. Unless otherwise specified, the old service line shall be abandoned after the existing meter has been reset in the existing or new meter box.

Where meter boxes are installed in sidewalks or driveways, the Contractor shall install a number one meter box (2 pieces) as shown in the Material Specifications Item No. 10-30 and the DD-833 Standard Drawing Series.

New meters will be set by the Owner where mains are extended and new services lines are installed for new or initial customer service. In lieu of the new meter, the Contractor shall furnish and install a meter template in accordance with the DD-833 Standard Drawing Series. Contractor shall make a 1 inch diagonal cut thru the wall of the template.

Meter and meter box configuration, shall have the meter set horizontal, approximately 6 inches below the top of meter box, so that the meter is above the bottom of the meter box and in-line with the meter box lid opening. The top of the meter box shall be flush with the existing ground

Fair Oaks Ranch Standard Specifications for Construction

surface. All excess soil above the meter coupling, meter flange and meter nuts inside the meter box shall be removed so that the meter register is clearly visible. The Contractor shall exercise special precautions during excavation at the existing meter location in order to minimize the disturbance of the customer's yard piping. However, if the existing meter elevation is low, the Contractor shall raise the existing meter to conform to the correct configuration indicated herein. Adjustment of meter to proper grade is incidental to the construction and will not be paid for separately.

Where required, pressure reducing valves shall be installed by the customer in accordance with the Uniform Plumbing Code and shall be placed beyond the outlet side of the meter, but not within the Owner's meter box. The pressure reducing valve shall be the property of the water user who will be responsible for its installation, maintenance, and replacement, as required.

2. The meter box adjustment shall not exceed 10 linear feet from the existing box.

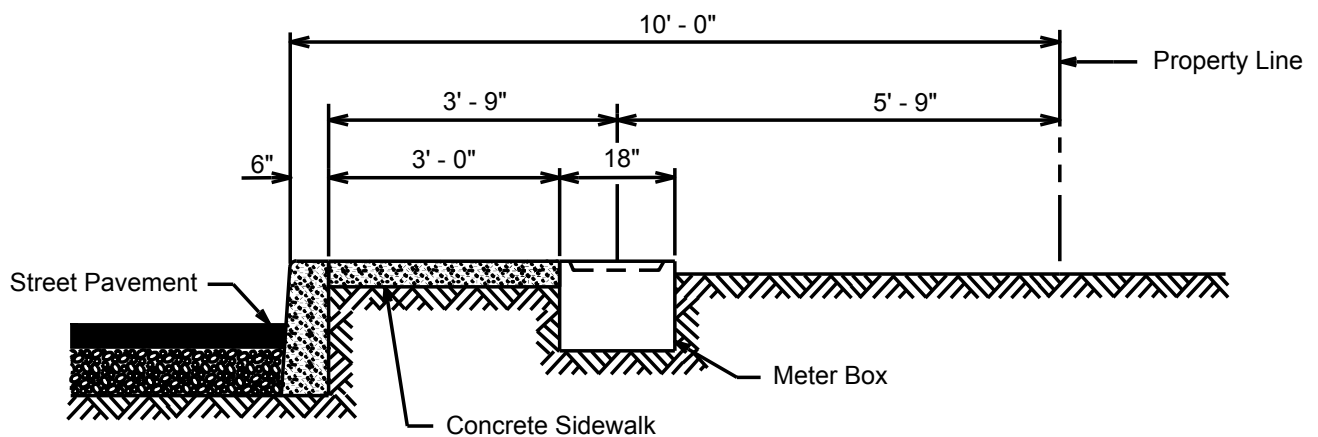
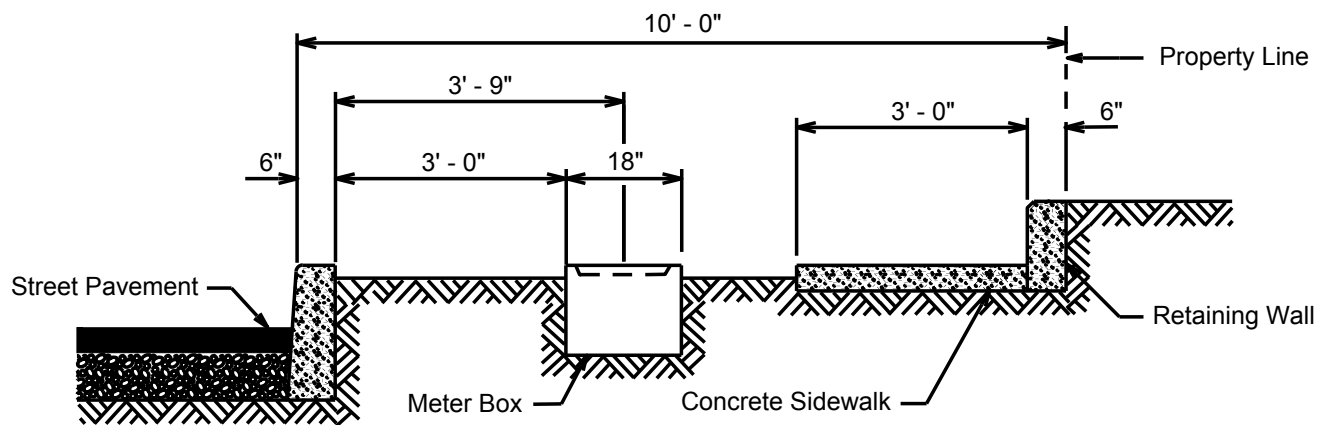
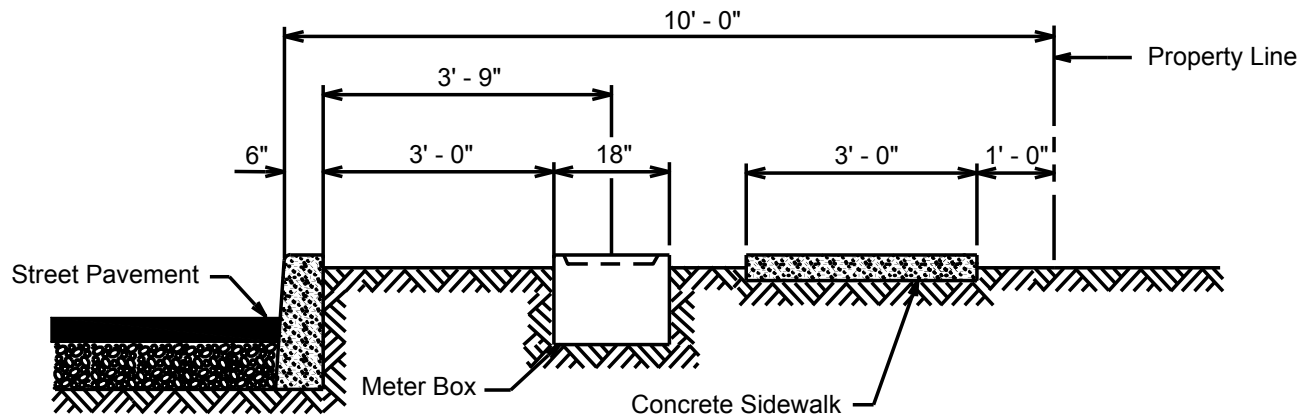
833.5 MEASUREMENT: Relocation of meters and boxes will be measured by the unit of the various types and sizes of meters and boxes relocated.

833.6 PAYMENT: Payment for "Existing Meter and Existing Meter Box Relocation (5/8 inch through 2-inch meter)" will be made at the unit price bid for each existing meter and existing meter box relocated. Such payment shall also include; excavation, hauling and disposition of surplus materials, sand backfill, removal and replacement of yard piping with polyethylene tubing of the various types and sizes and in the quantities necessary to complete the connection and adjustment between the relocated existing meter and existing meter box, and the existing yard piping.

Payment for "Existing Meter and New Meter Box Relocation (5/8 inch through 2-inch meter)" will be made at the unit price bid for each existing meter relocated to a new meter box. Such payment shall also include excavation, hauling and disposition of surplus materials, sand backfill, removal and replacement of whatever type surface structure encountered, salvaging the existing meter box, reconnection and adjustment of yard piping with polyethylene tubing of the various types and sizes and in the quantities necessary to complete the connection between the relocated existing meter and new meter box, and the existing yard piping.

Payment for number one meter box installation in sidewalks and driveways shall be paid in the amount of difference between the standard meter box and the number one box.

- End of Specification -



NOTES:

1. Meter Box location in commercial and industrial areas will be as directed by the Engineer.
2. The customer cut off valve shall be located 8" to 18" from the meter box. The pressure reducing valve, where required, shall be located 8" to 18" from the customer cut off valve.

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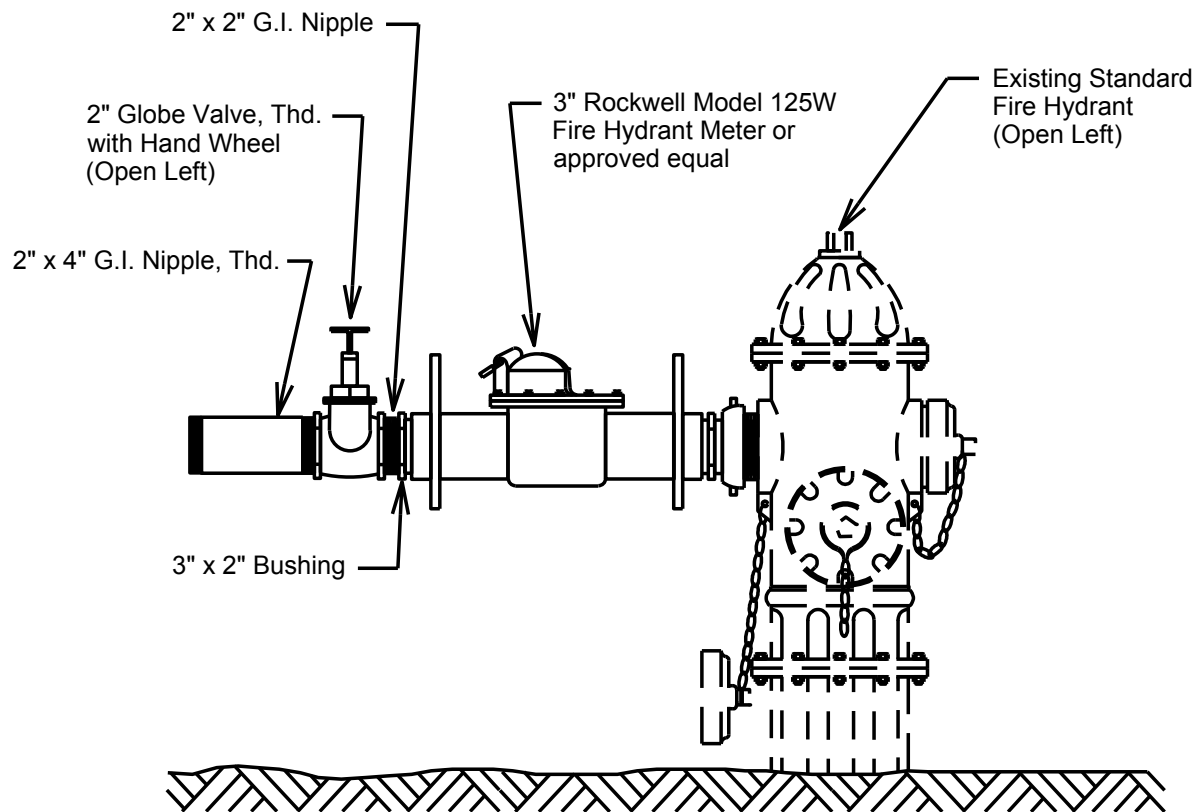
TYPICAL
METER BOX LOCATION
(RESIDENTIAL)

APPROVED
JANUARY 2019

REVISED

DD-833-01

SHEET
1 OF 1



NOT TO SCALE

PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

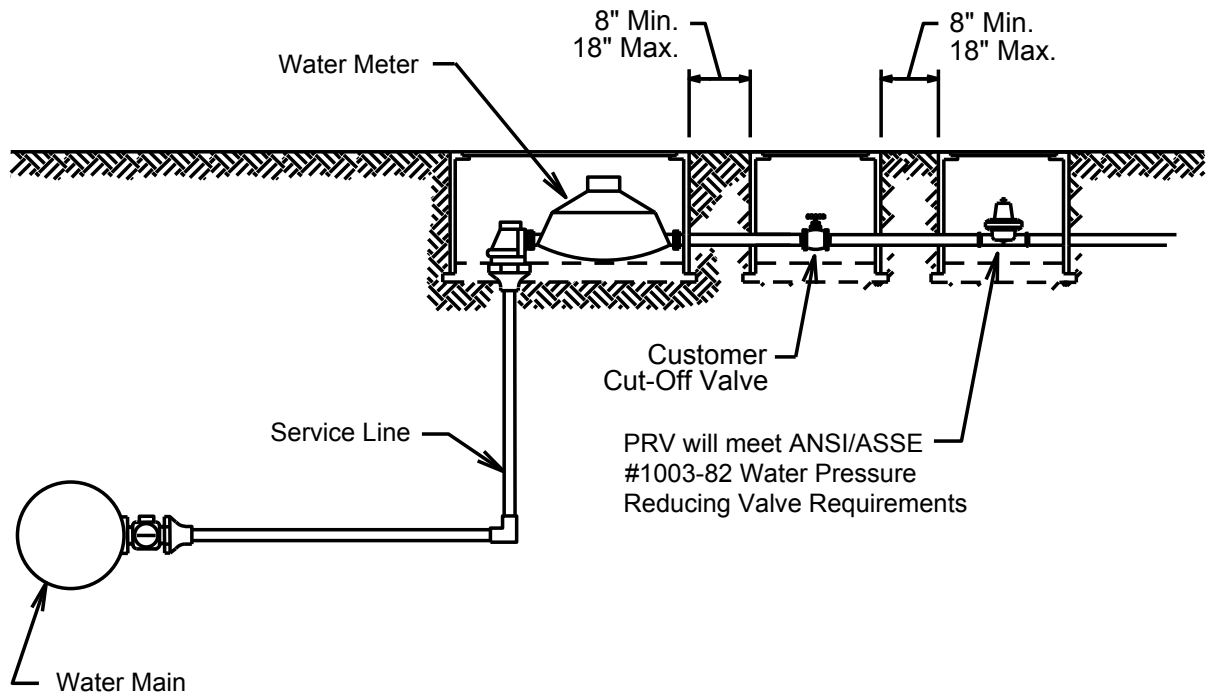
TEMPORARY 3"
FIRE HYDRANT
METER

APPROVED
JANUARY 2019

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DD-833-02

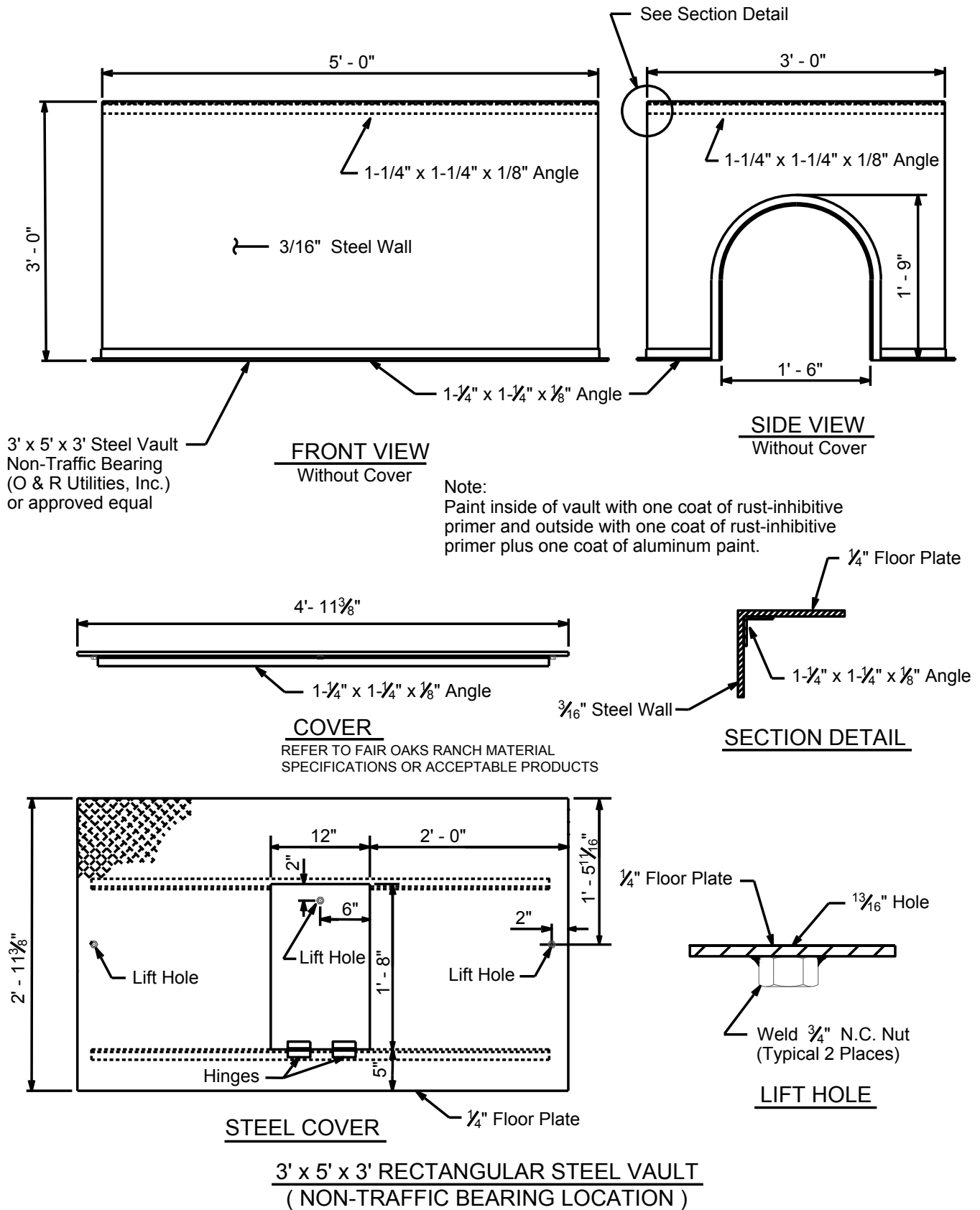
SHEET
1 OF 1



3/4" THRU 2" SERVICE
PRESSURE REDUCING VALVE

NOTE:
1. For Tapping Schedule, See DD-824-01 Sheet 3 of 3.

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		JANUARY 2019	
		DD-833-03	SHEET 1 OF 1



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VAULT FOR 3", 4", 6" & 8"
TURBINE METER AND 6" & 8"
TURBINE METER AND 6" & 8"
DETECTOR CHECK
INSTALLATION

APPROVED
JANUARY 2019

REVISED

DD-833-04

SHEET
1 OF 1

Fair Oaks Ranch Standard Specifications for Construction

**ITEM NO. 834
FIRE HYDRANTS**

834.1 DESCRIPTION: This item shall consist of fire hydrant installations using joint restraints in accordance with these specifications and as directed by the Engineer with the contract documents.

834.2 MATERIALS: The materials for fire hydrant installations shall conform to the specifications contained within the latest revision of Fair Oaks Ranch' Material Specification Item No. 95-10, "Specifications of Pipe Joint Restraint Systems," Item No. 95-10, Item No. 113-02, "Ductile Iron Restrained Joint Fittings for Use on Ductile Iron and Polyvinyl Chloride Pipe," and Item No. 21-30, "Fire Hydrants."

Contractor must provide Geographic Information Systems (GIS) point .shp file for any installed fire hydrant. The GIS .shp file must include information on the location of the fire hydrant at a minimum. Confirm the information to be included in the .shp file with Fair Oaks Ranch prior to submission. Additional information to be included in the shapefile may be requested by Fair Oaks Ranch.

834.3 CONSTRUCTION:

1. General: Hydrants shall be connected to mains as shown in the contract documents or as directed by the Engineer. They shall be installed in accordance with Standard Drawings DD-834-01, DD-834-02, and DD- 834-03. Hydrants shall also be installed in a location where there is accessibility and in a safe location where there is a minimum possibility of damage from vehicles or injury to pedestrians. In situations where hydrants are placed directly behind curbs, hydrant barrels shall be set so that no portion of the hydrant will be less than 12 inches nor more than 7 feet from the back of the curb. Where hydrants are set in the lawn spaces between the curb and the sidewalk or between the sidewalk and the property line, no portion of the hydrant or nozzle cap shall be within 6 inches of the sidewalk.

Setting final grade of fire hydrants to match proposed or existing field conditions is the responsibility of Contractor.

Hydrants shall be set in accordance with Standard Drawings DD-834-01, DD-834-02, and DD-834-03 and shall be set plumb and shall have their nozzles parallel with, or at right angles to, the curb with the pumper nozzle facing the curb. Drainage and concrete pads shall be provided at the base of hydrants as specified. No fire hydrant drainage system or pit shall be connected to a storm or sanitary sewer.

Fair Oaks Ranch Standard Specifications for Construction

The Contractor shall install anchored or flanged style fittings in accordance with Standard Drawings DD-834-01, DD-834-02, and DD- 834-03.

2. Restrained Joints: Restrained mechanical joints that require field welding or groove cuts into the pipe barrel for restraint will not be accepted. Restrained joints shall be furnished for pipe at all changes in direction as indicated in the contract documents, or as directed by the Engineer. Restrained mechanical joints shall be locked mechanical joints. All joints shall conform to Fair Oaks Ranch Material Specification Item No. 95-10, "Pipe Joint Restraint Systems." The restraint system shall be capable of a test pressure twice the maximum sustained working pressure of 350 psi for ductile iron and PVC pipe.
3. Replacing and Relocating Existing Fire Hydrants: When existing fire hydrants are to be replaced or relocated, the work shall be accomplished by either of the following:
 - a. Cutting or installing a tee of the size and type as indicated in the contract documents or as directed by the Engineer.
 - b. Using a tapping sleeve and valve of the size and type as indicated in the contract documents to install a new fire hydrant to an existing or new water main. Size on size taps will not be permitted.
 - c. Relocating the existing fire hydrant by closing the existing fire hydrant branch valve, removing the existing fire hydrant, extending the fire hydrant branch and installing the existing fire hydrant as specified herein.

The Contractor shall salvage the existing fire hydrants and other materials as designated in the field by the Inspector and shall deliver this material to the Fair Oaks Ranch materials storage yard, located at 3930 East Houston Street. Fire hydrant branches shall be abandoned by cutting and capping the fire hydrant cast iron tee at the service main and the surface restored to its original condition.

After a fire hydrant has been set, hydrants shall be painted with a suitable primer and finished with oil-based aluminum paint from the top of the hydrant to a point 18-20 inches below the center line of the pumper nozzle and applied to all exposed metal surfaces above the hydrant base flange. The payment for fire hydrant painting shall be included in the unit cost for installing the fire hydrant.

4. Installation on Water Mains: Ductile iron pipe, cast iron and ductile iron fittings, and valves used in the placement of fire hydrants and connections to

Fair Oaks Ranch Standard Specifications for Construction

the main will be considered part of the fire hydrant installation and not a part of the main construction. No separate payment will be made for this pipe. Hydrants shall be connected to the mains as shown in the contract documents or as directed by the Engineer. Hydrants shall also be installed in a location where there is accessibility and in a safe location where there is a minimum possibility of damage from vehicles or injury to pedestrians.

834.4 **MEASUREMENT:** Standard Fire Hydrants with 6 inch Valve and Box will be measured by the unit of each fire hydrant, valve, and box installed. Relocate Fire Hydrants will be measured by the unit of each fire hydrant relocated.

Standard Fire Hydrants with Tapping Sleeve, 6 inch Valve, and Box will be measured by the unit of each fire hydrant, including the various sizes of tapping sleeves, valves and boxes installed.

834.5 **PAYMENT:** Payment included in following bid pay items shall include: excavation, backfill, selected material, anti corrosion embedment when specified, hauling and disposition of surplus excavated materials, backfill, branch line pipe, nipples, and fittings exclusive of the tee from the main line pipe, polyethylene sleeve where required, asphalted material for ferrous surfaces, joint restraints, concrete pad, restoration of existing fire hydrant sites and removal and relocation of existing fire hydrant as specified.

PAY ITEM No. 834.1 – Fire Hydrant: Installation of a new fire hydrant as specified in the contract documents and as specified herein for a fire hydrant with 6 inch valve and box.

PAY ITEM No. 834.2 – Tapped Fire Hydrant: Payment for installation of a new fire hydrant by tapping an existing or new water main as specified in the contract documents and as specified herein for a Fire Hydrant with tapping sleeve, 6 inch valve and box.

PAY ITEM No. 834.3 – Relocate Fire Hydrant: Payment for Relocate Fire Hydrant shall include relocating an existing fire hydrant to a new location as specified in the contract documents and as specified herein. Restoration of the existing fire hydrant site shall be inclusive to this line item.

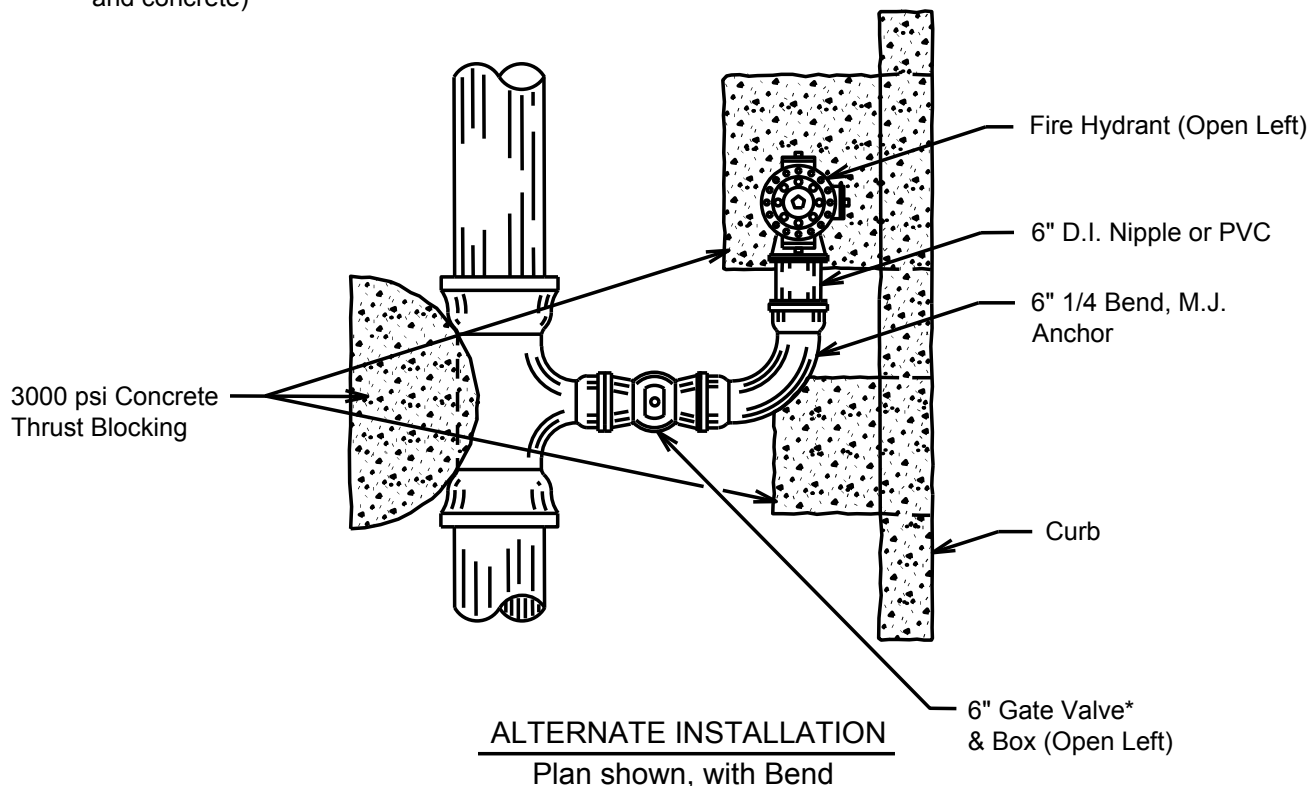
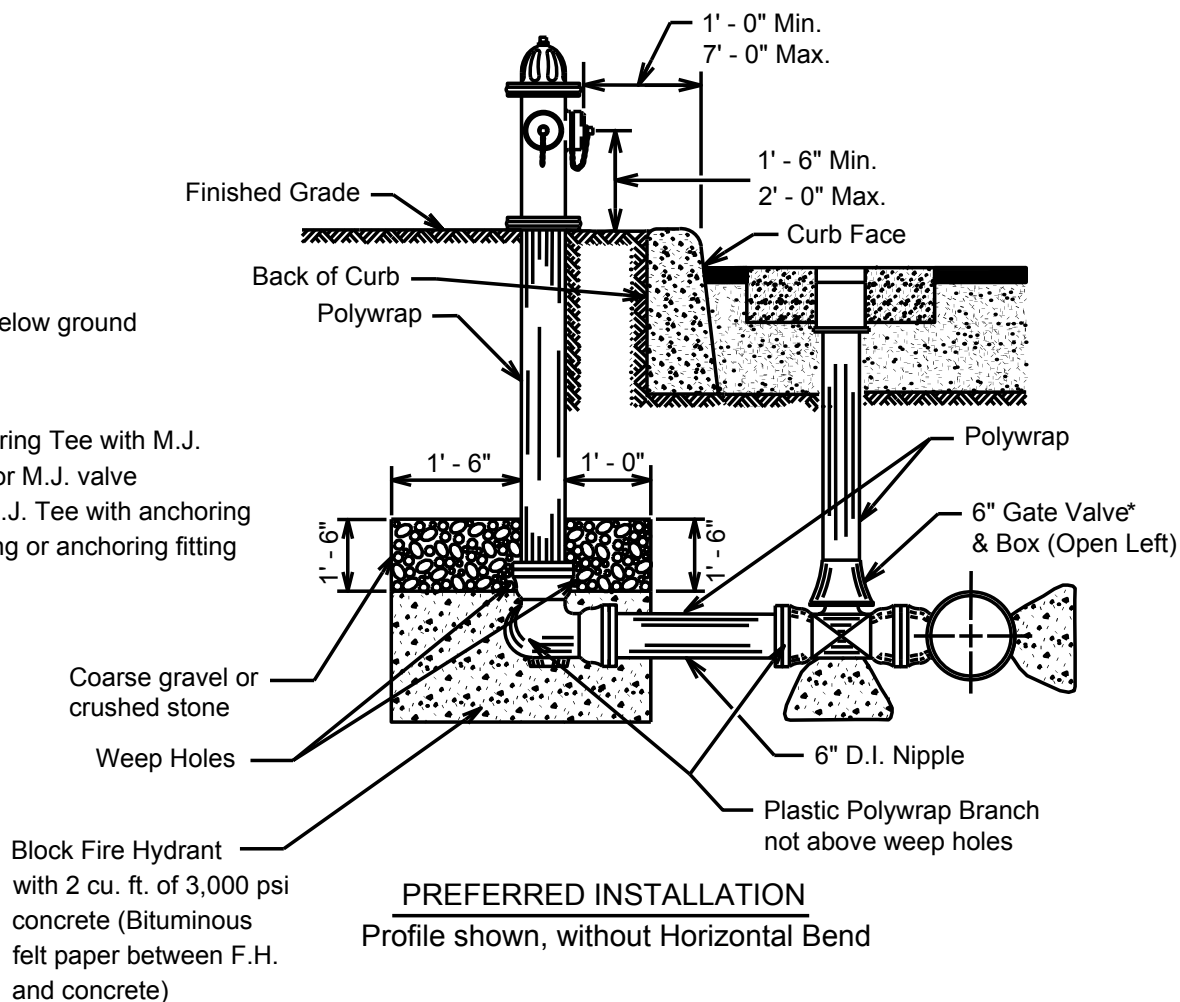
- End of Specification -

Note:
Polywrap below ground

Note

Use:

- (a) Anchoring Tee with M.J. fitting or M.J. valve
- (b) Std. M.J. Tee with anchoring coupling or anchoring fitting



* Resilient Seat

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FIRE HYDRANT
INSTALLATION

APPROVED

JANUARY 2019

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DD-834-01

SHEET
1 OF 2

NOTE:
Polywrap Below Ground

NOTE:

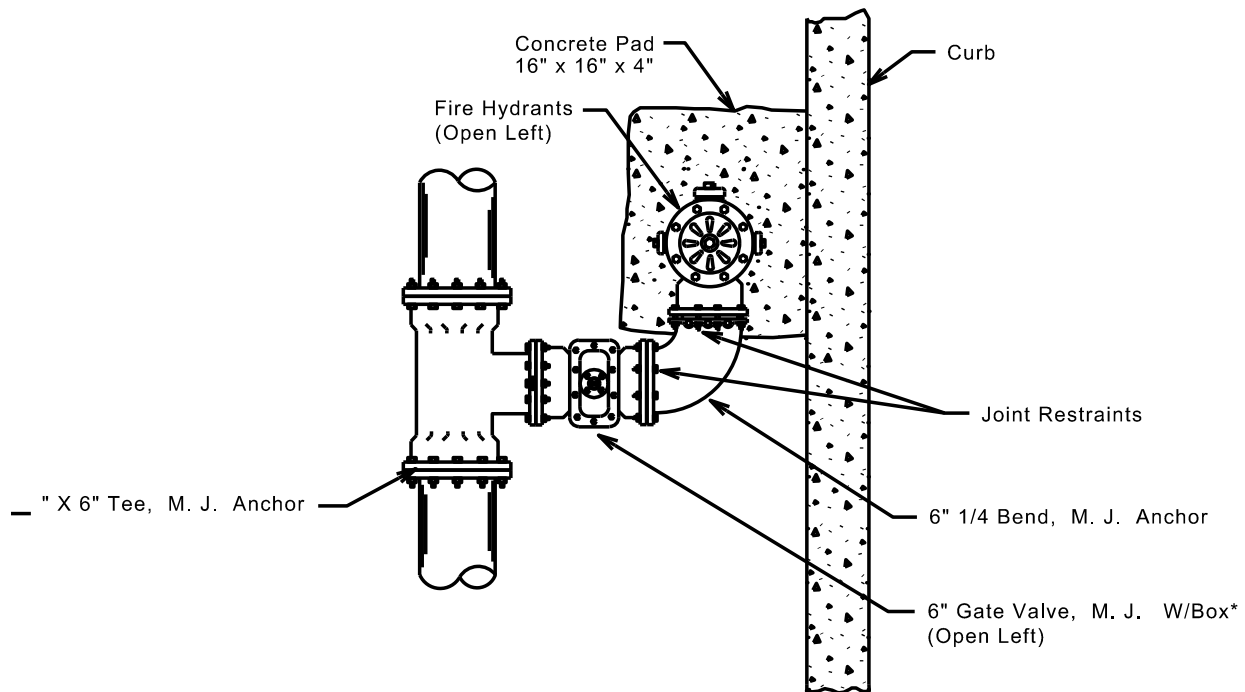
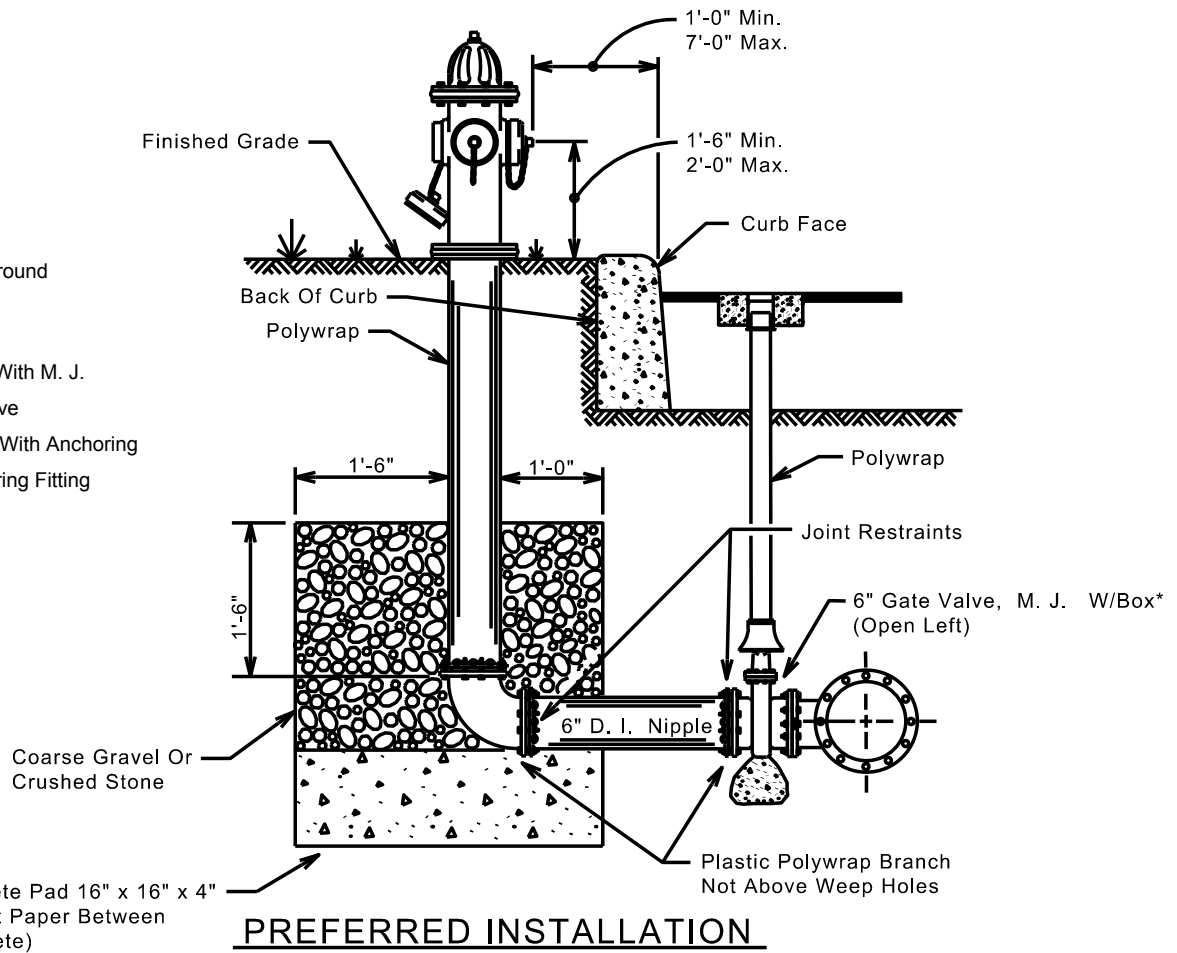
Use:

(A) Anchoring Tee With M. J.

Fitting Or M. J. Valve

(B) Std. M. J. Tee With Anchoring

Coupling Or Anchoring Fitting



* RESILIENT SEAT

ALTERNATE INSTALLATION
PLANVIEW SHOWN, WITH BEND

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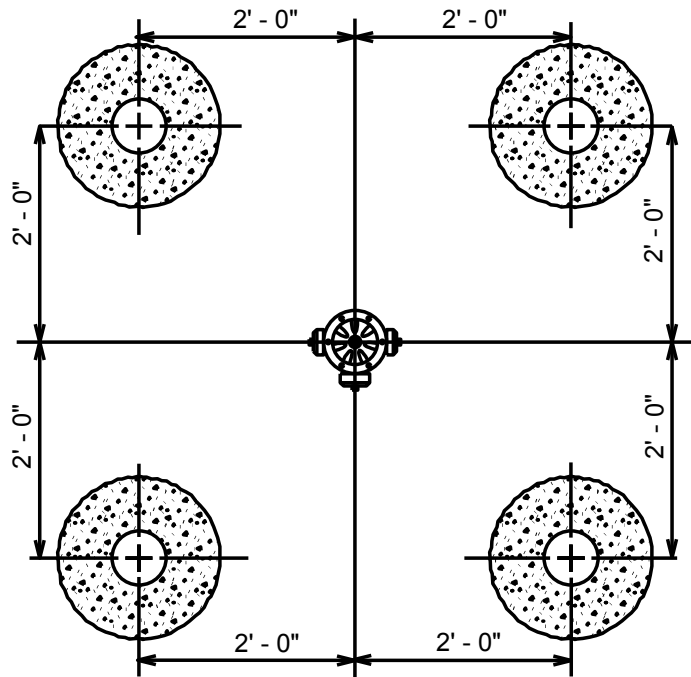
FIRE HYDRANT
INSTALLATION
(JOINT RESTRAINT)

APPROVED
JANUARY 2019

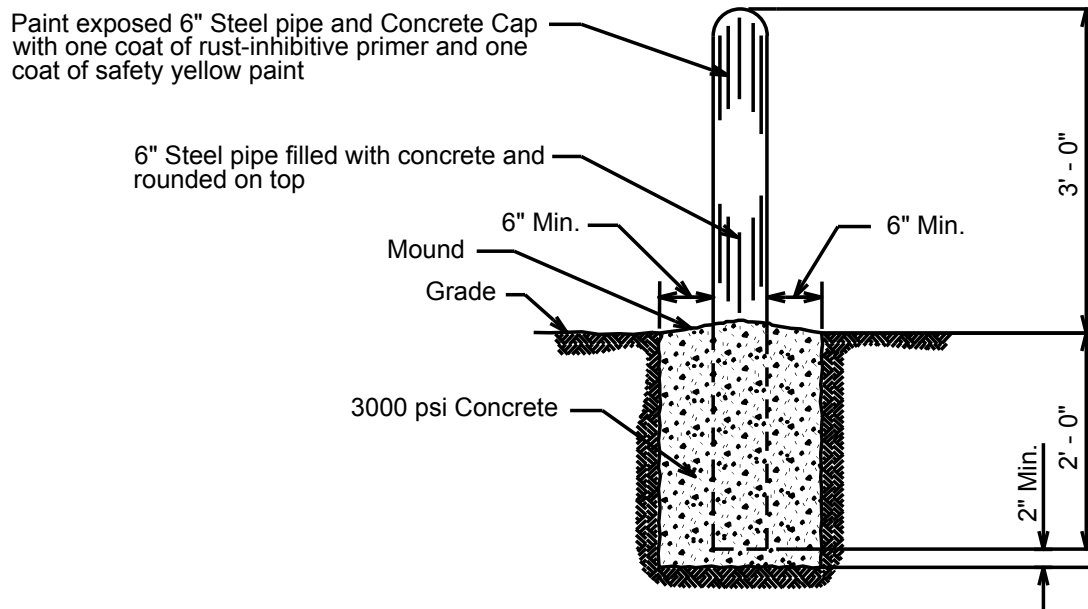
REVISED

DD-834-01

SHEET
2 OF 2

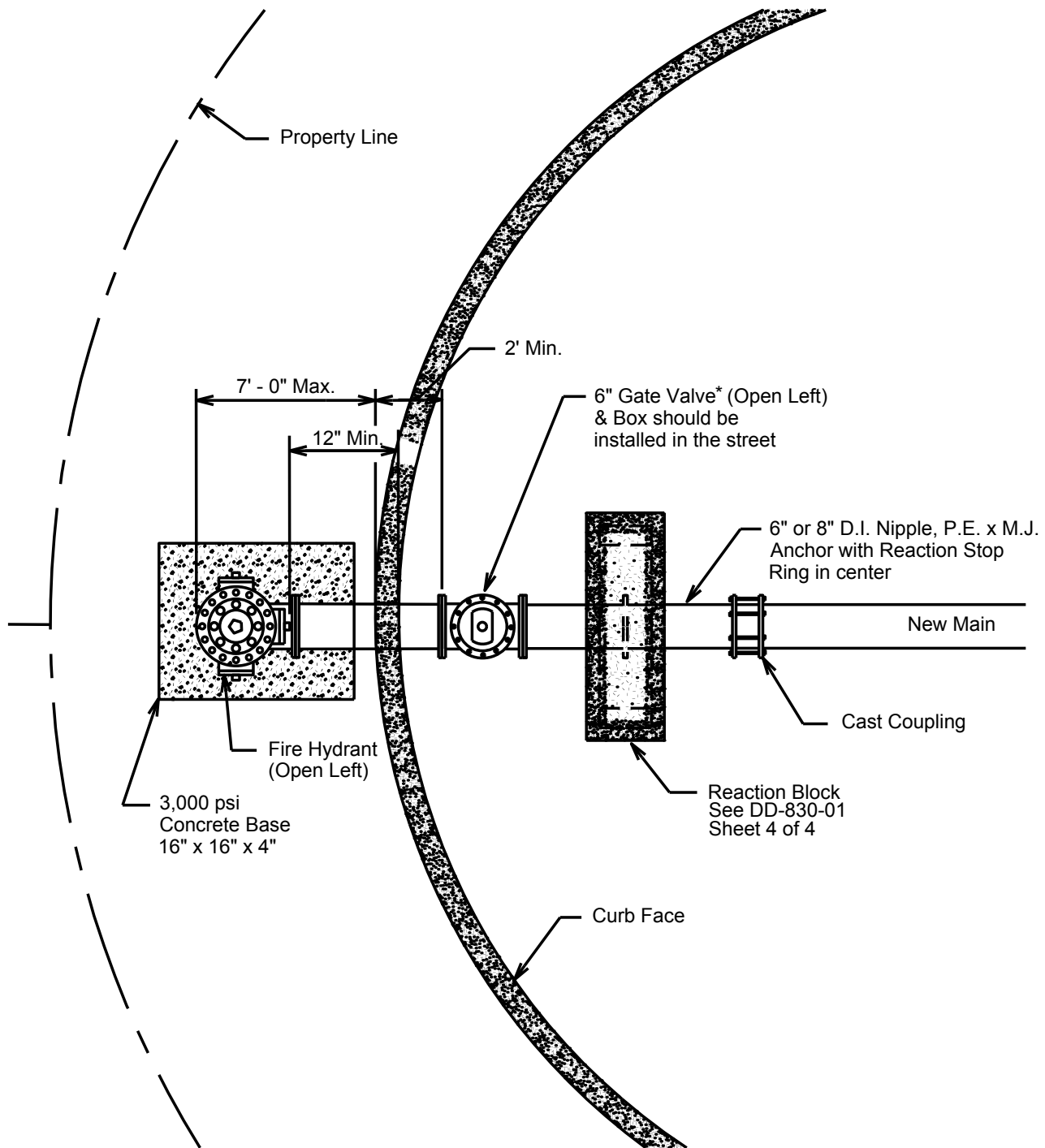


Note:
1. For Highway installation, see TxDOT Specifications.



Note:
1. Install Guard Post as required to protect Fire Hydrant from vehicular traffic.

PROPERTY OF THE CITY OF FAIR OAKS RANCH	FIRE HYDRANT GUARD POST	APPROVED	REVISED
		JANUARY 2019	
		DD-834-02	SHEET 1 OF 1



* Resilient Seat

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RANCH

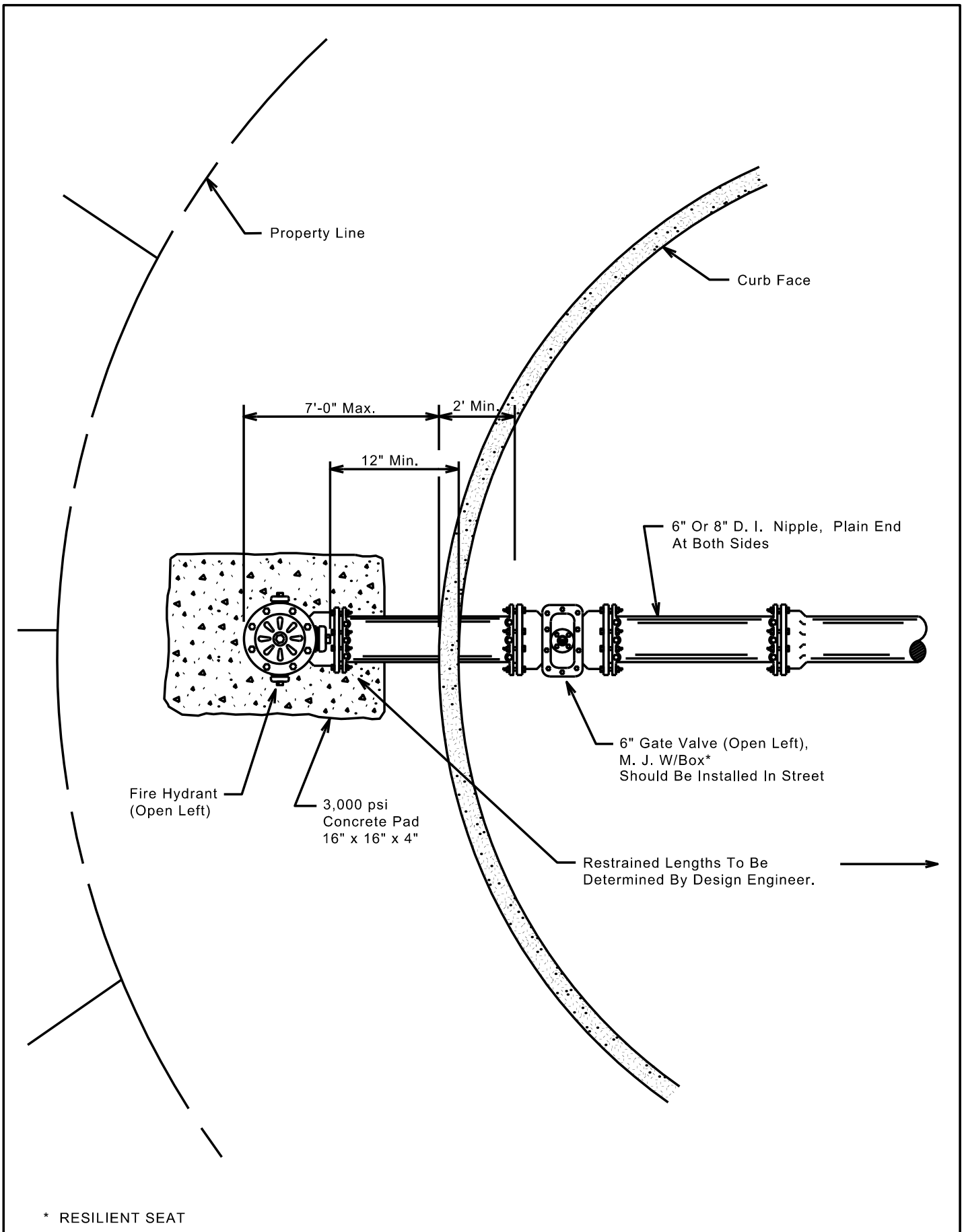
FIRE HYDRANT
INSTALLATION AT
CUL-DE-SAC

APPROVED
JANUARY 2019

REVISED

DD-834-03

SHEET
1 OF 2



PROPERTY OF THE CITY OF FAIR OAKS RANCH	FIRE HYDRANT INSTALLATION AT CUL-DE-SAC (JOINT RESTRAINT)	APPROVED	REVISED
		JANUARY 2019	
		DD-834-03	SHEET 2 OF 2

ITEM NO. 836
GREY-IRON AND DUCTILE-IRON FITTINGS

- 8361 DESCRIPTION:** This item shall consist of grey-iron and ductile-iron fittings installation and adjustment installed in accordance with these specifications and as directed by the Engineer.
- 8362 SUBMITTALS:** Contractor shall submit manufacturer's product data, instructions, recommendations, shop drawings, and necessary certifications.
- 8363 MATERIALS:** The materials for grey-iron and ductile-iron fittings installation shall conform to the latest provisions of American National Standard for Ductile-Iron (ANSI)/ American Water Works Association (AWWA) C153/A21.53, Compact Fittings 3-inch through 64-inch and ANSI/AWWA C110/A21.10, Full Body Fittings 3-inch through 48-inch for Water Service or most applicable approved equal provisions, and the specifications contained within the latest revision of Fair Oaks Ranch' Material Specification Item No. 10-10, "Grey-Iron and Ductile-Iron Fittings."
- 8364 CONSTRUCTION:** All fittings shall be either restrained mechanical joint compact or flanged joint, unless otherwise specified in the contract documents. All mechanical joint compact fittings shall be installed using approved restraining glands in accordance with Fair Oaks Ranch' Material Specification Item No. 113-02. No separate payment will be made for these restraining glands. Approved adapters shall be used where necessary to provide a transition between pipes and/or fittings of differing outside diameters. Thrust blocking shall only be utilized, in addition to restraining glands, if specified in the contract documents, when tying into existing non-restrained pipe, or when approved by the Inspector. Anti-corrosion protection consisting of polyethylene sleeve and asphaltic material for ferrous surfaces shall be applied to exterior surfaces of all fittings installed. Anti-corrosion embedment shall be provided as specified in Item No. 804, "Excavation, Trenching and Backfill."
- 8365 MEASUREMENT:** Ductile-Iron and Grey-Iron Fittings will be measured by their weight as listed in Table 836-1 of this specification of the various sizes of fittings installed.

Fair Oaks Ranch Standard Specifications for Construction

8366

PAYMENT: Payment for Grey-Iron and Ductile-Iron Fittings shall be for Mechanical Joint Compact fittings (AWWA) C153/A21.53 and/or flanged fittings. Payment will be made at the unit price bid for each ton of fittings to the nearest one-hundredth of a ton of fittings installed. Individual fitting weights used for payment calculations will be the weights of fittings listed in Table 836-1 of this specification. Weights of glands, bolts, nuts, gaskets (all types) are considered subsidiary to the fittings and no separate payment will be made for their weight. Payment for fitting weights listed in Table 836-1 shall be full compensation for excavation, installation, anti-corrosion protection, select anti-corrosion embedment material and installation, hauling and disposition of surplus excavated materials, all glands, bolts, nuts, rubbers, and flange gaskets of whatever type required, and concrete thrust/reaction blocking, if required. If fittings other than those listed in Table 836-1 are approved and installed, the Contractor shall provide quantities and manufacturers unit weights exclusive of glands, bolts, and rubbers with pay request.

TABLE 836-1							
WEIGHTS OF GREY-IRON AND DUCTILE-IRON FITTINGS (LBS.)							
BENDS							
Size (Inches)	MJ Compact (C153)	MJ (C110)	FLG SB	Size (Inches)	MJ Compact (C153)	MJ (C110)	FLG SB
1/4 Bend (90 Degrees)				1/8 Bend (45 degrees)			
4	25	55	44	4	21	51	36
6	43	86	67	6	35	75	57
8	61	125	115	8	50	110	105
12	119	258	236	12	96	216	196
16	264	454	478	16	200	345	315
20	447	716	878	20	337	555	485
24	602	1105	1085	24	441	777	730
30	979	1740	1755	30	775	1393	1355
36	1501	2507	2135	36	1140	2163	1755
42	2277	3410	3055	42	1652	2955	2600
48	3016	4595	4095	48	2157	4080	3580
BENDS							
Size (Inches)	MJ Compact	MJ (C110)	FLG SB	Size (Inches)	MJ Compact	MJ (C110)	FLG SB

Fair Oaks Ranch Standard Specifications for Construction

	(C153)				(C153)		
1/16 Bend (22-1/2 Degrees)				1/32 Bend (11-1/4 degrees)			
4	18	50	35	4	17	50	40
6	32	75	64	6	30	73	56
8	46	110	90	8	42	109	90
12	85	220	194	12	74	220	193
16	175	354	315	16	153	354	315
20	314	550	505	20	265	553	505
24	414	809	528	24	339	815	760
30	668	1500	1385	30	603	1410	1395
36	963	2182	1790	36	830	2195	1805
42	1354	3020	2665	42	1210	3035	2680
48	1790	4170	3665	48	1523	4190	3695

TABLE 836-1 CONTINUATION				
WEIGHTS OF GREY-IRON AND DUCTILE-IRON FITTINGS (LBS.)				
TEES				
Size (Inches)		Weight		
Run	Branch	MJ Compact (C153)	MJ (C110)	FLG Short Body
24	6	466	1035	1089
	8	487	1047	1060
	12	539	1075	1125
	16	625	1109	1070
	20	729	1504	1510
	24	785	1617	1685
30	8	739	1808	-
	12	800	1842	1801
	16	959	1885	-
	20	1026	1941	-
	24	1228	2496	2475
	30	1373	2531	2615
36	24	1548	2710	2255

Fair Oaks Ranch Standard Specifications for Construction

TABLE 836-1 CONTINUATION				
WEIGHTS OF GREY-IRON AND DUCTILE-IRON FITTINGS (LBS.)				
TEES				
Size (Inches)		Weight		
Run	Branch	MJ Compact (C153)	MJ (C110)	FLG Short Body
3	3	26	56	53
4	3	31	76	54
	4	33	80	60
6	4	49	114	90
	6	60	124	98
8	4	65	163	155
	6	76	175	148
	8	89	188	179
12	4	99	316	322
	6	115	325	297
	8	127	339	346
	12	162	407	369
16	6	226	563	573
	8	240	565	555
	12	283	615	590
	16	326	676	635
20	6	344	750	773
	8	371	766	720
	12	427	799	816
	16	503	975	950
	20	566	1068	1005

	30	1901	3545	3000
	36	2012	3686	3160
42	24	2272	3690	3245
	30	2512	4650	4125
	36	3048	5119	5360
	42	3225	6320	5580
48	24	2934	4995	4385
	30	3147	5140	4455
	36	4046	6280	5555
	42	4249	8130	7195
TABLE 836-1 CONTINUATION				
WEIGHTS OF GREY-IRON AND DUCTILE-IRON FITTINGS (LBS.)				
CROSSES				
Size (Inches)		Weight		
Run	Branch	MJ Compact (C153)	MJ (C110)	FLG Short Body
24	6	566	1025	-
	8	578	1085	1045
	12	610	1153	1110
	16	663	1256	1200
	20	975	1733	1675
	24	907	1906	1835
30	8	650	1795	-
	12	870	1925	1865
	16	900	1950	-
	20	1220	2060	-
	24	1497	2776	2675
	30	1808	3188	3075
36	24	1853	2928	2980
	30	2580	3965	-
	36	2698	4370	4370
42	24	2415	3910	-
	30	2920	5040	-
	36	3788	5835	-
	42	3908	6493	7145

Fair Oaks Ranch Standard Specifications for Construction

TABLE 836-1 CONTINUATION				
WEIGHTS OF GREY-IRON AND DUCTILE-IRON FITTINGS (LBS.)				
CROSSES				
Size (Inches)		Weight		
Run	Branch	MJ Compact (C153)	MJ (C110)	FLG Short Body
3	3	34	70	-
4	3	42	90	-
	4	46	105	-
6	4	63	140	-
	6	74	160	160
8	4	88	185	185
	6	97	205	205
	8	105	239	234
12	4	114	340	-
	6	135	360	360
	8	151	382	385
	12	199	493	495
16	6	250	590	575
	8	270	619	605
	12	332	685	-
	16	409	811	790
20	6	358	760	-
	8	379	822	790
	12	413	883	860
	16	550	1117	1085
	20	598	1274	1230

48	24	3435	5210	-
	30	4145	5495	-
	36	4873	6790	-
	42	5465	8815	-
	48	5588	9380	-

Fair Oaks Ranch Standard Specifications for Construction

TABLE 836-1 CONTINUATION				
WEIGHTS OF GREY-IRON AND DUCTILE-IRON FITTINGS (LBS.)				
CAPS			PLUGS	
Size (Inches)	MJ Compact (C153)	MJ (C110)	MJ Compact (C153)	MJ (C110)
4	10	17	12	16
6	16	29	19	28
8	24	45	30	46
12	45	82	54	85
16	95	160	97	146
20	141	235	146	218
24	193	346	197	350
30	362	644	381	626
36	627	912	688	884
42	893	1322	1200	1222
48	1076	1737	1550	1597

TABLE 836-1 CONTINUATION				
WEIGHTS OF GREY-IRON AND DUCTILE-IRON FITTINGS (LBS.)				
SOLID SLEEVES				
Size (Inches)	Weight			
	MJ Short Compact (C153)	MJ Long Compact (C153)	MJ Short (C110)	MJ Long (C110)
4	17	21	35	46
6	28	35	45	65
8	38	48	65	86
12	57	77	113	143
16	127	172	192	257
20	201	258	258	359
24	264	337	340	474
30	500	651	690	1005
36	725	960	947	1374
42	877	1209	1187	1628
48	1406	1516	1472	2033

Fair Oaks Ranch Standard Specifications for Construction

TABLE 836-1 CONTINUATION			
WEIGHTS OF GREY-IRON AND DUCTILE-IRON FITTINGS(LBS.)			
CONCENTRIC REDUCERS			
Size (Inches)			Weight
Large End	Small End	MJ Compact (C153)	MJ (C110)
6	4	27	59
8	4	38	81
8	6	41	95
12	4	70	136
12	6	69	150
12	8	70	167
16	6	134	234
16	8	136	258
16	12	126	310
20	12	213	427
20	16	221	492
24	12	304	562
24	16	315	633
24	20	315	727
30	16	596	1027
30	20	599	1085
30	24	492	1204
36	20	1042	1459
36	24	785	1580
36	30	655	1868
42	24	1356	2060
42	30	1112	2370
42	36	1116	2695
48	30	1722	3005
48	36	1650	3370
48	42	1429	3750

Fair Oaks Ranch Standard Specifications for Construction

TABLE 836-1 CONTINUATION		
WEIGHTS OF GREY-IRON AND DUCTILE-IRON FITTINGS (LBS.)		
2" Tapped Tees and Crosses		
Size (Inches)	Weight	
	MJ Compact (C153)	MJ (C110)
4	24	47
6	36	71
8	54	97
10	69	130
12	87	169
20	-	259
24	-	320

TABLE 836-1 CONTINUATION		
WEIGHTS OF GREY-IRON AND DUCTILE-IRON FITTINGS (LBS.)		
OFFSETS		
Size (Inches)	Weight	
	MJ Compact (C153)	MJ (C110)
4 x 6	35	75
4 x 12	55	83
6 x 6	35	110
6 x 12	67	138
6 x 24	96	189
8 x 6	82	164
8 x 12	98	209
8 x 24	141	280
12 x 6	121	320
12 x 12	178	420
12 x 24	240	645
20 x 12	-	1025
20 x 24	-	1245

- End of Specification -

ITEM NO. 839

ANCHORAGE/THRUST BLOCKING AND JOINT RESTRAINT

839.1 DESCRIPTION: This item shall consist of anchorage/thrust blocking installation and adjustment, in accordance with these specifications and as directed by the Engineer. Pipe restraint devices shall be installed according to the lengths prescribed herein or as noted in the contract documents, whichever is more restrictive.

839.2 MATERIALS: The materials for anchorage/thrust blocking installation shall conform to the appropriate specifications contained within the latest revision of Fair Oaks Ranch Material Specifications. Pipe restraint devices shall conform to the latest revision of Fair Oaks Ranch Material Specification Item Nos. 95-10 and 113-02.

839.3 CONSTRUCTION: Suitable anchorage/thrust blocking or joint restraint shall be provided at all of the following main locations: dead ends, plugs, caps, tees, crosses, valves, and bends, in accordance with the Standard Drawings DD-839 Series. All mechanical (joint) restraints shall be bidirectional. Anchor blocks shall be constructed solidly behind the fitting and symmetrical with the axis of resultant thrust, except where this is not possible as in the case of gravity anchorage for vertical bends. Special ties and anchor fittings may be utilized in conjunction with blocking when shown in the contract documents or as directed by the Engineer.

All thrust blocking shall be a minimum of 3,000 psi concrete placed between solid ground and the fitting except as otherwise shown in the contract documents. The area of bearing in contact with solid ground shall be that shown in the contract documents or as directed by the Engineer.

All thrust blocking placed in conjunction with mains and appurtenances constructed in high pressure zones shall be in accordance with Standard Drawings DD-839 Series. In all cases, the design of thrust blocking shall be of sufficient size to withstand an assumed soil lateral load bearing capacity of 3,000 psf, unless specified otherwise in the contract documents. When specifically requested by the Contractor and approved by the Engineer, the maximum soil lateral load bearing capacity that will be allowed for the design of thrust blocking shall be 5,000 psf. When soil lateral load bearing capacities of 4,000 psf or 5,000 psf are recorded for design of thrust blocks, copies of soil tests made for determining the lateral load bearing capacity of the subject soil shall be submitted to the Engineer for approval.

The blocking shall be placed so that pipe and fitting joints will be accessible. Pipe polywrap shall be placed between the pipe or fitting and the concrete.

Fair Oaks Ranch Standard Specifications for Construction

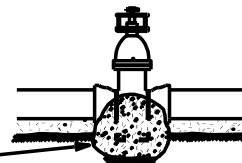
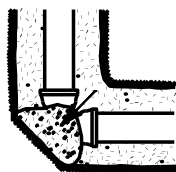
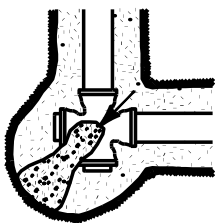
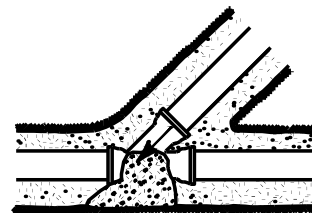
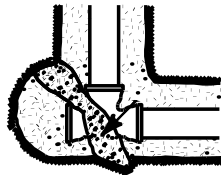
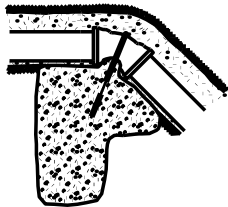
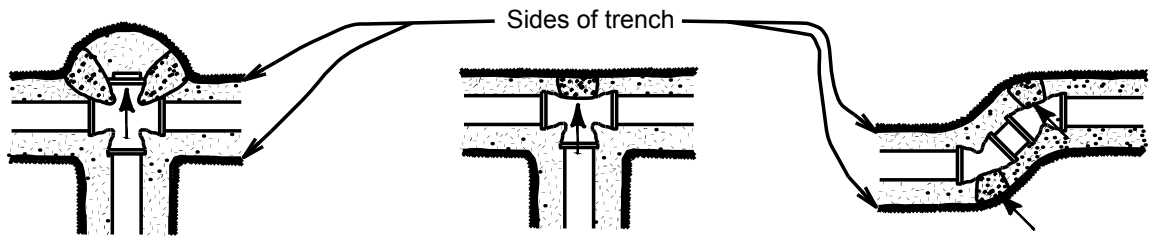
The reaction block on the unused branch of a fitting shall be poured separately from the block across the back of the fitting. If they are poured simultaneously, a rigid partition shall be placed between the blocks.

Valves 12 inches or larger in size shall be supported on a concrete pad extending vertically from 12 inches below the bottom of the valve to the lower quarter point of the hub and laterally from face to face of hubs and transversely from wall to wall of the trench.

839.4 **MEASUREMENT:** Anchorage/Thrust Blocking or Joint Restraints are considered subsidiary to the work and no separate payment will be made to the Contractor for this work.

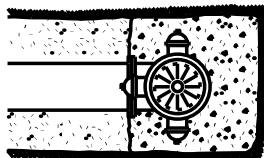
839.5 **PAYMENT:** Anchorage/Thrust Blocking or Joint Restraints are considered subsidiary to the work and no separate payment will be made to the Contractor for this work.

- End of Specification -



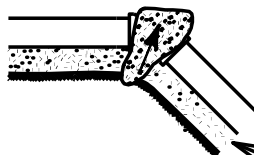
Concrete blocking required for all 12" & larger, except in high pressure distribution system where blocking is required for all valves

Select Material

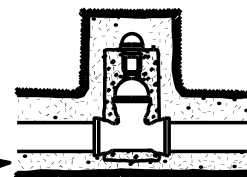


PLAN

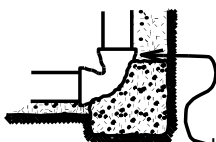
Pour base after Hydrant has been placed



Select Material

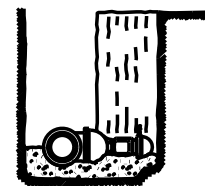
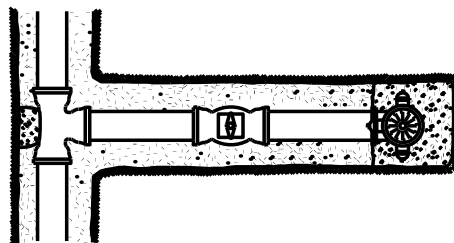


PLAN



ELEVATION

Hydrant Drain



ELEVATION

PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

THRUST BLOCKS FOR
FITTINGS (WATER ONLY)

APPROVED
JANUARY 2019

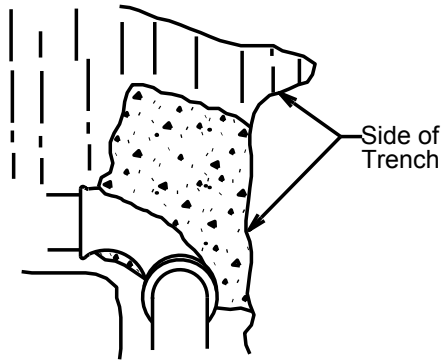
REVISED

DD-839-01

SHEET
1 OF 1

Typical
blocking for
90° Bend

Area in Sq. Ft.
for each of the
following
pipe sizes

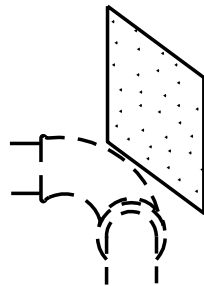


Area Sq. Ft.

THRUST BLOCKING DESIGN

On basis of 200 psi water pressure used for tests, the blocking required for two types of soils are noted below. In one case, a soil pressure of 5000 psi is used for rock excavation and for soils other than rock a 3000 psi bearing soil pressure is used. The distribution on system is pressure of 175 psi all calculations apply to A.C. Pipe Class 200 and Ductile Iron Pipe Class 2. PVC Pipe Class 200 (SDR 13.5)

2 Sq. Ft. in rock
& 4 Sq. Ft. in
other soils

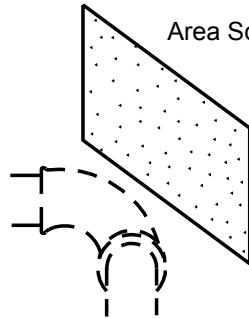


6" Class 200

Square feet of blocking required
for rock excavation

SIZE PIPE	TEES & DEAD ENDS	90° BENDS	45° BENDS	22 1/2° BENDS
6"	2	2	1	1
8"	3	4	2	1
12"	6	9	5	2
16"	11	15	8	4

4 Sq. Ft. in rock
& 6 Sq. Ft. in
other soils

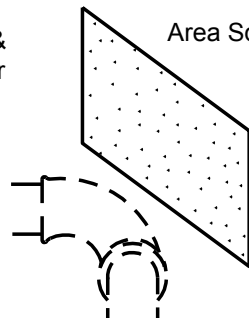


8" Class 200

Square feet of blocking required
for other than rock excavation

SIZE PIPE	TEES & DEAD ENDS	90° BENDS	45° BENDS	22 1/2° BENDS
6"	3	4	2	1
8"	4	6	4	2
12"	10	14	8	4
16"	18	25	14	7

9 Sq. Ft. in rock &
14 Sq. Ft. in other
soils



12" Class 200

Blocking area for 200 psi tests &
175 psi working pressures.

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RANCH

THRUST BLOCKING FOR
HIGH PRESSURE
SYSTEM

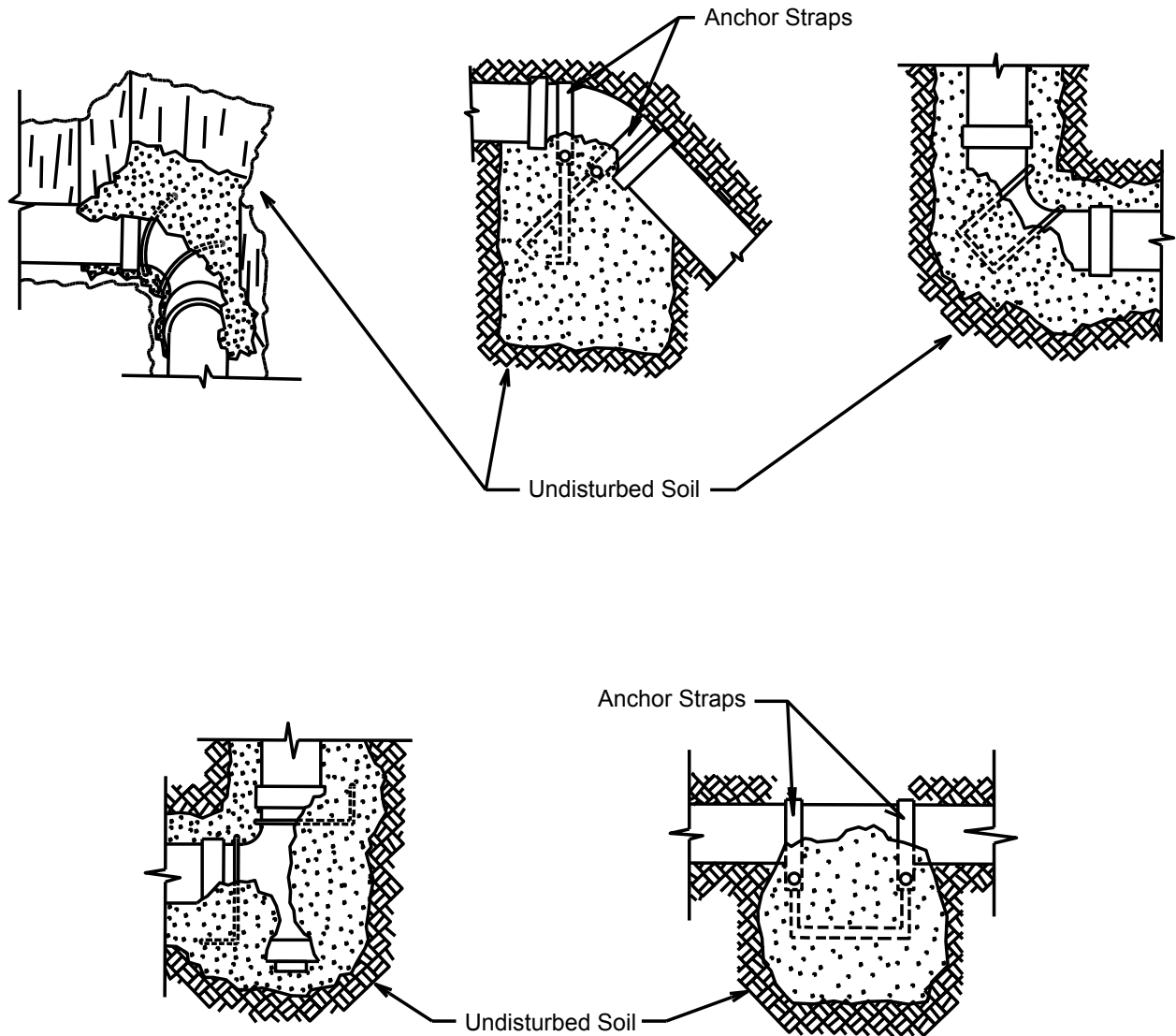
APPROVED

JANUARY 2019

REVISED

DD-839-02

SHEET
1 OF 1



Note:

1. All concrete used for thrust blocking shall have a minimum concrete strength of 3,000 psi

PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

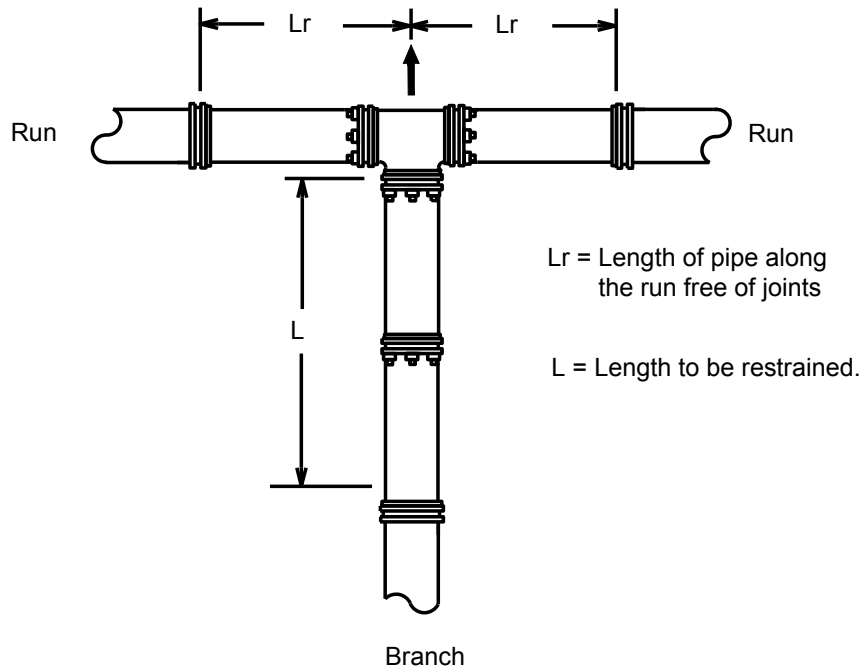
TYPICAL THRUST BLOCKS
(SEWER ONLY)

APPROVED
JANUARY 2019

REVISED

DD-839-03

SHEET
1 OF 1



RESTRAINED LENGTH FOR TEES

PIPE SIZE (inch)	BRANCH SIZE (inch)	LENGTH OF RUN (ft.)	RESTRAINED LENGTH IN FEET, WHEN TEST PRESSURE = 200 psi	RESTRAINED LENGTH IN FEET, WHEN TEST PRESSURE = 150 psi
6	4	0	42	31
6	4	5	7	1
6	4	10	1	1
6	6	0	59	44
6	6	5	35	20
6	6	10	11	1
8	4	0	42	31
8	4	5	1	1
8	6	0	59	44
8	6	5	28	13
8	6	10	1	1
8	8	0	77	58
8	8	5	53	34
8	8	10	30	11
8	8	15	6	1

RESTRAINED LENGTH DESIGN

Restrained length calculations are for P.V.C pipe bedded in compacted granular material extending to the top of the pipe. The native soil material is assumed to be inorganic clay of high plasticity. Depth of bury is assumed to be 4 feet.

Note:

These calculations are provided for reference. The restrained length shall be designed based upon the conditions encountered during the installation.

PROPERTY OF THE CITY OF FAIR OAKS RANCH	RESTRAINED LENGTHS FOR TEES	APPROVED	REVISED
		JANUARY 2019	
		DD-839-04	SHEET 1 OF 2

RESTRAINED LENGTH FOR TEES (Cont'd)

PIPE SIZE (inch)	BRANCH SIZE (inch)	LENGTH OF RUN (ft.)	RESTRAINED LENGTH IN FEET, WHEN TEST PRESSURE = 200 psi	RESTRAINED LENGTH IN FEET, WHEN TEST PRESSURE = 150 psi
12	4	0	42	31
12	4	5	1	1
12	6	0	59	44
12	6	5	13	1
12	6	10	1	1
12	8	0	77	58
12	8	5	42	23
12	8	10	7	1
12	8	15	1	1
12	12	0	109	82
12	12	5	86	59
12	12	10	63	35
12	12	15	39	12

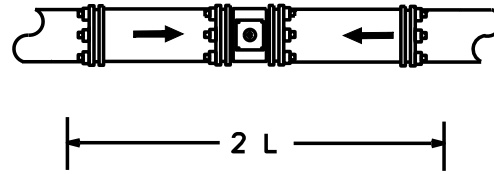
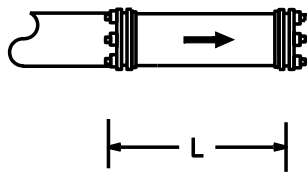
RESTRAINED LENGTH DESIGN

Restrained length calculations are for P.V.C pipe bedded in compacted granular material extending to the top of the pipe. The native soil material is assumed to be inorganic clay of high plasticity. Depth of bury is assumed to be 4 feet.

Note:

These calculations are provided for reference. The restrained length shall be designed based upon the conditions encountered during the installation.

PROPERTY OF THE CITY OF FAIR OAKS RANCH	RESTRAINED LENGTHS FOR TEES	APPROVED	REVISED
		JANUARY 2019	
		DD-839-04	SHEET 2 OF 2



L=LENGTH TO BE RESTRAINED

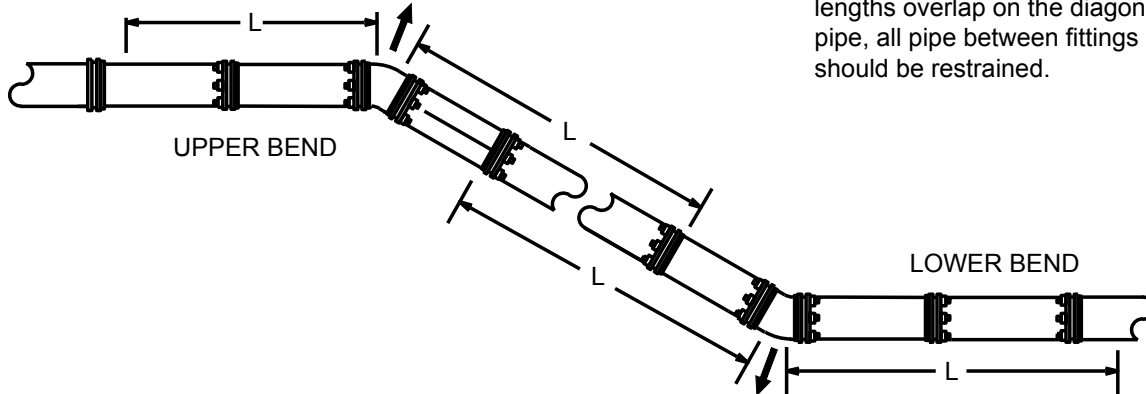
PIPE SIZE (inch)	RESTRAINED LENGTH IN FEET, WHEN TEST PRESSURE = 200 psi	RESTRAINED LENGTH IN FEET, WHEN TEST PRESSURE = 150 psi
6	59	44
8	77	58
10	93	69
12	109	82

RESTRAINED LENGTH DESIGN

Restrained length calculations are for P.V.C. pipe bedded in compacted granular material extending to the top of the pipe. The native soil material is assumed to be inorganic clay of high plasticity. Depth of bury is assumed to be 4 feet.

Note:

These calculations are provide for reference. The restrained length shall be designed based upon the conditions encountered during the installation.



PIPE SIZE (inch)	BEND ANGLE (deg.)	LOW SIDE DEPTH	UPPER BEND RESTRAINED LENGTH IN FEET TEST PRESSURE = 200 psi	LOWER BEND RESTRAINED LENGTH IN FEET TEST PRESSURE = 200psi	UPPER BEND RESTRAINED LENGTH IN FEET TEST PRESSURE = 150 psi	LOWER BEND RESTRAINED LENGTH IN FEET TEST PRESSURE = 150 psi
6	45	5	24	8	18	6
6	22.5	5	12	4	9	3
6	11.25	5	6	2	4	1
6	45	10	24	5	18	4
6	22.5	10	12	2	9	2
6	11.25	10	6	1	4	1
8	45	5	32	11	24	8
8	22.5	5	15	5	11	4
8	11.25	5	8	3	6	2
8	45	10	32	7	24	5
8	22.5	10	15	3	11	2
8	11.25	10	8	2	6	1
12	45	5	45	16	34	12
12	22.5	5	22	7	16	6
12	11.25	5	11	4	8	3
12	45	10	45	10	34	7
12	22.5	10	22	5	16	3
12	11.25	10	11	2	8	2

RESTRAINED LENGTH DESIGN

Restrained length calculations are for P.V.C. pipe bedded in compacted granular material extending to the top of the pipe. The native soil material is assumed to be inorganic clay of high plasticity. Depth of bury is assumed to be 4 feet.

Note:

These calculations are provided for reference. The restrained length shall be designed based upon the conditions encountered during the installation.

PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

RESTRAINED LENGTHS
VERTICAL OFFSETS

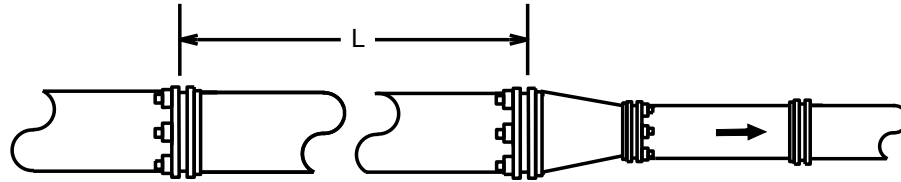
APPROVED

JANUARY 2019

REVISED

DD-839-06

SHEET
1 OF 1



L=Length to be restrained

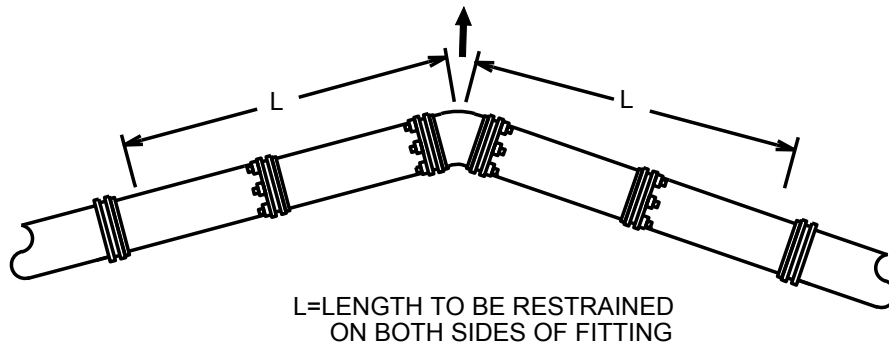
PIPE SIZE (inch)	SMALL SIZE (inch)	RESTRAINED LENGTH IN FEET, WHEN TEST PRESSURE = 200 psi	RESTRAINED LENGTH IN FEET, WHEN TEST PRESSURE = 150 psi
6	4	30	23
8	4	55	42
8	6	32	24
12	4	95	71
12	6	80	60
12	8	58	43

RESTRAINED LENGTH DESIGN

Restrained length calculations are for P.V.C. pipe bedded in compacted granular material extending to the top of the pipe. The native soil material is assumed to be inorganic clay of high plasticity. Depth of bury is assumed to be 4 feet.

Note:

These calculations are provided for reference. The restrained length shall be designed based upon the conditions encountered during the installation.



PIPE SIZE (inch)	BEND ANGLE (deg)	RESTRAINED LENGTH IN FEET, WHEN TEST PRESSURE = 200 psi	RESTRAINED LENGTH IN FEET, WHEN TEST PRESSURE = 150 psi
6	90	23	17
6	45	9	7
6	22.5	5	3
6	11.25	2	2
8	90	30	22
8	45	12	9
8	22.5	6	4
8	11.25	3	2
12	90	43	32
12	45	18	13
12	22.5	8	6
12	11.25	4	3

RESTRAINED LENGTH DESIGN

Restrained length calculations are for P.V.C pipe bedded in compacted granular material extending to the top of the pipe. The native soil material is assumed to be inorganic clay of high plasticity. Depth of bury is assumed to be 4 feet.

Note:

These calculations are provided for reference. The restrained length shall be designed based upon the conditions encountered during the installation.

Fair Oaks Ranch Standard Specifications for Construction

**ITEM NO. 840
WATER TIE-INS**

- 840.1 DESCRIPTION:** This item shall consist of water main tie-ins installed in accordance with these specifications and as directed by the Engineer.
- 840.2 MATERIALS:** The materials for water main tie-ins shall conform to the specifications contained within the latest revision of Fair Oaks Ranch' Material Specifications for all appropriate items.
- 840.3 CONSTRUCTION:** The Contractor shall make tie-ins from new water mains to existing water mains as shown in the contract documents or as directed by the Engineer. The Contractor shall be responsible for all shutdowns and isolation of the existing mains; cutting pipe for the connection; dewatering the excavation; customer notification of the shutdown; and all other requirements as directed by the Inspector in order to provide completion of this effort in a safe and secure manner. Work performed by the Contractor on mains 16 inches and larger, will require operation of any valves by Fair Oaks Ranch forces. Therefore ample coordination beforehand (2 work days) shall be provided by the Contractor for this interaction to occur. All tie-ins shall be done after normal work hours, (8am-5pm). During construction, the planned shutdown and tie-in work shall be coordinated through and approved by the Inspector with a minimum of two weeks prior notice of such activity and accomplished at a time which will be at the least inconvenience to the customers. No additional compensation will be provided for tie-ins accomplished after normal working hours.
- 840.4 MEASUREMENT:** Tie-ins will be measured by the unit of each such assembly of the various sizes of tie-ins installed at the proposed main to be accepted.
- 840.5 PAYMENT:** Payment for "Tie-ins" will be made at the unit price bid for each tie-in of the various types and sizes completed from an existing main to the proposed main to be accepted. Such payment shall include; shut-down and isolation of the existing main to which the new main is to be connected, cutting pipe for the connection, dewatering the excavation, and customer notification of service interruption where required. Connections between new and existing mains which are made with tapping sleeves and valves and by cutting-in tees will be processed as a no separate pay item.

- End of Specification -

ITEM NO. 841
HYDROSTATIC TESTING OPERATIONS

841.1 DESCRIPTION: This item shall consist of hydrostatic testing operations, of water mains in accordance with these specifications.

841.2 MATERIALS: The materials for hydrostatic testing operations installation and adjustment shall conform to the appropriate specifications contained within the latest revision of Fair Oaks Ranch' Material Specifications.

841.3 PROTOCOL:

1. Flushing: Immediately upon completion of water main work, the Contractor shall flush all mains affected by the scope of the work. This flushing shall consist of completely filling sections of main between valves and then displacing such initial volumes of water by introducing clear water from existing facilities into and through the main to the point of discharge from the main being flushed. The flow-through shall continue until it is determined all dust, debris, or foreign matter that may have entered during pipe laying operations has been flushed out. All new mains shall then be left under system pressure for testing.

To avoid damage to pavement and inconvenience to the public, fire hoses shall be used to direct flushing water from the main into suitable drainage channels or sewers. The contractor is to coordinate with the Inspector prior to flushing.

2. Operation of Valves: No valve in the Owner's water distribution system shall be operated by the Contractor without prior permission of the Inspector. The Contractor shall notify the Inspector when a valve is to be operated and shall only operate the valve in the presence of the Inspector.
3. Hydrostatic Test: Except in the high pressure sections of the water distribution system where test pressures will exceed 150 psi, all new mains shall be hydrostatically field tested at a maximum test pressure of 150 psi before acceptance by the Engineer or Inspector. Where designated as "High Pressure Area," all new mains shall be hydrostatically field tested at a maximum test pressure of 200 psi before acceptance by the Engineer or Inspector. It is the intent of these Specifications that all joints be

Fair Oaks Ranch Standard Specifications for Construction

watertight and that all joints which are found to leak by observation during any test shall be made watertight by the Contractor. When repairs are required, the hydrostatic field test shall be repeated until the pipe installation conforms to the specified requirements and is acceptable to the Engineer/Inspector. The Contractor shall insure that the Engineer/Inspector be present for the duration of the pressure test.

4. Test Procedures: After the new main has been laid and backfilled as specified (but prior to chlorination and replacement of pavement), it shall be filled with water for a minimum of 24 hours and then subjected to a hydrostatic pressure test.

The specified test pressure shall be supplied by means of a pump connected to the main in a satisfactory manner. The pump, pipe connection, and all necessary appurtenances including gauges and meters shall be furnished by the Contractor. Unless otherwise specified, the Owner will furnish water for filling lines and making tests through existing mains. Before applying the specified test pressure, all air shall be expelled from the main. To accomplish this, taps shall be made, if necessary, at the points of highest elevation and afterwards tightly plugged at no cost to the Owner. At intervals during the test, the entire route of the new main shall be inspected to locate any leaks or breaks. If any are found, they shall be stopped or repaired, and the test shall be repeated until satisfactory results are obtained. The hydrostatic test shall be made so that the maximum pressure at the lowest point does not exceed the specified test pressure.

The duration of each pressure test shall be a minimum of 4 hours for new mains in excess of 1000 linear feet and a minimum of 1 hour for new mains less than 1000 linear feet after the main has been brought up to test pressure. The test pressure shall be measured by means of a tested and properly calibrated pressure gauge acceptable to the Engineer/Inspector. All pressure tests shall be continued until the Inspector is satisfied that the new main meets the requirements of these Specifications.

Should any test of pipe in place disclose leakage greater than that listed in Table 841-1 or 841-2, "Hydrostatic Test Leakage Allowances," as applicable, the Contractor shall, at his own expense, locate and repair the defective joints until the leakage is within the specified allowance.

Fair Oaks Ranch Standard Specifications for Construction

Leakage is defined as the quantity of water supplied into the newly laid main, or any valved section of it, necessary to maintain the specified leakage test pressure after the main has been filled with water and the air expelled.

Exhibit S-841 is a schematic showing the arrangement of the test apparatus as well as the detailed procedure for conducting the hydrostatic field test.

8414 **MEASUREMENT:** Hydrostatic Pressure Test will be measured by the unit of each successful test conducted.

8415 **PAYMENT:** Payment for "Hydrostatic Pressure Test" will be made at the unit price bid for each successful test. Such payment shall also include all pipe, valves, fittings, pumping equipment, pressure gauge, and other required apparatus incidental to the conduct of the test.

Fair Oaks Ranch Standard Specifications for Construction

TABLE 841-1														
HYDROSTATIC TEST LEAKAGE ALLOWANCES (MAXIMUM) @ 150 PSI														
Nominal Diameter & Type Pipe	ALLOWABLE LEAKAGE IN GALLONS PER HOUR (GPH)*													
	100 L.F.	200 L.F.	300 L.F.	400 L.F.	500 L.F.	600 L.F.	700 L.F.	800 L.F.	900 L.F.	1000 L.F.	2000 L.F.	3000 L.F.	4000 L.F.	5000 L.F.
6" DI**	0.11	0.22	0.33	0.44	0.55	0.66	0.77	0.88	0.99	1.10	2.20	3.30	4.40	5.50
8" DI**	0.15	0.29	0.44	0.59	0.71	0.88	1.03	1.18	1.32	1.47	2.94	4.41	5.88	7.35
12" DI**	0.22	0.44	0.66	.088	1.10	1.32	1.54	1.76	1.98	2.20	4.40	6.60	8.80	11.00
16" DI**	0.29	0.59	0.88	1.18	1.47	1.76	2.06	2.35	2.65	2.94	5.88	8.82	11.76	14.70
20" DI**	0.39	0.74	1.10	1.47	1.84	2.21	2.55	2.94	3.31	3.68	7.63	11.04	14.72	18.40
20" CSC	0.08	0.16	0.24	0.32	0.40	0.47	0.55	0.63	0.71	0.79	1.58	2.37	3.16	3.95
24" DI**	0.44	0.88	1.32	1.76	2.21	2.65	3.09	3.53	9.97	4.41	8.82	13.23	17.64	22.05
24" CSC	0.1	0.19	0.29	0.38	0.48	0.57	0.67	0.76	0.86	0.95	1.90	2.85	3.80	4.75
30" DI**	0.55	1.1	1.66	2.21	2.76	3.31	3.86	4.42	4.97	5.52	11.04	16.56	22.08	27.60
30" CSC	0.12	0.24	0.35	0.47	0.59	0.71	0.83	0.94	1.06	1.18	2.36	3.54	4.72	5.90
36" DI**	0.66	1.32	1.99	2.65	3.31	3.97	4.63	5.3	5.96	6.62	13.24	19.86	26.48	33.10
36" CSC	0.14		0.28	0.57	0.71	0.85	0.99	1.14	1.28	1.42	2.84	4.26	5.68	7.10
42" DI**	0.77	1.54	2.32	3.09	3.86	4.63	5.4	6.18	6.95	7.72	15.44	22.16	30.88	38.60
42" CSC	0.17	0.33	0.5	0.66	0.83	1	1.16	1.33	1.49	1.66	3.32	4.98	6.64	8.30
48" DI**	0.88	1.77	2.65	3.53	4.42	5.3	6.18	7.06	7.95	8.83	17.66	26.16	35.32	44.15
48" CSC	0.19	0.38	0.57	0.76	0.95	1.13	1.32	1.51	1.7	1.89	3.78	4.98	6.64	8.30
54" CSC	0.21	0.42	0.63	0.84	1.05	1.26	1.47	1.68	1.89					
60" CSC	0.24	0.48	0.72	0.96	1.2	1.44	1.68	1.92	2.16					

* PVC pipe shall be tested to DI pressures. GPH for CSC Pipe are manufacturer's maximum.

** DI pipe includes mechanical and push-on joints.

Fair Oaks Ranch Standard Specifications for Construction

TABLE 841-2										
Hydrostatic Test Leakage Allowances (Maximum) @ 200 PSI										
Nominal Pipe Diameter	Allowable Leakage in Gallons Per Hour (GPH)*									
	100 L.F.	200 L.F.	300 L.F.	400 L.F.	500 L.F.	600 L.F.	700 L.F.	800 L.F.	900 L.F.	1000 L.F.
6" DI**	0.13	0.25	0.38	0.51	0.64	0.6	0.89	1.02	1.14	1.27
8" DI**	0.17	0.34	0.51	0.68	0.85	1.02	1.19	1.36	1.53	1.7
12" DI**	0.26	0.51	0.77	1.02	1.28	1.53	1.79	2.04	2.3	2.55
16" DI**	0.34	0.68	1.02	1.36	1.7	2.04	2.38	2.72	3.06	3.4
20" DI**	0.43	0.85	1.28	1.7	2.13	2.55	2.98	3.4	3.83	4.25
20" CSC	0.08	0.16	0.24	0.32	0.4	0.47	0.55	0.63	0.71	0.79
24" DI**	0.51	1.02	1.53	2.04	2.55	3.06	3.57	4.08	3.59	5.1
24" CSC	0.1	0.19	0.29	0.38	0.48	0.57	0.67	0.76	0.86	0.95
30" DI**	0.64	1.27	1.91	2.55	3.19	3.82	4.46	5.1	5.73	6.37
30" CSC	0.12	0.24	0.35	0.47	0.59	0.71	0.83	0.94	1.06	1.18
36" DI**	0.76	1.53	2.29	3.06	3.82	4.58	5.35	6.11	6.88	7.64
36" CSC	0.14	0.28	0.43	0.57	0.71	0.85	0.99	1.14	1.28	1.42
42" DI**	0.89	1.78	2.68	3.57	4.46	5.35	6.24	7.14	8.03	8.92
42" CSC	0.17	0.33	0.5	0.66	0.83	1	1.16	1.33	1.49	1.66
48" DI**	1.02	2.04	3.06	4.08	5.1	6.11	7.13	8.15	9.17	10.19
48" CSC	0.19	0.38	0.7	0.76	0.95	1.13	1.32	1.51	1.7	1.89
54" CSC	0.21	0.42	0.63	0.84	1.05	1.26	1.47	1.68	1.89	2.1
60" CSC	0.23	0.46	0.69	0.92	1.15	1.38	1.61	1.84	2.07	2.3

* PVC pipe shall be tested to DI pressures. GPH for CSC pipe are manufacturer's maximum.

** DI pipe includes mechanical and push-on joints.

- End of Specification -

Fair Oaks Ranch Standard Specifications for Construction

**ITEM NO. 844
BLOW-OFF ASSEMBLIES**

844.1 DESCRIPTION: This item shall consist of blow-off assemblies installed in accordance with these specifications and as directed by the Engineer.

844.2 MATERIALS: The materials for blow-off assemblies, installation and adjustment shall conform to the specifications contained within the latest revision of Fair Oaks Ranch' Material Specification.

844.3 CONSTRUCTION: Permanent and temporary blow-off assemblies shall be installed where shown on the plans and/or at locations designated by the Engineer/Owner and at the end of all dead end mains in accordance with the Texas Administrative Code (TAC) rules to include 30 TAC § 290.44.(d)(5), (6).

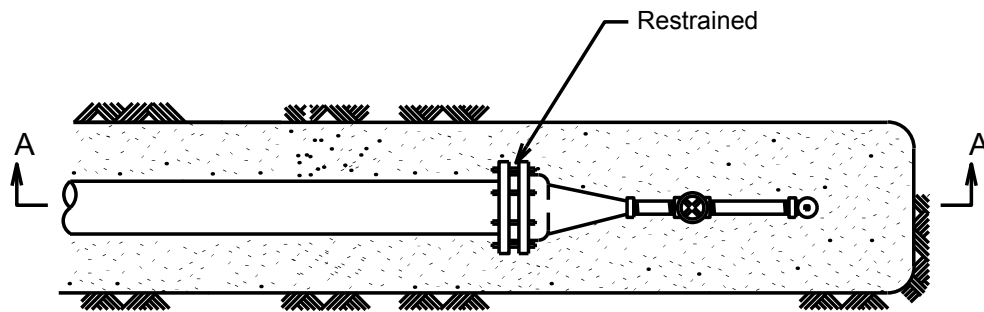
The permanent blow-off shall consist of the following: all galvanized iron pipe, valve, and fittings of the various sizes shown on the plans, 6 inch valve box assembly and concrete collar around the valve box. The temporary blow-off shall consist of the following; all galvanized iron pipe, valve and fittings of the various sizes shown on the plans. Valve box shall be raised or installed to finished grade and installed in accordance with Standard Drawing DD-844 Series.

844.4 MEASUREMENT: Permanent Blow-off assemblies will be measured by the unit of each such assembly of the various sizes of permanent blow-offs installed.

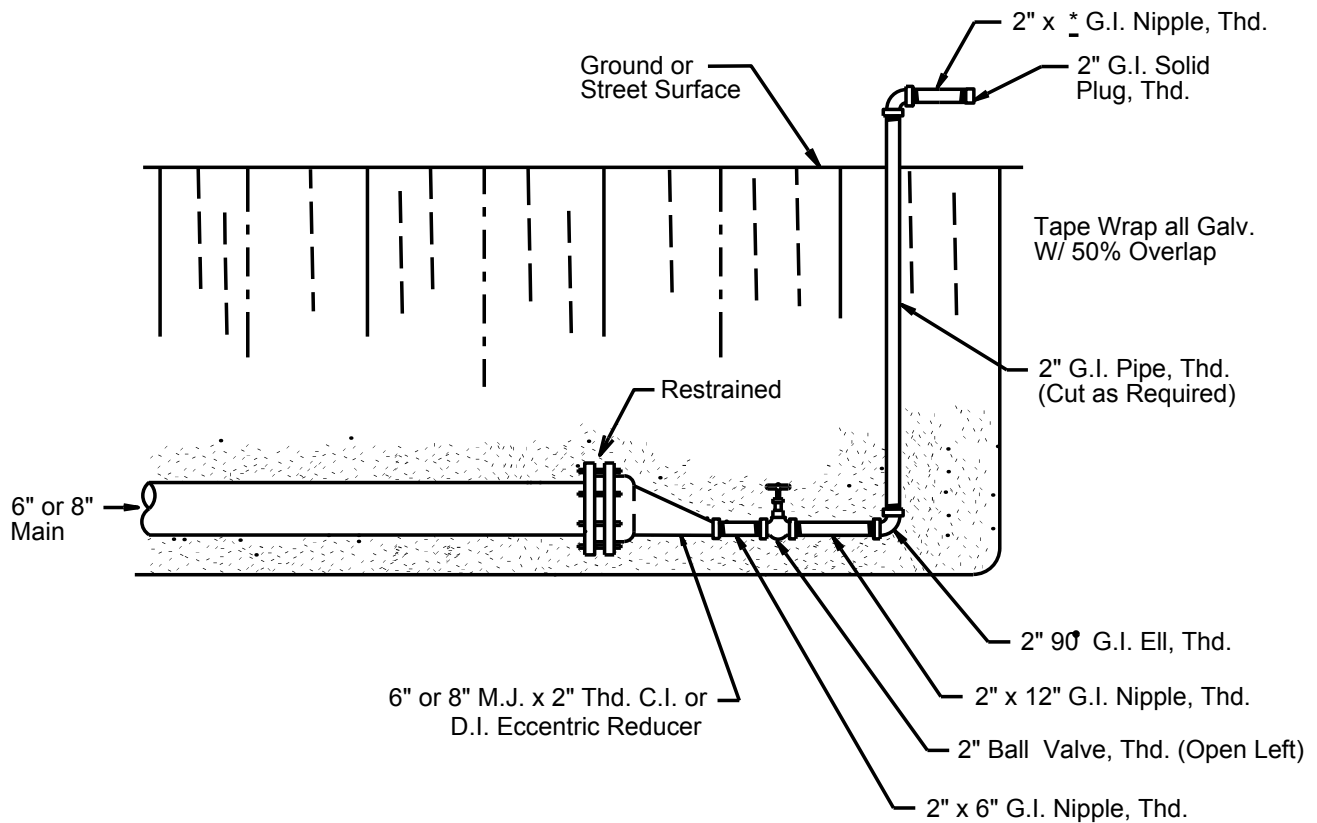
Temporary Blow-off assemblies will be measured by the unit of each such assembly of the various sizes of temporary blow-offs installed.

844.5 PAYMENT: Payment for Permanent and Temporary Blow-off will be made at the unit price bid for each such assembly of the various types and sizes installed in accordance with the details shown in the Standard Drawing DD-844 Series. Such payment shall also include excavation, selected embedment material, anti-corrosion embedment when specified, and the hauling and disposition of surplus excavated materials. Payment for eccentric reducers and eccentrically tapped caps and flanges will be made under Item No. 836, "Grey-Iron and Ductile-Iron Fittings," while payment for the pipe nipple with reaction stop ring will be made under Item No. 812, "Water Main Installation,"

- End of Specification -



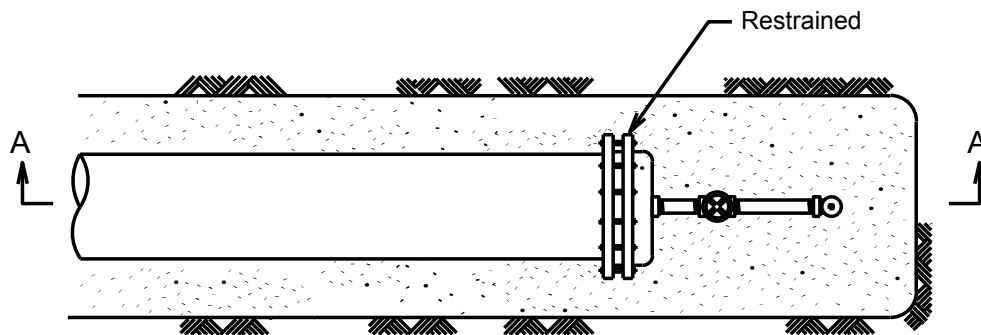
PLAN



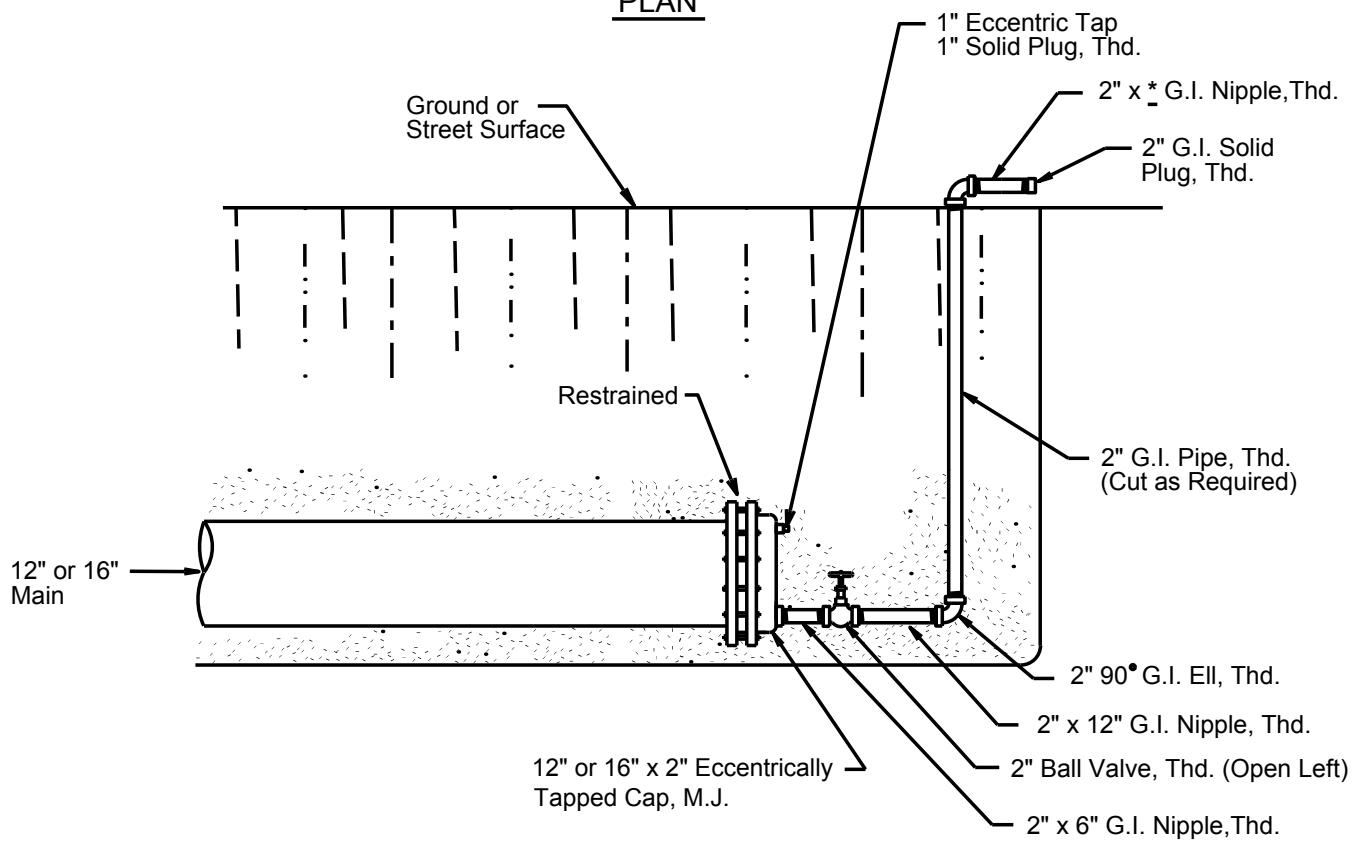
SECTION A-A

* Cut as required to extend beyond excavation

PROPERTY OF THE CITY OF FAIR OAKS RANCH	2" TEMPORARY BLOW-OFF ASSEMBLY ON 6" & 8" D.I. MAINS	APPROVED	REVISED
		JANUARY 2019	
		DD-844-01	SHEET 1 OF 4



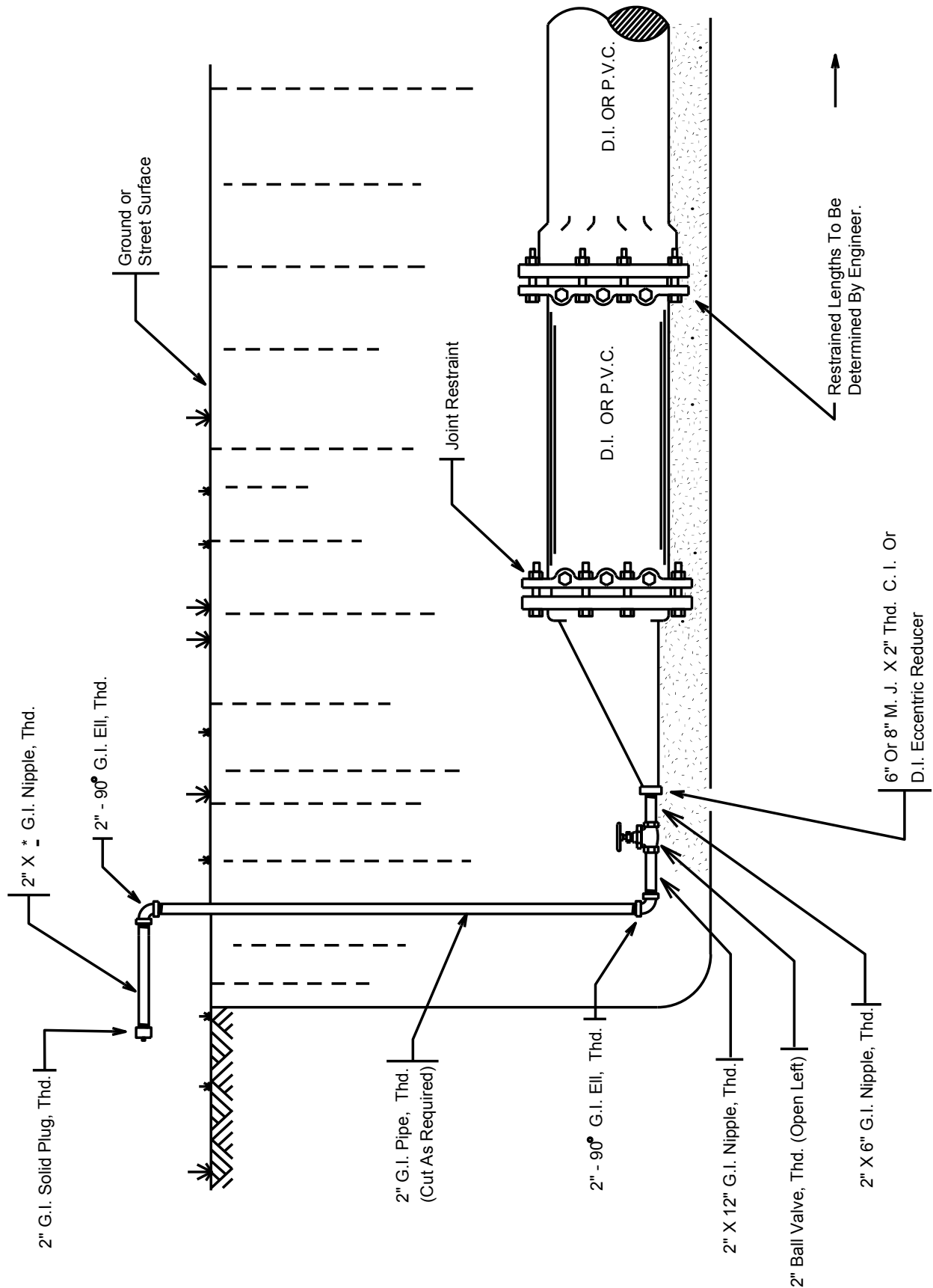
PLAN



SECTION A-A

* Cut as required to extend beyond excavation.

PROPERTY OF THE CITY OF FAIR OAKS RANCH	2" TEMPORARY BLOW-OFF ASSEMBLY ON 12" & 16" D.I. MAINS	APPROVED	REVISED
		JANUARY 2019	
		DD-844-01	SHEET 2 OF 4



* Cut as required to extend beyond excavation.

NOTE:
1. FITTINGS FOR 6" AND 8" PIPE

PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

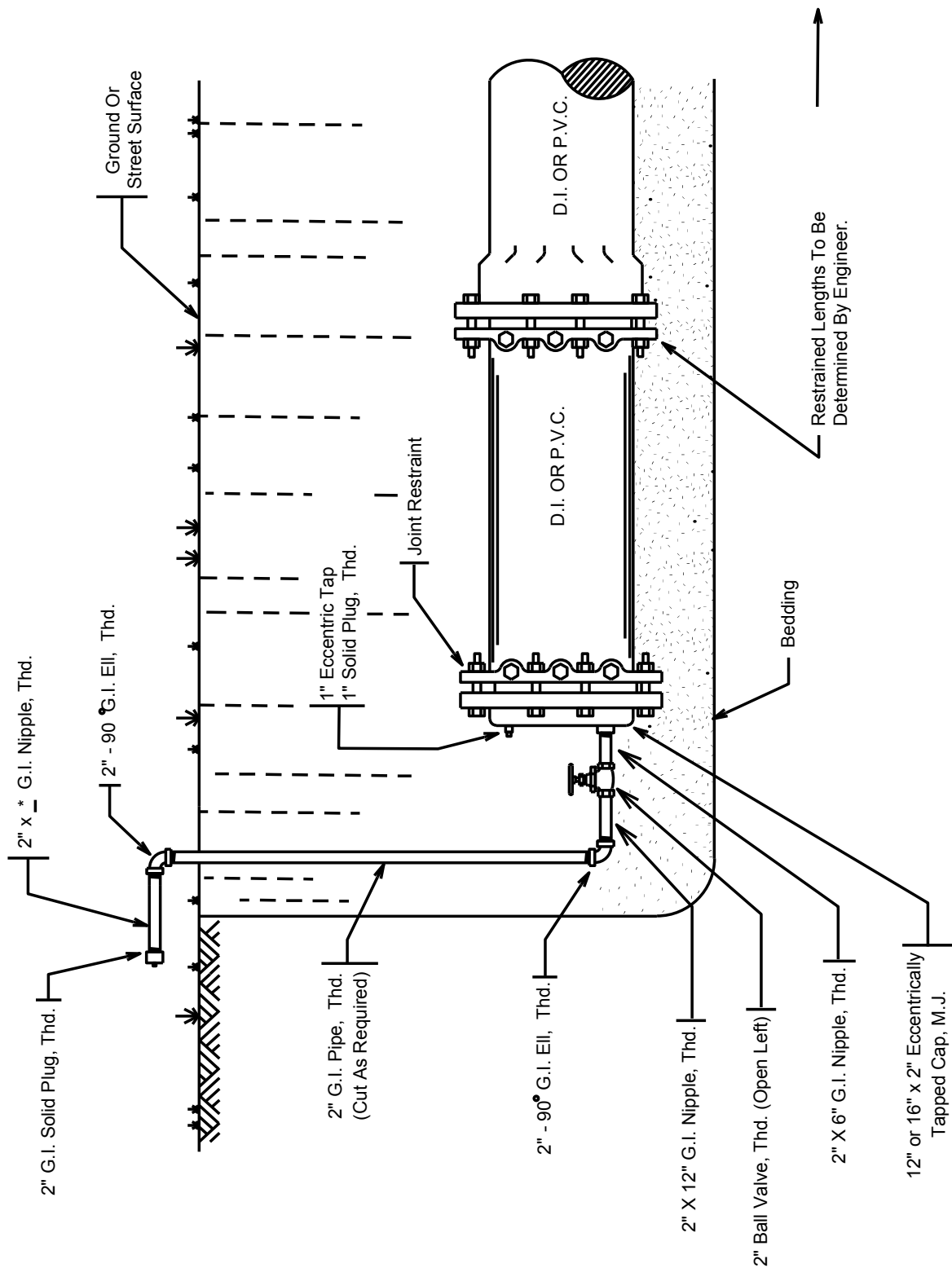
2" (TEMPORARY) BLOW-OFF
ASSEMBLY ON 6" & 8" D.
I.P.V.C. MAINS (JOINT
RESTRAINT)

APPROVED
JANUARY 2019

REVISED

DD-844-01

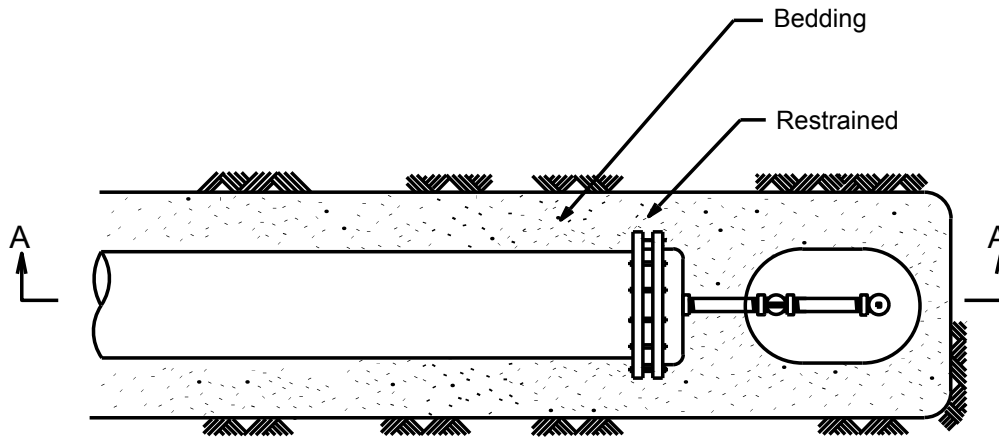
SHEET
3 OF 4



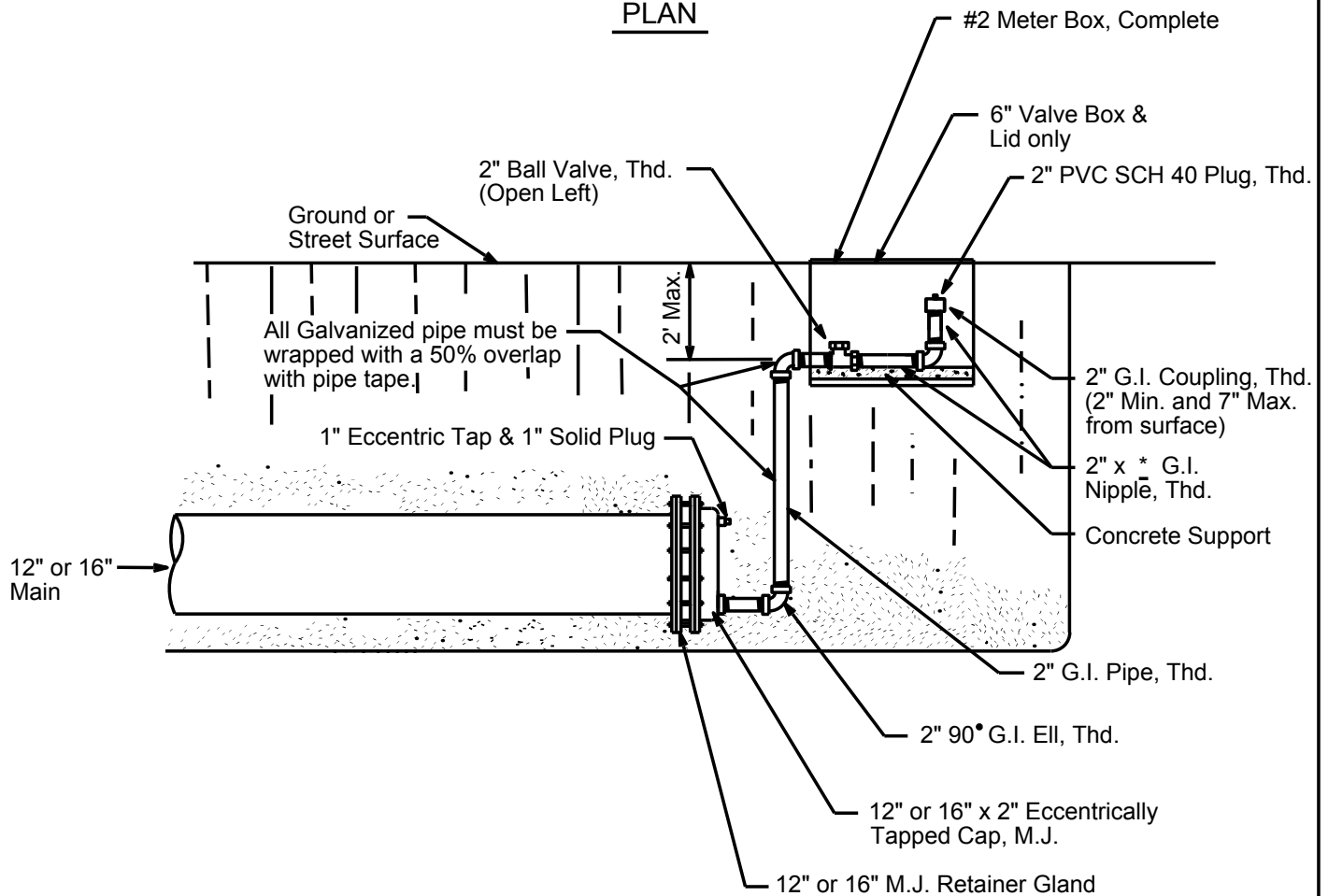
* Cut as required to extend beyond excavation.

NOTE:
1. FITTINGS FOR 12" AND 16" PIPE

PROPERTY OF THE CITY OF FAIR OAKS RANCH	2" (TEMPORARY) BLOW-OFF ASSEMBLY ON 12" & 16" D. I./P.V.C. MAINS (JOINT RESTRAINT)	APPROVED	REVISED
		JANUARY 2019	
		DD-844-01	SHEET 4 OF 4



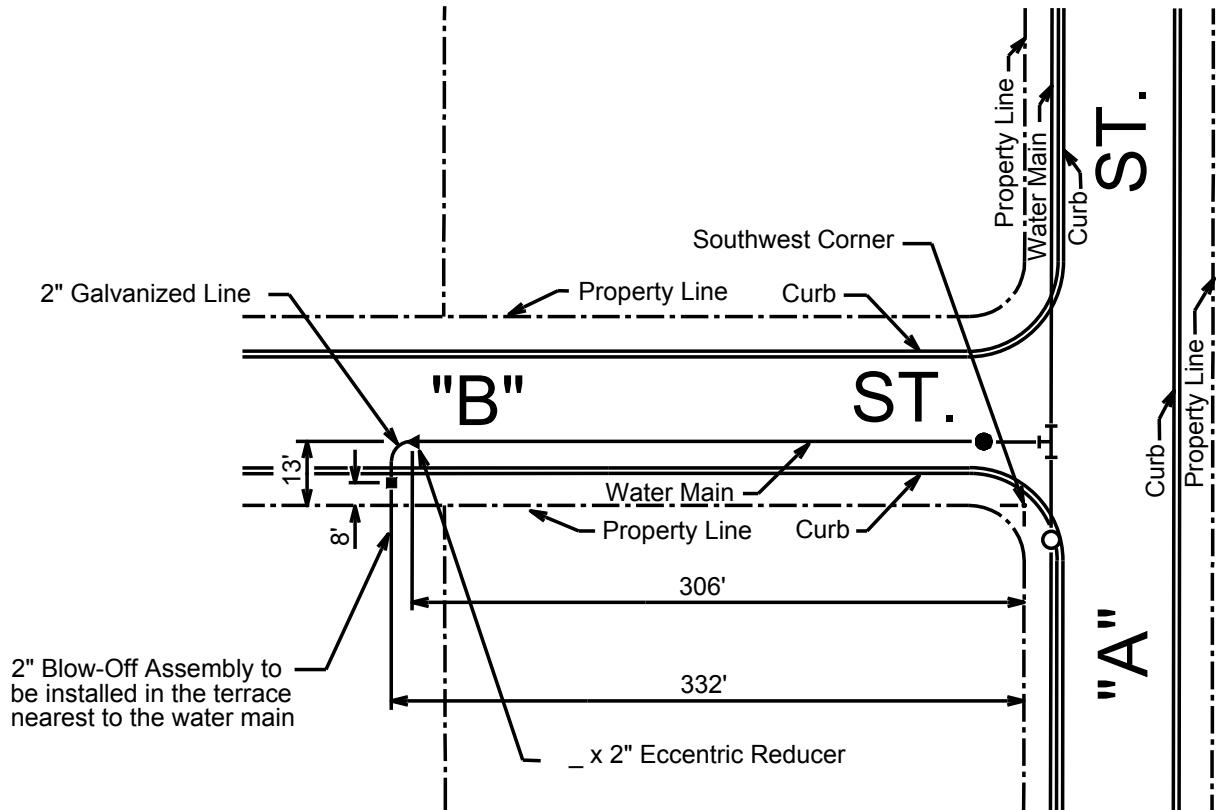
PLAN



SECTION A-A

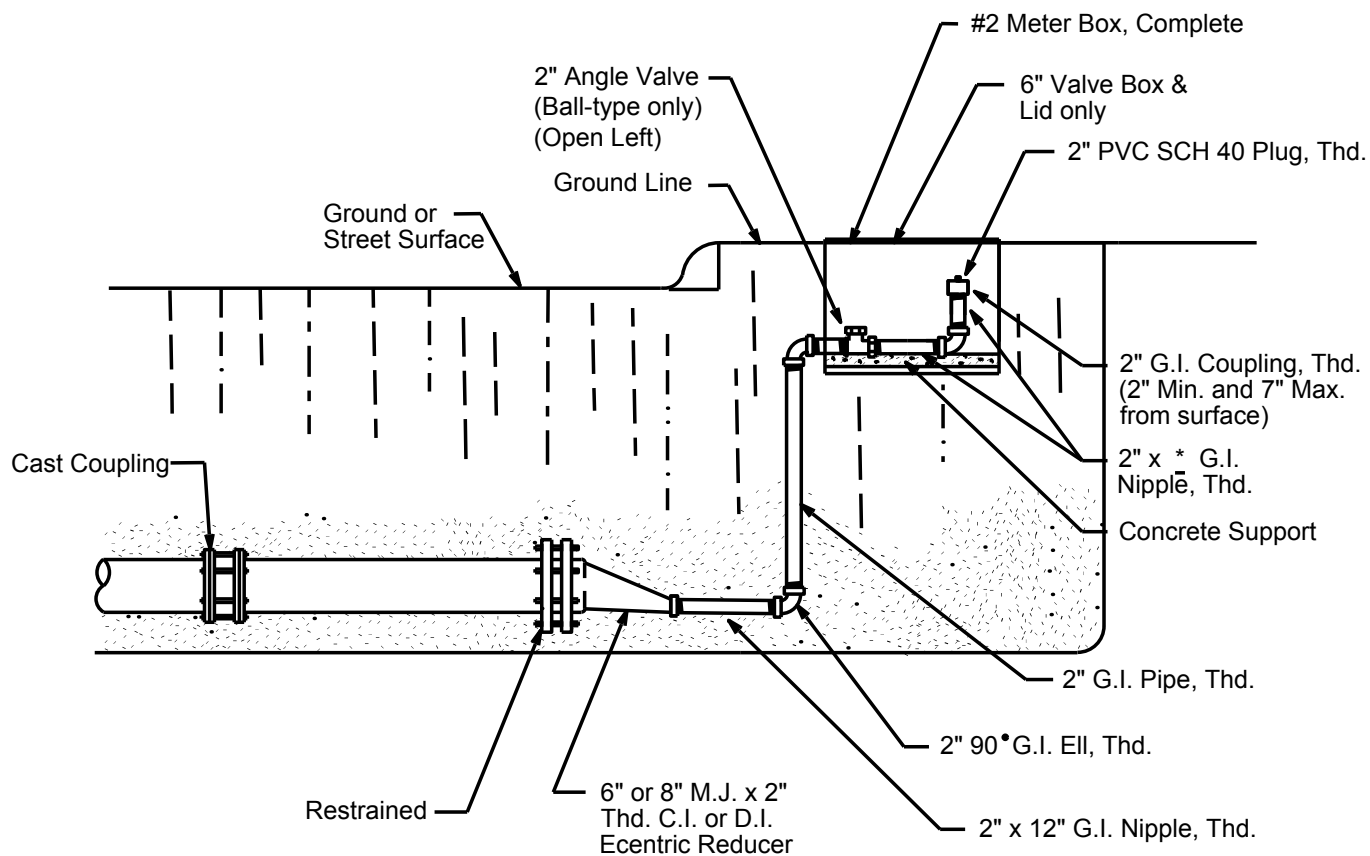
* Cut to fit in meter box.

PROPERTY OF THE CITY OF FAIR OAKS RANCH	2" PERMANENT BLOW-OFF ASSEMBLY ON 12" & 16" MAINS	APPROVED	REVISED
		JANUARY 2019	
		DD-844-02	SHEET 1 OF 5



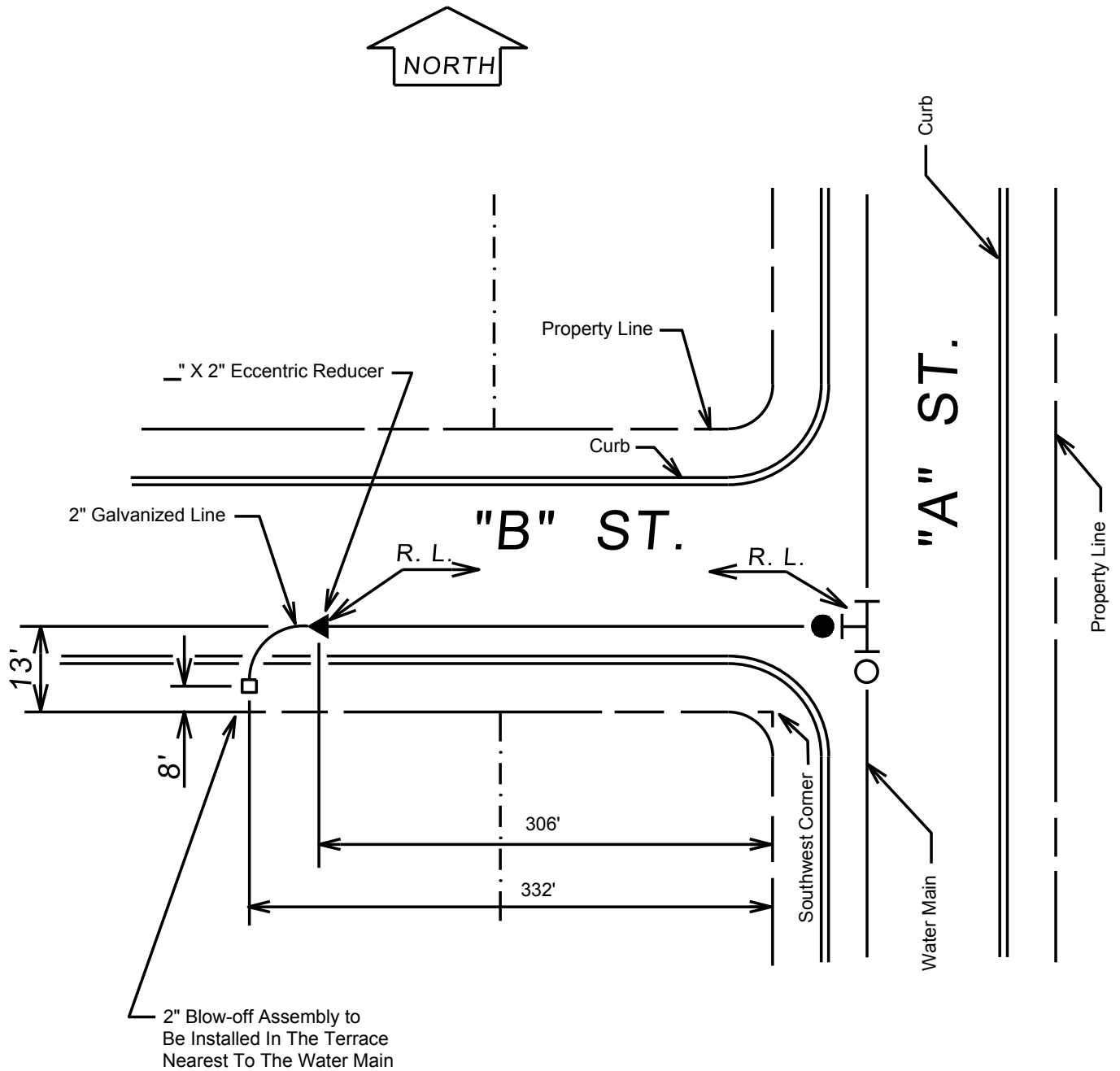
BLOW-OFF MEASUREMENT: From the Southwest Corner of "A" St. and "B" St. West 306' and North 13' to Eccentric Reducer, and West 332' and North 8' to Blow-Off Assembly

PROPERTY OF THE CITY OF FAIR OAKS RANCH	TYPICAL BLOW-OFF ARRANGEMENT ON DEAD END MAINS	APPROVED	REVISED
		JANUARY 2019	
		DD-844-02	SHEET 2 OF 5



* Cut to fit in meter box.

PROPERTY OF THE CITY OF FAIR OAKS RANCH	2" PERMANENT BLOW-OFF ASSEMBLY ON 6" & 8" MAINS	APPROVED	REVISED
		JANUARY 2019	
		DD-844-02	SHEET 3 OF 5



2" BLOW-OFF MEASUREMENT: FROM THE SOUTHWEST CORNER OF "A" ST. AND "B" ST. WEST 306' AND NORTH 13' TO ECCENTRIC REDUCER, AND WEST 332' AND NORTH 8' TO BLOW-OFF ASSEMBLY

R. L. = RESTRAINED LENGTHS TO BE DETERMINED BY ENGINEER.

PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

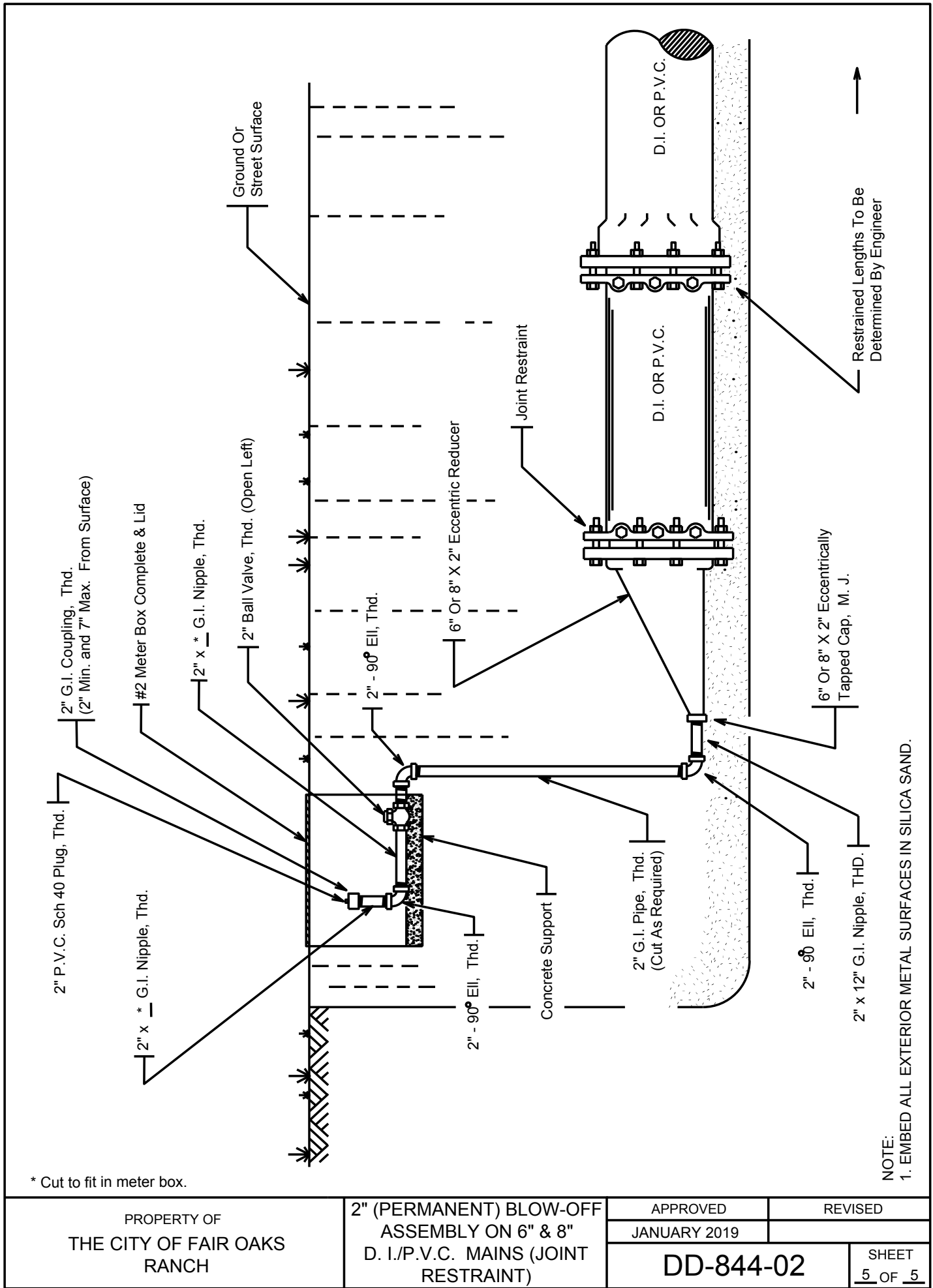
TYPICAL BLOW-OFF
ARRANGEMENT ON
DEAD END MAINS
(JOINT RESTRAINT)

APPROVED
JANUARY 2019

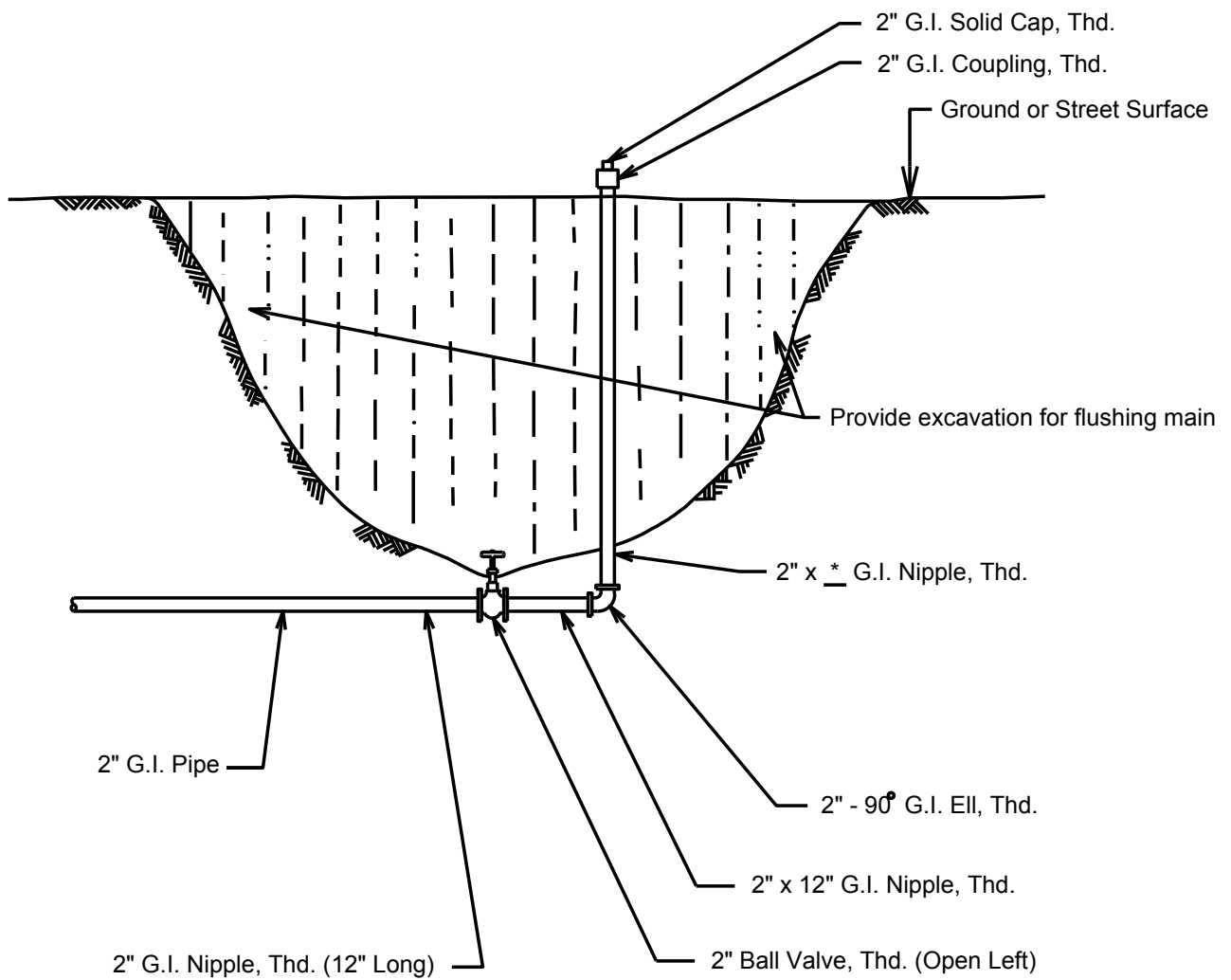
REVISED

DD-844-02

SHEET
4 OF 5



PROPERTY OF THE CITY OF FAIR OAKS RANCH	2" (PERMANENT) BLOW-OFF ASSEMBLY ON 6" & 8" D. I./P.V.C. MAINS (JOINT RESTRAINT)		APPROVED		REVISED	
			JANUARY 2019			
			DD-844-02		SHEET 5 OF 5	



* Cut as required to extend beyond excavation.

PROPERTY OF THE CITY OF FAIR OAKS RANCH	INSTALLATION OF BLOW-OFF ASSEMBLY ON 2" TEMPORARY MAIN	APPROVED	REVISED
		JANUARY 2019	
		DD-844-03	SHEET 1 OF 1

Fair Oaks Ranch Standard Specifications for Construction

ITEM NO. 845

GATE, FENCING, AND PROPERTY MARKER DETAILS

845.1 DESCRIPTION: This item shall consist of gates, fences, and property markers installed, replaced, or modified in accordance with these specifications and as directed by the Engineer.

845.2 SUBMITTALS: Contractor shall submit manufacturer's product data, installation instructions, recommendations, shop drawings, and any required installer certification(s).

845.3 MATERIALS: The materials for gate and fence installation and/or adjustment, as well as property marker installation shall conform to those as identified on drawings DD-845-00 and DD-845-01.

845.4 MEASUREMENT: Measurement for fencing installed will be measured by the linear foot for each size and type shown installed, replaced, or modified herein or as superseded by the contract documents.

Measurement for gates installed will be measured by the unit of each hinged or cantilevered assembly shown installed herein or as superseded by the contract documents.

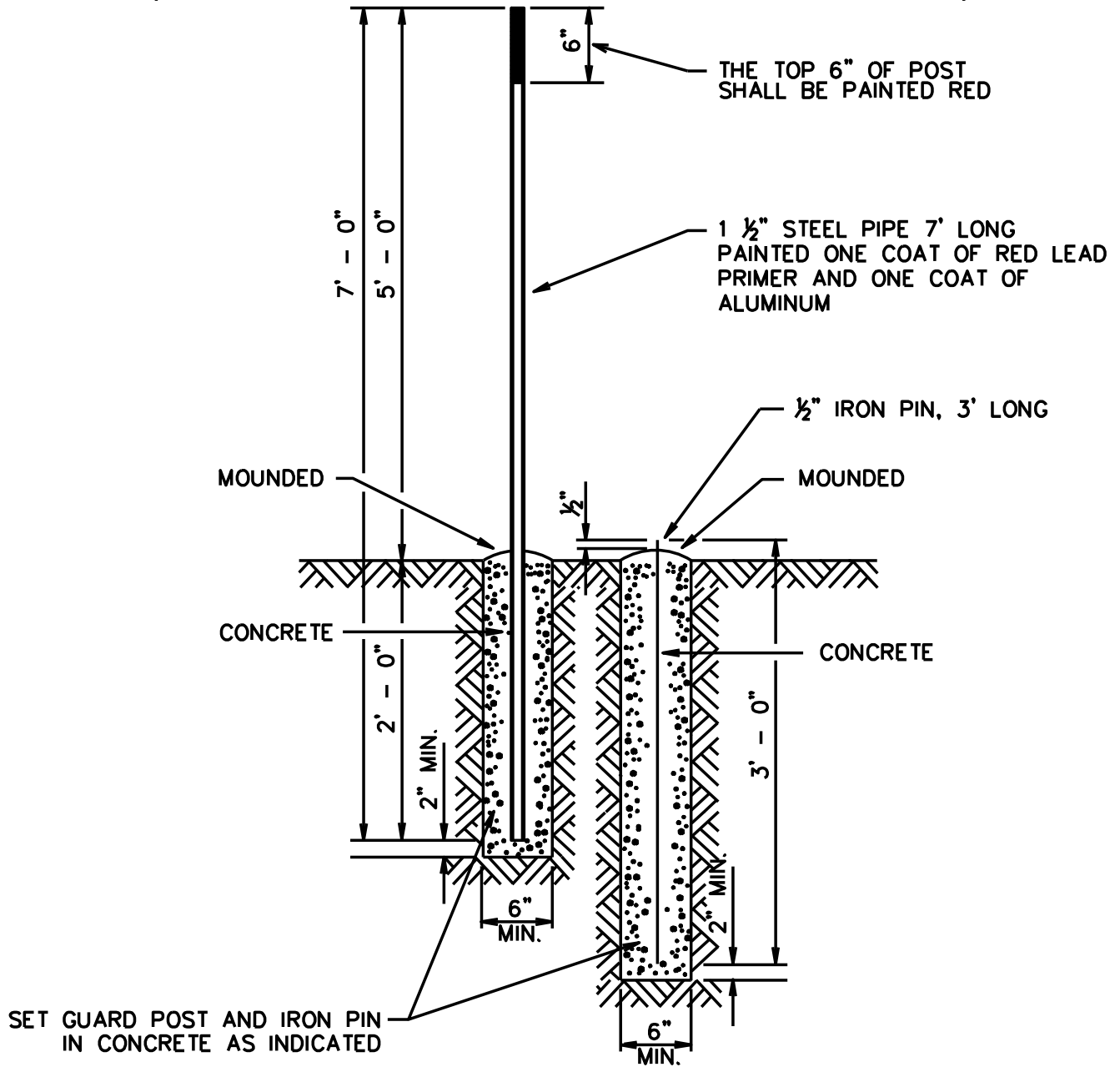
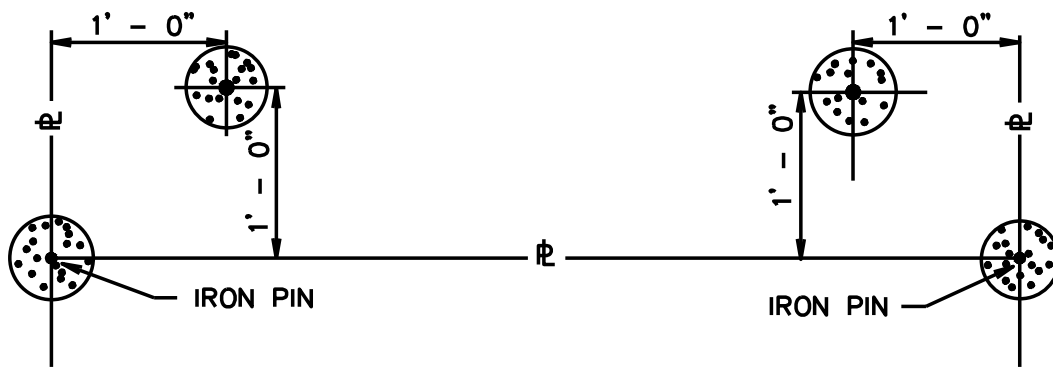
Measurement for property markers will be measured by the unit of each assembly shown installed herein or as superseded by the contract documents,

845.5 PAYMENT: Payment for fencing will be made at the unit price bid for each linear foot installed.

Payment for gates will be made at the unit price bid for each such assembly of the type and size installed in accordance with the details shown in the Standard Drawing DD-845 Series, or as superseded by the contract documents.

Payment for property markers will be made at the unit price bid for each such assembly of the type and size installed in accordance with the details shown in the Standard Drawing DD-845 Series, or as superseded by the contract documents.

- End of Specification -



PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

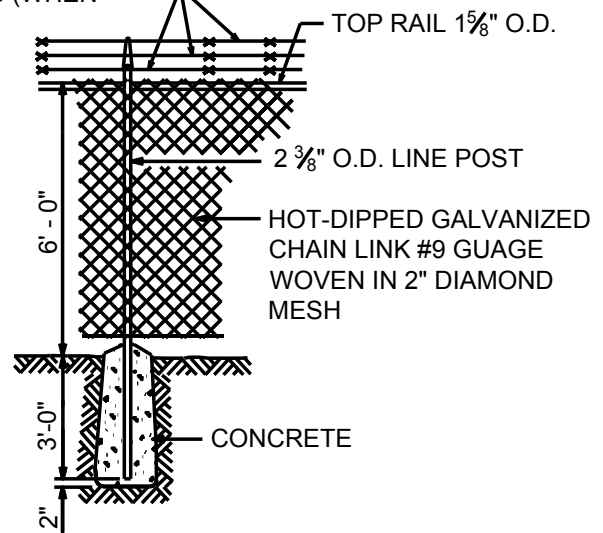
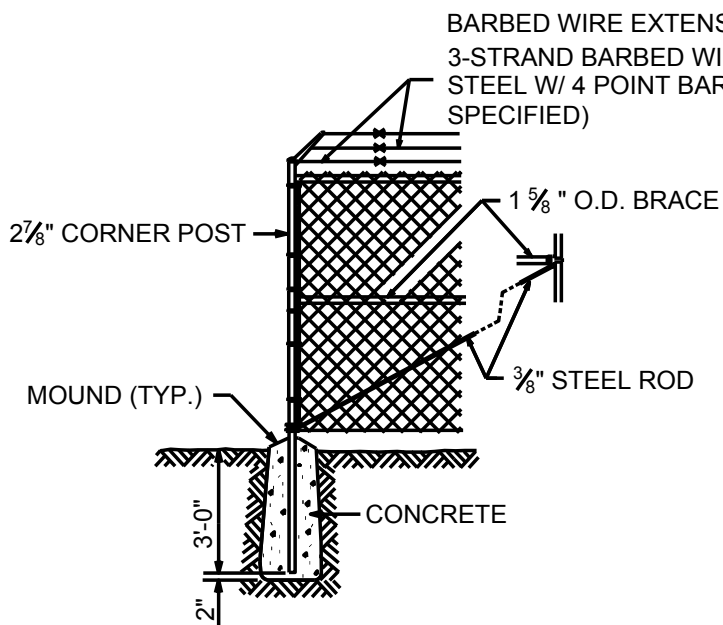
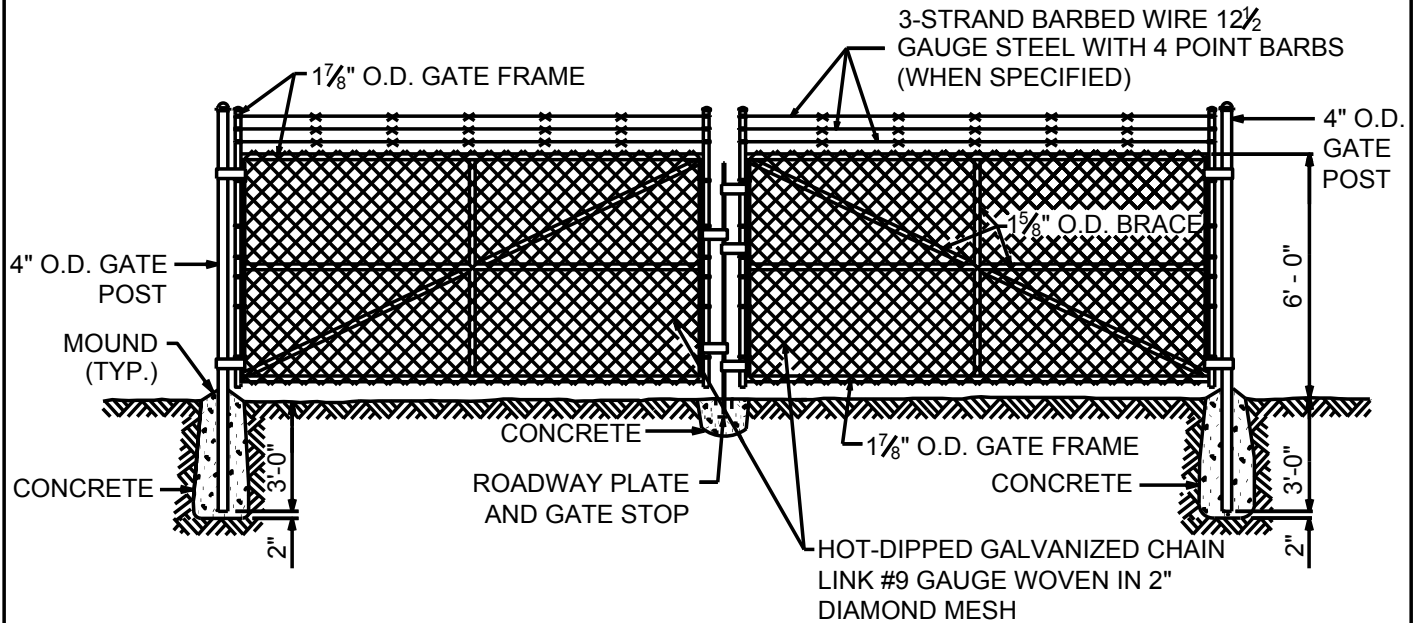
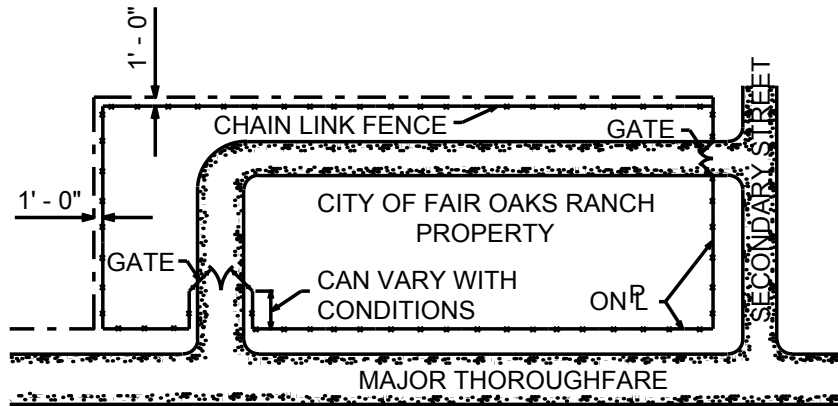
SAWS PROPERTY
MARKER ON UNFENCED
PROPERTY

APPROVED
JANUARY 2019

REVISED

DD-845-00

SHEET
1 OF 1



PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

STANDARD GATE AND
FENCE AROUND CITY
PROPERTY

APPROVED
JANUARY 2019

REVISED

DD-845-01

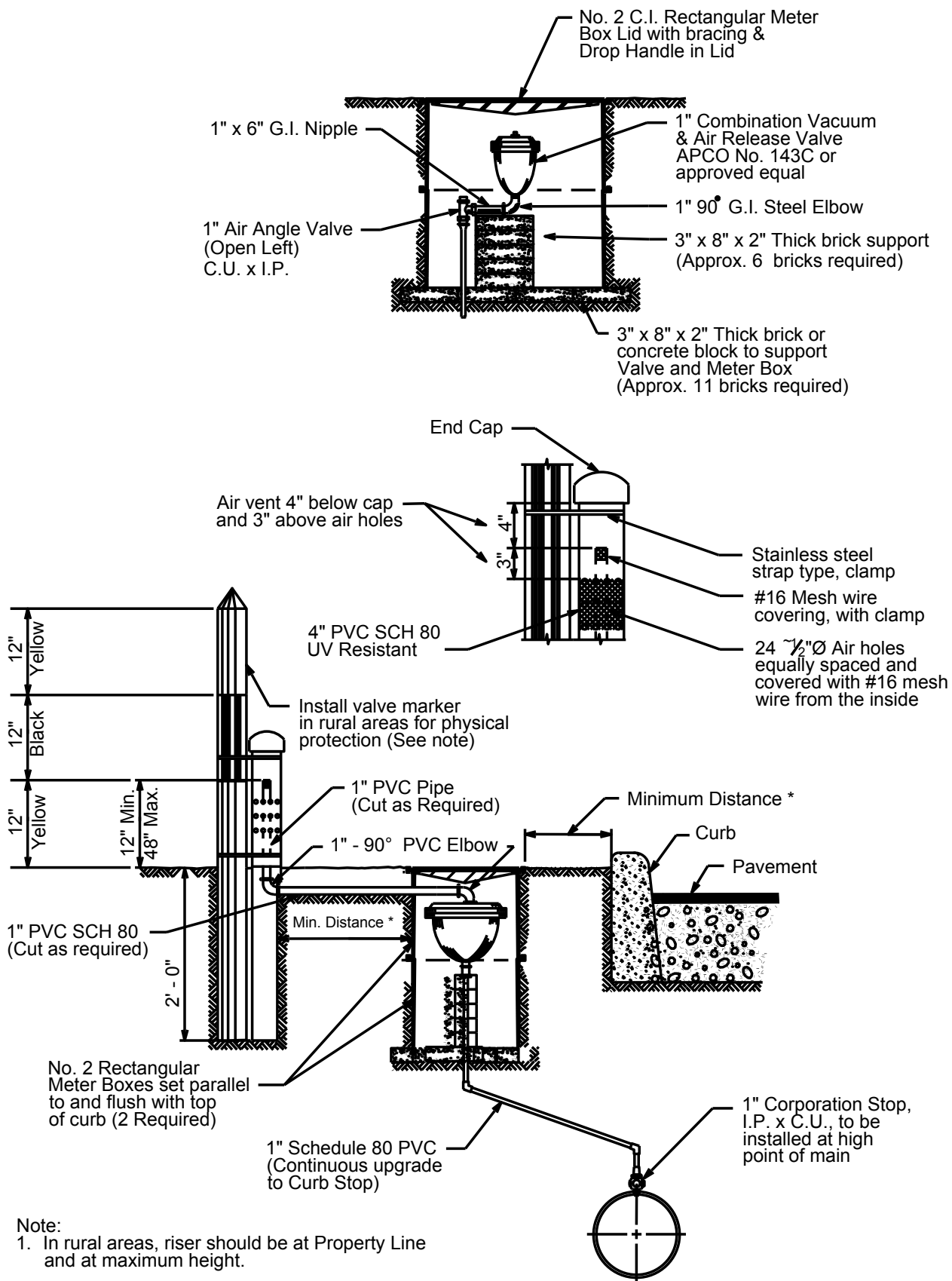
SHEET
1 OF 1

Fair Oaks Ranch Standard Specifications for Construction

**ITEM NO. 846
AIR RELEASE ASSEMBLIES**

- 846.1 DESCRIPTION:** This item shall consist of air release assemblies installed in accordance with these specifications and as directed by the Engineer.
- 846.2 SUBMITTALS:** Contractor shall submit manufacturer's product data, instructions, recommendations, shop drawings, etc.
- 846.3 MATERIALS:** The materials for air release assemblies installation and adjustment shall conform to the specifications contained within the latest revision of Fair Oaks Ranch' Material Specification 29-01, "Air Release, Vacuum and Combination Air Valves."
- 846.4 CONSTRUCTION:** Air release assemblies shall be installed at the location shown in the contract documents or as directed by the Engineer.
- Air release assemblies in an open trench water main installation shall be installed in accordance with Standard Drawing DD-846 Series and shall include the valve, valve boxes, tapping saddle, pipe, fittings, accessories and appurtenances. It shall also include the service line and tap to the main line. Air release assemblies installed in parkways or easements and adjacent to street pavements shall be installed in accordance with Standard Drawing DD 846-01, sheet 2 of 2, regardless of size.
- Air release assemblies installed on steel pipe attached to a bridge structure shall include the outlet on the steel pipe, valve, valve box, pipe, fittings, security enclosure, accessories and appurtenances.
- 846.5 MEASUREMENT:** Air release assemblies will be measured by the unit of each such assembly of the various sizes of air release assemblies installed.
- 846.6 PAYMENT:** Payment for air release assemblies will be made at the unit price bid for each such assembly of the various sizes installed in accordance with the details shown in the Standard Drawing DD-846 Series. Such payment shall also include: excavation, selected embedment material, anti-corrosion embedment when specified, hauling and disposition of surplus excavated materials, blocking, and various types and sizes of meter boxes.

- End of Specification -



PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

INSTALLATION OF 1" AIR RELEASE VALVE

APPROVED

JANUARY 2019

REVISED

DD-846-01

SHEET
1 OF 1

Fair Oaks Ranch Standard Specifications for Construction

**ITEM NO. 847
DISINFECTION**

847.1 DESCRIPTION: This item shall consist of disinfection of new mains utilizing Calcium Hypochlorite (HTH) in accordance with these specifications. Machine chlorination shall be performed by Fair Oaks Ranch as specified in the contract documents. The Contractor is required to provide all appurtenances to the main(s) to allow machine chlorination.

847.2 MATERIALS: The materials for disinfection shall conform to the appropriate specifications contained within the latest revision of Fair Oaks Ranch' Material Specification Item No. 100-20.

847.3 CONSTRUCTION: After the new mains have successfully passed the pressure test specified in Item No. 841, "Hydrostatic Testing Operations," the Owner will disinfect only those mains shown in the contract documents or otherwise indicated as "Machine Chlorination by Fair Oaks Ranch," and in accordance with the Standard Drawing DD-847. This disinfection shall include: chlorination, flushing, and placing the mains into service. All other disinfection requirements shall be accomplished by the Contractor. Disinfection by the Contractor is limited to sections of main less than 800 feet in length.

1. Operation of Valves: During and after disinfection of mains less than or equal to 16 inches in diameter, the Contractor shall be notified by the Inspector sufficiently in advance (2 work days) to enable the Contractor to have a competent representative present whenever valves are to be operated that will affect the pressure in any part of the work for which the Contractor is responsible.
2. Contractor's Personnel and Equipment: The Contractor shall supply labor and equipment necessary to make all excavations required for chlorination, equipment connections, subsequent flushing, and placing the mains into service.
3. Safeguarding and Backfilling Open Holes: The Contractor shall be responsible for safeguarding any open holes excavated or left open for flushing and disinfection purposes. Following completion of disinfection, the Contractor shall backfill holes in accordance with appropriate provisions of Item No. 804, "Excavation, Trenching and Backfill."

If an open hole is unsafe and does not have proper trench protection,

Fair Oaks Ranch Standard Specifications for Construction

Fair Oaks Ranch Chlorination personnel will not disinfect the required pipe and related appurtenances until acceptable trench protection is provided.

4. General: Mains shall be disinfected with dry HTH where shown in the contract documents or as directed by the Inspector, and shall not exceed a total length of 800 feet. This method of disinfection will also be followed for main repairs. The Contractor shall utilize all appropriate safety measures to protect his personnel during disinfection operations.
5. Dosage: The Contractor shall disinfect the new or replaced mains with HTH of 70% available chlorine furnished by the Contractor. Sufficient HTH shall be used to obtain a minimum chlorine concentration of 50 ppm. Table 847-1, "Chlorine Dosage," is included for the convenience of the Contractor.

A heaping tablespoon holds approximately ½ ounce, and a standard measuring cup holds approximately 8 ounces.

6. Filling the Main: Those sections of main to which the dry HTH has been applied shall be filled slowly to allow for the even distribution of the disinfecting material. The manipulation of valves shall be under the supervision of the Engineer's representative in accordance with Item No. 847.3.1, "Operation of Valves."
7. Holding Time: The length of time that sections of main disinfected with HTH shall be allowed to stand undisturbed will depend upon the particular job and Texas Commission on Environmental Quality (TCEQ) criteria.
 - a. When circumstances permit a shutdown with no customers out of service, the required minimum detention time will be 24 hours with a 50 ppm chlorine dosage.
 - b. When customers are out of service during a shutdown with no leakage past valves, the required minimum detention time will be 3 hours and the chlorine dosage will be 300 ppm.
 - c. When customers are out of service with some leakage past valves, the required minimum detention time will be 30 minutes with a 500 ppm chlorine dosage.
8. Flushing: Following the expiration of the specified holding time, the treated section of main shall be flushed thoroughly by the Contractor in

Fair Oaks Ranch Standard Specifications for Construction

accordance with the applicable provisions of Item No. 841, "Hydrostatic Testing Operations." Flushing shall continue until no chlorine remains detectable by taste or odor or until the chlorine residual is less than 0.3 ppm. The Contractor must make provisions for the disposal and runoff of the flushing operations in order to minimize erosion or impact to residents.

9. Preventing Reverse Flow: Valves shall be manipulated so that the strong chlorine solution in the line being treated will be flushed out of the main and will not flow back into the line supplying the water.
10. Supervision. All disinfection of mains shall be done under the general supervision of the Inspector.
11. Additional Treatment: Should the new main fail to meet minimum public health standards for bacteriological quality after flushing, further treatment shall be as directed by the Inspector. If further disinfection is required, chlorination shall be done in accordance with the Fair Oaks Ranch guidelines for Disinfection of New Mains Utilizing Machine Chlorination. In no case, however, shall the new line be acceptable as complete and satisfactory until the bacteriological quality of the water taken from the main meets the standards of the TCEQ.

8474 MEASUREMENT: Disinfection operations are considered subsidiary to the work and no separate measurement will be made by the Contractor for this work.

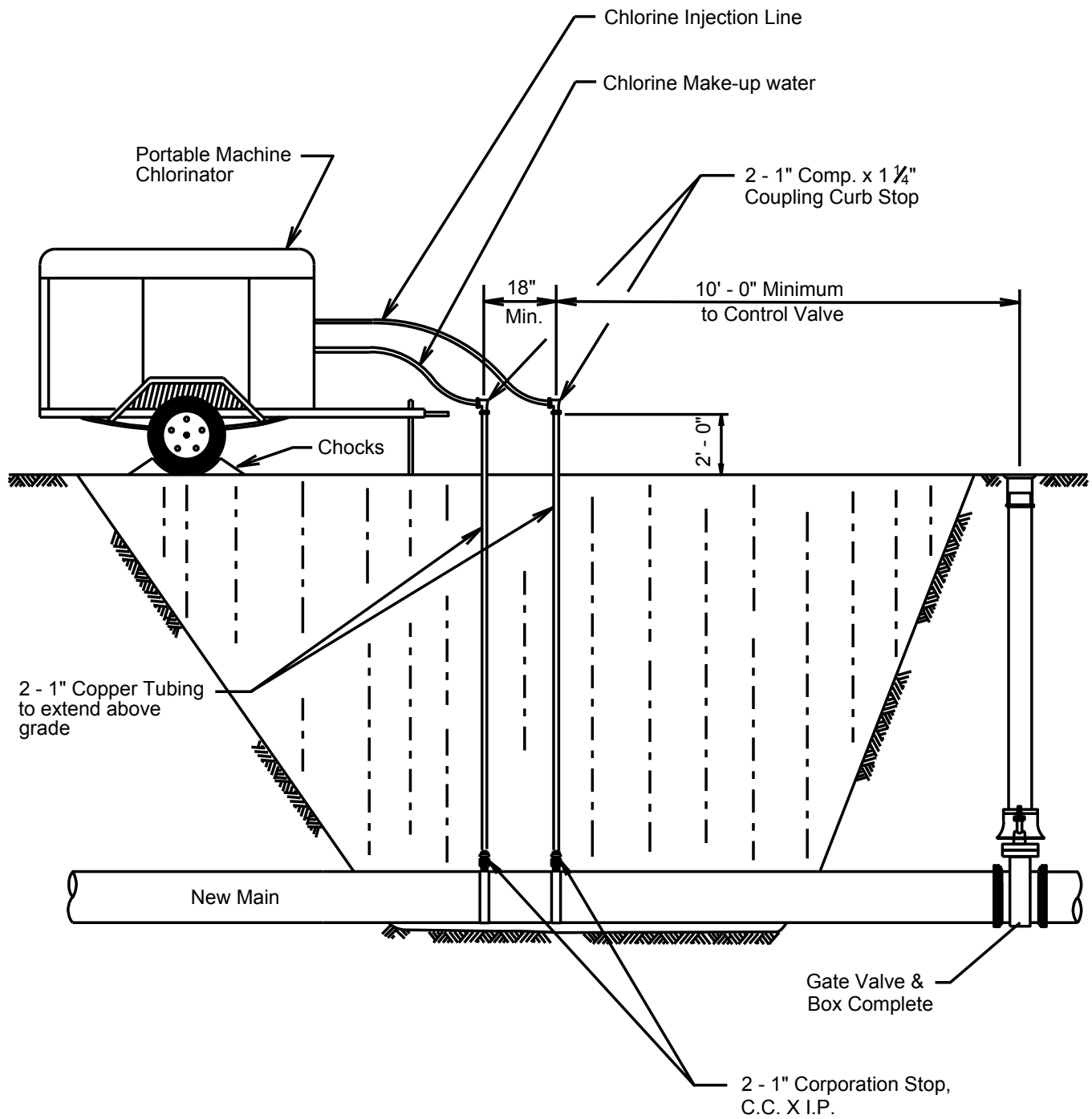
8475 PAYMENT: Disinfection operations are considered subsidiary to the work and no separate payment will be made to the Contractor for this work.

The Contractor is required to provide all appurtenances to the pipe to allow for machine chlorination at no additional cost or separate pay item.

- End of Specification -

Fair Oaks Ranch Standard Specifications for Construction

TABLE 847-1	
CHLORINE DOSAGE	
Ounces Per Foot; Diameter of Pipe in Inches	To Obtain 50 ppm Chlorine Dosage
6	0.0138
8	0.0233
10	1.0
12	0.0523
14	0.0708
16	0.0934
18	0.1175
20	0.1455
24	0.208
30	0.327
36	0.469
42	0.637
48	0.0833
54	1.0575
60	1.308



Note:

1. 2 - 1 1/4" Solid Cap, Thd. to be installed on Corporation Stop after chlorination.

PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

STANDARD CHLORINATION
INSTALLATION

APPROVED
JANUARY 2019

REVISED

DD-847-01

SHEET
1 OF 1

Fair Oaks Ranch Standard Specifications for Construction

ITEM NO. 848
SANITARY SEWERS

848.1 DESCRIPTION: This item shall govern the furnishing, installation, adjustment, or replacement of sanitary sewer pipe of the size and type specified in the contract documents.

848.2 SUBMITTALS: Contractor shall submit manufacturer's product data, instructions, recommendations, shop drawings, and certifications.

All plans, materials and specifications shall be in accordance with the Texas Administrative Code (TAC) rules to include: 30 TAC § 213 ("Edwards Aquifer"), and 30 TAC § 217 ("Design Criteria for Sewerage Systems") or any revisions thereto as applicable.

Contractor must provide Geographic Information Systems (GIS) line .shp file for any installed sewer line. The GIS .shp file must include information on the pipe diameter, location, material, upstream invert, upstream depth, downstream invert, downstream depth, slope and length at a minimum. Confirm the information to be included in the .shp file with Fair Oaks Ranch prior to submission. Additional information to be included in the shapefile may be requested by Fair Oaks Ranch.

848.3 MATERIALS: Materials for sanitary sewer pipe and fittings shall be either rigid or flexible. All pipe not listed shall be subject to pre-approval by the Engineer.

1. Rigid Pipe: Ductile iron pipe shall, for the purpose of this specification, be known as rigid pipe.
2. Flexible Pipe: Pipe consisting of materials other than those listed above.
 - a. Any flexible pipe having a deflection of the inside diameter greater than 5% after 30 days of installation will not be accepted.

Unless directed otherwise by the Engineer, a "GO, NO-GO" Deflection Testing Mandrel built in accordance with the detail drawing, as shown in the DD-848 Standard Drawing Series, and 30 TAC § 217, shall be furnished at the Contractor's expense and shall be used in testing pipe deflection for acceptance. Refer to Fair Oaks Ranch Specification Item No. 849, "Air and Deflection testing," for more information about mandrel deflection testing.

Fair Oaks Ranch Standard Specifications for Construction

- b. Working room: The working room for flexible pipe shall be a minimum of 6 inches.
 - c. Pipe Stiffness: All mains are to be SDR 26 PVC (ASTM D3034-08) with a pressure rating of 115 psi.
 - d. At waterline crossings and where water and sewer mains are parallel and separation distance cannot be achieved as per 30 TAC § 217.53, use extra stiff pipe SDR 26 PVC (ASTM D2241-09) with a pressure rating of 150 psi. This shall include all lateral piping as well.
 - e. All sanitary sewer piping shall pass the low pressure test, as described in 30 TAC § 217.57.
3. Concrete Pipe: Concrete pipe shall not be used.
4. Asbestos-Cement (AC) Pipe: AC pipe shall not be used. Refer to Item No. 3000, "Handling Asbestos Cement Pipe."
5. Fiberglass Reinforced Sewer Pipe, Non-Pressure Type: Fiberglass reinforced sewer pipe, non-pressure type, shall be a factory-formed conduit of polyester resin, continuous roving fiberglass and silica sand built up in laminates and shall conform to the requirements of ASTM D3262-11, including the appendix and subsequent specifications, and in accordance with Fair Oaks Ranch' material specifications. Depths shall comply with requirement of ASTM D3681-12.

Coupling Joints: Joints for pipe and fittings shall be confined compression rubber gasket bell and spigot type joints conforming to the material and performance requirements of ASTM D4161-01. Depths shall comply with requirement of ASTM D3681-12.

Fittings: Flanges, elbows, reducers, tees, wyes, laterals, and other fittings shall be capable of withstanding all operating conditions when installed. They may be contact molded or manufactured from mitered sections of pipe joined by glass-fiber reinforced overlays. For pipe diameters 15 inches or larger, lateral openings 6 inch or greater in size shall be made using PVC sewer saddles conforming to ASTM D2661-11 or service connections conforming to ASTM D3034-08, approved by the Engineer, and found in Fair Oaks Ranch' Material Specifications.

Minimum pipe stiffness shall not be less than 115 psi for direct bury applications.

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6. PSM Polyvinylchloride (PVC) Sewer Pipe: Pipe shall be made from class 12454-B materials as prescribed in ASTM D1784-11. For pipes 4 inches to 15 inches in diameter, fittings and joints shall conform to ASTM D3034-08 and D3212-07, with the exception that solvent cement joints shall not be used. All pipes that are 18 inches to 36 inches in diameter shall meet the requirements of ASTM F679-08.
7. Pressure Pipe/Force Mains: Pipe shall be made from Class 1254-A or 1254-B, as defined in ASTM D1784-11. All pipe, fittings, and joints shall meet or exceed the requirements of ASTM D2241-09, with the exception that solvent cement joints shall not be used. The pressure rating, size, and pressure class shall be as shown in the contract documents. Pipe shall have an integral bell and gasket seal with the locked-in type gasket reinforced with a steel band or other rigid material conforming to ASTM F477-10. The joint shall comply with the requirements of ASTM D3139- 98(2011). All required joint restraint shall be approved by the Engineer prior to the work being accepted. Pressure pipe/Force mains are required to have modified grade 5 material used as bedding. Pipes also shall be hydrostatically tested at a minimum of 100 psi after their construction to ensure proper construction.
8. Mechanical or compression joints, concrete jointing collars, or non-reinforced rubber adaptors shall be used only as approved by the Engineer.
9. Ductile Iron Pipe and Fittings: Ductile iron pipe shall be centrifugally cast of 60-42-10 iron and shall conform to the requirements of the latest revision of ANSI Standard A21.51/American Water Works Association (AWWA) C151-09. Ductile iron pipe may be "thickness designed" in accordance with requirements of the latest revision of ANSI Standard A21.50/AWWA C150-08. Thickness design shall be based on standard laying conditions 4 or 5 in accordance with conditions at the site. Fittings for ductile iron pipe shall have not less than the thickness, class, or pressure rating specified for ductile iron pipe. Fittings shall be furnished with all necessary glands, gaskets, bolts, etc. as may be required to complete the joints.

Rubber gasket joints for mechanical joints or push on type joints shall conform to the requirements of ANSI Standard A21/AWWA C111-12.

All ductile iron pipe and fittings shall be cement mortar-lined or polyethylene-lined. The cement mortar lining shall be in accordance with ANSI A21.4/AWWA C104-08. Contractor shall also be required to protect the pipe by externally wrapping it in accordance with Item No. 814, "Ductile Iron Pipe."

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The polyethylene lining material for pipe and fitting shall be virgin polyethylene complying with ANSI/ASTM D1248-12, compounded with inert filler and with sufficient carbon black to resist ultraviolet rays during storage of the pipe and fittings. The polyethylene shall be bonded to the interior of the pipe or fitting by heat. Polyethylene lining in pipe and in fittings shall be 40 mils nominal thickness. Minimum lining thickness shall be 30 mils.

10. Concrete Steel Cylinder Pipe: Concrete Steel Cylinder Pipe shall not be used.
11. All sanitary sewer pipe and fittings produced within the jurisdiction of Fair Oaks Ranch shall be tested by a Fair Oaks Ranch-approved laboratory method at the source of supply. All shipments of pipe not tested shall be accompanied by a certificate of compliance to these specifications prepared by an independent testing laboratory and signed by a Texas registered professional engineer.

848.4

CONSTRUCTION: All sanitary sewer mains shall be constructed in accordance with the specifications herein outlined and in conformity with the required lines, grades, and details shown in the contract documents and as directed by the Engineer. Successful passage of the air test and mandrel test (for flexible pipe, 30 days after installation), as described under TCEQ criteria, shall be required for the acceptance of the mains.

1. Water Main Crossings: Where gravity or force main sewers are constructed in the vicinity of water mains, the requirements of the 30 TAC § 217.53 shall be met.
2. For excavation, trenching and backfill requirements see Item No. 804, "Excavation, Trenching and Backfill."
3. Pipe Installation: The Inspector will inspect all pipe before it is placed in the trench and will reject any sections found to be damaged or defective to a degree that would affect the structural integrity of the pipe. Rejected pipe shall be immediately removed from the site of the work and replaced with new acceptable pipe. The Contractor shall commence installation of the pipe at the downstream end of the sanitary sewer line and proceed non-stop in a forward upstream direction. No pipe shall be laid within 10 feet of any point where excavation is in progress. Pipe installation shall proceed upgrade with the bell pointing in the upstream direction of flow. Pipe shall be lowered into the trench without disturbing the prepared foundation or the trench sides. The drilling of lifting holes in the field will not be

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permitted. Pipe shall be installed by means of a concentric pressure being applied to the pipe with a mechanical pipe puller. Pulling or pushing a joint of pipe in place by using a crane, bulldozer, or backhoe will not be permitted. Pipe shall be "pulled home" in a straight line with all parts of the pipe on line and grade at all times. No side movement or up and down movement of the pipe will be permitted during or after the pulling operation. Should coupled joints of pipe be out of line or off grade, they shall be removed one joint at a time in the presence of the Inspector and brought to the proper line and grade. The lifting or moving of several joints of coupled pipe at one time to close a partially open joint or to fine grade under laid joints of pipe will not be permitted.

Also, Contractor shall insure that all existing or proposed manholes or structures shall remain visible and accessible at all times. No manhole or structure covers shall be covered by pavement, equipment, or other obstructions other than a removable, temporary lid provided for safety. Inspector shall cause all work to be suspended until this requirement is met without any valid claims of costs or schedule delays.

4. Pipe Separation: Sewer pipe separation distances shall be maintained in accordance with TCEQ rules 30 §217.53.
 - a. A sewer collection system that parallels a public water supply pipe must have a vertical separation of at least two feet between outside diameters of the pipes.
 - b. A sewer collection system that parallels a public water supply pipe must have a horizontal separation of at least four feet between outside diameters of the pipes.
 - c. A sewer system that crosses a public water supply pipe shall have a minimum separation distance of six inches between outside diameters of pipes. All sewer collection piping must be below a public water supply pipe.
 - d. A sewer collection system that crosses over a public water supply pipe shall be encased in a joint of at least 150 psi pressure class pipe.
 - (1) Pipe shall be centered on the crossing;
 - (2) Pipe shall be sealed at both ends with cement grout or

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manufactured seal;

- (3) Pipe shall be at least 18 feet long;
- (4) Pipe casing shall be at least two nominal sizes larger than the wastewater collection pipe. Steel or PVC pipe may be used for casing of at least 150 psi pressure class.
- (5) Pipe shall be supported by spacers between the collection system pipe and the encasing pipe at a maximum of five-foot intervals.

5. **Laser Beams**: The use of laser beams for vertical control shall be required. Contractor shall also make available to the Inspector, when requested, a level and rod, of sufficient sensitivity, to accurately determine differences in elevation between points 300 feet apart with one instrument set-up. **Contractor shall provide a written summary to the Inspector of all elevations that all installed, repaired, or replaced sewer main enter and exit a manhole or structure.**

No pipe shall be installed in tunnels except as noted in the contract documents or by approval of the Engineer. If the Contractor finds it necessary to install pipe in tunnels not provided in the contract documents, he shall submit to the Engineer a detailed outline of procedures, methods, and use of materials depending on existing soil conditions. This information requires review and approval prior to the commencement of work.

No horizontal or vertical curves shall be permitted in conformance with appropriate regulatory agency requirements.

Before leaving the work unattended, the upper ends of all pipelines shall be securely closed with a tight fitting plug or closure. The interior of laid pipe shall be kept free from dirt, silt, gravel, or foreign material at all times. All pipes in place must be approved by the Inspector before backfilling.

When replacing an existing system in place, Contractor shall maintain screens to prevent the entrance of construction debris into the sewer system.

848.5 MEASUREMENT: All sewer pipes will be measured from center of manhole to center of manhole or end of main. Measurement will be continuous through any fittings in the main, even though the fittings are pay items of the contract.

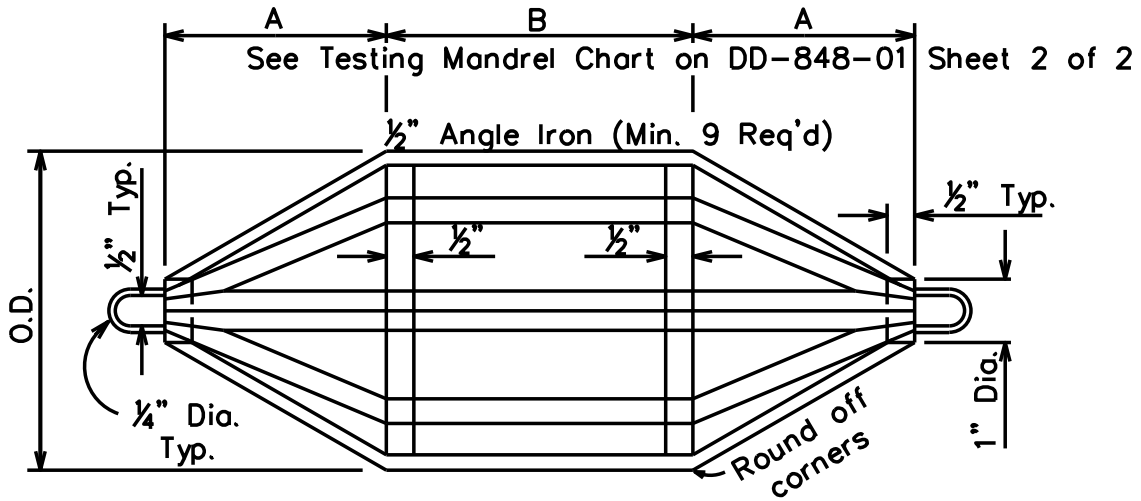
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848.6

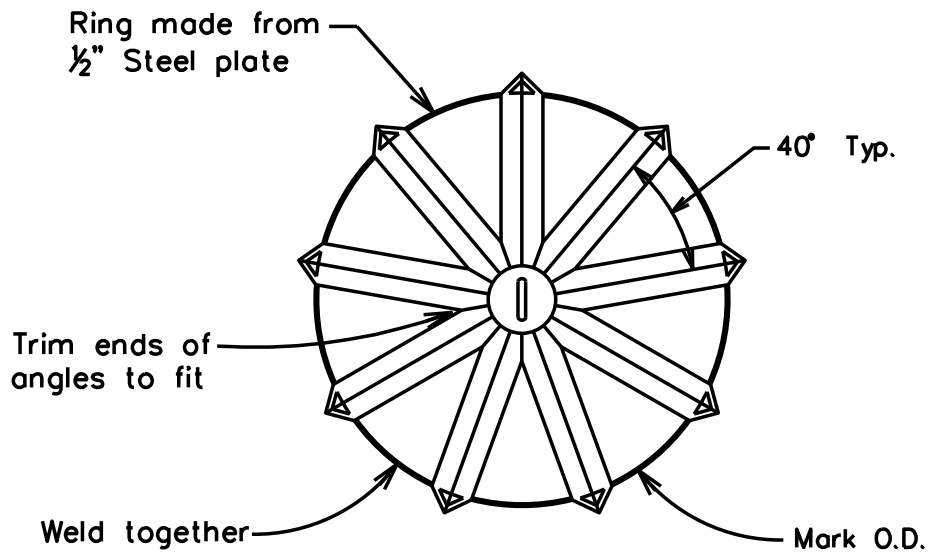
PAYMENT:

1. Sewer pipe will be paid for at the contract bid price per linear foot complete in place for the types, size and depth constructed. Said price shall be full compensation for furnishing all materials, including pipe, couplings, trenching, pumping, concrete, plugs, laying and jointing, backfilling, select bedding and initial backfill material, tamping, water, labor, tools, equipment, and other incidentals necessary to complete the work.
2. When the minimum separation distances for any water and sewer piping facilities cannot be maintained per 30 TAC §217.53, Contractor shall install SDR-26 PVC pipe (150 psi pressure rated). Payment for this higher pressure rated pipe shall be made the contract bid price per linear foot complete in place for the type, and size constructed.
3. Sewer pipe fittings, as part of the main line such as wyes and tees, are inclusive in the cost of Item No.854, ("Sanitary Sewer Laterals.")
4. Pay cuts will be measured from the top of ground prior to the Contractor's operation and along the centerline of the pipe to the invert of the pipe.

- End of Specification -



SIDE OR TOP VIEW



END VIEW

Note:

1. All mandrels must be approved by City of Fair Oaks Ranch Construction Inspections and stamped before use.

PROPERTY OF THE CITY OF FAIR OAKS RANCH	GO, NO GO DEFLECTION TESTING MANDREL	APPROVED	REVISED
		JANUARY 2019	
		DD-848-01	SHEET 1 OF 2

			MANDREL O.D.	RING O.D.
SIZE	A	B *	PVC (SDR-26)	PVC (SDR-26)
6"	4.0"	4.5"	5.50	4.79
8"	5.5"	6"	7.37	6.66
10"	7.0"	7.5"	9.21	8.50
12"	8.0"	9"	10.96	10.25
15"	10.0"	11"	13.42	12.71
18"	12.0"	13.5"	—	—
21"	14.0"	16"	—	—
24"	16.0"	18"	—	—
27"	18.0"	20"	—	—

* Minimum Length

CHART

Notes:

PVC pipes and fittings 6" to 15" in diameter shall conform to ASTM D-3034-08.

PVC pipes and fittings 18" to 27" in diameter shall conform to ASTM F-679-08.

This information is provided as a reference. All deflection testing shall be done in accordance with TCEQ Chapter 217.

PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

GO, NO GO DEFLECTION
TESTING MANDREL CHART

APPROVED
JANUARY 2019

REVISED

DD-848-01

SHEET
2 OF 2

ITEM NO. 849

SANITARY SEWER PIPE AIR AND DEFLECTION TESTING

- 849.1 DESCRIPTION:** This item shall consist of air and deflection tests in accordance with this specification and as directed by the Engineer.
- 849.2 SUBMITTALS:** Contractor shall submit manufacturer's product data instructions, recommendations, shop drawings, and certifications.
- 849.3 MATERIALS:** The materials installed for air and deflection tests shall conform to the appropriate specifications contained within the latest revision of Fair Oaks Ranch' Material Specifications.
- 849.4 TESTING OF INSTALLED PIPE:** The Contractor shall perform a low- pressure air test, or an infiltration/exfiltration test, and a mandrel test before the installed work shall be considered accepted. If a gravity collection main is composed of flexible pipe, a deflection test will also be required. Flexible pipe is defined as pipe that will deflect at least 2% without structural distress. Contractor shall insure that all testing is performed in the presence of the Inspector, with copies of all written test results made available to the Inspector. Tests shall conform to the following requirements:

1. Low-Pressure Air Test: The procedure for the low-pressure air test shall conform to the procedures described in ASTM C828, ASTM C924, and ASTM F1417 (or other appropriate procedures), except for testing times. The test times shall be as outlined in this section. For sections of pipe less than 36-inch average inside diameter, the following procedure shall apply. The pipe shall be pressurized to 3.5 psi greater than the pressure exerted by groundwater above the pipe. Once the pressure is stabilized, the minimum time allowable for the pressure to drop from 3.5 pounds per square inch gauge to 2.5 pounds per square inch gauge shall be computed from the following equation:

$$T = \frac{0.085 \times D \times K}{Q}$$

T = Time for pressure to drop 1.0 pound per square inch gauge in seconds;

K = 0.000419xDxL, but not less than 1.0;

D = Average inside pipe diameter, in inches;

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L = Length of line of same pipe size being tested, in feet;

Q = Rate of loss, 0.0015 cubic feet per minute per square foot internal surface shall be used since a K value of less than 1.0 shall not be used.

The minimum testing times for each pipe diameter is as follows:

Pipe Diameter	Minimum Time	Length for Minimum Time	Time for Longer Length
Inches	Seconds	Feet	Seconds/Ft
6	340	398	0.855
8	454	298	1.520
10	567	239	2.374
12	680	199	3.419
15	850	159	5.342
18	1,020	133	7.693
21	1,190	114	10.471
24	1,360	100	13.676
27	1,530	88	17.309
30	1,700	80	21.369
33	1,870	72	25.856

* Note: Test time starts after the required 60 seconds of stabilization time has transpired.

The test may be stopped if no pressure loss has occurred during the first 25% of the calculated testing time. If any pressure loss or leakage has occurred during the first 25% of the testing period, then the test shall continue for the entire test duration as outlined above or until failure.

Mains with a 27 inch average inside diameter and larger must be air tested at each joint. If the joint test is used, a visual inspection of the joint shall be performed immediately after testing. The pipe is to be pressurized to 3.5 psi greater than the pressure exerted by groundwater above the pipe. Once the pressure has stabilized, the minimum time allowable for the pressure to drop from 3.5 pounds per square inch gauge to 2.5 pounds per square inch gauge shall be 10 seconds.

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Mains that are greater than 33-inch diameter must be tested for leakage at each joint, or as approved by the Engineer.

2. Infiltration/Exfiltration Test: The total exfiltration, as determined by a hydrostatic head test, must not exceed 50 gallons per inch of diameter per mile of main per 24 hours, at a minimum test head of 2 feet above the crown of the main at an upstream manhole. The Contractor shall use an infiltration test in lieu of an exfiltration test when mains are installed below the ground water level. In such cases, the total exfiltration, as determined by a hydrostatic head test, must not exceed 50 gallons per inch diameter per mile of main 24 hours at a minimum test head of 2 feet above the crown of the main at an upstream manhole, or at least 2 feet above the existing groundwater level, whichever is greater. For construction work occurring within a 25-year floodplain, the infiltration or exfiltration must not exceed 10 gallons per inch diameter per mile of main per 24 hours at the same minimum test head as stated in the previous sentence. If the quantity of infiltration or exfiltration exceeds the maximum quantity specified, the Contractor shall propose to the Engineer, and receive approval therefrom, all necessary remedial action, solely at the Contractor's own cost, in order to reduce the infiltration or exfiltration to an amount within the limits specified herein.
3. Deflection Testing: As stated in the 30 TAC § 217, deflection test shall be performed on all flexible pipe installed.
 - a. For mains with inside diameters less than 27 inches, a rigid mandrel shall be used to measure deflection.
 - b. For main with an inside diameter 27 inches and greater, a method approved by the Engineer shall be used to test for vertical deflections.

The deflection test must be accurate to within $\pm 0.2\%$ deflection. The test shall be conducted after the final backfill has been in place at least 30 days. No pipe shall exceed a deflection of five percent. If a pipe should fail to pass the deflection test, the problem shall be corrected and a second test shall be conducted after the failed area's final backfill has been in place an additional 30 days. The tests shall be performed without mechanical pulling devices. The Engineer should recognize that this is a maximum deflection criterion for all pipes and a deflection test less than

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5 % may be more appropriate for specific types and sizes of pipe. Upon completion of construction, the Engineer or other Texas Registered Professional Engineer appointed by the owner shall certify to the Inspector, that the entire installation has passed the deflection test. This certification may be made in conjunction with the notice of completion required in 30 TAC § 217.14. (1) of this title (relating to General Provisions). This certification shall be provided for the Owner to consider the requirements of the approval have been met.

- a. Mandrel Sizing. The rigid mandrel shall have an outside diameter (O.D.) not less than 95% of the inside diameter (I.D.) of the pipe. The inside diameter of the pipe, for the purpose of determining the outside diameter of the mandrel, shall be the average outside diameter minus two minimum wall thicknesses for O.D. controlled pipe and the average inside diameter for I.D. controlled pipe. All dimensions shall be per appropriate standard. Statistical or other "tolerance packages" shall not be considered in mandrel sizing.
- b. Mandrel Design: The rigid mandrel shall be constructed of a metal or a rigid plastic material that can withstand 200 psi without being deformed. The mandrel shall have nine or more "runners" or "legs" as long as the total number of legs is an odd number. The barrel section of the mandrel shall have a length of at least 75% of the inside diameter of the pipe. A proving ring shall be provided and used for each size mandrel in use.
- c. Method Options: Adjustable or flexible mandrels are prohibited. A television inspection is not a substitute for the deflection test.

849.5 MEASUREMENT: Air/Infiltration/Exfiltration and Deflection Testing will not be measured for payment.

849.6 PAYMENT: No direct payment shall be made for Air/Infiltration/Exfiltration and Deflection Testing, and all costs in connection therewith shall be included in the applicable contract price for the item to which the work pertains.

- End of Specification -

ITEM NO. 850
SANITARY SEWER STRUCTURES

850.1 DESCRIPTION: This item shall govern for the construction or rehabilitation of all concrete sanitary sewer structures other than standard sanitary sewer manholes (Item No. 852). Structures shall be required for all sewer main larger than 24 inches. All material and construction work shall be in accordance with the Texas Commission on Environmental Quality (TCEQ) rules to include: Design Criteria for Sewerage Systems (30 TAC § 217), or any revisions thereto as applicable. All structures shall be watertight and coated with a Fair Oaks Ranch-approved sewer coating. Structure covers may be either watertight or water resistant, depending upon their specific location. Every structure cover located in the Edward's Aquifer Recharge Zone, shall be watertight. Sewer manhole ring and cover castings shall meet the current requirements of AASHTO Designation M306-10.

850.2 SUBMITTALS: Contractor shall submit manufacturer's product data, instructions, recommendations, shop drawings, and certifications.

Contractor must provide Geographic Information Systems (GIS) point .shp file for any installed sanitary sewer structure. The GIS .shp file must include information on the location, top of concrete, and invert of the structure at a minimum. Confirm the information to be included in the .shp file with Fair Oaks Ranch prior to submission. Additional information to be included in the shapefile may be requested by Fair Oaks Ranch.

850.3 MATERIALS:

1. Concrete: All concrete shall conform to the provisions of Item No. 300, "Concrete (Natural Aggregate)," or shall be of the class/type as noted in the contract documents.
2. Reinforcing Steel: All reinforcing steel shall conform to the provisions of Item No. 301, "Reinforcing Steel."
3. Membrane Curing Compound: All membrane curing compound shall conform to the provisions of TxDOT's DMS-4650, "Hydraulic Cement Concrete Curing Materials and Evaporation Retardants."
4. Structure Ring and Covers: The standard structure ring and cover shall be ductile iron and manufactured to the dimensions shown herein. The ring and cover shall be hinged. Lifting slots cast into the covers shall be provided for lifting purposes. A water-resistant (cam lock) ring and cover shall be used in areas of minimal infiltration potential to allow

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venting. A watertight (bolt down) ring and cover must be used in areas of high infiltration potential, such as in the Edward's Aquifer Recharge Zone, an identified 100-year floodplain, or as otherwise directed by the Engineer. The nominal cover diameter shall be 32 inches, with a 30 inch clear opening, as required by TCEQ. Rings shall have a minimum of four 1 inch holes/slots for anchoring purposes.

5. Rings shall be a minimum of 4-1/2 inches in height, or as otherwise accepted by the Engineer. Slots for embedment/lightening are not allowed in ring flanges.

Water-resistant Rings and Covers: Rings and covers shall have two hinges for added stability. The hinge shall have a drain to allow for proper debris and foreign object removal. Prior to acceptance of the work, a stainless steel keyed "cam" lock shall be provided by the Contractor to the Inspector. When the key is inserted in the cam, it shall remain in the lid while the cam is in the open (unlocked) position. When in the closed (locked) position, the key can be removed. When not in use, the cam lock key hole shall be covered with a plastic plug to prevent infiltration of debris. The cover shall positively lock at 90° to prevent accidental closure and open fully to 120°. The cover shall also include a single multi-tool lifting slot adjacent to the edge of the cover to facilitate opening/lifting/prying once it is unlocked. Covers shall be provided with a continuous vulcanized (one piece) EPDM gasket with a shore durometer of 70 ±5 permanently attached to the cover.

Watertight Rings and Covers: Rings and covers shall be the same as above for water-resistant version, except the covers shall be bolted to the ring instead of secured with the cam lock mechanism. No vent hole(s) shall be provided. A minimum of four 1/2 inch diameter, stainless steel, hex head bolts shall be provided for each cover. The 4 bolt holes in the covers shall be evenly spaced and provided with a minimum 1-1/2 inch diameter counter sink for the bolt heads. On the fastened and bolted position, the bolt heads shall not extend above the surface or the cover. Washers of a size and material as approved by the Engineer shall be provided for the bolts to insure air and water tightness.

The finished ring and cover shall have the bearing surfaces machined ground and sets of rings and covers shall be marked in such a way that they can be matched for assembly in the field. All covers shall be standard covers for sanitary sewer manholes have the words "Sewer" cast thereon. Ring and cover shall have the approved foundry's name,

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part number, country of origin preceded by "Made in" (example: MADE IN USA) in compliance with the country of origin law of 1984, and production date (example: mm/dd/yy) for tracking purposes. Each casting must be marked with DI and ASTM A536 or A536 80-55-06 to verify the materials used. Castings without proper markings shall be rejected.

6. Mortar: Mortar shall be composed of 1 part Portland Cement, 2 parts sand and sufficient water to produce a workable mixture. When used to plaster manholes, it may be composed of 1 part cement to 3 parts sand. Lime up to 10% may be used.
7. Throat Rings: Throat rings shall be made of either HDPE or reinforced concrete rings having a maximum thickness of 2 inches. The internal diameter shall match that of the ring and cover's opening. Concrete shall conform to the provisions of Item No. 300 "Concrete (Natural Aggregate)." If concrete throat rings are to be utilized, they must be used in conjunction with a UV stabilized polyethylene liner. I/I barrier must meet the following ASTM standards: ASTM D790/1505 Density of Polyethylene Materials, ASTM D1238-10 Melt Flow index, ASTM 638- 10 Tensile Strength @ Yield (50mm/mm), ASTM 790-10 Flexural Modulus, ASTM 648-07 Heat Deflection Temperature @IGEPAL, ASTM 1693-12 EsCR, 100% IGEPAL/10% IGEPAL. A minimum of two and a maximum of four throat rings may be used at each manhole installed.
8. Coating: After all structures have been constructed or rehabilitated, and all testing has passed, they shall be considered watertight. Afterward, they shall be coated with a Fair Oaks Ranch-approved sewer coating.

For new structures, or existing ones scheduled to be rehabilitated, contractors shall apply a combination of both products with the cementitious coating first, followed by the epoxy coating. Kernoes SewperCoat 2000 HR regular, with the required one inch thick application, is the only product yet approved which satisfies the requirement of applying the combination of both the cementitious coating and epoxy coating. Other approved materials are as follows:

- a. Cementitious coating: With required one inch thick application:
 - (1) Permaform CR-9000;
 - (2) Strong - Seal MS-2C;
 - (3) Standard Cement Material Inc. Reliner;

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- (4) Quadex Aluminaliner;
- (5) ConShield Biotech Armor.

b. Epoxy coating: With specified thickness application:

- (1) Raven 405 Series High Build Epoxy Liner:
Required thickness – 125 mils;
- (2) Spray Wall polyurethane System: Required thickness –
125 mils;
- (3) Carbolite Plasite 4500: Required thickness – 125 mils.

8504

CONSTRUCTION: All concrete sanitary sewer structures shall be constructed or rehabilitated in accordance with these specifications and in conformity with the required lines, grades, sections, and details shown in the contract documents or as directed by the Engineer.

Construction methods shall conform to all applicable terms of Item No. 307, "Concrete Structures." Where portions of structures are shown in the contract document details, such portions shall be constructed in accordance with applicable provisions of Item No. 852, "Sanitary Sewer Manholes." Sanitary sewer structures constructed to function as manholes or maintenance access appurtenances to gravity sewer systems shall be constructed to accommodate influent and effluent pipes greater than 24 inches in diameter as shown in Standard Drawing DD-850- 01.

8505

TESTING: The Contractor shall perform the testing for all sanitary sewer structures in accordance with the following.

- 1. Leakage Testing: All structures must pass a leakage test. The Contractor shall test each structure (after assembly and backfilling) for leakage, separate and independent of the all other sanitary sewer piping, by means of either a hydrostatic test, vacuum test, or other methods approved by the Engineer.

Contractor is hereby instructed to conduct either of the two identified tests in the following manner:

- a. Hydrostatic Testing: Hydrostatic testing shall be conducted by utilizing approved plugs to seal all influent and effluent pipes in the structure and filling the structure to the top of the structure with water. Additional water may be added over a 24 hour period to compensate for absorption and evaporation

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losses. At the conclusion of the 24 hour saturation period, the structure shall be filled to the top of the structure and observed. Any measureable loss within a 30 minute period shall be considered an unsuccessful test and thus require the Contractor to assess the needed repairs, perform such repairs (subject to the approval of the Engineer), and notify the Inspector when the retest will be performed. All effort, materials, or other costs shall be solely at the Contractor's expense.

b. Vacuum Testing:

- (1) General: Structures shall be tested after construction/installation and backfilling with all connections (existing and/or proposed) in place. Drop-connections and gas sealing connections shall be installed prior to testing.
- (2) Test Procedure: The lines entering the structure shall be temporarily plugged with the plugs braced to prevent them from being drawn into the structure. The plugs shall be installed in the lines beyond drop connections, gas sealing connections, etc. Prior to performing the test, the contractor shall plug lift holes and exterior joints with a non-shrink grout and plug all pipes entering the structure. No grout shall be placed in horizontal joints prior to testing. Contractor shall use a minimum 60 inch/lb torque wrench to tighten the external clamps that secure the test cover to the top of the structure. The test head shall be inflated in accordance with the manufacturer's recommendations. A vacuum of 10 inches of mercury shall be drawn, and the vacuum pump will be turned off. The test does not begin until after the vacuum pump is off. With the valve closed, the level vacuum shall be read after the required test time. If the drop in the level is less than 1 inch of mercury (final vacuum greater than 9 inches of mercury), the structure will have passed the vacuum test. The required test time is 2 minutes.
- (3) Acceptance: Structures will be accepted with relation to vacuum test requirements, if they meet the criteria above. Any structure which fails the initial test must be repaired with a non-shrink grout or other suitable material based on the material of which the structure is constructed. Structures shall be repaired on the exterior surface only. The structure shall be retested as described above until a

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successful test is attained. After a successful test, the temporary plugs will be removed. To ensure that the plugs have been removed, Contractor shall only do so in the presence of the Inspector.

- (4) Repairs to Existing Structures: Any existing structure which fails to pass the vacuum test shall be closely examined by the Inspector and the Contractor to determine if the structure can be repaired. Thereafter, the Contractor shall either repair or remove and replace the structure as directed. The structure shall then be retested and coated with a Fair Oaks Ranch-approved structural coating as stated above. The Owner may elect to simply remove and replace the existing structure with a new one. Any structure excavated for repairs or excavated for tie in, shall be backfilled with flowable fill up to 1 foot below the top of the structure/cone. The Contractor also has the option of backfilling with approved secondary materials, subject to the provisions of Item No. 804, "Excavation, Trenching and Backfill."
- (5) Measurement and Payment: Vacuum testing of new structures will not be a pay item. The cost of this work will be included in the bid price for the new structure. Each vacuum test of an existing structure shall be a separate pay item. Repairs to existing structures shall be a separate pay item when authorized.

- 2. Holiday Testing: Inspect each sanitary sewer structure using high-voltage holiday detection equipment. All detected holidays shall be marked and repaired by abrading the coating surface with grit disk paper, or other hand tooling method. After abrading and cleaning, additional protective coating material shall be applied to the repair area. All touch-up repair procedures shall follow the protective coating manufacturer's recommendations.

If a sanitary sewer structure fails to pass one of the above tests, it shall be repaired in accordance with the manufacturer's recommendations and re-tested. It shall not be accepted until it passes all tests. All repairs and re-testing shall be at no additional cost to Fair Oaks Ranch.

850.6

MEASUREMENT: Sanitary Sewer Structures will be measured as each structure complete in place.

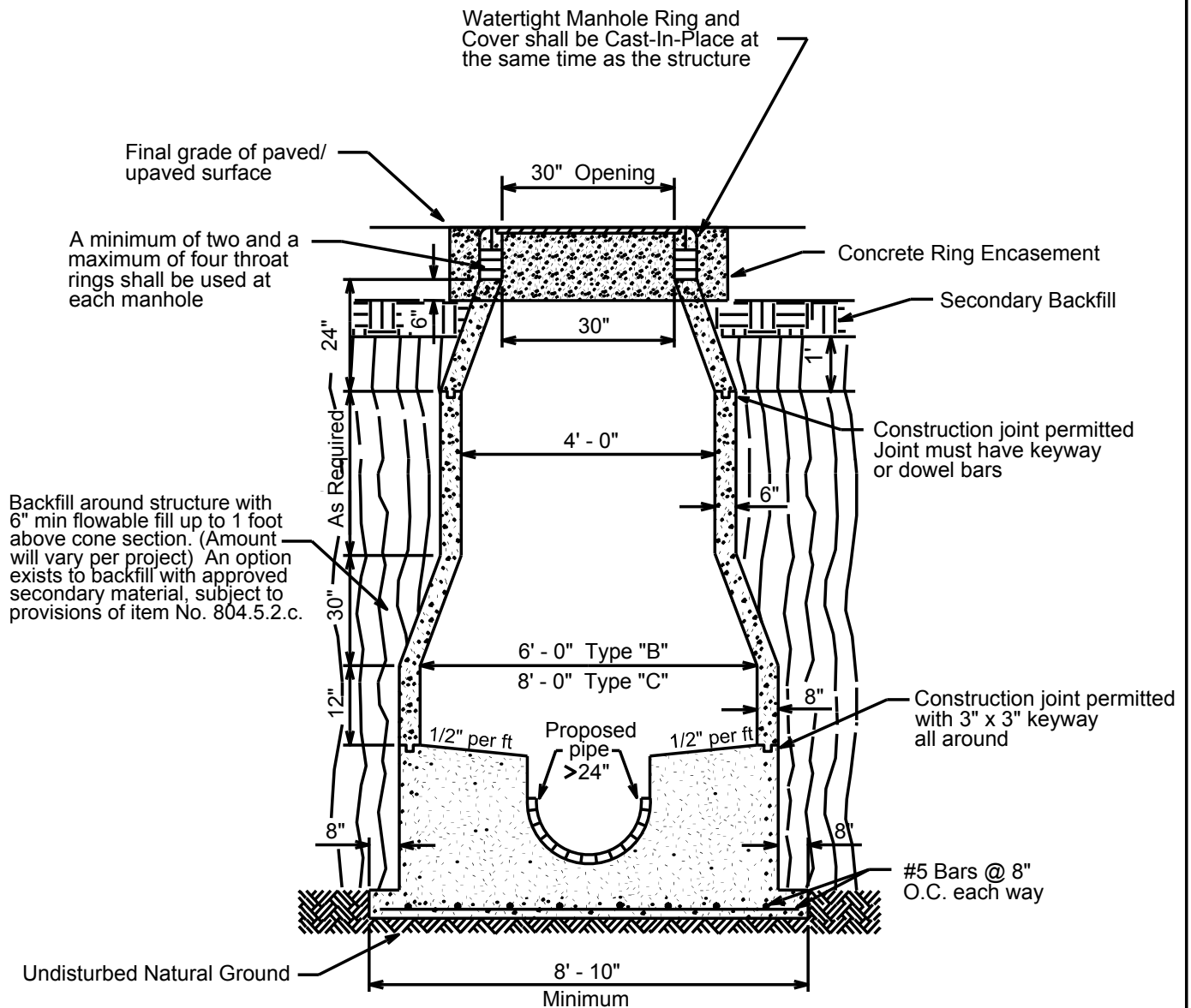
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850.7

PAYMENT: The work, as prescribed by this item, will be paid for at the unit price bid per each for "Sanitary Sewer Structures," which price shall be full compensation for furnishing and placing all materials, manipulations, bases with pipe cradles, rings and covers, cones, throat rings, I/I barrier, testing precast sections, concrete, flowable fill, manhole ring encasement, mortar, diversion of flows within structure installation, labor, tools, equipment and incidentals necessary to complete the work. Note: No separate payment for coating.

Concrete cradles for pipes entering and leaving a structure shall be measured and paid for at the price bid as provided for in Item No. 858, "Concrete Encasement, Cradles, Saddles and Collars."

- End of Specification -



SANITARY SEWER STRUCTURE
6' & 8' STRUCTURE TYPE "B" & "C"

Notes:

The channel depth shall be at least equal to the largest pipe diameter. Structures shall be designed and installed on all mains greater than 24" in diameter.

PROPERTY OF
**THE CITY OF FAIR OAKS
 RANCH**

**TYPICAL SANITARY
 SEWER STRUCTURE**

APPROVED
 JANUARY 2019

REVISED

DD-850-01

SHEET
1 OF 1

Fair Oaks Ranch Standard Specifications for Construction

ITEM NO. 851

EXISTING MANHOLE ADJUSTMENTS

851.1 DESCRIPTION: This item shall govern the adjustment of all existing manholes, to include the replacing of existing manhole covers and rings regardless of type shown in the contract documents and in conformity with the provisions of these specifications or as directed by the Engineer. All material and construction work shall be in accordance with current Texas Commission on Environmental Quality (TCEQ) rules to include: Design Criteria for Sewage Systems (30 TCEQ § 217), or any revision thereto as applicable. All manholes shall be watertight and coated with a Fair Oaks Ranch-approved sewer coating. The context of this specification is limited to adjusting the final elevation of the manhole by the maximum or minimum number of throat rings. Manhole rings and covers shall be in conformance with Item No. 852, “Sanitary Sewer Manholes”. Sewer manhole ring and cover castings shall meet the current requirements of the American Association of State Highway and Transportation Officials (AASHTO) Designation M306-10. All manholes requiring adjustments beyond the maximum or minimum number of throat rings (described herein), shall be subject to Item No. 855, “Existing Manhole Reconstruction.”

851.2 REFERENCED STANDARDS: The following standards are referenced herein or otherwise related to the project work and shall be the current edition:

1. AASHTO – American Association of State Highway and Transportation Officials:
 - a. M306: Standard Specification for Drainage, Sewer, Utility, and Related Castings.
2. ASTM – American Society for Testing and Materials:
 - a. A536: Standard Specification for Ductile Iron Castings.
 - b. D638: Test Method for Tensile Properties of Plastics.
 - c. D648: Standard Test Method for Deflection Temperature of Plastics under Flexural Load in the Edgewise Position.
 - d. D790: Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
 - e. D1238: Standard Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer.
 - f. D1505: Standard Test Method for Density of Plastics by the Density-Gradient Technique.
 - g. D1693: Standard Test Method for Environmental Stress-Cracking of Ethylene Plastics.

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3. COSA – City of Fair Oaks Ranch:
 - a. Utility Excavation Criteria Manual.
4. TCEQ – Texas Commission on Environmental Quality:
 - a. Design Criteria for Sewage Systems (30 TCEQ § 217).

851.3 SUBMITTALS: Contractor shall submit manufacturer's product data, instructions, recommendations, shop drawings, and certifications. All submittals shall be in accordance with Owner's requirements and submittals shall be approved by the Owner prior to delivery.

851.4 MATERIALS:

1. Manhole Rings and Covers (if replaced): Refer to Item No. 852, "Sanitary Sewer Manholes".
2. Concrete Throat Rings (if applicable): Refer to Item No. 852, "Sanitary Sewer Manholes".
3. Internal Liner for Use in Conjunction with Concrete Throat Rings: Refer to Item No. 852, "Sanitary Sewer Manholes". UV stabilized polyethylene for the purpose of providing an infiltration/inflow (I/I) barrier. I/I barrier must meet the following ASTM standards: ASTM D790 for flexural properties; ASTM D1505 for density; ASTM D1238 for Melt Flow Index; ASTM D638 for tensile strength at yield (50mm/mm); ASTM D790 for flexural modulus; ASTM D648 for heat deflection temperature at IGEPAL; and ASTM D693 for EsCR, 100% IGEPAL/10% IGEPAL.
4. Bitumastic Joint Sealant. To be applied between cones, risers, adjustment rings, flat tops, and between the ductile cast iron ring and the uppermost adjustment ring or flat top: RAM-NEK, as manufactured by Henry, Inc.; Kent Seal, as manufactured by Hamilton-Kent, Inc.; Encapseal, as manufactured by Miller Pipeline Corporation; or approved alternate.

851.5 CONSTRUCTION: Manholes shall be lowered below street subgrade before placing base materials, and openings shall be protected by temporary hatch covers. Manholes adjusted in non-paved areas shall be set per proposed final grade.

Existing manhole rings and covers which are determined by the Inspector to be in an unacceptable condition, will be removed and replaced with new rings and covers. If the cone section is removed, the Contractor is to upgrade it to a 30 inch opening as required by 30 TAC § 217. All manhole openings upgraded to 30 inches shall then be subjected to all provisions of Item No. 855, "Existing Manhole Reconstruction," except for the "Manhole Ring and Cover" provisions, which are specified under Item No. 852, "Sanitary Sewer Manholes."

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Contractor shall take all necessary measures to prevent damage to existing or new rings, covers, or cones from equipment and materials used in, or taken through, the work area. If an existing or new manhole cover, ring, or cone is damaged by the Contractor, it shall be replaced (as directed by the Inspector) by the Contractor at his own expense within 10 working days. If concrete throat rings are to be installed, they must be used in conjunction with a UV stabilized polyethylene liner and inflow/infiltration (I/I) barrier, as specified under No. 852, "Sanitary Sewer Manholes."

Manholes shall be adjusted after the street's base material has been laid and before placing of the final surface course. Manholes that are going to be adjusted on an existing surface course (not planned for replacement) will be in accordance to the City of Fair Oaks Ranch Utility Excavation Criteria Manual Standard Drawing No. 8.8, but must first be directed by the Engineer. All manholes shall then be raised, or lowered a sufficient height so as to be level with the finished surface course. Adjustment in height will be made by the addition or removal of "throat rings" above the manhole cone.

Note of Clarification: A minimum of two and a maximum of six "throat rings" may be used at each adjusted manhole. "Throat rings" are limited to a minimum of two and a maximum of four rings for new manhole construction.

The sets of rings and covers shall be marked in such as way that they can be matched for assembly in the field. All covers shall be standard covers for sanitary sewer manholes have the words " "Sewer" cast thereon.. Ring and cover shall have the approved foundry's name, part number, country of origin preceded by "Made in" (example: MADE IN USA) in compliance with the country of origin law of 1984, and production date (example: mm/dd/yy) for tracking purposes. Each casting must be marked with DI (ductile iron) and ASTM A536 or A536 80-55-06 or CI (cast iron) and ASTM A-48, Class 35B to verify the materials used. Castings without proper markings shall be rejected. Refer to Item No. 852, "Sanitary Sewer Manholes" for further details.

Joints between cones, risers, adjustment "throat rings", flat tops, and between the ductile cast iron ring and the uppermost adjustment ring or flat top shall be thoroughly sealed in accordance with manufacturer's recommendations with strongly adhesive bitumastic products: RAM-NEK, as manufactured by Henry, Inc.; Kent Seal, as manufactured by Hamilton-Kent, Inc.; Encapseal, as manufactured by Miller Pipeline Corporation; or approved alternate. Where precast concrete risers are used, any gaps in the outer joint surfaces shall be additionally coated with quick-set, non-shrink grout.

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Other Construction Requirements: Refer to Item No. 852 “Sanitary Sewer Manholes” for the following requirements:

1. The Contractor shall conform to detail DD-852-03 as modified herein and install concrete manhole ring encasements for manhole adjustments and for ring and cover replacements and re-installations when required by Engineer or Inspector.

Material excavation from around the manholes shall be replaced with flowable fill in accordance with these specifications, and select materials from the excavation (as shown in the contract documents). All excess materials shall be disposed of by the Contractor at his own expense and in an approved location. Disposal location to be approved by Engineer or Inspector. The Contractor also has the option of backfilling with approved secondary materials, subject to the provisions of Item No. 804, “Excavation, Trenching and Backfill.”

851.6 MEASUREMENT: Manholes completely adjusted, as prescribed above, will be measured by the unit of each manhole adjusted. The excavation and the amount of flowable fill, reinforced concrete, or any other material as necessary to fill the area excavated, will not be measured for payment.

851.7 PAYMENT: The work performed as prescribed by this item will be paid for at the contract unit price bid per manhole for “Existing Manhole Adjustment,” which price shall be full compensation for all excavation, including saw cutting of surfaces as required, reinforced concrete and disposal of material excavated; for furnishing and placing all materials and for all labor, tools, equipment, all testing and incidentals necessary to complete the work.

- End of Specification -

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ITEM NO. 852A

SANITARY SEWER MANHOLES

855.1 **DESCRIPTION:** This item shall govern the construction of standard sanitary sewer manholes complete in place and the materials therein, including manhole rings and covers. All material and construction work shall be in accordance with current Texas Commission on Environmental Quality (TCEQ) rules to include: Design Criteria for Sewage Systems (30 TCEQ § 217), or any revision thereto as applicable. All constructed manholes shall be watertight and equipped with pre- tested and approved low leakage frames and lids, as specified herein. Sewer manhole ring and cover castings shall meet the current requirements of the American Association of State Highway and Transportation Officials (AASHTO) Designation M306-10. The approved list of sewer coating manufacturers will be found herein. All manholes must be spray coated per specification. Polymer concrete manholes may be used per Item No. 852B, at the City's discretion.

852.1 **REFERENCED STANDARDS:** The following standards are referenced herein or otherwise related to the project work and shall be the current edition:

1. AASHTO – American Association of State Highway and Transportation Officials:
 - a. M306: Standard Specification for Drainage, Sewer, Utility, and Related Castings.
2. ASTM – American Society for Testing and Materials:
 - a. A536: Standard Specification for Ductile Iron Castings.
 - b. C478: Standard Specification for Circular Precast Reinforced Concrete Manhole Sections.
 - c. D638: Test Method for Tensile Properties of Plastics.
 - d. D648: Standard Test Method for Deflection Temperature of Plastics under Flexural Load in the Edgewise Position.
 - e. D790: Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
 - f. D1238: Standard Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer.
 - g. D1505: Standard Test Method for Density of Plastics by the Density-Gradient Technique.
 - h. D1693: Standard Test Method for Environmental Stress-Cracking of Ethylene Plastics.

3. COSA – City of San Antonio:

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a. Utility Excavation Criteria Manual.

4. TCEQ – Texas Commission on Environmental Quality:

a. Design Criteria for Sewage Systems (30 TCEQ § 217).

8522

SUBMITTALS: Contractor shall submit manufacturer's product data, instructions, recommendations, shop drawings, and certifications. All submittals shall be in accordance with Owner's requirements and submittals shall be approved by the Owner prior to delivery.

Contractor must provide Geographic Information Systems (GIS) point .shp file for any installed sanitary sewer manhole. The GIS .shp file must include information on the location, top of concrete, and invert of the manhole at a minimum. Confirm the information to be included in the .shp file with Fair Oaks Ranch prior to submission. Additional information to be included in the shapefile may be requested by Fair Oaks Ranch.

8523

MATERIALS:

1. Concrete Manhole Components: For new concrete manholes, all concrete manhole components (cast-in-place or precast manhole base, precast risers, precast cone sections, cast-in-place or precast flat tops, and concrete "throat rings" as applicable) for new manholes shall conform to the applicable requirements of ASTM Designation C478, except as modified below.
 - a. Concrete Grout: All concrete grout used for patching or other similar fill-in work shall be of non-shrink type made with the Komponent® admixture specified above, or approved alternate, in accordance with the manufacturer's recommended formulation with Portland cement, fine aggregate, water, and water reducer to produce a compressive strengths of approximately 4,800 psi within 7 days and 7,250 psi within 28 days at a 70 °F baseline temperature.
2. Manhole Ring and Cover: The manhole ring and cover shall be of ductile iron or gray cast iron construction. The cover shall be solid with no vent or pick holes; hinged with underlying special hinge area leakage protection; the cover secured with four (4) stainless steel bolts; and shall have a recessed "pick bar" for cover opening. Cam lock type covers shall not be allowed. Approved manufacturers, as listed below, have previously completed required inflow leakage shop testing and have met a maximum allowable leakage rate criterion of 1 gallon per minute (gpm) at 12 inches of water submergence above the manhole cover. Rings and covers

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shall be furnished from either of the following two manufacturers with the specified features:

a. Approved Manufacturers:

- (1) Neenah Foundry, Division of Neenah Enterprises, Inc.
 - a) 24-inch Clear Opening Cover: “Lift Mate” Model R- 1650-LM. Refer to drawing DD-852-07, Sheet 4 of 5.
 - b) 30-inch Clear Opening Cover: “Lift Mate” Model R- 1743-LM. Refer to drawing DD-852-07, Sheet 5 of 5.
 - c) Hinge Area Leakage Protection (both cover sizes): Insertion plug beneath hinge shall be neoprene, pre-installed by the manufacturer. The plug shall be self-sealing and held firmly in place by direct contact of the hinge upon closure and bolting down of the cover.

(2) East Jordan (EJ)

- a) 24-inch Clear Opening Cover: Product Number 41418105L01. Refer to drawings DD-852-07, Sheets 1 and 2 of 5.
- b) 30-inch Clear Opening Cover: Product Number 41421084L01. Refer to drawing DD-852-07, Sheet 3 of 5.
- c) Hinge Area Leakage Protection, 24-in Clear Opening Cover: Flat neoprene sheet gasket pre-installed by the manufacturer to the underside of the single hinge pocket with quick-set epoxy glue.
- d) Hinge Area Leakage Protection, 30-in Clear Opening Cover: Insertion plug beneath each hinge shall be low density polyethylene (LDPE), pre-installed by the manufacturer with silicone sealant. The plug shall be held firmly in place by direct contact of the hinge upon closure and bolting down of the cover.

- b. Cover Gasket. The underside of the cover shall be equipped with a continuous (one piece) vulcanized “T-shaped” gasket for perimeter leakage sealing. The gasket shall either be of nitrile, neoprene, or EPDM construction and pre-inserted into the perimeter retainer slot by the manufacturer as shown by the above referenced drawings. If the gasket is damaged in any way through shipping or through on-site storage or handling by the Contractor, a completely new manhole cover must be provided. Field repairs of a damaged gasket shall not be attempted or allowed.

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- c. Machined Metal Surfaces: Prior to gasket insertion, the underside of the metal mating surfaces on the underside of the cover and the inner frame ledge supporting the cover shall have been machined smooth to allow uniform seating of the cover gasket.
 - d. Cover Labeling: All covers shall be standard covers for sanitary sewer manholes have the words " "Sewer" cast thereon. Ring and cover shall have the specified foundry's name, part number, country of origin preceded by "Made in" (example: MADE IN USA) in compliance with the country of origin law of 1984, and production date (example: mm/dd/yy) for tracking purposes. Each casting must be marked with DI (ductile iron) and ASTM A536 or A536 80-55-06 or CI (cast iron) and ASTM A- 48, Class 35B to verify the materials used. Castings without proper markings shall be rejected.
 - e. Cover Bolts. Four (4) bolts of 1/2-IN diameter x 13 thread pitch shall be used to secure the cover. Bolts shall be of stainless steel, grade 304 or better. The top of the cover shall have a recessed area around each bolt assembly to accommodate the washer diameter and thickness and bolt head height so that the bolting assembly does not exceed the top of the manhole cover. Where cover bolts directly thread into the underlying cast iron frame, the bolt threads shall be thoroughly coated with Nikal Jet Lube product, as manufactured by CSW Industrials Company or approved alternate before insertion to avoid subsequent "seize up" from dissimilar metals. If such bolts are removed for any purpose, the threads must be recoated. Stainless steel bolts that are threaded into stainless steel nuts within recessed slots in the underlying frame optionally do not require an anti-seize coating of the bolt threads.
3. "Throat Rings": "Throat rings" shall be made of reinforced concrete and have a maximum thickness of 2 inches. The internal diameter shall match that of the ring and cover's opening. Concrete shall conform to the provisions of Item No. 300 "Concrete (Natural Aggregate)." Concrete "throat rings" are to be used in conjunction with a UV stabilized internal polyethylene liner for the purpose of providing an infiltration/inflow (I/I) barrier. The I/I Barrier shall be as manufactured by Strike Tool Products of Cannon Falls, MN and must meet the following ASTM standards: ASTM D790 for flexural properties; ASTM D1505 for density; ASTM D1238 for Melt Flow Index; ASTM D638 for tensile strength at yield (50mm/mm); ASTM D790 for flexural modulus; ASTM D648 for heat deflection temperature at IGEPAL; and ASTM D693 for EsCR, 100% IGEPAL/10% IGEPAL.

Note of Clarification: A minimum of two and a maximum of six "throat

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rings” may be used at each adjusted manhole. “Throat rings” are limited to a minimum of two and a maximum of four rings for new manhole construction.

4. Infiltration dishes: Infiltration dishes will be required in manholes where applicable (I.E, such as low drainage areas) and every third manhole shall be vented. 30” manhole cover with 1” inch hole center of cover where applicable/or water tight /bolt down.

Note: Manhole cover inserts shall be FRW industries, inc., “inflow protectorcover” “Preco industries. Ltd.”, “sewer guard”, or approved equal, and shall be installed in strict accordance with the manufacturer's recommendations. The contractor shall be responsible for making the necessary field measurements for the manufacturer prior to production.

5. Bitumastic Joint Sealant. To be applied between cones, risers, adjustment rings, flat tops, and between the ductile or gray cast iron ring (frame) and the uppermost adjustment ring or flat top: RAM-NEK, as manufactured by Henry, Inc.; Kent Seal, as manufactured by Hamilton- Kent, Inc.; Encapseal, as manufactured by Miller Pipeline Corporation; or approved alternate.
6. Interior Coating: The interior of all new and rehabilitated manholes shall be rendered watertight, chemically resistant, and abrasion resistant or Engineer.
7. Note of Clarification: Existing manholes being adjusted only as per Item 851 will not require a coating system.

For new and rehabilitated manholes, apply a combination of both products with the cementitious coating first, followed by the epoxy coating. Kerneos SewperCoat 2000 HS and PG, applied at the required one inch thick application, is the only product approved which does not require a subsequent epoxy coating. Other approved materials are as follows:

- a. Cementitious coating: With required one inch thick application:
 - (1) Permaform CR-5000;
 - (2) Strong - Seal MS-2C;
 - (3) Standard Cement Material Inc. Reliner;
 - (4) Quadex Aluminaliner;
 - (5) ConShield Biotech Armor.
- b. Epoxy coating: With specified thickness application:
 - (1) Carboline “Plasite 4500” System: Min required thickness – 125 mils

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- (2) Carboline Reactamine ET: Min required thickness – 125 mils

8524

CONSTRUCTION:

1. Manholes shall be constructed of materials and workmanship as prescribed by these specifications, at such places shown in the contract documents or as designated by the Engineer, and in conformity with the typical details and sketches shown.
- a. Unless otherwise shown in the contract documents or approved by the Engineer, standard sanitary sewer manholes shall be constructed with influent and effluent piping less than or equal to 24 inches in diameter with precast reinforced concrete manhole sections. A standard sanitary sewer manhole shall be a single entrance cylindrical structure, having a minimum internal diameter of 4 feet between the cone and base sections. The base of the structure shall include the load bearing portion beneath and exterior of the structure, invert channels and the fill or bench portions adjacent to the lower sewer pipes within the structure. The maximum vertical height of the diameter adjustment section or cone shall be 36 inches. Adjustment or throat rings may be used for final elevation adjustment of the manhole ring and cover. Concrete encasement of the manhole's ring shall be as shown in the DD-852 Standard Drawing Series. Specifically, they shall attach the ring and cover to the diameter adjustment section or cone. Manholes which differ from the above description shall be governed by Item No. 850, "Sanitary manhole's ring shall be as shown in the DD-852 Standard Drawing Series. Specifically, they shall attach the ring and cover to the diameter adjustment section or cone. Manholes which differ from the above description shall be governed by Item No. 850, "Sanitary Sewer Structures."

An internal drop manhole shall be required, when sewer lines enter a manhole more than 24 inches above the manhole invert, while an external drop manhole shall be provided for a sewer entering a manhole more than 30 inches above the invert. Both conditions will require prior approval by the Engineer.

- b. Footings or bases of manholes shall be a minimum of 6 inches in depth below the bottom of the pipe.
- c. All invert channels shall be constructed and shaped accurately so as to be smooth, uniform and cause minimum resistance to flow. The bench shall be finished smooth with a slope of ½ inch per foot

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from the manhole walls to the edges of the invert. The top half of all sewer pipes within the invert channel or bench zone shall be removed flush to the inside manhole walls.

- d. Joints on sewer pipes shall not be cast or constructed within the wall sections of manholes.
- e. Concrete cradles shall be required for new pre-cast manholes. Concrete cradles shall extend beyond the outside walls of the manhole a minimum of 36 inches.
- f. Voids between exterior pipe walls and manhole walls at all pipe connections in manholes shall be filled with a non-shrink grout, as specified above, or as approved by the Engineer, or as shown in the contract documents and inspected prior to backfilling.
- g. Where connections to existing manholes are required, the adjacent pipe bedding shall be prepared to proper grade, the existing manhole neatly cut and the new pipe inserted so that the end is projecting 2 inches from the inside wall. The invert shall then be reshaped to properly channel new flows. Debris of any kind shall be kept out of new or existing manholes or mains.
- h. Joints between cones, risers, adjustment rings, flat tops, and between the ductile cast iron ring and the uppermost adjustment ring or flat top, as applicable, shall be thoroughly sealed in accordance with manufacturer's recommendations with strongly adhesive bitumastic products as specified above. Where precast concrete risers are used, any gaps in the outer joint surfaces shall be additionally coated with non-shrink grout to a minimum thickness of ¼ inch.
- i. After adjustment ring joints have been sealed as specified above and prior to the placement of final backfill and pavement, the Contractor shall apply the specified heat shrink wrap around the outer perimeter of the adjustment "throat rings". All receiving surfaces shall first be thoroughly cleaned to allow proper adhesion of the heat shrink wrap. Installation of the wrap shall be in strict accordance with manufacturer's instructions and using the proper hot air equipment under suitable temperature and dry weather conditions. Provide sufficient vertical overlaps of the wrap around the base of the manhole ductile cast iron ring and the top of the manhole cone as applicable to the finished manhole geometry. Final backfill and pavement work must be conducted in a careful manner to avoid damaging the plastic wrap, as further specified

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below.

- j. No more than 4 throat rings may be used on any new manhole or no more than 21 inches from the top of the cone to the top of the ring and cover.
- k. Manhole Ring Encasement: All manhole rings shall be encased with 4,000 psi reinforced concrete as shown in the contract documents or as approved by the Engineer.
 - (1) Concrete manhole ring encasement shall extend 6 inches below the top of the cone and have a minimum width when measured at the manhole ring of 1 foot. The surface of the encasement shall be flush with the top of the manhole ring.
 - (2) Where manholes are constructed in existing streets and where directed by the Engineer or shown in the contract documents, the exterior exposed surfaces of the ring, mortar; throat rings and manhole surface shall be coated with a $\frac{1}{8}$ inch minimum thickness of heat shrink wrap plastic prior to placement of concrete.

8525

TESTING: The Contractor shall notify Inspector and Engineer 48 hours prior to beginning of manhole testing. The Contractor shall perform the testing for all sanitary sewer manholes in accordance with the following:

- 1. **Leakage Testing:** All manholes must pass a leakage test. The contractor shall test each manhole (after assembly and backfilling) for leakage, separate and independent of all other sanitary sewer piping, by means of either a hydrostatic test, vacuum test, or other methods approved by the Engineer. The Contractor is hereby instructed to conduct either of the two identified tests in the following manner:
 - a. **Hydrostatic Testing:** Hydrostatic testing shall be conducted by utilizing approved plugs to seal all influent and effluent pipes in the manhole and filling the manhole to the top of the cone with water. Additional water may be added over a 24-hour period to compensate for absorption and evaporation losses. At the conclusion of the 24- hour saturation period, the manhole shall be filled to the top and observed. Any measurable loss within a 30 minute period shall be considered an unsuccessful test and thus require the Contractor to assess the needed repairs, perform such repairs (subject to the approval of the Engineer), and notify the Inspector when the retest will be performed. All effort, materials, or

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other costs shall be solely at the Contractor's expense.

b. Vacuum Testing:

- (1) General: Manholes shall be tested after construction/ installation and backfilling with all connections (existing and/or proposed) in place. Drop- connections and gassealing connections shall be installed prior to testing.
- (2) Test Procedure: The lines entering the manhole shall be temporarily plugged with the plugs braced to prevent them from being drawn into the manhole. The plugs shall be installed in the lines beyond drop connections, gas sealing connections, etc. Prior to performing the test, the Contractor shall plug all lift holes and exterior joints with a non-shrink grout and plug all pipes entering the manhole. No grout shall be placed in horizontal joints prior to testing. Contractor shall use a minimum 60 inch-lb. torque wrench to tighten the external clamps that secure the test cover to the top of the manhole. The test head shall be inflated in accordance with the manufacturer's recommendations. A vacuum of 10 inches of mercury shall be drawn, and the vacuum pump will be turned off. With the valve closed, the level vacuum shall be read after the required test time. If the drop in the level is less than 1 inch of mercury (final vacuum greater than 9 inches of mercury), the manhole will have passed the vacuum test. The required test time is 2 minutes.
- (3) Acceptance: Manholes will be accepted with relation to vacuum test requirements, if they meet the criteria above. Any manhole which fails the initial test must be repaired with a non-shrink grout or other suitable material based on the material of which the manhole is constructed. The manhole shall be retested as described above until a successful test is attained. After a successful test, the temporary plugs will be removed. To ensure that the plugs have been removed, Contractor shall only do so in the presence of the Inspector.
- (4) Repairs to Existing Manholes: Any existing manhole which fails to pass the hydrostatic/vacuum test shall be closely examined by the Inspector and the Contractor to determine if the manhole can be repaired. Thereafter, the Contractor shall either repair or remove and replace the manhole as directed. The manhole shall then be retested and coated with a Fair Oaks Ranch- approved sewer coating as stated above. The Owner may elect to simply remove and replace the existing manhole with a new one. Any manhole excavated for repairs or excavated for tie in, shall be backfilled with flowable fill up to 1 foot below the top of the cone. The Contractor also has

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the option of backfilling with approved secondary materials, subject to the provisions of Item No. 804, "Excavation, Trenching and Backfill."

2. Holiday Testing: Inspect each sanitary sewer manhole using high-voltage holiday detection equipment. All detected holidays shall be marked and repaired by abrading the coating surface with grit disk paper, or other hand tooling method. After abrading and cleaning, additional protective coating material shall be applied to the repair area. All touch- up repair procedures shall follow the protective coating manufacturer's recommendations
3. If a sanitary manhole fails to pass one of the above tests, it shall be repaired in accordance with the manufacturer's recommendations and re- tested. It shall not be accepted until it passes all tests. All repairs and re- testing shall be at no additional cost to Fair Oaks Ranch.

852.6 MEASUREMENT:

1. All manholes zero feet to 6 feet deep and designated in the contract documents will be measured as the total number of such manholes constructed, including those exceeding 6 feet in depth from the lowest invert elevation to the top of the ring.
2. Manholes deeper than 6 feet shall be measured by the number of vertical feet in excess of 6 feet.

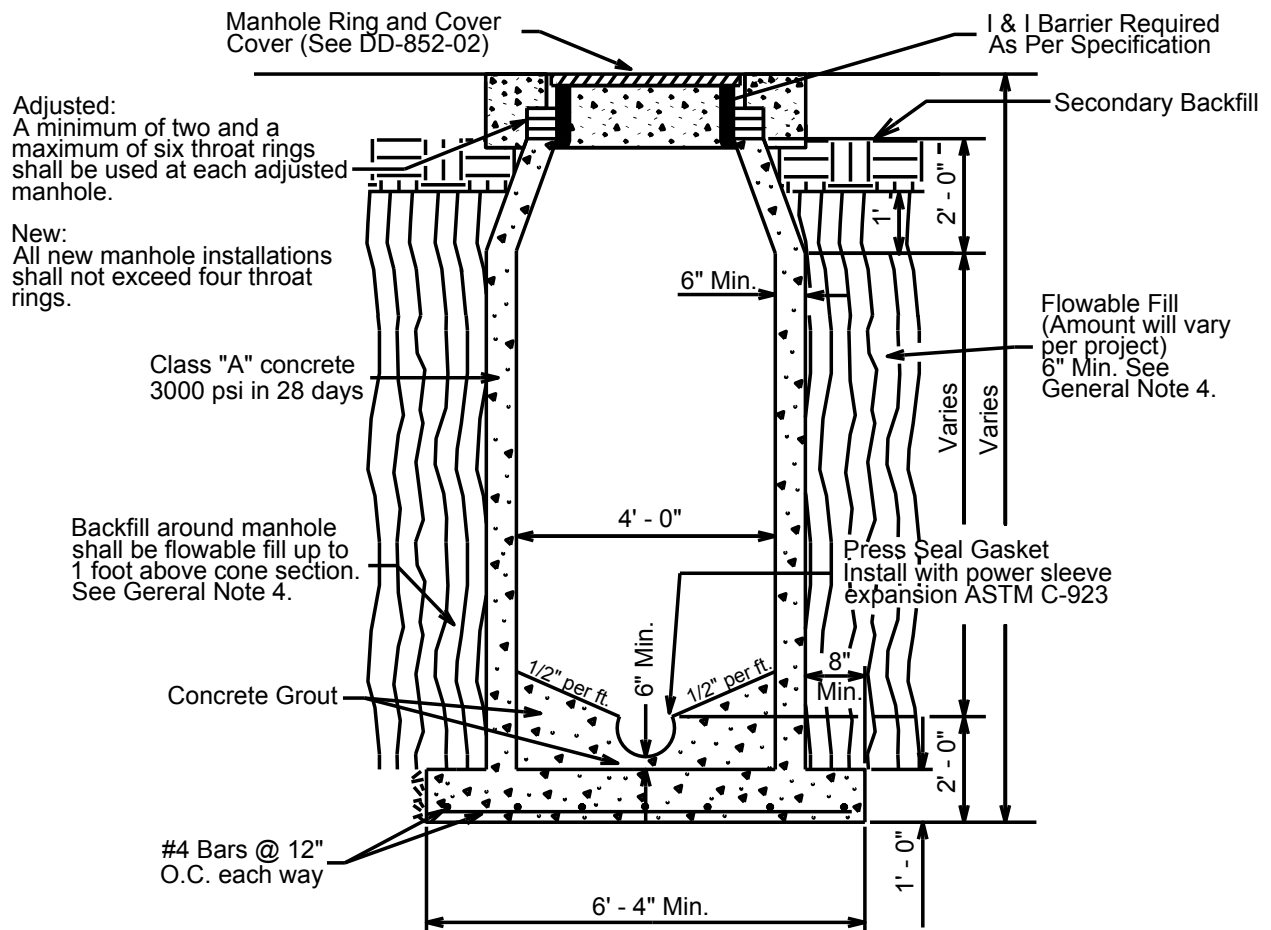
852.7 PAYMENT:

1. All manholes shall be paid at the contract unit price bid for each such manhole, which price shall be full compensation for all precast sections or throat rings, UV stabilized polyethylene liner, cones, bases, rings and covers, manhole ring, approved sewer coating, encasement, concrete, flowable fill, mortar, drop pipes, Fair Oaks Ranch cutting of surfaces, and fittings, labor, tools, equipment, all testing, tees, wyes, and incidentals necessary to complete the work.
2. Extra depth manholes shall be paid for at the contract unit price bid per vertical foot as measured above.
3. Concrete cradles for pipes shall be measured and paid for at the contract unit price bid as provided for in Item No. 858, "Concrete Encasement, Cradles, Saddles and Collars."

Fair Oaks Ranch Standard Specifications for Construction

4. Gravel subgrade filler for manholes shall not be measured separately for payment.
5. Hydrostatic Testing and Vacuum testing of new and/or existing structures will not be a pay item. The cost of this work will be included in the bid price for the new and/or existing manholes.

- End of Specification -



MONOLITHIC MANHOLE

General Notes:

- 1) Material for sanitary sewer pipe must be the same from manhole to manhole. Changes in type of pipe may be made only at manholes, or special structures, except as approved by the City of Fair Oaks Ranch project Engineer.
- 2) Adaptors and Concrete Collars shall be used as directed by the Engineer and as approved by the City of Fair Oaks Ranch project Engineer.
- 3) Watertight manhole rings and covers shall be Trans-Tex A77 "O" Ring or approved equal.
- 4) Contractor can opt to backfill with approved secondary material, subject to provisions of item 304.5.2.C.

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RANCH

STANDARD
MONOLITHIC MANHOLE

APPROVED
JANUARY 2019

REVISED

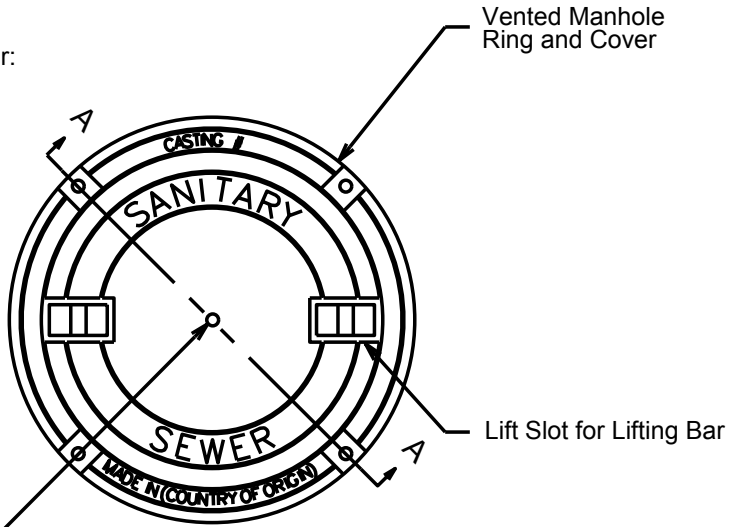
DD-852-01

SHEET
2 OF 2

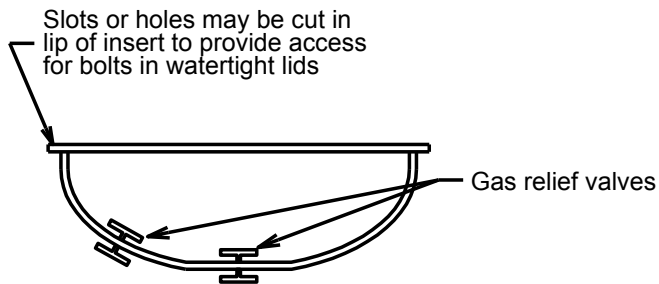
Note:
Standard Manhole Ring and Cover:
All applicable dimensions shall
conform to the dimensions shown
here

Note:
The bearing surfaces and
O-Ring groove shall be
Machine ground

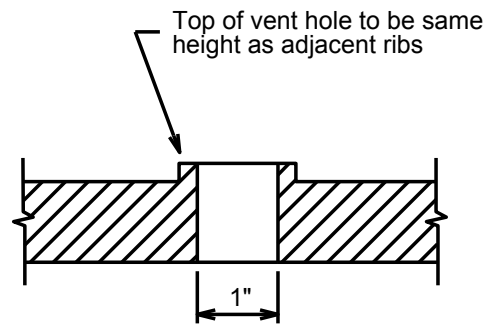
1" Dia. Cast Hole



VENTED MANHOLE RING AND COVER



WATERTIGHT MANHOLE
INSERT DETAIL



VENT HOLE DETAIL
SECTION A-A

Note:

1. Manhole cover inserts shall be installed in strict accordance with the manufacturer's recommendations. The contractor shall be responsible for making the necessary field measurements for the manufacturer prior to production.

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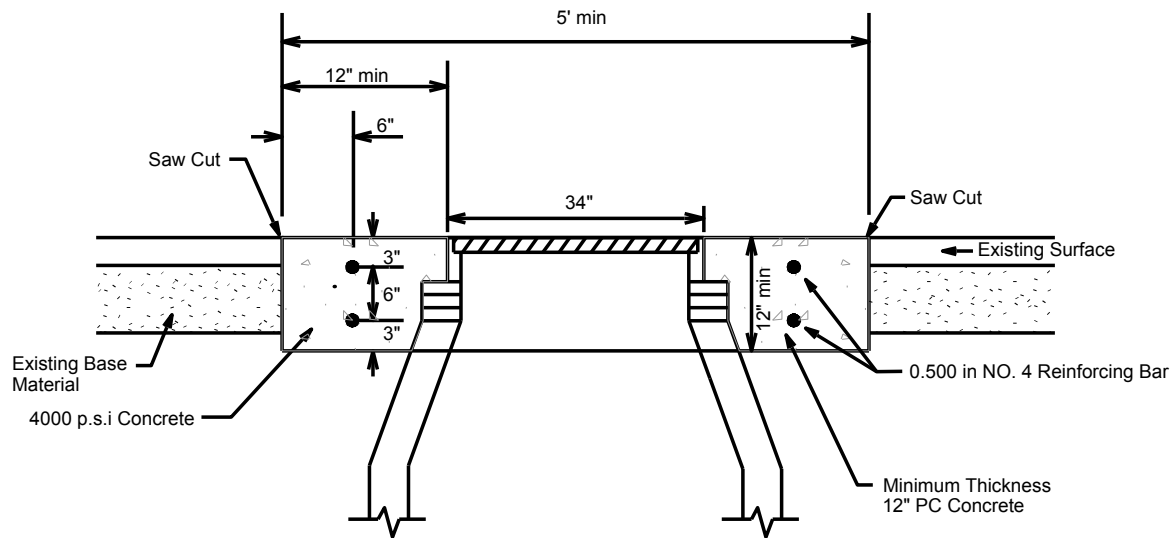
VENTED MANHOLE RING
AND COVER DETAIL

APPROVED
JANUARY 2019

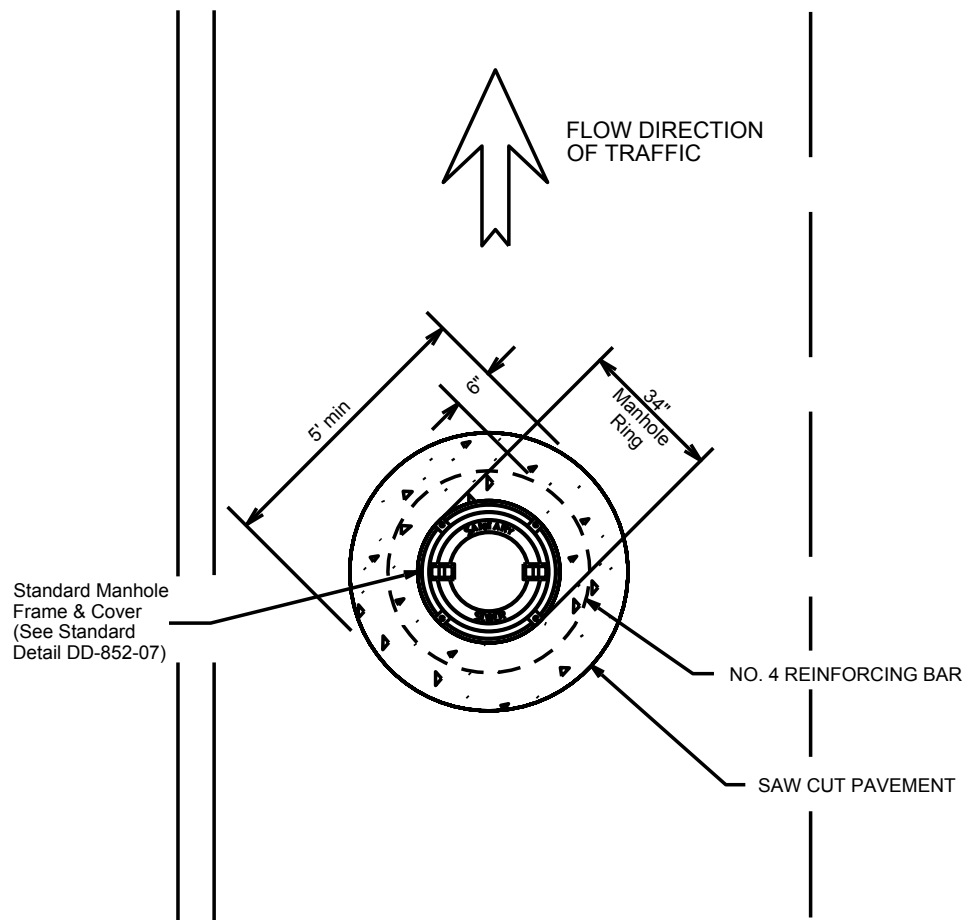
REVISED

DD-852-02

SHEET
1 OF 1



SECTION A-A



NOTE:

1. The concrete shall be 4000 psi, min, and reinforced with No. 4 bars, as shown.
2. The concrete shall extend to edge of saw cut pavement.
3. Manhole Ring Encasement is required on all manholes.

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RANCH**

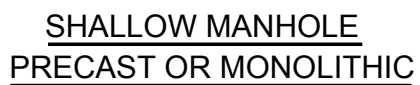
**MANHOLE RING
ENCASEMENT DETAIL**

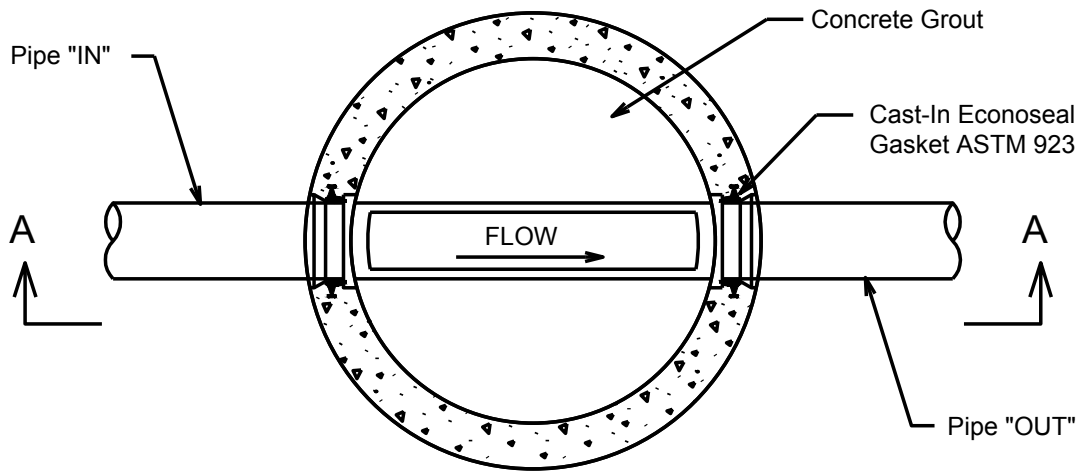
APPROVED
JANUARY 2019

REVISED

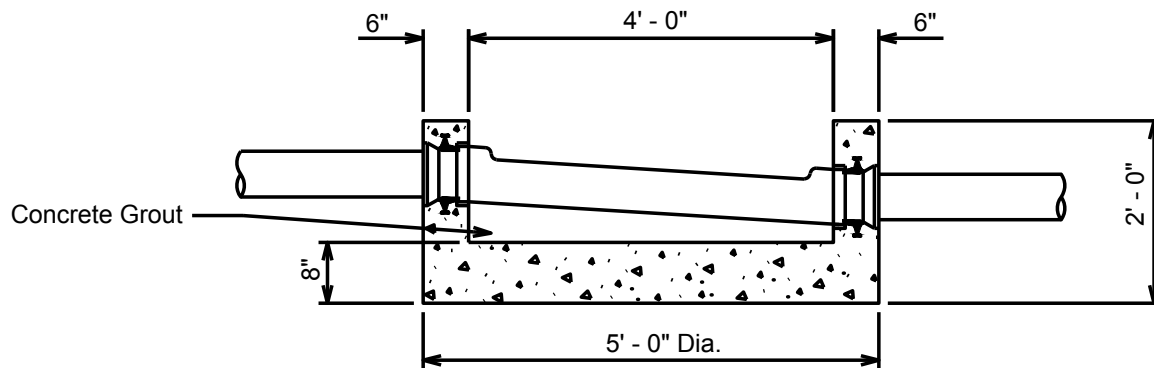
DD-852-03

SHEET
1 OF 2





PLAN



SECTION A-A

PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

PRECAST MANHOLE BASE
STRAIGHT THROUGH

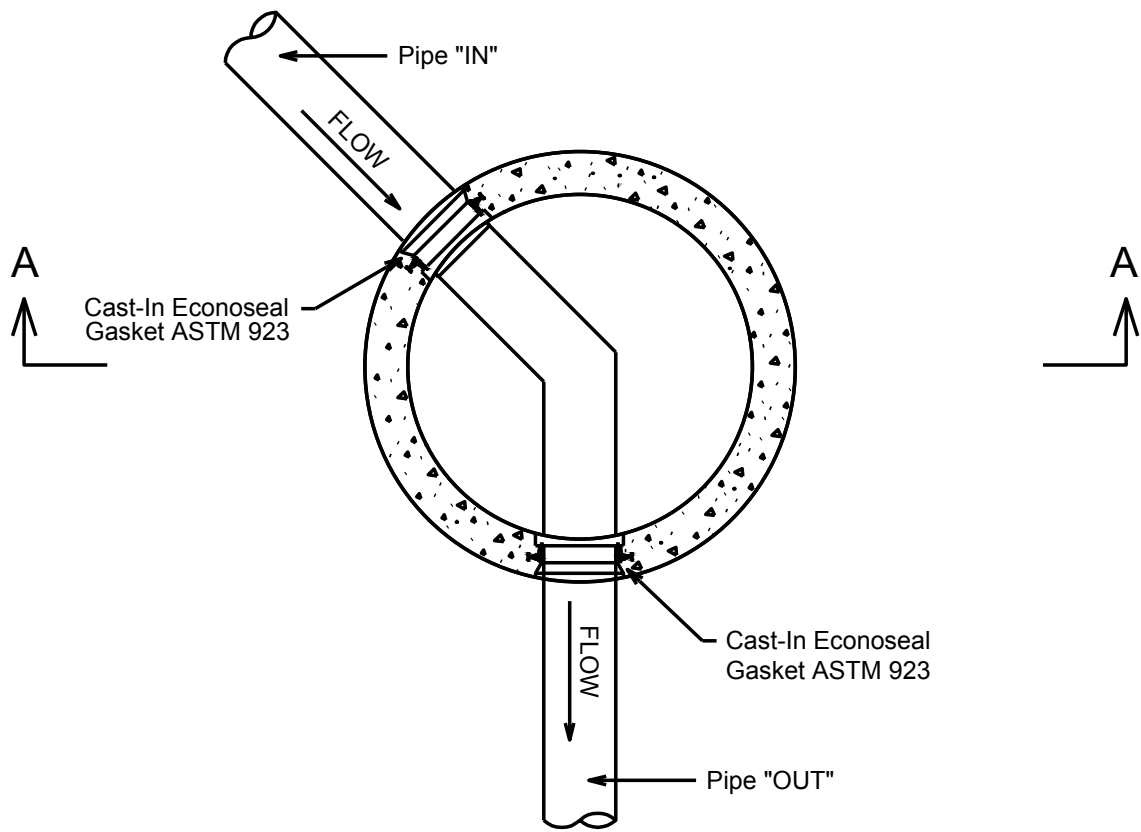
APPROVED

JANUARY 2019

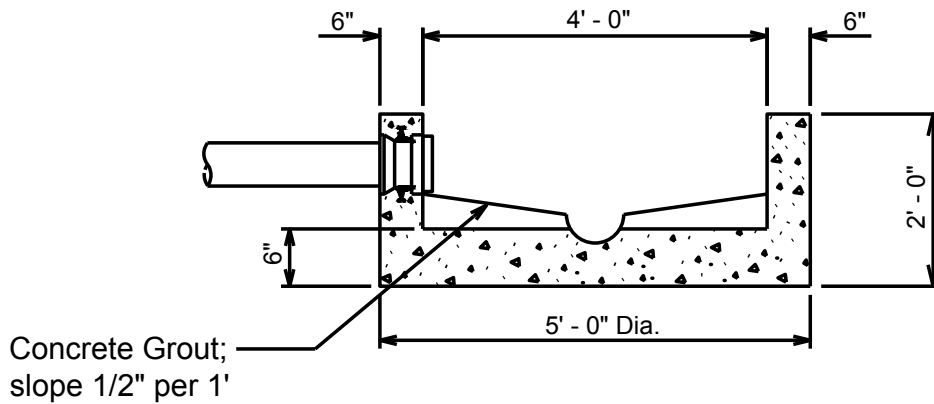
REVISED

DD-852-05

SHEET
1 OF 1



PLAN



SECTION A-A

PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

PRECAST MANHOLE BASE
45° ANGLE

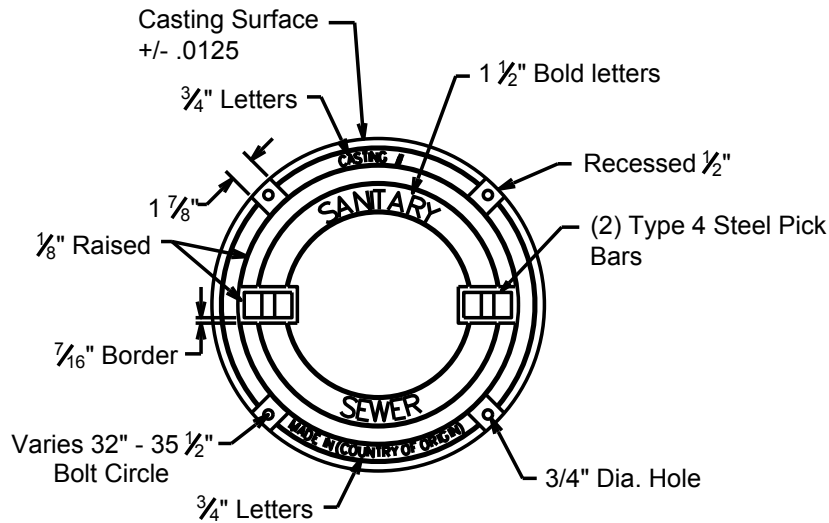
APPROVED
JANUARY 2019

REVISED

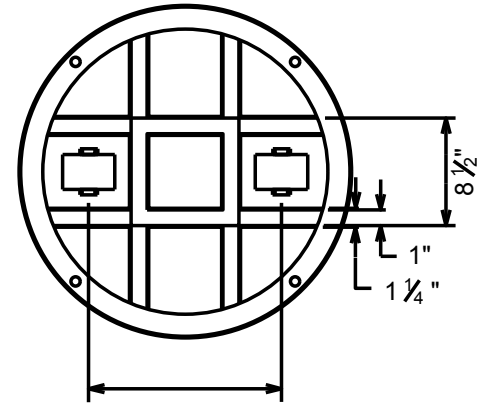
DD-852-06

SHEET
1 OF 1

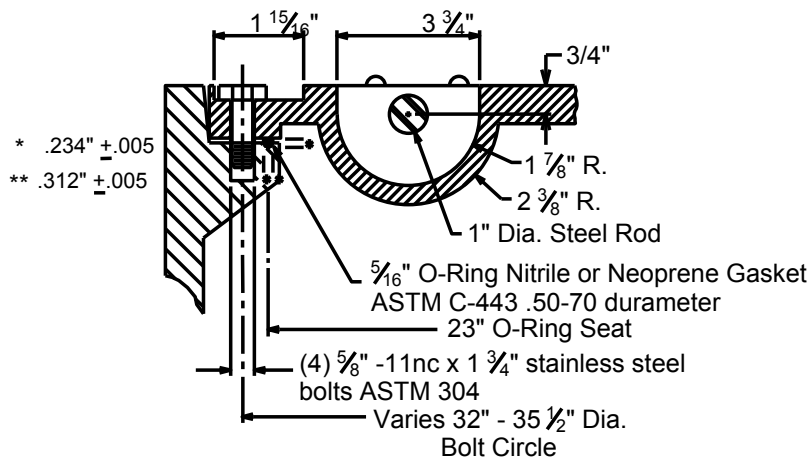
MATERIAL STANDARDS REQUIREMENTS
 ASTM A 48 Class 30 B AASHTO M-306-89
 Ring Wt 220 +/- 5 Lbs. Lid Wt 200 +/- 5 Lbs.



COVER FACE
 (Unpainted +/- .125)



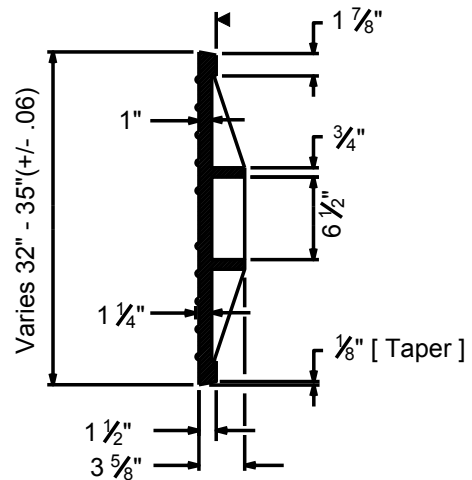
COVER BACK
 (Unpainted +/- .125)



WATERTIGHT AND PICK BAR DETAIL

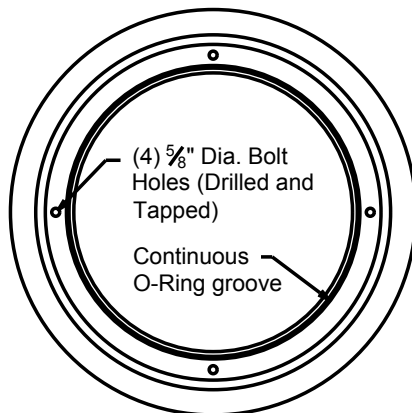
Manhole shall be proof-load tested to 40,000 lbs. in accordance with AASHTO M-306-89

Covers and Rings shall be interchangeable with approved manufacturers.

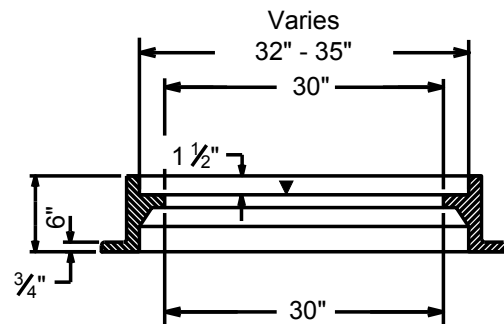


COVER SECTION
 (Unpainted +/- .125)

▼ All seating surfaces shall be machined (+/- .06).



FRAME TOP VIEW



FRAME SECTION
 (Unpainted +/- .125)

PROPERTY OF
 THE CITY OF FAIR OAKS
 RANCH

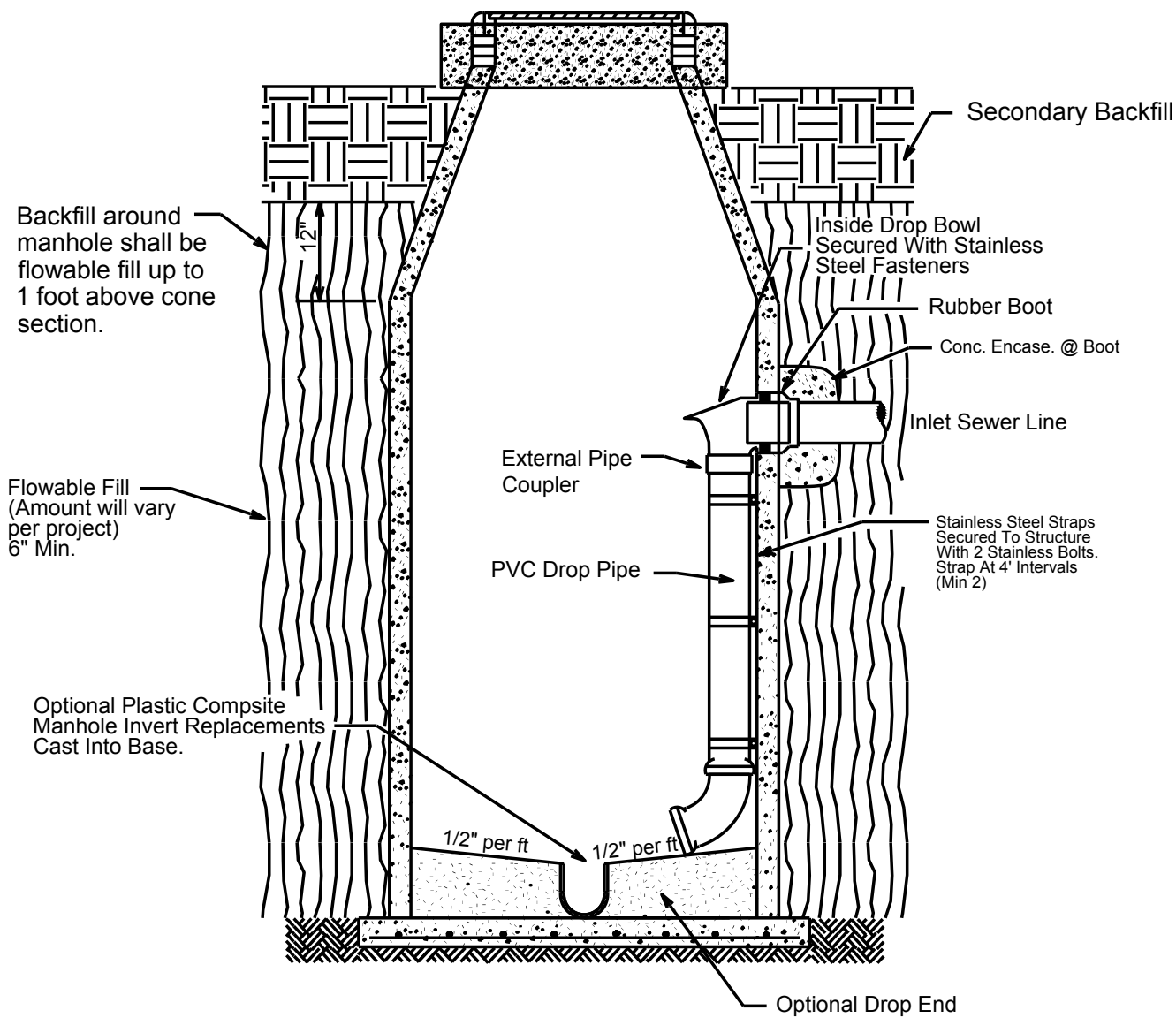
MANHOLE RING
 AND COVER
 DETAIL

APPROVED
 JANUARY 2019

REVISED

DD-852-07

SHEET
 1 OF 1



NOTE:
 1. THIS MANHOLE IS TO BE APPROVED BY CITY OF FAIR OAKS RANCH INSPECTION AND ENGINEERING PRIOR TO CONSTRUCTION.

PROPERTY OF THE CITY OF FAIR OAKS RANCH	MANHOLE INSIDE DROP SYSTEM	APPROVED	REVISED
		JANUARY 2019	
		DD-852-09	SHEET 1 OF 1

ITEM NO. 852B
POLYMER CONCRETE MANHOLES

852.1 DESCRIPTION

This specification covers polymer concrete manholes intended for use in sanitary sewers, storm sewers and water lines where corrosion resistance is required. Spray coated sanitary sewer manholes may be used per Item No. 852A, at the City's discretion.

852.2 REFERENCED STANDARDS

ASTM C 478 (most current) Standard Specification for Precast Reinforced Concrete Manhole Sections

ASTM C 579 (most current) Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic, Surfacing, and Polymer Concretes

ASTM C 443 (most current) Standard Specification for Joints for Concrete Pipe and Manholes Using Rubber Gaskets

ASTM C 580 (most current) Standard Test Method for Flexural Strength and Modulus of Elasticity of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes

ASTM C 857 (most current) Standard Practice for Minimum Structural Design Loading for Underground Utility Structures

ACI 350-06 Code Requirements for Environmental Engineering Concrete Structures & Commentary

ACI 440.1R-15 Guide for the Design and Construction of Structural Concrete Reinforced with Fiber-Reinforced Polymer (FRP) Bars

ACI 548.6R-96 Polymer Concrete-Structural Applications State-of-the-Art Report

ASTM D 648 (most current) Test Method for Deflection Temperature of Plastics Under Flexural Load in Edgewise Position

ASTM D 6783 (most current) Standard Specification for Polymer Concrete Pipe

ASTM D 2584 (most current) Test Method for Ignition Loss of Cured Reinforced Resins

Fair Oaks Ranch Standard Specifications for Construction

ASTM C 923 (most current) Standard Specifications for Resilient Connectors between Concrete Manholes Structures and Pipe

ASTM C 990 (most current) Standard Specification for Joints for Concrete Pipe, Manholes and Precast Box Sections using Preformed Flexible Joint Sealants

ASTM C 497 (most current) Test Methods for Concrete Pipe, Manhole Sections, or Tile

California Greenbook Standard Specifications for Public Works Construction Section 211-2

- 852.3 SUBMITTALS:** Contractor shall submit manufacturer's product data, instructions, recommendations, shop drawings, and certifications. All submittals shall be in accordance with Owner's requirements and submittals shall be approved by the Owner prior to delivery.

Contractor must provide Geographic Information Systems (GIS) point .shp file for any installed sanitary sewer manhole. The GIS .shp file must include information on the location, top of concrete, and invert of the manhole at a minimum. Confirm the information to be included in the .shp file with Fair Oaks Ranch prior to submission. Additional information to be included in the shapefile may be requested by Fair Oaks Ranch.

852.4 MATERIALS

1. Provide polymer concrete manhole sections, monolithic base sections and related components referencing to ASTM C 478. ASTM C 478 material and manufacturing is allowed compositional and dimensional differences required by a polymer concrete product
2. Provide base riser section with monolithic floors, unless shown otherwise
3. Provide riser sections joined with bell and spigot / ship-lap design seamed with butyl mastic and or rubber gaskets (ASTM C 990) so that on assembly, manhole base, riser and top section make a continuous and uniform manhole structure
4. Construct riser sections for polymer concrete manholes from standard polymer concrete manhole sections of the diameter indicated on drawings. Use various lengths of polymer concrete manhole sections in combination to provide correct height with the fewest joints
5. Design wall sections for depth and loading conditions with wall thickness as designed by polymer concrete manufacturer

Fair Oaks Ranch Standard Specifications for Construction

6. Provide tops to support AASHTO HS-20 or HL-93 or vehicle loading or loads as required and receiving cast iron frame covers or hatches, as indicated on drawings
7. All materials needed for grouting and patching will be a polyester mortar compound provided by the manufacturer or an approved equal by the manufacturer.
8. Approved Manufacturers:
 - a) Armorock LLC
 - b) Approved Equal

852.5 DESIGN CRITERIA: Polymer Concrete Manhole risers, cones, flat lids, grade rings and manhole base sections shall be designed by manufacturer to meet the intent of ASTM C 478 with allowable compositional and sizing differences as designed by the polymer concrete manufacturer.

1. AASHTO HS-20 or HL-93 design or as required loading applied to manhole cover and transition and base slabs
2. Polymer manholes will be designed based upon live and dead load criteria in ASTM C 857 and ACI 350-06
3. Unit soil weight of 120 pcf located above portions of manhole, including base slab projections
4. Internal liquid pressure based on unit weight of 63 pcf
5. Dead load of manhole sections fully supported by polymer concrete manhole base

852.6 DESIGN: Polymer Concrete Manhole risers, cones, flat lids, grade rings and manhole base sections shall be designed by manufacturer to meet loading requirements of ASTM C 478, ASTM C 857 and ACI 350-06 as modified for polymer concrete manhole design as follows:

1. Polymer Concrete Mix Design shall consist of thermosetting resin, sand, and aggregate. No Portland cement shall be allowed as part of the mix design matrix. All sand and aggregate shall be inert in an acidic environment
2. Reinforcement – Shall use acid resistant reinforcement (FRP Bar) in accordance with ACI 440.1R-06 as applicable for polymer concrete design
3. The wall thickness of polymer concrete structures shall not be less than that

Fair Oaks Ranch Standard Specifications for Construction

prescribed by the manufacturer's design by less than 95% of stated design thickness

4. Thermosetting Resin - The resin shall have a minimum deflection temperature of 158° F when tested at 264 psi (1.820 mPa) following Test Method D 648. The resin content shall not be less than 7% of the weight of the sample as determined by test method D 2584. Resin selection shall be suitable for applications in the corrosive conditions to which the polymer concrete manhole structures will be exposed
5. Each polymer concrete manhole component shall be free of all defects, including indentations, cracks, foreign inclusions and resin starved areas that, due to their nature and degree or extent, detrimentally affect the strength and serviceability of the component part. Cosmetic defect shall not be cause for rejection. The nominal internal diameter of manhole components shall not vary more than 2%. Variations in height of two opposite sides of risers and cones shall not be more the 5/8 inch. The under run in height of a riser or cone shall not be more than ¼ in/ft of height with a maximum of ½ inch in any one section
6. Marking and Identification - Each manhole shall be marked with the following information - Manufacturer's name or trademark, Manufacturer's location and Production Date
7. Manhole joints shall be assembled with a bell/spigot or shiplap butyl mastic and/or gasketed joint so that on assembly, manhole base, riser and top section make a continuous and uniform manhole. Joint sealing surfaces shall be free of dents, gouges and other surface irregularities that would affect joint integrity
8. Minimum clearance between wall penetrations and joints shall be per manufacturer's design
9. Construct invert channels to provide smooth flow transition with minimal disruption of flow at pipe-manhole connections. Invert slope through manhole is as indicated on drawings. All precast base sections to be cast monolithically. Polymer bench and channel are to be constructed with all polymer concrete material. Extended ballast slab requirements for buoyancy concerns can be addressed with cementitious concrete material
10. Provide resilient connectors conforming to requirements of ASTM C 923 or other options as available. All connectors are to be water tight. Install approved resilient connectors at each pipe entering and exiting manholes in accordance with manufacturer's instructions
11. Infiltration dishes: Infiltration dishes will be required in manholes where applicable (I.E, such as low drainage areas) and every third manhole shall be vented. 30" manhole cover with 1" inch hole center of cover where applicable/or

Fair Oaks Ranch Standard Specifications for Construction

water tight /bolt down.

Note: Manhole cover inserts shall be FRW industries, inc., “inflow protectorcover” “Preco industries. Ltd.”, “sewer guard”, or approved equal, and shall be installed in strict accordance with the manufacturer's recommendations. The contractor shall be responsible for making the necessary field measurements for the manufacturer prior to production.

852.7 **QUALITY CONTROL:** Facility Quality Control should be maintained by adhering to ISO 9001:2008 for manufacturing. All fabricators will be ISO 9001:2008 Certified. All fabrication will take place in an all polymer concrete fabrication facility. At no time will the polymer concrete fabrication facility share the facility with a cementitious precast product production facility. Fabricator is also to provide references of 5 previous projects in the last 5 years performed with both owner and contractor for reference and review by owner. Polymer concrete shall be cast in a polymer only facility and shall not be manufactured in a cementitious concrete facility

852.9 **TESTING:** The Contractor shall notify Inspector and Engineer 48 hours prior to beginning of manhole testing. The Contractor shall perform the testing for all sanitary sewer manholes in accordance with the following:

11. Leakage Testing: All manholes must pass a leakage test. The contractor shall test each manhole (after assembly and backfilling) for leakage, separate and independent of all other sanitary sewer piping, by means of either a hydrostatic test, vacuum test, or other methods approved by the Engineer. The Contractor is hereby instructed to conduct either of the two identified tests in the following manner:

- a. Hydrostatic Testing: Hydrostatic testing shall be conducted by utilizing approved plugs to seal all influent and effluent pipes in the manhole and filling the manhole to the top of the cone with water. Additional water may be added over a 24-hour period to compensate for absorption and evaporation losses. At the conclusion of the 24- hour saturation period, the manhole shall be filled to the top and observed. Any measurable loss within a 30 minute period shall be considered an unsuccessful test and thus require the Contractor to assess the needed repairs, perform such repairs (subject to the approval of the Engineer), and notify the Inspector when the retest will be performed. All effort, materials, or other costs shall be solely at the Contractor’s expense.
- b. Vacuum Testing:
 - (1) General: Manholes shall be tested after construction/ installation and backfilling with all connections (existing and/or proposed) in place. Drop- connections and gas sealing connections shall be installed prior to testing.

Fair Oaks Ranch Standard Specifications for Construction

- (2) Test Procedure: The lines entering the manhole shall be temporarily plugged with the plugs braced to prevent them from being drawn into the manhole. The plugs shall be installed in the lines beyond drop connections, gas sealing connections, etc. Prior to performing the test, the Contractor shall plug all lift holes and exterior joints with a non-shrink grout and plug all pipes entering the manhole. No grout shall be placed in horizontal joints prior to testing. Contractor shall use a minimum 60 inch-lb. torque wrench to tighten the external clamps that secure the test cover to the top of the manhole. The test head shall be inflated in accordance with the manufacturer's recommendations. A vacuum of 10 inches of mercury shall be drawn, and the vacuum pump will be turned off. With the valve closed, the level vacuum shall be read after the required test time. If the drop in the level is less than 1 inch of mercury (final vacuum greater than 9 inches of mercury), the manhole will have passed the vacuum test. The required test time is 2 minutes.
 - (3) Acceptance: Manholes will be accepted with relation to vacuum test requirements, if they meet the criteria above. Any manhole which fails the initial test must be repaired with a non-shrink grout or other suitable material based on the material of which the manhole is constructed. The manhole shall be retested as described above until a successful test is attained. After a successful test, the temporary plugs will be removed. To ensure that the plugs have been removed, Contractor shall only do so in the presence of the Inspector.
 - (4) Repairs to Existing Manholes: Any existing manhole which fails to pass the hydrostatic/vacuum test shall be closely examined by the Inspector and the Contractor to determine if the manhole can be repaired. Thereafter, the Contractor shall either repair or remove and replace the manhole as directed. The manhole shall then be retested and coated with a Fair Oaks Ranch- approved sewer coating as stated above. The Owner may elect to simply remove and replace the existing manhole with a new one. Any manhole excavated for repairs or excavated for tie in, shall be backfilled with flowable fill up to 1 foot below the top of the cone. The Contractor also has the option of backfilling with approved secondary materials, subject to the provisions of Item No. 804, "Excavation, Trenching and Backfill."
12. Holiday Testing: Inspect each sanitary sewer manhole using high-voltage holiday detection equipment. All detected holidays shall be marked and repaired by abrading the coating surface with grit disk paper, or other hand tooling method. After abrading and cleaning, additional protective coating material shall be applied to the repair

Fair Oaks Ranch Standard Specifications for Construction

area. All touch- up repair procedures shall follow the protective coating manufacturer's recommendations

13. If a sanitary manhole fails to pass one of the above tests, it shall be repaired in accordance with the manufacturer's recommendations and re- tested. It shall not be accepted until it passes all tests. All repairs and re- testing shall be at no additional cost to Fair Oaks Ranch.

852.6 MEASUREMENT:

1. All manholes zero feet to 6 feet deep and designated in the contract documents will be measured as the total number of such manholes constructed, including those exceeding 6 feet in depth from the lowest invert elevation to the top of the ring.
2. Manholes deeper than 6 feet shall be measured by the number of vertical feet in excess of 6 feet.

852.7 PAYMENT:

1. All manholes shall be paid at the contract unit price bid for each such manhole, which price shall be full compensation for all precast sections or throat rings, UV stabilized polyethylene liner, cones, bases, rings and covers, manhole ring, approved sewer coating, encasement, concrete, flowable fill, mortar, drop pipes, Fair Oaks Ranch cutting of surfaces, and fittings, labor, tools, equipment, all testing, tees, wyes, and incidentals necessary to complete the work.
2. Extra depth manholes shall be paid for at the contract unit price bid per vertical foot as measured above.
3. Concrete cradles for pipes shall be measured and paid for at the contract unit price bid as provided for in Item No. 858, "Concrete Encasement, Cradles, Saddles and Collars."
4. Gravel subgrade filler for manholes shall not be measured separately for payment.
5. Hydrostatic Testing and Vacuum testing of new and/or existing structures will not be a pay item. The cost of this work will be included in the bid price for the new and/or existing manholes.

- End of Specification -

ITEM NO. 853
SANITARY SEWER GLASS-FIBER
REINFORCED POLYESTER (FRP) MANHOLES

853.1 DESCRIPTION: This item shall govern the construction of FRP sanitary sewer manholes, complete in place and the materials therein, including manhole ring and covers. All material and construction work shall be in accordance with current Texas Commission on Environmental Quality (TCEQ) rules to include: Design Criteria for Sewage Systems (30 TCEQ §217), or any revisions thereto as applicable. All constructed FRP manholes shall be watertight. Sewer manhole ring and cover castings, throat rings, and miscellaneous specifications and details shall meet the current requirements of AASHTO Designation M306-10 and Item No. 852, "Sanitary Sewer Manholes."

853.2 SUBMITTALS: Contractor shall submit manufacturer's product data, instructions, recommendations, shop drawings, and certifications.

Contractor must provide Geographic Information Systems (GIS) point .shp file for any installed sanitary sewer structure. The GIS .shp file must include information on the location, top of manhole, and invert of the structure at a minimum. Confirm the information to be included in the .shp file with Fair Oaks Ranch prior to submission. Additional information to be included in the shapefile may be requested by Fair Oaks Ranch.

853.3 MATERIALS:

1. FRP Manholes: All manholes shall be watertight. Glass-Fiber Reinforced Polyester Manholes shall be a one-piece monolithic designed unit constructed of glass-fiber reinforced, supplier-certified, unsaturated isophthalic polyester resin containing chemically enhanced silica to improve corrosion resistance, strength and overall performance. FRP manholes shall be manufactured in strict accordance with ASTM D3753- 12.
2. Exterior Surface: For a UV inhibitor, the resin on the exterior surface of the manhole shall have gray pigment added for a minimum thickness of 0.125 inches.
3. Dimension: Manholes shall be a circular cylinder, reduced at the top to a circular manway not smaller than 30 inches (inside diameter). Manholes shall also be produced in whole foot increments of length +/- 2 inches. Nominal inside diameter shall be 48 inches. Tolerance on the inside diameter shall be +/- 1%. The minimum wall thickness for all FRP manholes (all depths) shall be 0.50 inches. Unless otherwise shown in

Fair Oaks Ranch Standard Specifications for Construction

the contract documents or approved by the Engineer, standard sanitary sewer FRP manholes shall be constructed on influent or effluent pipes less than 24 inches in diameter.

The maximum vertical height of the diameter adjustment section or cone shall be 36 inches.

4. Configuration: The manway reducer must provide a bearing surface on which a standard ring and cover may be supported and adjusted to grade. The reducer shall be joined to the barrel section at the factory with resin and glass fiber reinforcement, thus providing the required monolithic design to prevent infiltration and/or exfiltration through the manhole.
5. Class: Manholes shall be manufactured in one class of load rating. This class shall be AASHTO H-20 wheel load.
6. Stub-outs and Connections: Several methods exist that may be used to connect primary and secondary lines to manholes, and these shall be performed per the Engineer's request. The most common of these methods include: installation of SDR PVC sewer pipe stub-outs to the manhole, Kor-N-Seal boots, or Insert-a-Tee fittings in the manhole wall. Installation of SDR PVC sewer pipe must be performed by sanding, priming, and using resin fiber-reinforced hand lay-up. The resin and fiberglass shall be the same type and grade as used in the fabrication of the fiberglass manhole. Kor-N-Seal boots may be installed by the manhole manufacturer using fiberglass reinforced pipe stub-out for Kor-N-Seal boot sealing surface. Insert-a-Tee fittings may be installed only with the approval of the Engineer, and shall be installed per the manufacturers' instructions.
7. Manhole Bottom: Manholes are required to have a resin fiber-reinforced bottom. Deeper manholes (> 6 feet) may require a minimum of two 1½ inches deep x 3½ inches wide stiffening ribs, completely enclosed with resin fiber-reinforcement. All fiberglass manholes with a fiberglass bottom will have a minimum 3-inch anti-flotation ring. Manhole bottoms shall be a minimum ½ inch thick.
8. Marking and Identification: All manholes shall be marked in letters no less than 1 inch in height with the following information:

Manufacturer's name or trademark;
Manufacturer's factory location;
Manufacturer's serial number;
Manhole length;
ASTM Designation;
Installation assist marks (vertical lines 90° apart at base of manhole).
9. Manhole Rings and Covers: Refer to Item No. 852, "Sanitary Sewer Manholes" for throat rings and miscellaneous specifications and details

Fair Oaks Ranch Standard Specifications for Construction

associated with ring and cover design and mounting.

10. Mortar: Mortar shall be composed of 1 part Portland Cement, 2 parts sand and sufficient potable water to produce a working mixture.
11. Membrane Curing Compound: All membrane curing compound shall conform to the provisions of TxDOT's DMS-4650, "Hydraulic Cement Concrete Curing Materials and Evaporation Retardants."
12. Concrete Encasements: Concrete encasement shall conform to Item No. 852, "Sanitary Sewer Manholes." Specifically, refer to Standard Detail Drawing DD-852-03.
13. Reinforcing Steel: All reinforcing steel shall conform to provisions of Item No. 301, "Reinforcing Steel."
14. Initial and Secondary Backfill Material: Refer to Item No. 804.5 for all backfill requirements.

8534

CONSTRUCTION:

1. Manholes shall be constructed of materials and workmanship as prescribed by these specifications, at such places shown in the contract documents and in conformity with the typical details.
2. Fiberglass manholes must be installed according to manufacturer's installation instructions. In addition to these instructions, local codes may apply and should be consulted as applicable in manhole installation. Correct manhole installation requires proper concrete foundation, good backfill and proper handling to prevent manhole damage and insure long-term corrosion resistant service.
3. Prepare excavation at manhole location should be at least wide enough to accommodate the slab specified and to provide working room around manhole. Ensure the depth of manhole is sufficient to allow between two and four concrete rings for adjustment of ring and cover at top of final grade. Quarter marks have been provided on barrel to facilitate alignment.
4. Manhole Base: Use initial backfill material to provide 4 to 6 inches of leveling base.
5. Set Manhole: To lift manhole, insert 4 inches x 4 inches timber crosswise inside the manhole to the underside of the collar with a rope or woven fabric slings attached to backhoe or other lifting device and lower the manhole. Level manhole and connect sewer lines to manhole. A concrete base encasement shall be placed at least 12 inches from the manhole and shall come over the top of the anti-flotation ring a minimum of 12 inches.

Fair Oaks Ranch Standard Specifications for Construction

6. Invert and Bench Area: The invert and bench area can be formed with wet concrete and finished with an epoxysealant.
7. Backfill Material: Initial backfill material shall be used for backfill around the manhole for a minimum distance of one foot from the outside surface and extending from the bottom of the excavation to the top of the reducer section. Secondary backfill material may be used for the remainder of the backfill, subject to pre-approval by the Engineer. An approved flowable fill material may also be used for backfilling operations.
8. Backfill Procedure: Backfill material shall be placed in layers of not more than 12 loose measure inches and mechanically tamped to 98% Standard Proctor Density. Refer to Item No. 804, "Excavation, Trenching and Backfill" for more specific measures for backfill and compaction requirements. Flooding will not be permitted. Backfill shall be placed in such a manner as to prevent any wedging action against the fiberglass manhole structure.
9. Testing: All structures must pass a leakage test. The Contractor shall test each structure (after assembly and backfilling) for leakage, separate and independent of the all other sanitary sewer piping, by means of either a hydrostatic test, vacuum test, or other methods approved by the Engineer.

Contractor is hereby instructed to conduct either of the two identified tests in the following manner:

- a. Hydrostatic Testing: Hydrostatic testing shall be conducted by utilizing approved plugs to seal all influent and effluent pipes in the structure and filling the structure to the top of the structure with water. Additional water may be added over a 24 hour period to compensate for absorption and evaporation losses. At the conclusion of the 24 hour saturation period, the structure shall be filled to the top of the structure and observed. Any measurable loss within a 30 minute period shall be considered an unsuccessful test and thus require the Contractor to assess the needed repairs, perform such repairs (subject to the approval of the Engineer), and notify the Inspector when the retest will be performed. All effort, materials, or other costs shall be solely at the Contractor's expense.
- b. Vacuum Testing:
 - (1) General: Structures shall be tested after construction/installation and backfilling with all connections (existing and/or proposed) in place. Drop- connections and gas sealing connections shall be installed prior to testing.

Test Procedure: The lines entering the structure shall be

Fair Oaks Ranch Standard Specifications for Construction

temporarily plugged with the plugs braced to prevent them from being drawn into the structure. The plugs shall be installed in the lines beyond drop connections, gas sealing connections, etc. Prior to performing the test, the contractor shall plug lift holes and exterior joints with a non-shrink grout and plug all pipes entering the structure. No grout shall be placed in horizontal joints prior to testing. Contractor shall use a minimum 60 inch/lb torque wrench to tighten the external clamps that secure the test cover to the top of the structure. The test head shall be inflated in accordance with the manufacturer's recommendations. A vacuum of 10 inches of mercury shall be drawn, and the vacuum pump will be turned off. The test does not begin until after the vacuum pump is off. With the valve closed, the level vacuum shall be read after the required test time. If the drop in the level is less than 1 inch of mercury (final vacuum greater than 9 inches of mercury), the structure will have passed the vacuum test. The required test time is 2 minutes.

- (2) Acceptance: Structures will be accepted with relation to vacuum test requirements, if they meet the criteria above. Any structure which fails the initial test must be repaired with a non-shrink grout or other suitable material based on the material of which the structure is constructed. Structures shall be repaired on the exterior surface only. The structure shall be retested as described above until a successful test is attained. After a successful test, the temporary plugs will be removed. To ensure that the plugs have been removed, Contractor shall only do so in the presence of the Inspector.
- (3) Repairs to Existing Structures: Any existing structure which fails to pass the vacuum test shall be closely examined by the Inspector and the Contractor to determine if the structure can be repaired. Thereafter, the Contractor shall either repair or remove and replace the structure as directed. The structure shall then be retested and coated with a Fair Oaks Ranch- approved structural coating as stated above. The Owner may elect to simply remove and replace the existing structure with a new one. Any structure excavated for repairs or excavated for tie in, shall be backfilled with flowable fill up to 1 foot below the top of the structure/cone. The Contractor also has the option of backfilling with approved secondary materials, subject to the provisions of Item No. 804, "Excavation, Trenching, and Backfill."
- (4) Measurement and Payment: Vacuum testing of new structures will not be a pay item. The cost of this work will be included in the bid price for the new structure. Each vacuum test of an existing structure shall be a separate pay item. Repairs to

Fair Oaks Ranch Standard Specifications for Construction

existing structures shall be a separate pay item when authorized.

853.5

MEASUREMENT:

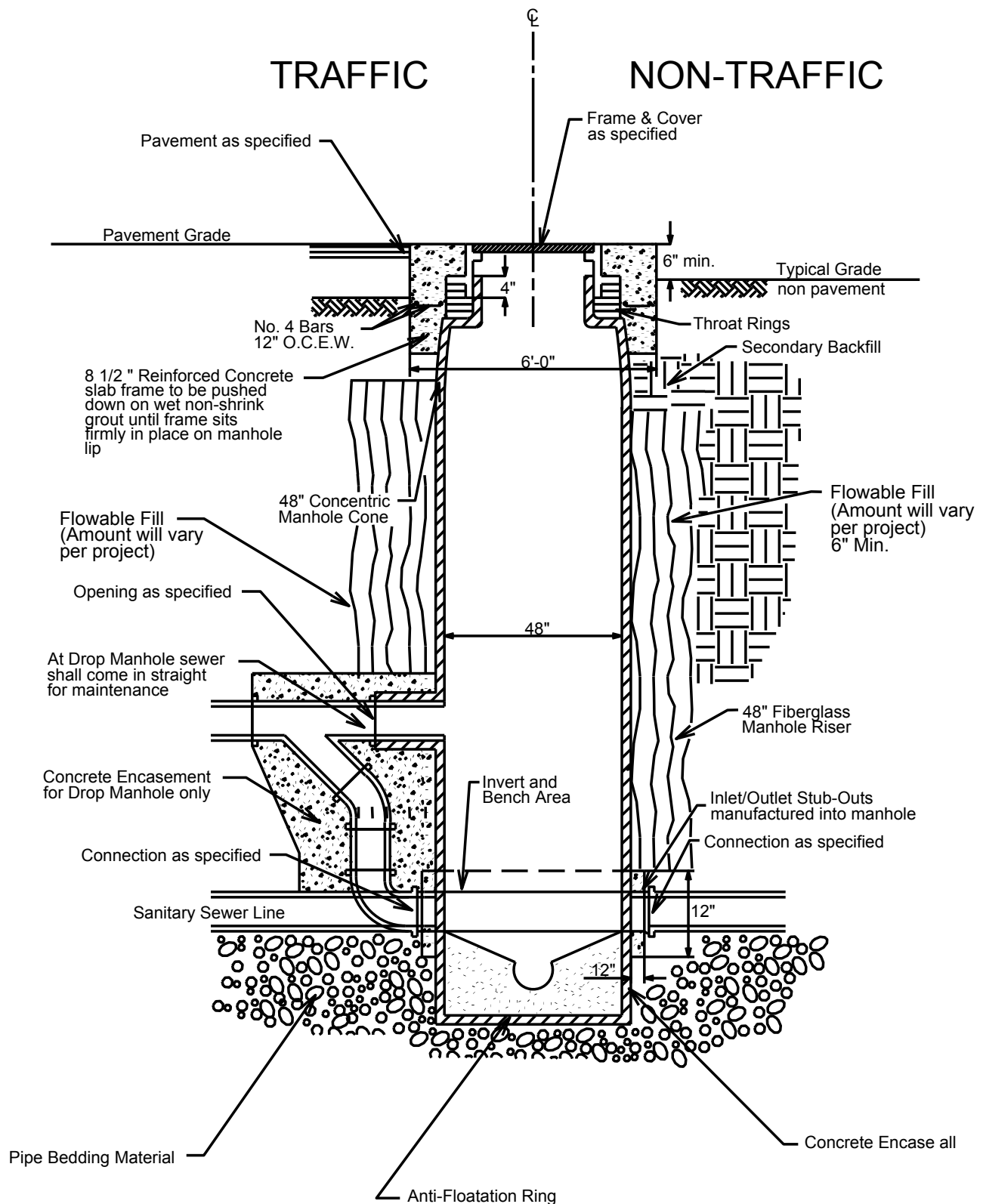
1. FRP sanitary sewer manholes (0 to 6 feet deep) as designated in the contract documents shall be measured as the total number of such manholes constructed, including those exceeding 6 feet in depth from the lowest invert elevation to the top of the ring.
2. Manholes deeper than 6 feet shall be measured by the number of vertical feet in excess of 6 feet.

853.6

PAYMENT:

1. FRP sanitary sewer manholes shall be paid at the contract unit price bid for each such manhole.
2. All manholes shall be paid at the contract unit price bid for each such manhole, which price shall be full compensation for all precast sections or throat rings, UV stabilized polyethylene liner, cones, bases, rings and covers, manhole ring, approved sewer coating, encasement, concrete, flowable fill, mortar, drop pipes, Fair Oaks Ranch cutting of surfaces, and fittings, labor, tools, equipment, all testing, tees, wyes, and incidentals necessary to complete the work.
3. Extra depth manholes (> 6 feet) shall be paid for at the contract unit price bid per vertical foot as measured above.
4. Gravel subgrade filler for manholes shall not be measured separately for payment.

- End of specification -



PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

TYPICAL FIBERGLASS MANHOLE DETAIL

APPROVED
JANUARY 2019

REVISED

DD-853-01

SHEET
1 OF 1

ITEM NO. 854
SANITARY SEWER LATERALS

854.1 DESCRIPTION: This item shall govern sanitary sewer laterals installed in accordance with these specifications and as directed by the Engineer. This item shall also consist of the installation of a two-way sewer cleanout at the property line.

854.2 SUBMITTALS: Contractor shall submit manufacturer's product data, instructions, recommendations, shop drawings, and certifications.

Contractor must provide Geographic Information Systems (GIS) line .shp file for any installed sewer lateral. The GIS .shp file must include information on the pipe diameter, location, and material at a minimum. Confirm the information to be included in the .shp file with Fair Oaks Ranch prior to submission. Additional information to be included in the shapefile may be requested by Fair Oaks Ranch.

854.3 MATERIALS: The materials for sanitary sewer laterals shall conform to the specification contained in Item No. 848, "Sanitary Sewers."

854.4 CONSTRUCTION:

1. Sanitary sewer laterals fittings and appurtenances shall conform to the material specifications and shall be installed by the Contractor as specified herein, or as directed by the Inspector or the Engineer and in accordance with the DD-854 Standard Drawing Series. When the lateral is within the Edwards Underground Recharge Zone, it shall be installed in accordance with Standard Drawing DD-854-ERZD.
2. Designation of Lateral: A sewer pipe located between the sanitary sewer main and the customer's premise, is designated as a "sanitary sewer lateral."
3. Lateral Installation: All lateral installations shall be performed in accordance with Item Nos. 848; "Sanitary Sewers" 804, "Excavation, Trenching and Backfill," and as described herein. For sanitary sewer mains that are 12 inch in diameter or smaller, all laterals shall be connected using the appropriate size tee/wye placed in line with the main line. For mains larger than 12 inch, insert-a-tee conforming to ASTM 3034-08, or approved or equal, shall be used. Where waterline crossings with sanitary sewer laterals are less than the regulated separation distances, all lateral piping shall be SDR-26 PVC pipe (ASTM D2241-09), with a pressure rating of 150 psi.

Connection to the customer's end of the lateral shall be performed using a

Fair Oaks Ranch Standard Specifications for Construction

flexible coupling, or pre-approved equal. All flexible couplings shall be concrete-encased to prevent movement or breakage of the steel bands. All cleanouts at job sites shall have installed an approved heavy duty sanitary sewer cap.

Cutting, excavation, and backfill shall be as specified herein and in accordance with applicable sections of Item No. 804, "Excavation, Trenching, Backfill."

854.5 **MEASUREMENT:** Sanitary sewer laterals shall be measured by the linear feet installed at the various diameter sizes. The measured dimension shall be taken from the centerline of the main to the connection at – or just inside – the customer's property line. Measurement will be continuous through any fittings in the main.

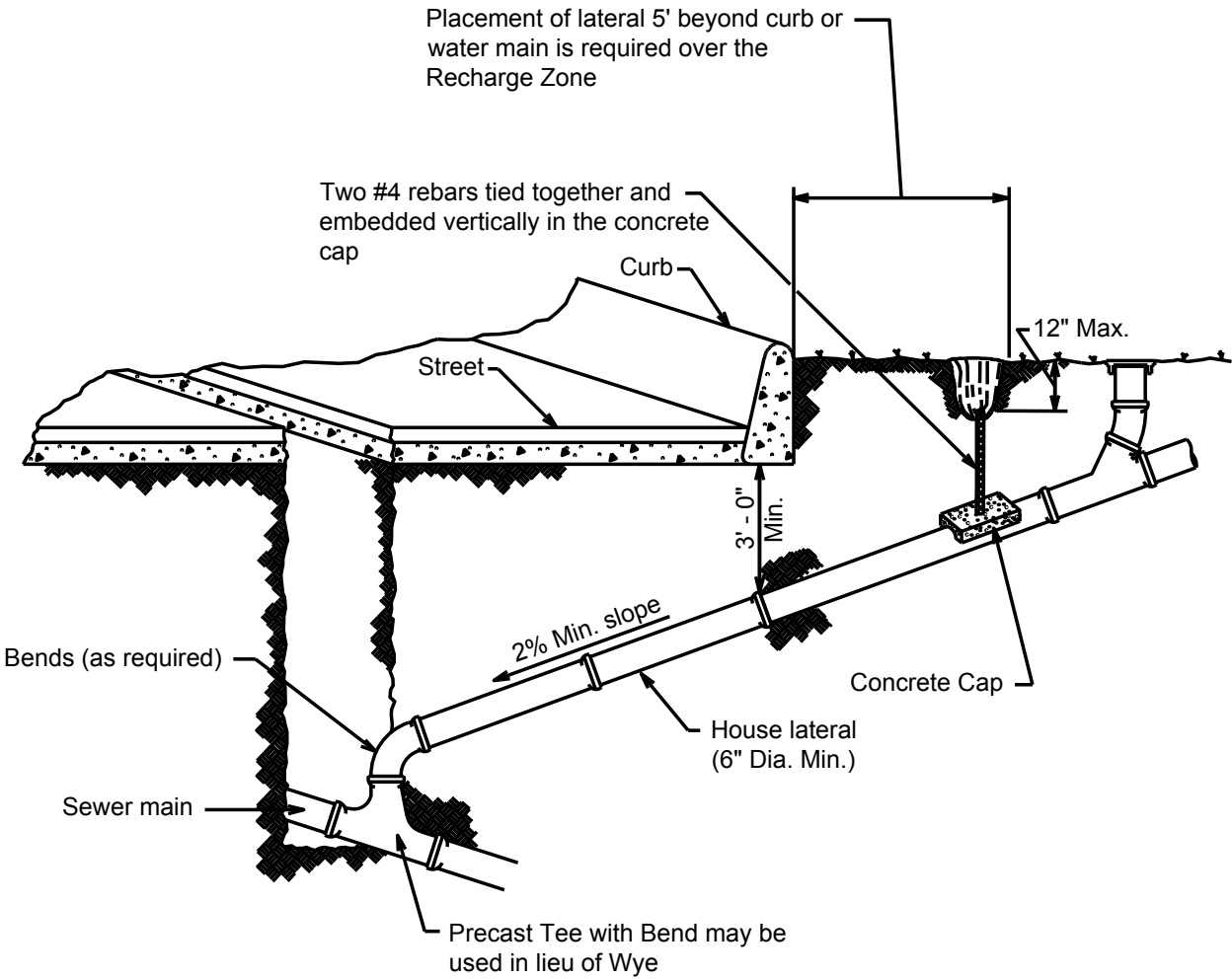
854.6 **PAYMENT:** Sanitary sewer laterals shall be paid for at the contract bid price per linear foot complete in place for the type, and size constructed. Price shall be full compensation for furnishing all materials, including pipe, pipe fittings (to include wyes, tees, bends), pumping, bedding, trenching or boring, trench protection, backfilling, tamping, cutting pavement and surface structures of whatever type encountered and replacement with whatever type specified and other incidentals required to complete the work.

When the minimum separation distances for any water and sewer piping facilities cannot be maintained per 30 TAC §217.53, contractor shall install SDR-26 PVC pipe (150 psi pressure rated). Payment for this higher pressure rated pipe shall be made at the contract bid price per linear foot complete in place for the type and size constructed.

Payment for the installation of the two-way cleanout shall be paid per each under the applicable line item. Only one-way cleanouts are required on the termination point of a dead-end main.

- End of Specification -

Depth and grade of service laterals as shown, are typical only. Actual depth, alignment and grade of service laterals shall be determined by the Engineer based on the elevations of the sewer main, street, natural ground and building to be serviced.

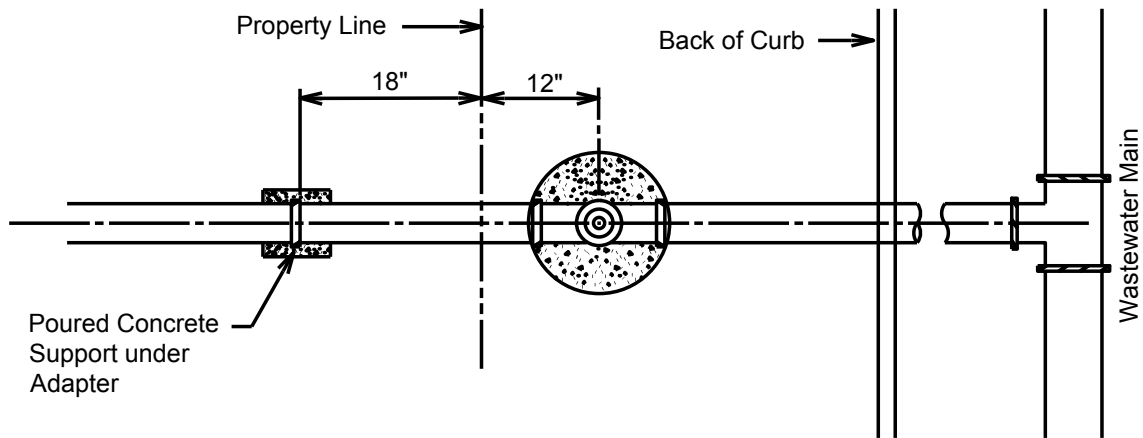


HOUSE LATERAL DETAIL

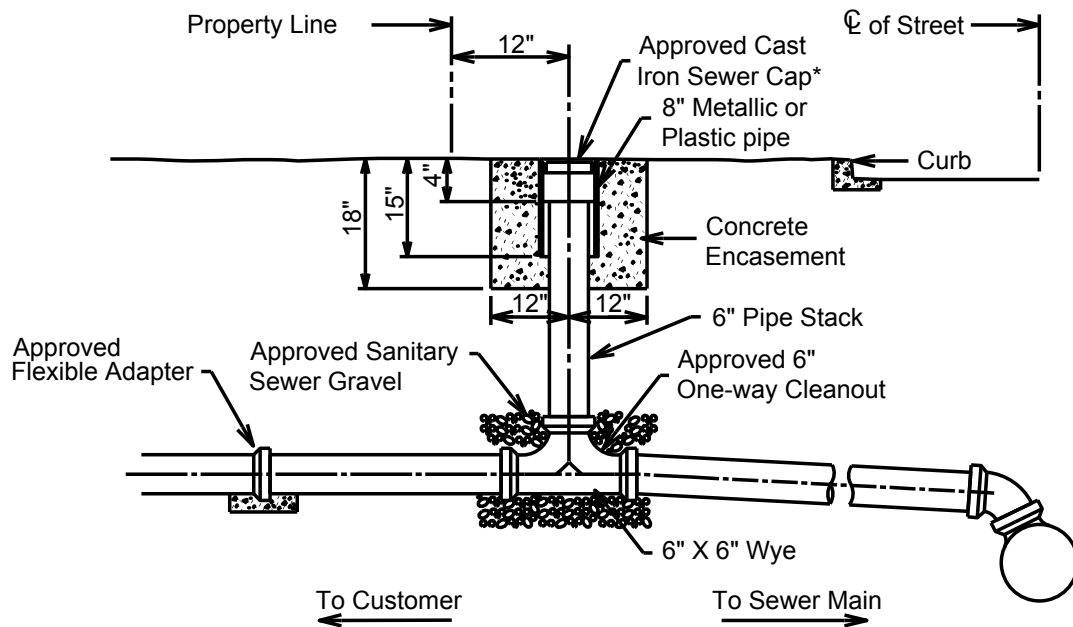
Note:

1. A minimum of 3' of cover to subgrade is necessary, otherwise concrete encasement will be required.

PROPERTY OF THE CITY OF FAIR OAKS RANCH	HOUSE LATERAL DETAIL	APPROVED	REVISED
		JANUARY 2019	
		DD-854-01	SHEET 1 OF 1



PLAN



PROFILE



* Approved Sewer Cap
(Heavy Duty)

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RANCH

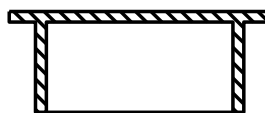
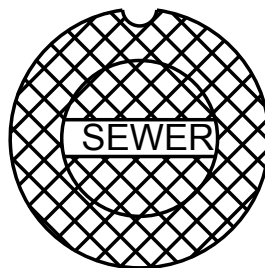
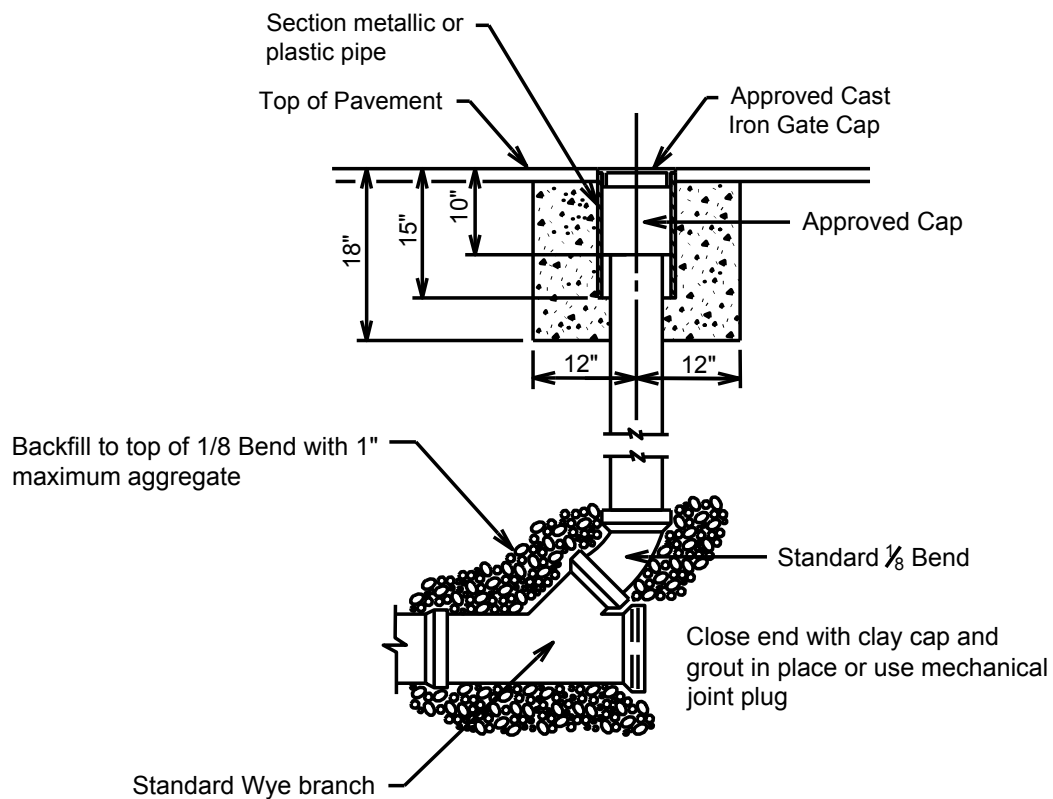
TYPICAL CLEANOUT
DETAIL

APPROVED
JANUARY 2019

REVISED

DD-854-02

SHEET
1 OF 1



Approved Gate Cap
(Heavy Duty)

PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

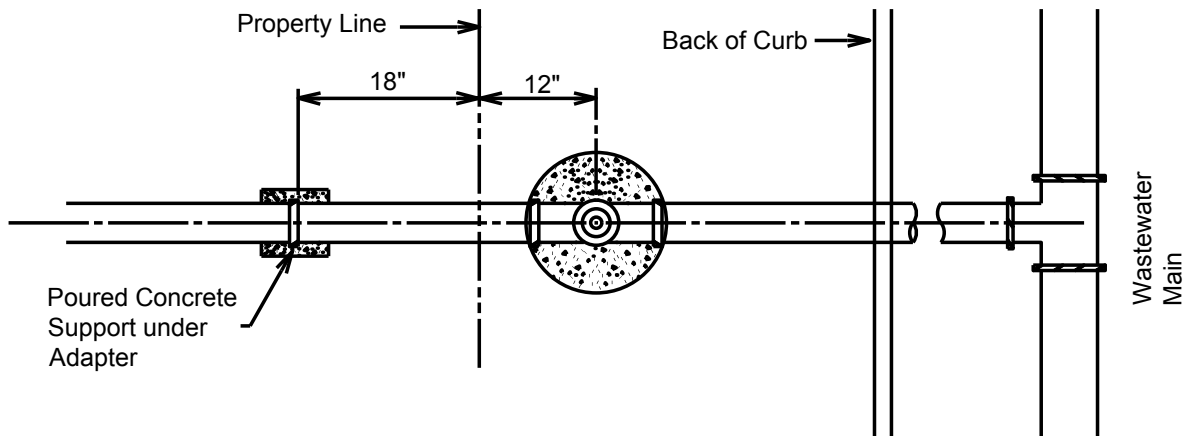
TYPICAL CLEANOUT
DETAIL

APPROVED
JANUARY 2019

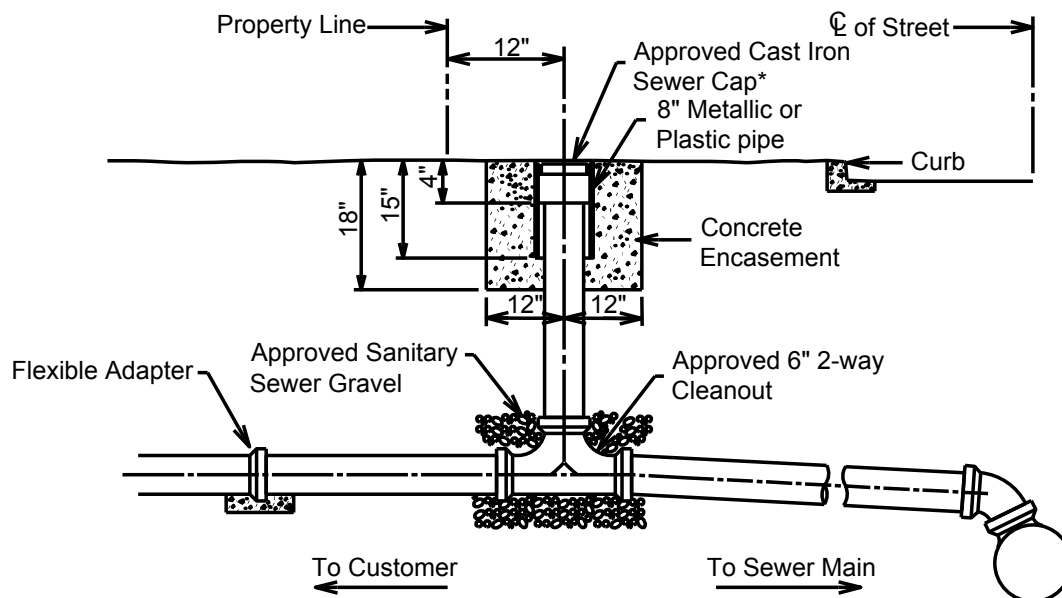
REVISED

DD-854-02

SHEET
1 OF 1



PLAN



PROFILE



* Approved Sewer Cap
(Heavy Duty)

PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

TYPICAL CLEANOUT
DETAIL

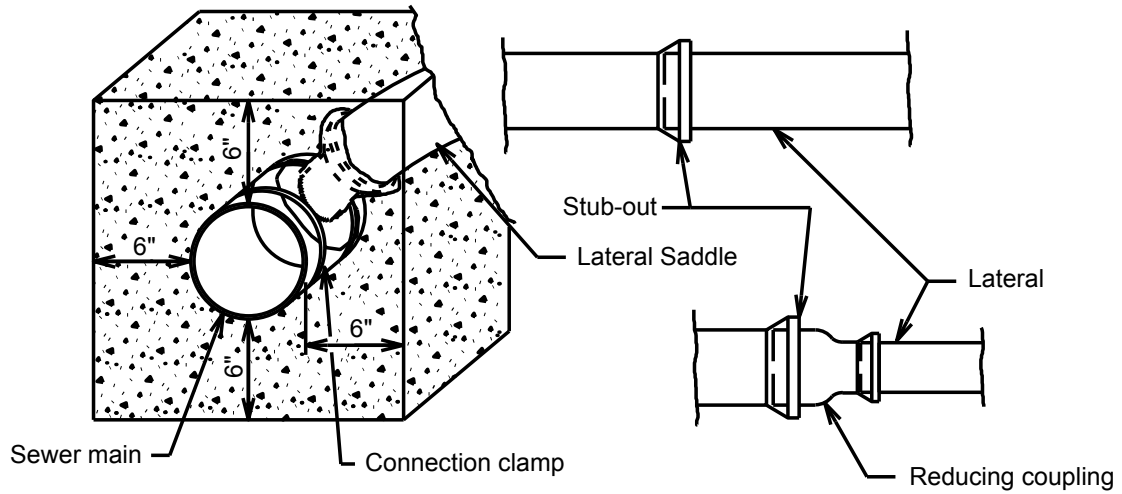
APPROVED
JANUARY 2019

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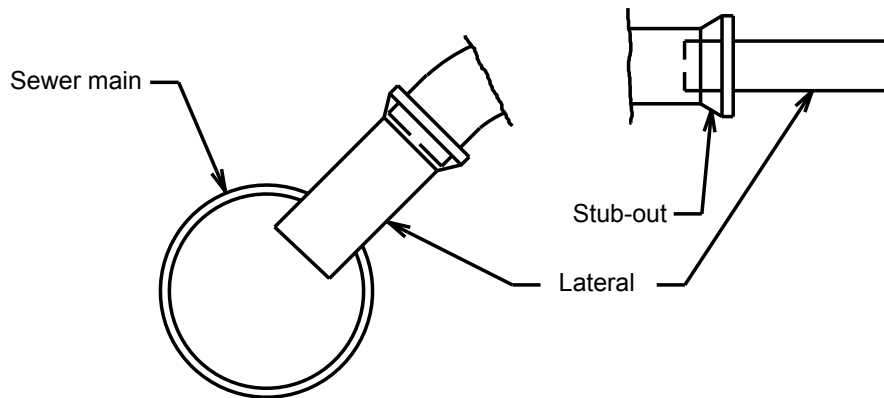
DD-854-02

SHEET
2 OF 2

LATERAL CONNECTION TO EXISTING SEWER MAIN/STUB-OUT



ACCEPTABLE



UNACCEPTABLE

Note:

1. The saddle shall be permanently bonded to the existing main by the use of compounds or or clamps as recommended by the manufacturer.

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RANCH

LATERAL CONNECTION

APPROVED
JANUARY 2019

REVISED

DD-854-03

SHEET
1 OF 1

**ITEM NO. 855A
RECONSTRUCTION OF EXISTING MANHOLES**

855.1

DESCRIPTION: This item shall consist of the reconstruction of all existing manholes, all types and sizes, to include the replacement of manhole ring and covers, the cones, manhole section(s) required regardless of type shown in the contract documents and in conformity with the provisions of these specifications. All material and construction work shall be in accordance with current Texas Commission on Environmental Quality (TCEQ) rules to include: Design Criteria for Sewage Systems (30 TCEQ § 217). All reconstructed manholes shall be watertight and coated with a Fair Oaks Ranch-approved sewer coating. Sewer manhole ring and cover castings shall meet the current requirements of AASHTO Designation M306-10. Existing Monolithic Manholes are not to be reconstructed, but replaced under Item Nos. 852, "Sanitary Sewer Manholes" or 850, "Sanitary Sewer Structures." The approved list of sewer coating manufacturers will be found herein. Polymer concrete rehabilitation system for existing manholes may be used per Item No. 855B at discretion of City.

855.2

REFERENCED STANDARDS: The following standards are referenced herein or otherwise related to the project work and shall be the current edition:

1. AASHTO – American Association of State Highway and Transportation Officials:
 - a. M306: Standard Specification for Drainage, Sewer, Utility, and Related Castings.
2. ASTM – American Society for Testing and Materials:
 - a. A48 - Standard Specification for Gray Iron Castings.
 - b. A536 - Standard Specification for Ductile Iron Castings.
 - c. C478 - Standard Specification for Circular Precast Reinforced Concrete Manhole Sections.
 - d. D638 - Test Method for Tensile Properties of Plastics.
 - e. D648 - Standard Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position.
 - f. D790 - Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
 - g. D1238 - Standard Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer.
 - h. D1505: Standard Test Method for Density of Plastics by the Density-Gradient Technique.
 - i. D1693 - Standard Test Method for Environmental Stress-Cracking of Ethylene Plastics.
3. COSA – City of San Antonio:

Fair Oaks Ranch Standard Specifications for Construction

- a. Utility Excavation Criteria Manual.
- 4. TCEQ – Texas Commission on Environmental Quality:
 - a. Design Criteria for Sewage Systems (30 TCEQ § 217).

8553

SUBMITTALS: Contractor shall submit manufacturer's product data, instructions, recommendations, shop drawings, and certifications. All submittals shall be in accordance with Owner's requirements and submittals shall be approved by the Owner prior to delivery of new materials.

8554

MATERIALS:

- 1. Precast Reinforced Concrete Manhole Sections: Precast reinforced concrete manhole sections shall conform to the requirements of ASTM Designation C478.
- 2. Concrete Grout: All concrete grout used for patching or other similar fill-in work shall be of non-shrink type made with a Komponent® formulation, as manufactured by CTS Cement Manufacturing Corporation, or approved alternate. The non-shrink grout shall be prepared in accordance with the manufacturer's recommended formulation with Portland cement, fine aggregate, water, and water reducer to produce compressive strengths of approximately 4,800 psi within 7 days and 7,250 psi within 28 days at a 70 °F baseline temperature.
- 3. Manhole Ring and Cover: The manhole ring and cover shall be of ductile iron or gray cast iron construction. The cover shall be solid with no vent or pick holes; hinged with underlying special hinge area leakage protection; the cover secured with four (4) stainless steel bolts; and shall have a recessed "pick bar" for cover opening. Cam lock type covers shall not be allowed. Approved manufacturers, as listed below, have previously completed required inflow leakage shop testing and have met a maximum allowable leakage rate criterion of 1 gallon per minute (gpm) at 12 inches of water submergence above the manhole cover. Rings and covers shall be furnished from either of the following two manufacturers with the specified features:
 - a. Approved Manufacturers:
 - (1) Neenah Foundry, Division of Neenah Enterprises, Inc.
 - a) 24-inch Clear Opening Cover: "Lift Mate" Model R-1650-LM. Refer to drawing DD-852-07, Sheet 4 of 5.
 - b) 30-inch Clear Opening Cover: "Lift Mate" Model R-1743-LM. Refer to drawing DD-852-07, Sheet 5 of 5.
 - c) Hinge Area Leakage Protection (both coversizes): Insertion plug beneath hinge shall be neoprene, pre- installed by the manufacturer. The plug shall be self-

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sealing and held firmly in place by direct contact of the hinge upon closure and bolting down of the cover.

- (2) East Jordan (EJ)
 - a) 24-inch Clear Opening Cover: Product Numbers NPR16-3611A and NPR16-3611J. Refer to drawings DD-852-07, Sheets 1 and 2 of 5.
 - b) 30-inch Clear Opening Cover: Model NPR16-3611L. Refer to drawing DD-852-07, Sheet 3 of 5.
 - c) Hinge Area Leakage Protection, 24-in Clear Opening Cover: Flat neoprene sheet gasket pre-installed by the manufacturer to the underside of the single hinge pocket with quick-set epoxy glue.
 - d) Hinge Area Leakage Protection, 30-in Clear Opening Cover: Insertion plug beneath each hinge shall be low density polyethylene (LDPE), pre-installed by the manufacturer with silicone sealant. The plug shall be held firmly in place by direct contact of the hinge upon closure and bolting down of the cover.
- b. Cover Gasket. The underside of the cover shall be equipped with a continuous (one piece) vulcanized "T-shaped" gasket for perimeter leakage sealing. The gasket shall either be of nitrile, neoprene, or EPDM construction and pre-inserted into the perimeter retainer slot by the manufacturer as shown by the above referenced drawings. If the gasket is damaged in any way through shipping or through on-site storage or handling by the Contractor, a completely new manhole cover must be provided. Field repairs of a damaged gasket shall not be attempted or allowed.
- c. Machined Metal Surfaces: Prior to gasket insertion, the underside of the metal mating surfaces on the underside of the cover and the inner frame ledge supporting the cover shall have been machined smooth to allow uniform seating of the cover gasket.
- d. Cover Labeling: All covers shall be standard covers for sanitary sewer manholes have the words " "Sewer" cast thereon. Ring and cover shall have the specified foundry's name, part number, country of origin preceded by "Made in" (example: MADE IN USA) in compliance with the country of origin law of 1984, and production date (example: mm/dd/yy) for tracking purposes. Each casting must be marked with DI (ductile iron) and ASTM A536 or A536 80-55-06 or CI (cast iron) and ASTM A-48, Class 35B to verify the materials used. Castings without proper markings shall be rejected.

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- e. **Cover Bolts.** Four (4) bolts of 1/2-IN diameter x 13 thread pitch shall be used to secure the cover. Bolts shall be of stainless steel, grade 304 or better. The top of the cover shall have a recessed area around each bolt assembly to accommodate the washer diameter and thickness and bolt head height so that the bolting assembly does not exceed the top of the manhole cover. Where cover bolts directly thread into the underlying cast iron frame, the bolt threads shall be thoroughly coated with Nikal Jet Lube product, as manufactured by CSW Industrials Company or approved alternate before insertion to avoid subsequent “seize up” from dissimilar metals. If such bolts are removed for any purpose, the threads must be recoated. Stainless steel bolts that are threaded into stainless steel nuts within recessed slots in the underlying frame optionally do not require an anti-seize coating of the bolt threads.
4. **“Throat Rings”:** “Throat rings” shall be made of reinforced concrete and have a maximum thickness of 2 inches. The internal diameter shall match that of the ring and cover’s opening. Concrete shall conform to the provisions of Item No. 300 "Concrete (Natural Aggregate)." Concrete “throat rings” are to be used in conjunction with a UV stabilized internal polyethylene liner for the purpose of providing an infiltration/inflow (I/I) barrier. The I/I Barrier shall be as manufactured by Strike Tool Products of Cannon Falls, MN and must meet the following ASTM standards: ASTM D790 for flexural properties; ASTM D1505 for density; ASTM D1238 for Melt Flow Index; ASTM D638 for tensile strength at yield (50mm/mm); ASTM D790 for flexural modulus; ASTM D648 for heat deflection temperature at IGEPAL; and ASTM D693 for EsCR, 100% IGEPAL/10% IGEPAL. A minimum of two and a maximum of four throat rings may be used at each manhole reconstructed.
5. **Bitumastic Joint Sealant.** To be applied between cones, risers, adjustment rings, flat tops, and between the ductile cast iron ring and the uppermost adjustment ring or flat top: RAM-NEK, as manufactured by Henry, Inc.; Kent Seal, as manufactured by Hamilton-Kent, Inc.; Encapseal, as manufactured by Miller Pipeline Corporation; or approved alternate.
6. **Interior Coating:** The interior of all reconstructed manholes shall be rendered watertight, chemically resistant, and abrasion resistant through the use of a Fair Oaks Ranch-approved sewer coating system. Prior to coating, all manholes shall be hydrostatic and/or vacuum tested, and approved by Inspector or Engineer.

For reconstructed manholes, apply a combination of both products with the cementitious coating first, followed by the epoxy coating. Kerneos SewperCoat 2000 HS and PG, applied at the required one inch thick

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application, is the only product approved which does not require a subsequent epoxy coating. Other approved materials are as follows:

- a. Cementitious coating: With required one inch thick application:
 - (1) Permaform CR-5000;
 - (2) Strong - Seal MS-2C;
 - (3) Standard Cement Material Inc. Reliner;
 - (4) Quadex Aluminaliner;
 - (5) ConShield Biotech Armor.
- b. Epoxy coating: With specified thickness application:
 - (1) Carboline "Plasite 4500" System: Min required thickness – 125 mils.
 - (2) Carboline Reactamine ET: Min required thickness – 125 mils.

8555

CONSTRUCTION:

1. Manholes shall be raised or lowered by replacing the existing cone and manhole section or sections as required for installation to the finished surface course. All openings shall be protected by hatch covers or the necessary steel plates. The Contractor shall be required to backfill all manholes with an approved flowable fill (in accordance with all requirements of the right-of-way owner having jurisdiction over the project scope) up to 1 foot above the cone section. The Contractor also has the option of backfilling with approved secondary materials, subject to the provisions of Item No. 804, "Excavation, Trenching and Backfill." All excess materials (of any type) shall be disposed of by the Contractor at his own expense, and in an approved location.
2. Reconstructed manholes shall also be cleaned of any debris as required by the Inspector. If a new manhole cover, ring, or reconstructed manhole is damaged by the Contractor, it shall be replaced (as directed by Inspector) by the Contractor at his own expense. All installed concrete throat rings must be used in conjunction with a UV stabilized polyethylene liner and I/I barrier as specified above. Coat all interior concrete surfaces with a Fair Oaks Ranch-approved coating system as specified above.
3. Voids between exterior pipe walls and manhole walls at all pipe connections in manholes shall be filled with a non-shrink grout, as specified above, or as approved by the Engineer, or as shown in the contract documents and inspected prior to backfilling.
4. Joints between cones, risers, adjustment rings, flat tops, and between the ductile cast iron ring and the uppermost adjustment ring or flat top, as

Fair Oaks Ranch Standard Specifications for Construction

ductile cast iron ring and the uppermost adjustment ring or flat top, as applicable, shall be thoroughly sealed in accordance with manufacturer's recommendations with strongly adhesive bitumastic products as specified above. Where precast concrete risers are used, any gaps in the outer joint surfaces shall be additionally coated with non-shrink grout to a minimum thickness of ¼ inch.

5. **Manhole Ring Encasement.** All manhole rings shall be encased with 4,000 psi reinforced concrete as shown in the contract documents or as approved by the Engineer.
 - a. Concrete manhole ring encasement shall extend 6 inches below the top of the cone and have a minimum width when measured at the manhole ring of 1 foot. The surface of the encasement shall be flush with the top of the manhole ring.
 - b. Where manholes are reconstructed in existing streets and where directed by the Engineer or shown in the contract documents, the exterior exposed surfaces of the ring, mortar; throat rings and manhole surface shall be coated with a ⅛ inch minimum thickness of heat shrink wrap plastic prior to placement of concrete.

8556

TESTING: The Contractor shall perform the testing for all sanitary sewer manholes in accordance with the following.

1. **Leakage Testing:** All manholes must pass a leakage test. The contractor shall test each manhole (after reconstruction and backfilling) for leakage, separate and independent of all other sanitary sewer piping, by means of either a hydrostatic test, vacuum test, or other methods approved by the Engineer. The Contractor is hereby instructed to conduct either of the two identified tests in the following manner:
 - a. **Hydrostatic Testing:** Hydrostatic testing shall be conducted by utilizing approved plugs to seal all influent and effluent pipes in the manhole and filling the manhole to the top of the cone with water. Additional water may be added over a 24-hour period to compensate for absorption and evaporation losses. At the conclusion of the 24-hour saturation period, the manhole shall be filled to the top and observed. Any measureable loss within a 30 minute period shall be considered an unsuccessful test and thus require the Contractor to assess the needed repairs, perform such repairs (subject to the approval of the Engineer), and notify the Inspector when the retest will be performed. All effort, materials, or other costs shall be solely at the Contractor's expense.

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b. Vacuum Testing:

- (1) General: Manholes shall be tested after construction/installation and backfilling with all connections (existing and/or proposed) in place. Drop- connections and gas sealing connections shall be installed prior to testing.
- (2) Test Procedure: The lines entering the manhole shall be temporarily plugged with the plugs braced to prevent them from being drawn into the manhole. The plugs shall be installed in the lines beyond drop connections, gas sealing connections, etc. Prior to performing the test, the Contractor shall plug all lift holes and exterior joints with a non-shrink grout and plug all pipes entering the manhole. No grout shall be placed in horizontal joints prior to testing. Contractor shall use a minimum 60 inch-lb. torque wrench to tighten the external clamps that secure the test cover to the top of the manhole. The test head shall be inflated in accordance with the manufacturer's recommendations. A vacuum of 10 inches of mercury shall be drawn, and the vacuum pump will be turned off. With the valve closed, the level vacuum shall be read after the required test time. If the drop in the level is less than 1 inch of mercury (final vacuum greater than 9 inches of mercury), the manhole will have passed the vacuum test. The required test time is 2 minutes.
- (3) Acceptance: Manholes will be accepted with relation to hydrostatic/vacuum test requirements, if they meet the criteria above. Any manhole which fails the initial test must be repaired with non-shrink grout or other suitable material based on the material of which the manhole is constructed. The manhole shall be retested as described above until a successful test is attained. After a successful test, the temporary plugs will be removed. To ensure that the plugs have been removed, Contractor shall only do so in the presence of the Inspector.
- (4) Repairs to Existing Manholes: Any existing manhole which fails to pass the hydrostatic and/or vacuum test shall be closely examined by the Inspector and the Contractor to determine if the manhole can be repaired. Thereafter, the Contractor shall either repair or remove and replace the manhole as directed. The manhole shall then be retested and coated with a Fair Oaks Ranch-approved sewer coating as stated above. The Owner may elect to

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simply remove and replace the existing manhole with a new one. Any manhole excavated for repairs or excavated for tie in, shall be backfilled with flowable fill up to 1 foot below the top of the cone. The Contractor also has the option of backfilling with approved secondary materials, subject to the provisions of Item No. 804, "Excavation, Trenching and Backfill."

- (5) Measurement and Payment: Hydrostatic/ Vacuum testing of new structures will not be a pay item. The cost of this work will be included in the bid price for the new manhole. Each hydrostatic/vacuum test of an existing manhole shall be a separate pay item. Repairs to existing manholes shall be a separate pay item when authorized.
2. Holiday Testing: Inspect each sanitary sewer manhole using high-voltage holiday detection equipment. All detected holidays shall be marked and repaired by abrading the coating surface with grit disk paper, or other hand tooling method. After abrading and cleaning, additional protective coating material shall be applied to the repair area. All touch-up repair procedures shall follow the protective coating manufacturer's recommendations.
3. If a sanitary sewer manhole fails to pass one of the above tests, it shall be repaired in accordance with the manufacturer's recommendations and re-tested. It shall not be accepted until it passes all tests. All repairs and re-testing shall be at no additional cost to Fair Oaks Ranch.

855.7 MEASUREMENT: All reconstructed manholes will be measured by the unit of each manhole (any type or size) regardless of the type shown in the contract documents.

855.8 PAYMENT: The work performed as prescribed by this item will be paid for at the contract unit price bid per manhole for "Reconstruction of Existing Manholes," which price shall be full compensation for all excavation, backfill material including select backfill, flowable fill, saw cutting of surfaces as required, reinforced concrete/concrete, diversion of flow, bypass pumping, trench protection, special shoring and disposal of material excavated, sewer coating, and all testing; for furnishing and placing all materials and for all labor, tools, equipment and incidentals necessary to complete the work.

- End of specification -

ITEM NO. 855B
POLYMER CONCRETE REHABILITATION SYSTEM FOR EXISTING
MANHOLES

855.1 DESCRIPTION: The item includes provisions for a structural resin aggregate manhole insert system such that manholes become structurally sound and impervious to ground water, soil, debris, and are resistant to hydrogen sulfide (sulfuric acid) corrosion. Manhole rehabilitation riser sections shall be constructed of supplier-certified isophthalic polyester resin, sand and aggregate. Provisions must be provided for confined space entry and for bypass pumping per Item No. 864. The Contractor is responsible for the complete installation of the manhole insert system including the removal of all old loose material, any pre-installation surface preparation and any manhole insert component. Manholes shall be manufactured in compliance with this specification, as manufactured by Geneva Polymer Products or engineered pre-approved equal.

855.2 REFERENCED STANDARDS: Manhole rehabilitation riser sections shall conform to the following design criteria (current edition):

1. ASTM C – 478 Standard Specification for Precast Reinforced Concrete Manholes Sections (Structural intent only)
2. ASTM D – 6783 Standard Specification for Polymer Concrete Pipe (material mix design)
3. ASTM C – 587 Standard Practice for Minimum Structural Design Loading for Underground Utility Structure
4. ASTM D -- 2584 (most current) Test Method for Ignition Loss of Cured Reinforced Resins
5. ASTM C -- 497 (most current) Test Methods for Concrete Pipe, Manhole Sections, or Tile
6. AASHTO HL 93 - LRFD Bridge Design and Axial Load Specifications

855.3 SUBMITTALS: Contractor shall submit manufacturer's product data, instructions, recommendations, shop drawings, and certifications. All submittals shall be in accordance with Owner's requirements and submittals shall be approved by the Owner prior to delivery of new materials.

855.4 MATERIALS: Manhole risers, conical tops, slab tops and grade rings shall be designed, by manufacturer, to meet the intent of ASTM C 478 with allowable compositional and sizing differences required by a polymer product and modification to accept polymer construction in lieu of concrete as follows:

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1. Insert system shall contain sufficient structural strength to carry all live, dead and hydrostatic loads for the installation. The original manhole that is being rehabilitated will not be repaired or rehabilitated since the insert system will be capable of providing all necessary structural support.
2. Acid resistant polymer manhole riser, cone sections and related components shall conform to the structural intent of ASTM C – 478. ASTM C – 478 material and manufacturing is allowed compositional and dimensional differences required by a polymer product.
3. Riser sections and eccentric cones are provided with flush edge configurations assembled with the appropriate alignment guides gaskets and/or butyl mastic to make a continuous and uniform manhole.
4. Polymer manhole riser and cone sections are to be provided in various lengths in combination to provide correct height with the fewest joints.
5. The polymer manhole sleeve will have a minimum wall thickness of 2” and an outside diameter clearance of 1.5”. Additional wall thickness may be required for interior dimensions in excess of 72”
6. Excessive compression and tensile strengths (as compared to ASTM C – 478) indicate that no reinforcement is required. Manufacture will determine the need for and type of reinforcement as it pertains to safety and lifting requirements.
7. Surfacing shell material for invert benches shall be an epoxy approved by the municipality and polymer manufacturer.
8. AASHTO LRFD HL-93 design live loading applied to manhole cover and riser sections.
9. Polymer manholes will be designed based upon live and dead load criteria in ASTM C 857
10. Polymer Mixture - the mixture shall consist solely of thermosetting resin, sand and aggregate. Resin used shall be unsaturated, certified, isophthalic polyester resins or vinyl ester resins. Mixing lots of resin from different manufacturers is not allowed. No cementitious or calcium carbonate materials shall be allowed.
11. Thermosetting Resin - The resin shall have a minimum of deflection temperature of 158° F when tested at 264 psi (1.820 mPa) following Test Method D 648. The resin content shall not be less than 7% of the weight of the sample as determined by test method D 2584. Resin selection shall be suitable for applications in the corrosive conditions to which the structures will be exposed.
12. Required wall thickness for all members will be a minimum of 2”. The wall

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thickness of risers and conical tops shall be not less than that prescribed by the manufacturer's design by more than 5%. A wall greater than the prescribed design shall not be cause for rejection.

13. Manhole joints shall be of a flush flat edge design that on assembly with alignment guides and gaskets and/or butyl mastic will make a continuous and uniform manhole. Joint sealing surfaces shall be free of dents, gouges and other surface irregularities that would affect joint integrity.
14. Each manhole component shall be free of all defects, including indentations, cracks, foreign inclusions and resin starved areas that, due to their nature and degree or extent, detrimentally affect the strength and serviceability of the component part. Variations in height of two opposite sides of risers and conical tops shall not be more the 5/8 inch. The under run in height of a riser or conical top shall not be more than 1/4in. /ft. of height with a maximum of ½ inch in any one section.
15. Marketing and Identification - Each manhole shall be marked on outside with the following information - Manufacturer's name or trademark, Manufacturer's location and Production Date.
16. Invert channels are to provide smooth flow transition waterway with no disruption of flow at pipe-manhole connections. Invert slope through manhole is as indicated on drawings. Provide curves for side inlets and smooth invert fillets for flow transition between pipe inverts. Unexposed support areas for enclosed invert and bench areas may be constructed of fill material and coated with a covering that will interlink with wall resins to prevent fill material corrosion.
17. Exceptions to ASTM C 478- components shall be designed for the intended combinations of manufacturing materials. Component designs may be as non-reinforced members or reinforced members as recommended by the manufacturer. Steel reinforcement is not required for circumferential reinforcement, joint reinforcement, or hoop reinforcement, but may be placed for the purpose of product handling.

855.5 CONSTRUCTION: Manhole installation should strictly follow the manufactures recommended installation procedures.

1. Excavate the area around the manhole as necessary to provide for removal of existing cone and castings while preventing soil and debris from falling into the manhole.
2. Follow all requirements for safety and ventilation in accordance with all applicable federal, state and local requirements.

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3. Provide means, labor and equipment to prevent solid waste contamination during construction activities. If necessary install and operate sewage diversion pumping equipment to maintain sewage flows without backup, overflow or spill.
4. Make repairs necessary to existing manhole in order to receive inserts. Power - wash / clean any loose debris from wall areas. Remove dirt, grease, and debris in bench area to prepare bench surfaces for resurfacing. Remove all debris without allowing any to enter the sewage system. Repair any active leaks. Repair and level the bench to prepare for polymer insert installation. Saw cut polymer riser section if necessary to accommodate pipe entry and bench slopes.
5. Depending on invert configuration the bench area should be prepared by building up the bench section with a Portland cement and sand mixture to provide a clean level surface to receive the riser. This build up should allow for a level surface above the existing top of the highest pipe. If pipe inverts are severely staggered the initial polymer sleeve can be modified in the field to accommodate the difference in bench slopes. After grout has set, lower the first riser section, clean and wipe down the polymer riser wall above the bench to allow for application of the epoxy coating. Epoxy coatings will be chosen from those epoxies currently approved by the local municipality. Follow all coating manufacturer's recommendations.
6. When the new bench configuration is sufficiently dry and clean, a thin shell coating of the municipality's approved epoxy will be built over the bench. The epoxy shell should continue 6" up the polymer riser face to allow for polymer interlinking. No additional surface coating is required as the riser sections are structural and corrosive resistant throughout.
7. All non-booted or flexible coupler pipe entry areas will be grouted by an epoxy patch kit provided by the manufacturer.
8. After the initial bottom seal has cured the additional remaining riser sections and cone shall be installed using the appropriate wall alignment guides, gaskets and/or mastic. The risers will be offloaded and lifted into place with approved manufacturer's lifting device. No other handling apparatus will be acceptable for handling material.
9. Fill the annular space between old and new structure with a one sack slurry mix / mixed fill, stabilized sand or stone (85% standard proctor) or a backfill material shall be subject to approval by engineer / owner.
10. Install polymer grade rings / concrete epoxy coated grade rings /or non-corrosive EPP grade rings, and casting. Grout where required with the manufacturers grout kit.
11. Finish the remainder of the backfill, remove any deleterious materials and

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debris from the manhole and replace pavement if required.

12. Upon completion of the installation process the contractor shall remove all surplus materials, protective coverings, accumulated rubbish, and thoroughly clean all surfaces and repair any other installation related damage as required by owner. All external surface areas shall be repaired and returned to its original or required condition. All debris shall be collected and hauled off to a proper disposal site as required by local, state and federal regulations.

855.6 **TESTING:** The Contractor shall perform the testing for all sanitary sewer manholes in accordance with the following.

1. Leakage Testing: All manholes must pass a leakage test. The contractor shall test each manhole (after reconstruction and backfilling) for leakage, separate and independent of all other sanitary sewer piping, by means of either a hydrostatic test, vacuum test, or other methods approved by the Engineer. The Contractor is hereby instructed to conduct either of the two identified tests in the following manner:
 - a. Hydrostatic Testing: Hydrostatic testing shall be conducted by utilizing approved plugs to seal all influent and effluent pipes in the manhole and filling the manhole to the top of the cone with water. Additional water may be added over a 24-hour period to compensate for absorption and evaporation losses. At the conclusion of the 24-hour saturation period, the manhole shall be filled to the top and observed. Any measurable loss within a 30 minute period shall be considered an unsuccessful test and thus require the Contractor to assess the needed repairs, perform such repairs (subject to the approval of the Engineer), and notify the Inspector when the retest will be performed. All effort, materials, or other costs shall be solely at the Contractor's expense.
 - b. Vacuum Testing:
 - (1) General: Manholes shall be tested after construction/installation and backfilling with all connections (existing and/or proposed) in place. Drop- connections and gas sealing connections shall be installed prior to testing.
 - (2) Test Procedure: The lines entering the manhole shall be temporarily plugged with the plugs braced to prevent them from being drawn into the manhole. The plugs shall be installed in the lines beyond drop connections, gas sealing connections, etc. Prior to performing the test, the Contractor shall plug all lift holes and exterior joints with a non-shrink grout and plug all pipes entering the manhole. No grout shall be placed in horizontal joints prior to

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testing. Contractor shall use a minimum 60 inch-lb. torque wrench to tighten the external clamps that secure the test cover to the top of the manhole. The test head shall be inflated in accordance with the manufacturer's recommendations. A vacuum of 10 inches of mercury shall be drawn, and the vacuum pump will be turned off. With the valve closed, the level vacuum shall be read after the required test time. If the drop in the level is less than 1 inch of mercury (final vacuum greater than 9 inches of mercury), the manhole will have passed the vacuum test. The required test time is 2 minutes.

- (3) Acceptance: Manholes will be accepted with relation to hydrostatic/vacuum test requirements, if they meet the criteria above. Any manhole which fails the initial test must be repaired with non-shrink grout or other suitable material based on the material of which the manhole is constructed. The manhole shall be retested as described above until a successful test is attained. After a successful test, the temporary plugs will be removed. To ensure that the plugs have been removed, Contractor shall only do so in the presence of the Inspector.
 - (4) Repairs to Existing Manholes: Any existing manhole which fails to pass the hydrostatic and/or vacuum test shall be closely examined by the Inspector and the Contractor to determine if the manhole can be repaired. Thereafter, the Contractor shall either repair or remove and replace the manhole as directed. The manhole shall then be retested and coated with a Fair Oaks Ranch-approved sewer coating as stated above. The Owner may elect to simply remove and replace the existing manhole with a new one. Any manhole excavated for repairs or excavated for tie in, shall be backfilled with flowable fill up to 1 foot below the top of the cone. The Contractor also has the option of backfilling with approved secondary materials, subject to the provisions of Item No. 804, "Excavation, Trenching and Backfill."
 - (5) Measurement and Payment: Hydrostatic/ Vacuum testing of new structures will not be a pay item. The cost of this work will be included in the bid price for the new manhole. Each hydrostatic/vacuum test of an existing manhole shall be a separate pay item. Repairs to existing manholes shall be a separate pay item when authorized.
2. Holiday Testing: Inspect each sanitary sewer manhole using high-voltage holiday detection equipment. All detected holidays shall be marked and repaired by abrading the coating surface with grit disk paper, or other hand tooling method. After abrading and cleaning,

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additional protective coating material shall be applied to the repair area. All touch-up repair procedures shall follow the protective coating manufacturer's recommendations.

3. If a sanitary sewer manhole fails to pass one of the above tests, it shall be repaired in accordance with the manufacturer's recommendations and re- tested. It shall not be accepted until it passes all tests. All repairs and re-testing shall be at no additional cost to Fair Oaks Ranch.

855.7 CERTIFICATION / WARRANTY / INSPECTION: When requested by Fair Oaks

Ranch, a certification can be made the basis of acceptance. This will require the material supplier to provide a copy of the appropriate test results that show that the polymer material meets the requirements listed in this specification and for any other qualified specification required by the owner for that particular project at time of bid.

1. The installing contractor shall demonstrate applicable experience and performance history by submitting references from a minimum of 3 other rehabilitation projects or shall have a minimum of five years' experience installing standard sanitary manholes and a certification of training from the manufacturer on a structural manhole insert system.
2. The installing contractor will appoint a Quality Assurance Manager to take full responsibility for the quality of work. The Quality Assurance Manager will at a minimum meet the requirements of Section 6 (1) and will coordinate with polymer manufacture on appropriate procedures. A Manufacturer's Field Representative can be made available to the contractor at additional cost.
3. The polymer riser and cone sections shall be subject to inspection and approval by the owner or the owner's engineer representative. At the time of inspection all material will be examined for specification compliance and approved drawings. Any sections damaged after delivery and not deemed repairable by the Manufacturer's Representative and owner representative - will be removed and replaced at contractor's expense.

855.8 MEASUREMENT: All reconstructed manholes will be measured by the unit of each manhole (any type or size) regardless of the type shown in the contract documents.

855.9 PAYMENT: The work performed as prescribed by this item will be paid for at the contract unit price bid per manhole for "Polymer Concrete Rehabilitation System for Existing manholes," which price shall be full compensation for all excavation, backfill material including select backfill, flowable fill, saw cutting of surfaces as required, reinforced concrete/concrete, diversion of flow, bypass pumping, trench protection, special shoring and disposal of material excavated, sewer coating, and all testing; for

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furnishing and placing all materials and for all labor, tools, equipment and incidentals necessary to complete the work.

- End of Specification -

ITEM NO. 856
JACKING, BORING OR TUNNELING PIPE

856.1 DESCRIPTION: This item shall govern the furnishing and installation of pipe by the methods of jacking, boring, or tunneling as shown in the contract documents and in conformity with this specification.

856.2 SUBMITTALS: Contractor shall submit manufacturer's product data, instructions, recommendations, shop drawings, and certifications.

856.3 MATERIALS:

1. Carrier Pipe: Carrier pipe shall be of the types and sizes shown in the contract documents and shall conform to the requirements of these specifications. If PVC pipe is to be utilized as carrier pipe, installation shall conform to Item No. 818, "PVC (C-900, C-905, and C-909) Pipe Installation" and shall be fully restrained in casing. For sanitary sewers, materials shall conform to Items No. 848.2.a through 848.2.d, or as specified in the contract documents by the Engineer, and in accordance with DD-856 of the Standard Drawing Series.
2. Casing Pipe: Casing, if required, shall be as follows for water mains:
 - a. RCP;
 - b. Steel;
 - c. Liner plate.
3. Grout: Grout for annular spaces shall be sand cement slurry containing a minimum of 7 sacks of Portland Cement per cubic yard of slurry. All slurry shall be plant batched and transit mixed.

856.4 CONSTRUCTION:

1. Jacking: Suitable pits or trenches shall be excavated for the purpose of jacking operations for placing end joints of the pipe. When trenches are cut in the side of embankment, such work shall be securely sheeted and braced. Jacking operations shall in no way interfere with the operation of railroads, streets, highways or other facilities and shall not weaken or damage such facilities. Barricades and lights shall be furnished as directed by the Engineer to safeguard traffic and pedestrians.

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The pipe to be jacked shall be set on guides to support the section of pipe being jacked and to direct it in the proper line and grade. Embankment material shall be excavated just ahead of the pipe and material removed through the pipe, and the pipe forced through the opening thus provided.

The excavation for the underside of the pipe, for at least $\frac{1}{3}$ of the circumference of the pipe, shall conform to the contour and grade of the pipe. A clearance of not more than 2 inches may be provided for the upper half of the pipe.

The distance that the excavation shall extend beyond the end of the pipe shall depend on the character of the material, but it shall not exceed 2 feet in any case.

Generally, the pipe shall be jacked from the downstream end. Permissible lateral or vertical variation in the final position of the pipe from line and grade will be as shown in the contract documents or as determined by the Engineer.

Any pipe that cannot be repaired to its original condition or is damaged in jacking operations shall be removed and replaced at the Contractor's expense. Jacking pits shall be backfilled immediately upon completion of jacking operations.

2. Excavation: Excavation for "Boring" pits and installation of shoring shall be as outlined under "Jacking." Boring operations may include a pilot hole which shall be bored the entire length of crossing and shall be used as a guide for the larger hole to be bored. Water or drilling fluid may be used to lubricate cuttings. Variation in line and grade shall apply as specified under "Jacking."
3. Tunneling: Tunneling may be used when the size of the proposed pipe or the use of a monolithic sewer would make the use of tunneling more satisfactory than "Jacking" or "Boring." The excavation for pits and the installation of shoring shall be as specified under "Jacking."

The lining of the tunnel shall be of the material shown in the contract documents.

Access holes for grouting annular space shall be spaced a maximum of 10 feet.

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4. Joints: Joints for pipe for "Jacking," "Boring," or "Tunneling," shall be as specified in Item No. 848, "Sanitary Sewers" or as shown in the contract documents, shop drawings, or as per additional pipe manufacturer's recommendations.
5. Grouting of Bores or Tunnels: Annular Space between casing pipe and limits of excavation (borehole) shall be pressure grouted, unless otherwise specified in the contract documents.

856.5 MEASUREMENT: Jacking, Boring or Tunneling shall be measured by the linear foot of bore or tunnel as measured from face to face of jacking pits.

Carrier pipe used in bores and tunnels or jacked into place shall be measured by the linear foot of pipe installed from end to end of pipe to the limits shown on the plans.

Casings or liners, where required by the plans, of the size and material required shall be measured by the linear foot actually installed in accordance with the plans.

856.6 PAYMENT: The work performed and materials furnished as specified herein, measured as provided above, shall be paid for at the contract unit price bid per linear foot of jacking, boring or tunneling, which price shall be full compensation for furnishing all materials (except carrier pipe, casings or liners), casing spacers, grout, labor, tools, equipment and incidentals necessary to complete the work, including excavation, grouting, backfilling, restoration to original ground conditions, end caps, and disposal of surplus materials.

Carrier pipe shall be paid for at the contract unit price bid for "Carrier Pipe for Jacking, Boring or Tunneling" per linear foot of pipe installed and measured as prescribed above.

Casings or liners shall be paid for at the contract unit price bid for "Casing or Liner" per linear foot of casing or liner installed and measured as prescribed above.

- End of Specification -

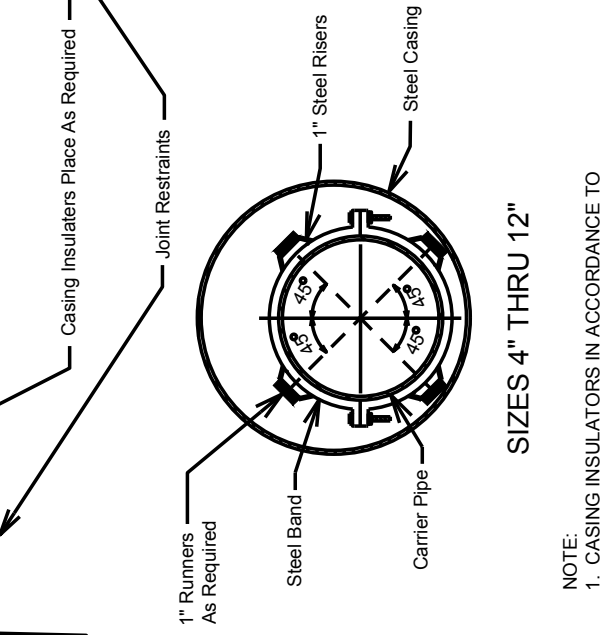
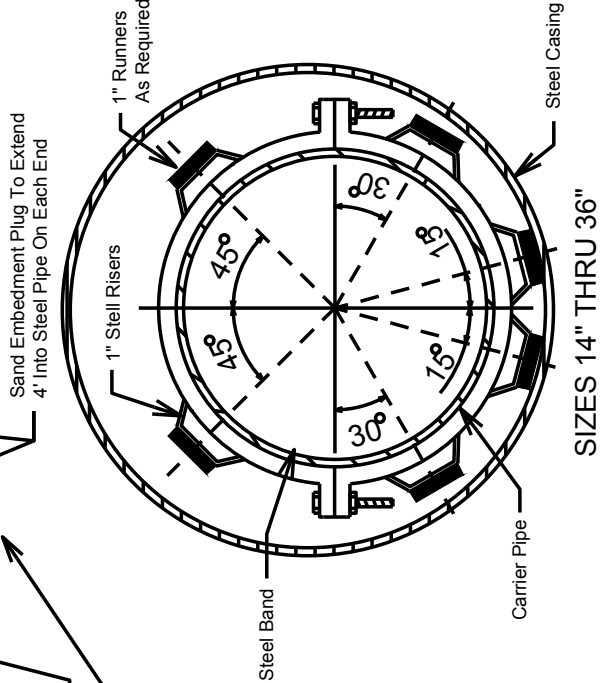
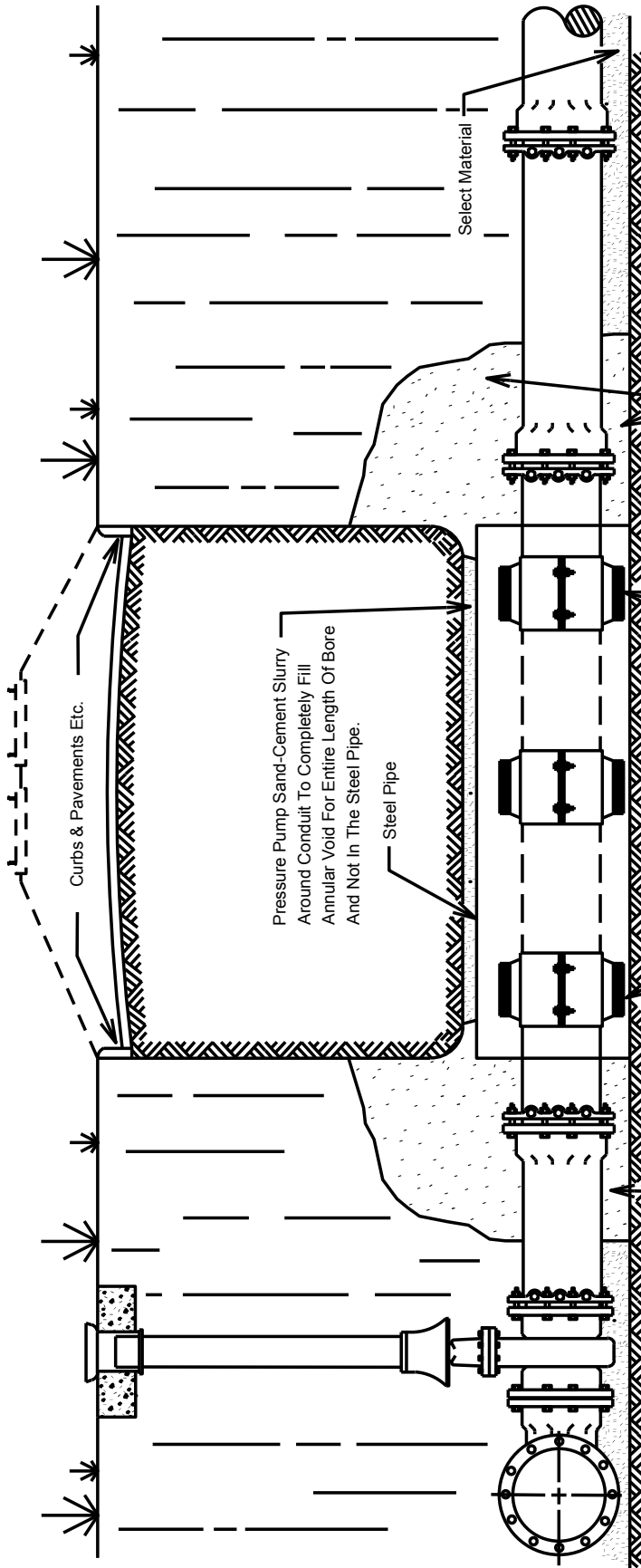
STEEL PIPE CASING / WATER MAIN		
Pipe Size (Inches)	Pipe Thickness (Inches)	Pipe Weight (Lbs./Ft.)
6	0.375	25.03
8	0.375	33.04
12	0.375	45.55
16	0.375	62.58
20	0.375	78.60
24	0.375	94.62
30	0.375	118.65

UNION PACIFIC RAILROAD CROSSING CASING REQUIREMENTS		
Nom. Dia. Steel Conduit (Inches)	Steel Pipe Thickness (Inches)	Pipe Weight (Lbs./Ft.)
18	0.375	70.59
24	0.438	110.22
30	0.50	157.53
36	0.562	212.70
42	0.625	276.18
48	0.625	316.53

WATER MAINS IN CONDUIT			
Water Main Size (Inches)	Nom. Dia. RCP* Or Steel (Inches)	Steel Pipe Thickness (Inches)	Pipe Weight (Lbs./Ft.)
6	12	0.375	70.59
8	16	0.375	94.62
12	24	0.375	94.62
16	30	0.375	118.65
20	36	0.438	166.19
24	42	0.438	194.02
30	48	0.50	259.02
36	54	0.50	291.07

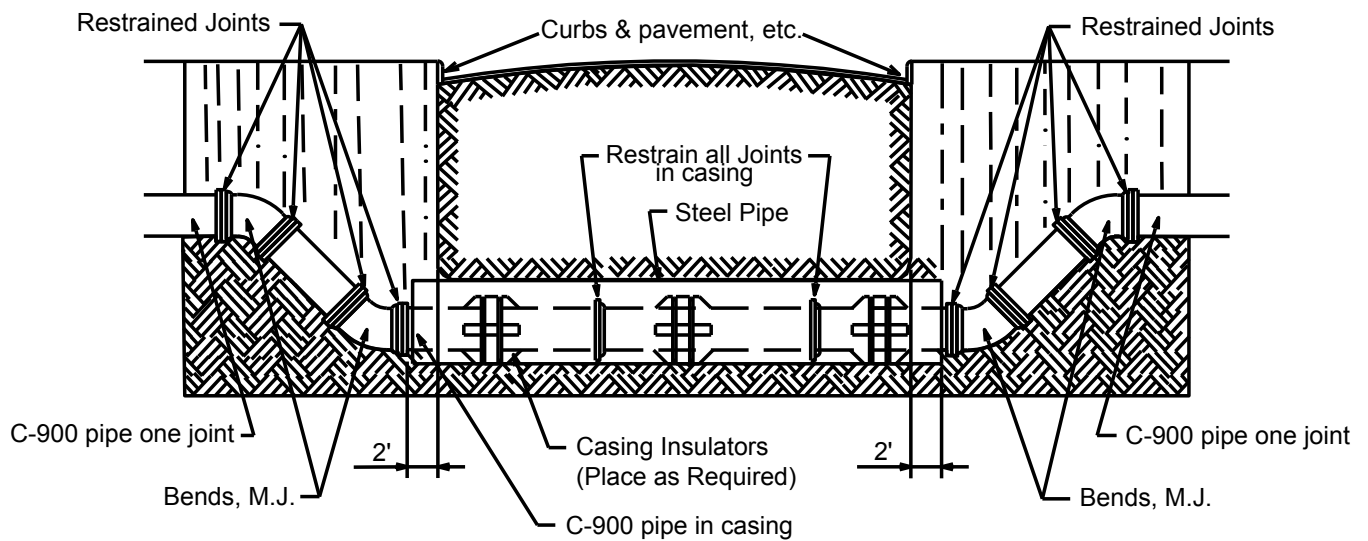
* Class III or IV Tongue and Groove, for non-railroad applications

PROPERTY OF THE CITY OF FAIR OAKS RANCH	INSTALLATION OF PIPE IN CONDUIT	APPROVED	REVISED
		JANUARY 2019	
		DD-856-01	SHEET 1 OF 2



NOTE:
1. CASING INSULATORS IN ACCORDANCE TO
STANDARD MATERIAL SPECIFICATION 05-31

SIZE	BAND WIDTH	NO. RUNNERS PER TIE	
8"	8"	2 TOP,	2 BOTTOM
12"	8"	2 TOP,	2 BOTTOM
16"	8"	2 TOP,	4 BOTTOM
20"	8"	2 TOP,	4 BOTTOM
24"	8"	2 TOP,	4 BOTTOM
30"	12"	2 TOP,	4 BOTTOM
36"	12"	2 TOP,	4 BOTTOM



Note:

1. Fittings shall be paid for by separate item Joint restraints shall be approved as specified in Material Specification Item 95-10.

PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

INSTALLATION OF PIPE
IN BORE

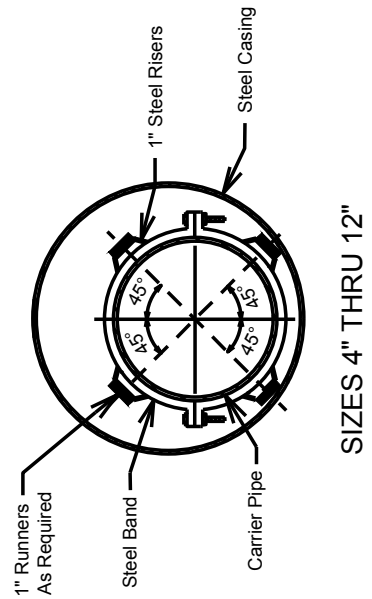
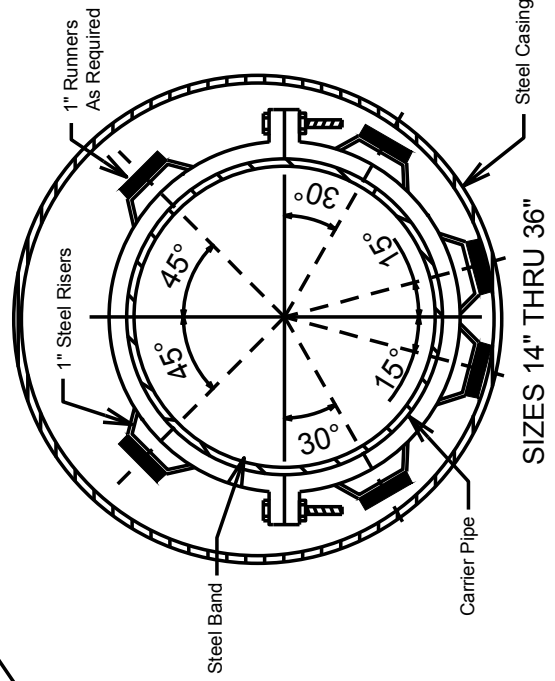
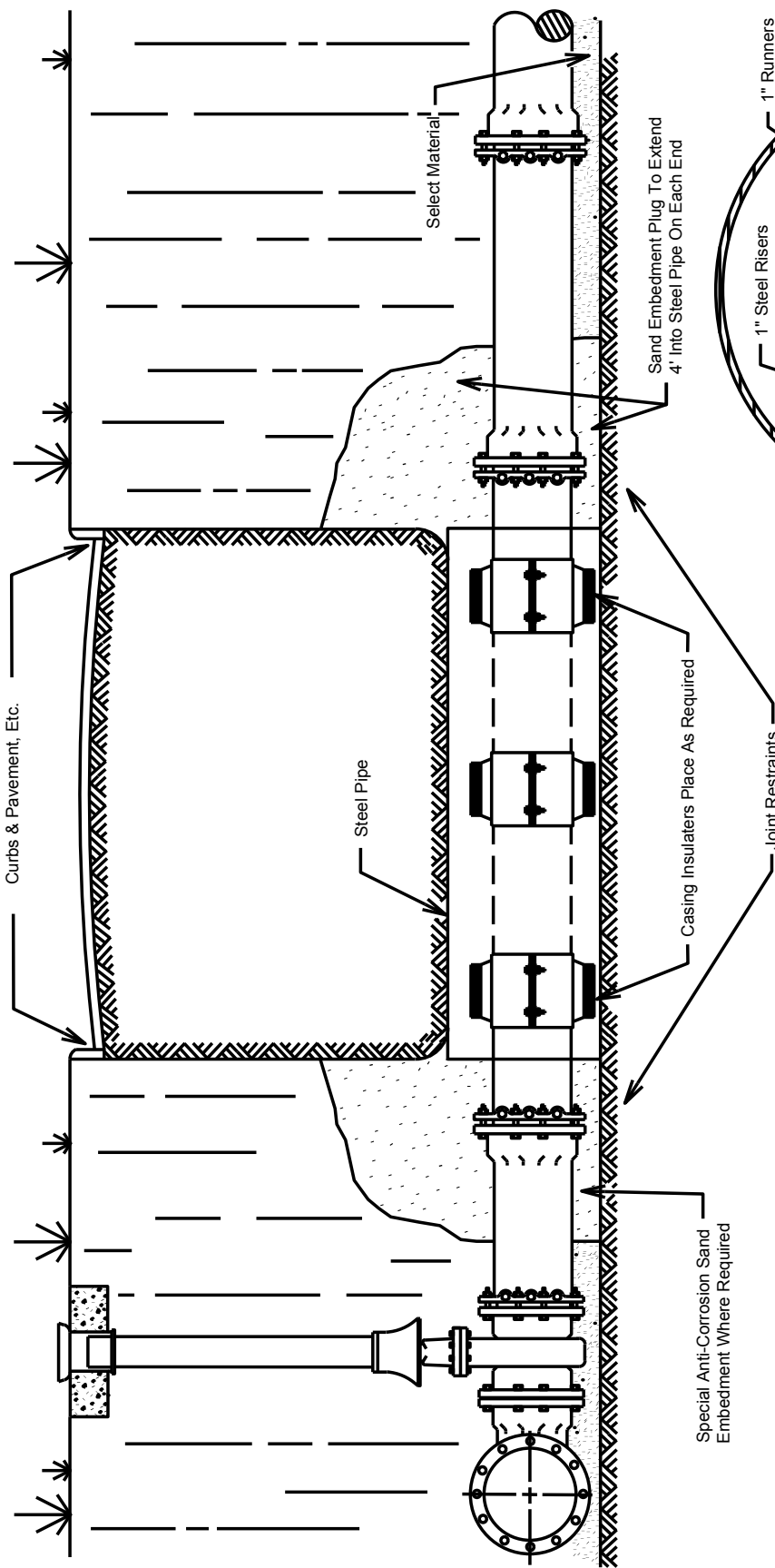
APPROVED

JANUARY 2019

REVISED

DD-856-02

SHEET
1 OF 3



NOTE:
1. CASING INSULATORS IN ACCORDANCE TO
STANDARD MATERIAL SPECIFICATION 05-31.

SIZE	BAND WIDTH	NO. RUNNERS PER TIE	
8"	8"	2 TOP,	2 BOTTOM
12"	8"	2 TOP,	2 BOTTOM
16"	8"	2 TOP,	4 BOTTOM
20"	8"	2 TOP,	4 BOTTOM
24"	8"	2 TOP,	4 BOTTOM
30"	12"	2 TOP,	4 BOTTOM
36"	12"	2 TOP,	4 BOTTOM

PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

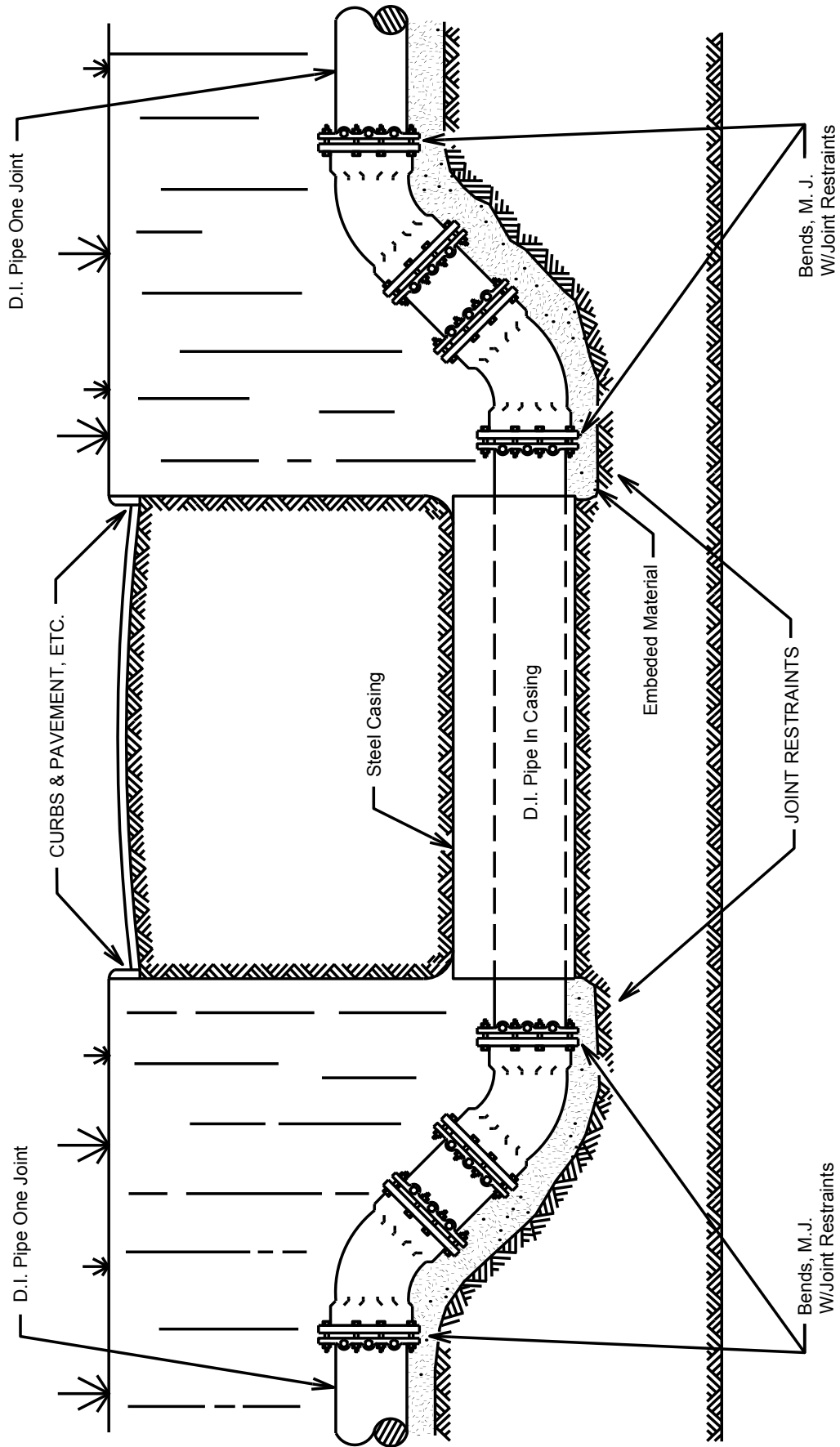
PAVEMENT INSTALLATION
OF PIPE IN BORE
(JOINT RESTRAINT)

APPROVED
JANUARY 2019

REVISED

DD-856-02

SHEET
2 OF 3



NOTE:
1. JOINT RESTRAINTS SHALL BE APPROVED AS
SPECIFIED IN MATERIAL SPECIFICATION ITEM 95-10.

PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

INSTALLATION OF PIPE
IN BORE
(JOINT RESTRAINT)

APPROVED
JANUARY 2019

REVISED

DD-856-02

SHEET
3 OF 3

ITEM NO. 857
FIBERGLASS REINFORCED PIPE FOR LARGE
DIAMETER GRAVITY SANITARY SEWER

- 857.1 DESCRIPTION:** This item shall govern the designing, fabricating, furnishing, installing, and joining of large diameter (18-inch or greater) fiberglass sewer piping for gravity-flow conveyance of wastewater. The pipe size, centerline alignment, and grades are presented in the project Drawings. All materials and construction shall be in accordance with the Texas Commission on Environmental Quality (TCEQ) rules to include: Design Criteria for Sewerage systems 30 TAC 217.1, 30 TAC 217.2, 30 TAC 217.3, and 30 TAC 217.13, or any revision thereto as applicable.

Contractor must provide Geographic Information Systems (GIS) line .shp file for any installed sewer line. The GIS .shp file must include information on the pipe diameter, location, material, upstream invert, upstream depth, downstream invert, downstream depth, slope and length at a minimum. Confirm the information to be included in the .shp file with Fair Oaks Ranch prior to submission. Additional information to be included in the shapefile may be requested by Fair Oaks Ranch.

- 857.2 REFERENCED STANDARDS:** Reference standards cited in this Specification Item No. 857 refer to the current reference standard published at the time of the latest revision date logged at the end of this Specification Item No. 857, unless a date is specifically cited.

1. Fair Oaks Ranch (Fair Oaks Ranch):
 - a. Specifications for Water and Sanitary Sewer Construction (2018)
 - b. Fair Oaks Ranch Materials Specifications
2. Texas Commission of Environmental Quality (TCEQ) Chapter 217 Design Criteria for Domestic Wastewater Systems
3. American Society for Testing and Materials (ASTM) International:
 - a. D3236, Standard Test Method for Apparent Viscosity of Hot Melt Adhesives and Coating Materials
 - b. D3262, Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Sewer Pipe
 - c. D3681, Standard Test Method for Chemical Resistance of "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe in a Deflected Condition
 - d. D4161, Standard Specification for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe Joints Using Flexible Elastomeric Seals.

Fair Oaks Ranch Standard Specifications for Construction

- e. ASTM D 3839 Standard Practice for Underground Installation of “Fiberglass” Pipe
- f. F477, Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
- 4. American Water Works Association (AWWA)
 - a. AWWA M45 Fiberglass Pipe Design
- 5. International Organization of Standardization (ISO)
 - a. ISO9001

857.3 SUBMITTALS:

- 1. All submittals shall be in accordance with Owner’s requirements and submittals shall be approved by the Owner prior to delivery.
- 2. Shop Drawings:
 - a. Catalog Data Sheets for all materials.
 - b. Details of all piping system components confirming that the pipe and fittings conform to the specified requirements.
 - c. Fabrication drawings showing:
 - 1) Wall thickness.
 - 2) Pipe length.
 - 3) Pipe joint.
 - 4) Design of pipe and fittings.
 - 5) Gasket details.
 - d. Shop drawings shall include fittings and specials that are to be installed.
 - e. Pipeline layout and profile drawings showing location, station, and invert elevation of pipe sections, fittings, closure pieces and test closures. Test methods and results including certification that pipe exceeds the minimum requirements of ASTM D2412, ASTM D2992, and ASTM D3262 as appropriate and International Organization of Standardization (ISO) 9001 certification. Quality control test reports shall be supplied by the manufacturer and be representative of the pipe fabricated for this project. All testing results shall be signed and sealed by a Texas Registered Professional Engineer and shall be in full compliance with the Standards. Strain corrosion test annual reconfirmation tests reports (1000-hr test) shall be from the production facility providing pipe for the project and conducted within the previous 18 months, and shall be accompanied by the base-test report (10,000-hr test).

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- f. Design calculations to meet all loadings: In-situ, service, handling, and jacking pressure. Calculations confirming the pipe will handle anticipated loading signed and sealed by a Licensed Professional Engineer in Texas.
- g. Manufacturer shall verify that pipe stiffness provided meets conditions as represented in the Contract Documents. If computer calculations are used, include example calculations to show the logic employed.
- h. Manufacturer shall provide a certificate of compliance to these specifications referencing project name and location. Manufacturer shall provide ISO 9001 certificate by a third party.
- i. Test reports: Furnish an affidavit certifying that all Fiberglass Reinforced Pipe meets the provisions of this Section and has been tested and submit reports from tests in accordance with ASTM D3262 and ASTM D4161.
- j. A copy of the full ASTM D3681 Strain Corrosion test report verifying that the proposed FRP meets the long-term corrosion resistance required for Septic Sanitary Sewer service when tested using 1N Sulfuric Acid.
- k. The test report and all data shall be from sample production pipe from the plant which will be supplying pipe to this project.
- l. Data from other sites, or report with mix data are subject to rejection by the Owner.
- m. Manufacturer shall provide a certificate confirming that it meets the required experience levels for years of production and footages and sizes as described in the specifications.
- n. Manufacturer's written instructions for handling, transporting, storage, and installation of pipe.
- o. Manufacturer shall provide as a Shop Drawing; recommendations for embedment, manhole connection details, encasement details, and any repair details.

857.4 MATERIALS:

1. General

- a. The work to be performed in this section includes design calculations, detailing, and fabrication of FRP for the conveyance of raw sanitary sewage. Pipe design calculations will be required for open-trench and tunneling installation methods.

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- b. Other work performed under this section includes: shop testing;
- c. Fabrication of fittings and appurtenances; handling, storage and protection; and loading and transportation of completed fittings and appurtenances to the construction site.
- d. All pipes shall be manufactured specifically for this project and no pipe shall be furnished from stock unless approved by the Owner.

2. Pipe

a. Performance / Design Criteria

- 1) Design in accordance with ASTM D3262 including the appendix and subsequent specifications, and in accordance with Fair Oaks Ranch specifications. Depths shall comply with requirement of ASTM D3681.
- 2) Design pipe for service loads that include:
 - i. External groundwater and earth loads
 - ii. Jacking/pushing loads (Acceptable Manufacturer only)
 - iii. The allowable jacking/pushing capacity shall not exceed 40 percent of the ultimate compressive strength or the maximum allowable compressive strength recommended by the manufacturer, whichever is less.
 - iv. Traffic loads
 - (a) Practical considerations for handling, shipping and other construction operations.
- 3) Design is to be conducted under the supervision of a Professional Engineer licensed in the State of Texas, who shall seal and sign the design. Standard lay length of 20 feet, except for special fittings or closure pieces necessary to comply with the Plans.
- 4) Design of pipe is to include the determination of design pressures up to 25 psi, stresses, external loads, pressure class (PN), and pipe stiffness class (SN).
- 5) Stiffness (SN) class that satisfies design requirement on the Plans, or not less than 115 psi when used in direct bury operations.
- 6) All lines must be able to withstand a high-velocity cleaning with a water jet capable of producing a minimum volume of 50 gpm with a

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pressure of 1500 psi at the nozzle. Install a gauge to indicate working pressure on the discharge of high-pressure water pumps. The jet angle of the outlet must be no greater than 30° relative to the pipe axis. A video of pipe before and after line cleaning must be submitted of all installed lines. No delamination should occur.

- 7) In no case shall pipe be installed deeper than its design allows.
- 8) Pipe markings shall meet the minimum requirements of ASTM 3236. Minimum pipe markings shall be as follows:
 - i. Manufacturer
 - ii. Manufacturer Number (identifies factory, location, date manufactured, shift and sequence)
 - iii. Nominal diameter
 - iv. Beam load
 - v. Laying length
 - vi. ASTM designation

3. Gaskets

- a. Supply from approved gasket manufacturer in accordance with ASTM F477 and suitable for service intended.
- b. Affix gaskets to pipe by means of suitable adhesive or install in a manner so as to prevent gasket from rolling out of pre-cut groove in pipe or sleeve coupling.
- c. Provide the following gaskets in potentially contaminated areas.
 - 1) Petroleum (diesel, gasoline) – Viton
 - 2) Other contaminants – Manufacturer recommendation

4. Joints

- a. Joints for pipe and fitting shall conform to the material and performance requirements of ASTM D4161. Depths shall comply with requirements of ASTM D3681.
- b. Field connect pipe with fiberglass sleeve couplings that utilize elastomeric sealing gaskets as sole means to maintain joint water tightness.

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5. Fittings

All bends exceeding a two-degree horizontal or vertical deflection shall consist of a manufacturer fabricated fitting meeting the same requirements as the pipe material. Provide tolerance of laying length of fittings to ± 2 inches. Use only manufactured fittings. Flanges, elbows, reducers, tees, wyes, laterals and other fittings shall be capable of withstanding all operating conditions when installed. They may be contact molded or manufactured from mitered sections of pipe joined by glass-fiber reinforced overlays. For pipe diameters 18 inches or larger, lateral openings 6 inch or greater in size shall be made using insert-tee conforming to ASTM D3034 service connections, approved by Engineer.

6. Couplings

Unless otherwise specified, the pipe shall be field connected with fiberglass sleeve couplings that utilize elastomeric sealing gaskets as the sole means to maintain joint water tightness. Elastomeric sealing gaskets shall be recommended by the manufacturer for application with sanitary sewage. Chemical grout, epoxy grout, or internal repair boots will not be accepted as long-term watertight seals. The joints must meet the performance requirements of ASTM D4161.

7. Structure Connections

Provide an FRP water stop flange (wall pipe) or raised rib for water-tight connection to a concrete cast-in-place structure/manhole.

8. Dimensional Tolerances

a. Inside diameter

Pipe shall not vary more than 1/8 inch from the nominal inside diameter.

b. Roundness

The difference between the major and minor outside diameters shall not exceed 0.1 percent of the nominal outside or 1/4 inch, whichever is less.

c. Wall thickness

Provide minimum single point thickness no less than 98 percent of stated design thickness.

d. End Squareness

Provide pipe ends square to pipe axis with maximum tolerance of 1/8 inch.

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e. Fittings

- 1) Provide tolerance of angle of elbow and angle between main and leg of wye or tee to ± 2 degrees.
- 2) Provide tolerance of laying length of fitting to ± 2 inches.

9. Acceptable Manufacturer

- a. Vendors must have approval through Fair Oaks Ranch Standards Committee prior to product use and must meet all requirements set forth in this Specification Item No. 857.

857.5 CONSTRUCTION: All sanitary sewer mains shall be constructed in accordance with the specification herein outlined and in conformity with the required lines, grades, and details shown in the contract documents and as directed by the Engineer.

1. Quality Control

- a. All project pipes shall be provided by a single manufacturer
- b. Only the pipe and fittings that will be installed during a single work day will be allowed to be stored within the barricaded work area.
- c. Pipe manufacturing operations shall be performed under the control of the manufacturer.
- d. All pipe furnished shall be in conformance with this Specification Item No. 857 and ASTM D3262.

2. Delivery of Materials

Provide adequate strapping during transport to prevent damage to the pipe, fittings and appurtenances in accordance with manufacturer's recommendations.

3. Storage Requirements

- a. Gravity pipe shall be stored and handled in accordance with the manufacturer's guidelines or Engineers recommendations.
- b. All products shall be stored above the ground upon platforms, pallets, skids, or other supports supplied by the Contractor and approved by Fair Oaks Ranch. Products shall be kept free from dirt and other foreign matter.

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- c. All products shall be stored to permit ready access for identification and inspection by the Inspector.
- d. If new pipe and fittings become damaged before or during installation, it shall be repaired as recommended by the manufacturer or replaced as required by the Inspector or Engineer at the Contractor's expense, before proceeding further. Deliver, store, and handle other materials as required to prevent damage.
- e. Pipe laid directly on the ground shall be placed on an area free of loose stones or sharp objects in accordance with manufacturer's recommendations and approved by the Fair Oaks Ranch.

4. Pipe Handling

- a. The Contractor shall abide by the required handling techniques specified by the Manufacturer.
- b. The Contractor shall provide suitable quantities of all lifting equipment to handle the pipe. In no case shall any equipment be used that is not rated to handle the intended loading or conditions of use to which it will be subjected, or which will damage or gouge the pipe.
- c. Dragging or dropping the pipe shall not be allowed.
- d. Haul and distribute pipe and fittings at the project site.
- e. Handle piping with care to avoid damage.
- f. Inspect each joint of pipe and reject or repair any damaged pipe prior to lowering into the trench.
- g. Use only nylon ropes, slings or other lifting devices that will not damage the surface of the pipe for handling pipe.

5. Pipe Installation

- a. Engineer and/or Inspector may request to inspect pipe prior to installation.
- b. Install pipe, fittings, specials and appurtenances as specified herein, and in accordance with the pipe manufacturer's recommendations or Engineers

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requirements.

- c. Must follow manufacture recommendation for initial and bedding.
- d. Lay pipe to the lines and grades as indicated on the Plans. Clean ends of pipe and coupling components. Apply manufacturer approved joint lubricant to pipe ends and to the elastomeric seals of coupling. Use suitable equipment and end protection to push or pull the pipes together, applying a uniform seating force across the entire pipe and coupling circumference. Do not exceed forces recommended by the manufacturer for coupling pipe. Join pipes in straight alignment then deflect to required angle. Do not allow the deflection angle to exceed the deflection permitted by the manufacturer, and not more than 2-degrees unless approved by the Engineer. Excavate and backfill trenches in accordance with the Fair Oaks Ranch Standard Specification Item No. 804.
- e. Pipe Separation: Sewer pipe separation distances shall be maintained in accordance with TCEQ rules 30 §217.53.
- f. Laser Beams: The use of laser beams for vertical control shall be required.
- g. Contractor shall also make available to the Inspector, when requested, a level and rod, of sufficient sensitivity, to accurately determine differences in elevation between points 300 feet apart with one instrument set-up.
- h. Contractor shall provide a written summary to the Inspector of all elevations that all installed, repaired, or replaced sewer main enter and exit a manhole or structure.
- i. No pipe shall be installed in tunnels except as noted in the contract documents or by approval of the Engineer. If the Contractor finds it necessary to install pipe in tunnels not provided in the contract documents, he shall submit to the Engineer a detailed outline of procedures, methods, and use of materials depending on existing soil conditions. This information requires review and approval prior to the commencement of work. Only Fair Oaks Ranch Product Standards Committee approved pipe manufacturer will be allowed for tunneling.
- j. No horizontal or vertical curves shall be permitted in conformance with appropriate regulatory agency requirements.
- k. Before leaving the work unattended, the upper ends of all pipelines shall be securely closed with a tight-fitting plug or closure in accordance with manufacturers recommendations and approved by the Fair Oaks Ranch

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- l. The interior of laid pipe shall be kept free from dirt, silt, gravel, or foreign material at all times.
- m. **All pipes in place must be approved by the Inspector before backfilling.**
- n. All fabricated bends shall be encased with reinforced concrete, with #4 Bars at 12-inches on center each way completely around pipe, approximately centered in the encasement thickness, and extending longitudinally one pipe diameter each direction along trench measured from the pipe interior bend point. Concrete encasement shall extend across the full width of the trench to both trench walls. Encasement requirement may be waived by the Engineer if manufacturer certifies that fabricated bends have been designed and constructed to withstand all static and dynamic loads imposed by the service conditions.
- o. When replacing an existing system in place, Contractor shall maintain screens to prevent the entrance of construction debris into the sewer system. Ensure properly temporarily connected or maintain continuous by-pass.
- p. At the close of each operating day:
 - 1) Keep the pipe clean and free of debris, dirt, animals and trash – during and after the laying operation. Effectively seal the open end of the pipe using a gasketed night cap. When not temporarily connected. Cap shall be in accordance with manufacturer's recommendations and approved by the Fair Oaks Ranch.

857.6 TESTING:

1. Successful passage of the air test and mandrel test as described under TCEQ Chapter 217 Criteria. Shall be required for acceptance of the mains.
2. The Contractor shall perform a low- pressure air test, or an infiltration/exfiltration test, and a mandrel test before the installed work shall be considered accepted. If a gravity collection main is composed of flexible pipe, a deflection test will also be required. Flexible pipe is defined as pipe that will deflect at least 2% without structural distress. Contractor shall insure that all testing is performed in the presence of the Inspector, with copies of all written test results made available to the Inspector. Tests shall conform to the following requirements:
 - a. Low-Pressure Air Test: For sections of pipe less than 27-inch average inside diameter the following procedure for the low-pressure air test shall apply and the tests shall conform to the procedures described in ASTM C828, ASTM C924, and ASTM F1417 (or other appropriate procedures), except for testing times. The test times shall be as outlined in this section. The pipe shall be

Fair Oaks Ranch Standard Specifications for Construction

pressurized to 3.5 psi greater than the pressure exerted by groundwater above the pipe. Once the pressure is stabilized, the minimum time allowable for the pressure to drop from 3.5 pounds per square inch gauge to 2.5 pounds per square inch gauge shall be computed from the following equation:

$$T = \frac{0.085 \times D \times K}{Q}$$

Where:

T = Time for pressure to drop 1.0 pound per square inch gauge in seconds;

K = $0.000419 \times D \times L$, but not less than 1.0;

D = Average inside pipe diameter, in inches;

L = Length of line of same pipe size being tested, in feet;

Q = Rate of loss, 0.0015 cubic feet per minute per square foot internal surface shall be used since a K value of less than 1.0 shall not be used

The minimum testing times for each pipe diameter is as follows:

Pipe Diameter	Minimum Time	Length for Minimum Time	Time for Longer Length
Inches	Seconds	Feet	Seconds/Ft
18	1,020	133	7.693
21	1,190	114	10.471
24	1,360	100	13.676
27	1,530	88	17.309

* Note: Test time starts after the required 60 seconds of stabilization time has transpired.

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- b. The test may be stopped if no pressure loss has occurred during the first 25% of the calculated testing time. If any pressure loss or leakage has occurred during the first 25% of the testing period, then the test shall continue for the entire test duration as outlined above or until failure.
- c. Mains with a 27 inch average inside diameter and larger must be air tested at each joint. If the joint test is used, a visual inspection of the joint shall be performed immediately after testing. The pipe is to be pressurized to 3.5 psi greater than the pressure exerted by groundwater above the pipe. Once the pressure has stabilized, the minimum time allowable for the pressure to drop from 3.5 pounds per square inch gauge to 2.5 pounds per square inch gauge shall be 10 seconds.
- d. Infiltration/Exfiltration Test: The total exfiltration, as determined by a hydrostatic head test, must not exceed 50 gallons per inch of diameter per mile of main per 24 hours, at a minimum test head of 2 feet above the crown of the main at an upstream manhole. The Contractor shall use an infiltration test in lieu of an exfiltration test when mains are installed below the ground water level. In such cases, the total exfiltration, as determined by a hydrostatic head test, must not exceed 50 gallons per inch diameter per mile of main 24 hours at a minimum test head of 2 feet above the crown of the main at an upstream manhole, or at least 2 feet above the existing groundwater level, whichever is greater. For construction work occurring within a 25-year floodplain, the infiltration or exfiltration must not exceed 10 gallons per inch diameter per mile of main per 24 hours at the same minimum test head as stated in the previous sentence. If the quantity of infiltration or exfiltration exceeds the maximum quantity specified, the Contractor shall propose to the Engineer, and receive approval therefrom, all necessary remedial action, solely at the Contractor's own cost, in order to reduce the infiltration or exfiltration to an amount within the limits specified herein.
- e. Deflection Testing: As stated in the 30 TAC § 217, deflection test shall be performed on all flexible pipe installed.
 - 1) For mains with inside diameters less than 27 inches, a rigid mandrel shall be used to measure deflection.
 - 2) For main with an inside diameter 27 inches and greater, a method approved by the Engineer shall be used to test for vertical deflections. A manufacturers approved Go-No-Go deflection rod can be utilized for deflection testing.
 - 3) The deflection test must be accurate to within + 0.2% deflection. The test shall be conducted after the final backfill has been in place at least 30 days. No pipe shall exceed a deflection of five percent. If a

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pipe should fail to pass the deflection test, the problem shall be corrected and a second test shall be conducted after the failed areas final backfill has been in place an additional 30 days. The tests shall be performed without mechanical pulling devices. The Engineer should recognize that this is a maximum deflection criterion for all pipes and a deflection test less than 5% may be more appropriate for specific types and sizes of pipe. Upon completion of construction, the Engineer or other Texas Registered Professional Engineer appointed by the owner shall certify to the Inspector, that the entire installation has passed the deflection test. This certification may be made in conjunction with the notice of completion required in 30 TAC § 217.14. (1) of this title (relating to General Provisions). This certification shall be provided for the Owner to consider the requirements of the approval have been met.

- i. Mandrel Sizing. The rigid mandrel shall have an outside diameter (O.D.) not less than 95% of the inside diameter (I.D.) of the pipe. The inside diameter of the pipe, for the purpose of determining the outside diameter of the mandrel, shall be the average outside diameter minus two minimum wall thicknesses for O.D. controlled pipe and the average inside diameter for I.D. controlled pipe. All dimensions shall be per appropriate standard. Statistical or other "tolerance packages" shall not be considered in mandrel sizing.
- ii. Mandrel Design: The rigid mandrel shall be constructed of a metal or a rigid plastic material that can withstand 200 psi without being deformed. The mandrel shall have nine or more "runners" or "legs" as long as the total number of legs is an odd number. The barrel section of the mandrel shall have a length of at least 75% of the inside diameter of the pipe. A proving ring shall be provided and used for each size mandrel in use.
- iii. Method Options: Adjustable or flexible mandrels are prohibited. A television inspection is not a substitute for the deflection test.

- 4) Test Reports: Submit reports from tests in accordance with ASTM D3262 and ASTM D4161.

857.7 MEASUREMENT:

- 1 All fiberglass gravity sanitary sewer pipes will be measured from the inside (face of wall) of structure to the center of manhole or inside of structure per Linear Foot, complete-in-place along the horizontal centerline alignment. Measurement will be continuous through any fittings in the main including tee-base manholes.

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857.8 PAYMENT:

1. Sewer pipe will be paid for at the contract bid price per linear foot complete in place for the types, size and depth constructed. Said price shall be full compensation for furnishing all materials, including pipe, stalling, temporary cap(s) or closures, protective measures, couplings, trenching, pumping, concrete, plugs, laying and jointing, backfilling, select bedding and initial backfill material, tamping, water, labor, tools, equipment, testing, temporary all weather surface in accordance with Specification Item No. 804 and other incidentals necessary to complete the work.
2. Any fittings required to connect to FRP will be incidental to pipe cost.
3. Pay cuts will be measured from the top of ground prior to the Contractor's operation and along the centerline of the pipe to the invert of the pipe.
4. Contractor to provide cut-sheets with centerline pay cuts for approval prior to installation.

- End of Specification -

ITEM NO. 858
CONCRETE ENCASEMENT, CRADLES, SADDLES AND COLLARS

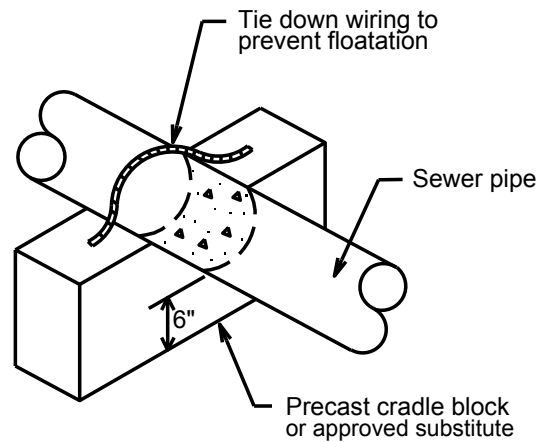
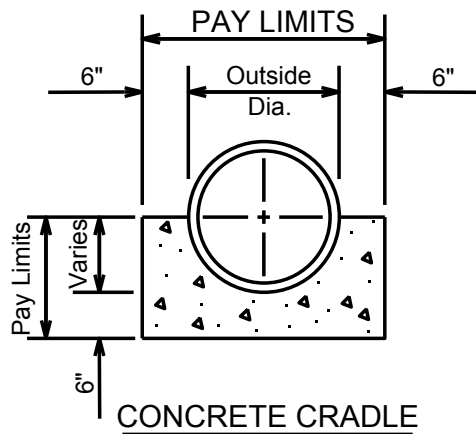
- 858.1 DESCRIPTION:** This item shall govern the placement of concrete encasements, cradles, saddles, collars on either existing or proposed water/sewer mains, when specified in the contract documents, or as directed by the Engineer or Inspector.
- 858.2 MATERIALS:** All concrete shall conform to the provisions of Item No. 300, "Concrete (Class B)," or as noted otherwise in the contract documents.
- 858.3 CONSTRUCTION:**
1. Concrete Encasement: When concrete encasement is shown in the contract documents, or when directed by the Engineer or Inspector, the trench shall be excavated and fine graded to a depth conforming to details and sections shown therein, or as per Standard Drawings DD-858-01 or DD-858-02. The main shall be supported by precast concrete blocks of the same strength as the concrete for encasement and securely tied down to prevent floatation. Encasement shall then be placed to a depth and width conforming to the details and sections shown in the contract documents or per the referenced standard drawings.
 2. Concrete Cradles: When concrete cradles are shown in the contract documents or when called for by the Engineer or Inspector, the trench shall be prepared and the main supported in the same manner as described in Paragraph 858.3.1, of this specification and shall be constructed in accordance with details and sections shown in the contract documents. Straps/Tie Downs shall be a minimum of No. 4 diameter rebar.
 3. Concrete Saddles: When shown in the contract documents or when directed by the Engineer or Inspector, the main to receive concrete saddles shall be backfilled in accordance with Item 804, "Excavation, Trenching and Backfill" to the spring line and concrete placed for a depth and width conforming with details and sections shown in the contract documents.
 4. Concrete Collars: When shown in the contract documents or when directed by the Engineer or Inspector, concrete collars shall be constructed in accordance with details and sections shown in the contract documents.
- 858.4 MEASUREMENT:** Concrete Encasement, Cradles, Saddles, and Collars will be measured by the cubic yard of accepted work, complete in place. Reinforcing, if required by the Engineer or Inspector, shall not be measured for payment.

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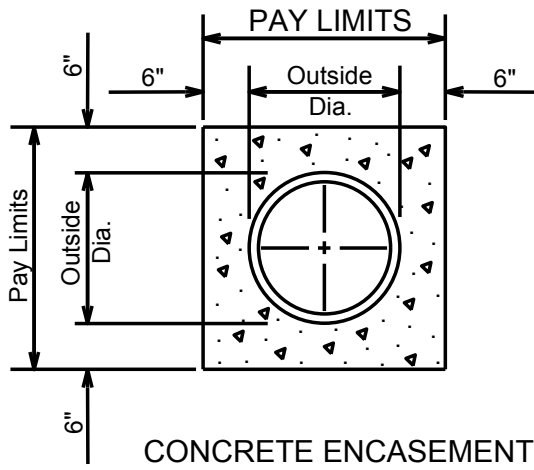
858.5

PAYMENT: Concrete Encasement, Cradles, Saddles and Collars will be paid for at the unit price bid per cubic yard, which price shall be full compensation for furnishing and placing all materials, manipulation, labor, tools, equipment and incidentals necessary to complete the work. Payment for concrete encasement shall consist of 6 inches of concrete around the pipe where required (as per Standard Drawings DD-858-01 or DD-858-02), minus manholes, structures, etc.

- End of Specification -



SUPPORT FOR
ENCASEMENT OR CRADLE

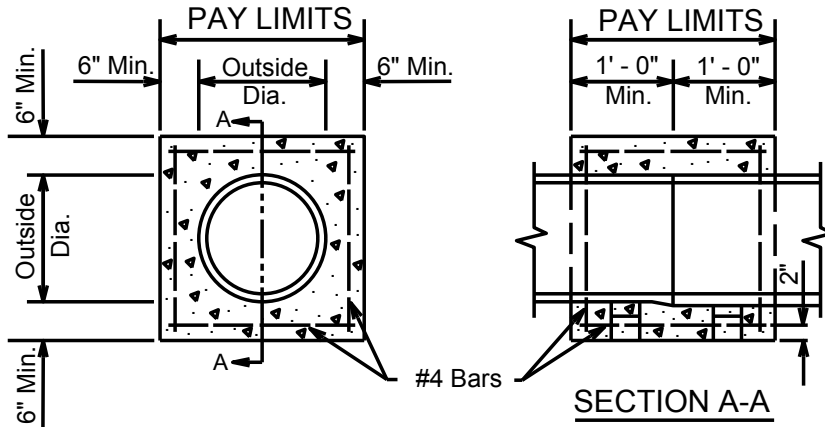


Notes:

- 1) All concrete encasement shall be poured at a plane 6" above the pipe between excavated trench walls.
- 2) All sewer pipe with less than 3' of cover to subgrade shall be concrete encased.
- 3) All Force mains shall be provided with thrust blocks, where changes in direction occur, at Tees, Bends, Crosses, changes in size, stops, or as directed by the City of Fair Oaks Ranch.

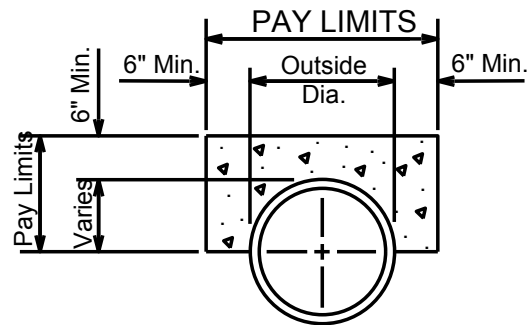
PROPERTY OF THE CITY OF FAIR OAKS RANCH	TYPICAL CONCRETE ENCASEMENT DETAILS	APPROVED	REVISED
		JANUARY 2019	
		DD-858-01	SHEET 1 OF 1

After centering pipe ends, wrap joints with 3" wide polyvinyl tape or rubber adapter, Can-Tex. 1-70A or equal



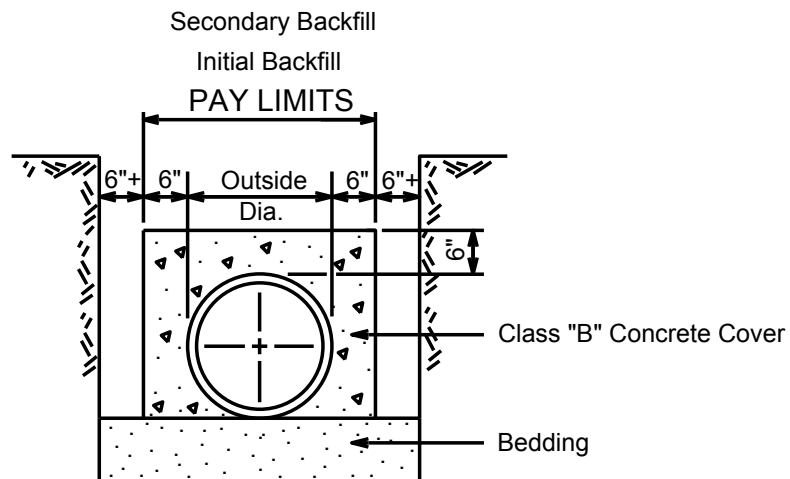
CONCRETE JOINTING COLLAR

Pipe sections to be blocked and supported similar to the encasement detail shown below, (subject to approval)



TYPICAL CONCRETE SADDLE

Note:
All concrete encasement shall be poured at a plane 6" above the pipe between excavated trench walls



CONCRETE COVER FOR FLEXIBLE PIPE

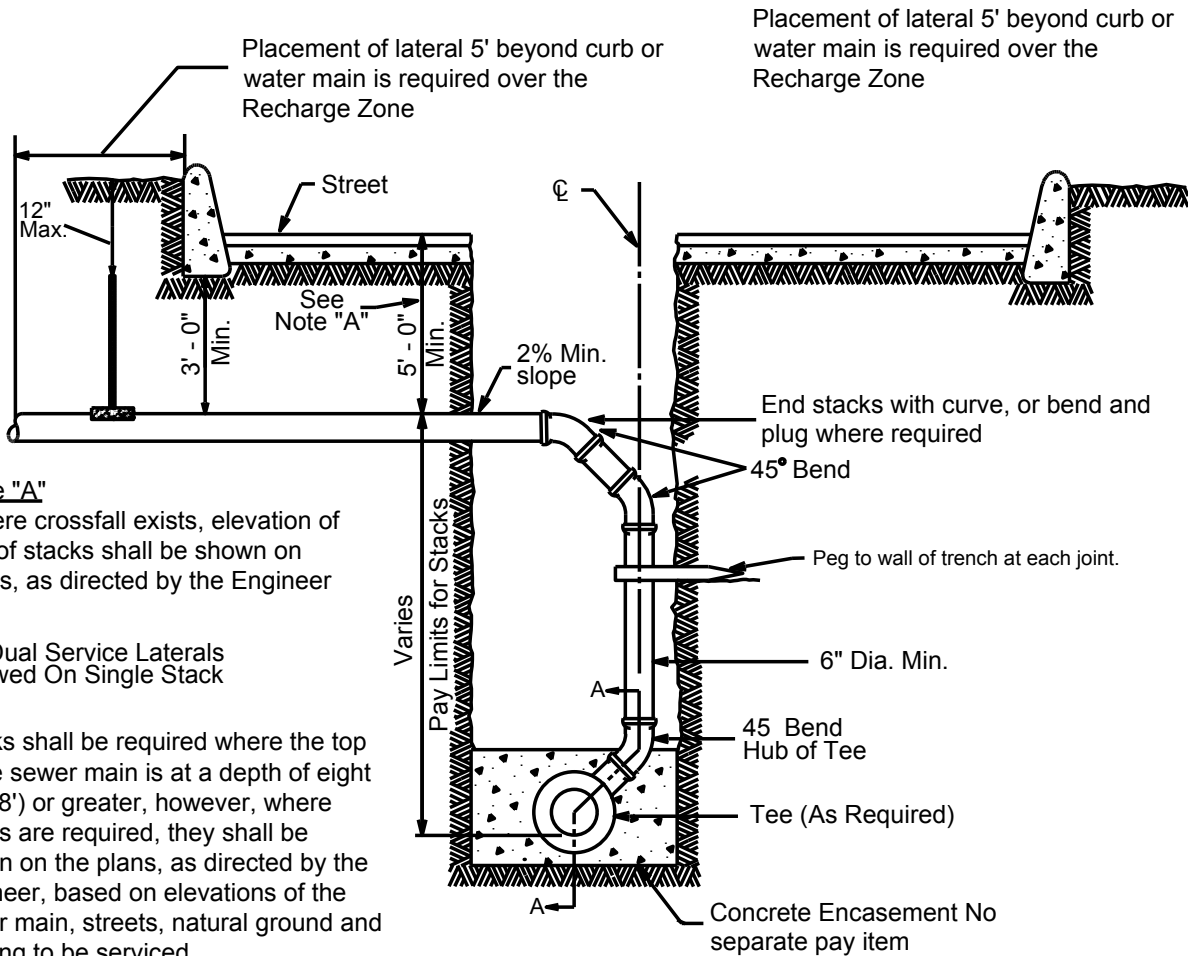
To be used wherever trench width is greater than two feet (2') plus O.D.

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**ITEM NO. 860
VERTICAL STACKS**

- 860.1 DESCRIPTION:** This item shall govern the construction of vertical stacks from the sewer main to the horizontal position of lateral heading towards the right of way.
- 860.2 SUBMITTALS:** Contractor shall submit manufacturer's product data, instructions, and recommendations
- 860.3 MATERIALS:**
1. Pipe: Pipe and fittings shall conform to the requirements of Item Nos. 848, "Sanitary Sewers," and 854, "Sanitary Sewer Laterals."
 2. Concrete Encasement: Concrete encasement shall conform to the requirements of Item No. 858, "Concrete Encasement, Cradles, Saddles and Collars."
- 860.4 CONSTRUCTION:** All work performed under this item shall conform to the latest applicable provisions of Item No. 848, "Sanitary Sewers," and the details shown in the contract documents. Generally, vertical stacks for sewer laterals shall be installed where the depth of the main (measured from the top of the sewer main to the finished grade) is eight feet or greater, or where specified by the Inspector.
- 860.5 MEASUREMENT:** Vertical stacks shall be measured by the vertical foot. Footage shall be computed as follows: Dimension from the top of the lateral (where it appears in the trench wall), to the invert of the sewer main.
- 860.6 PAYMENT:** Vertical stacks shall be paid for at the contract unit price bid per vertical foot as measured above, which price shall be full compensation for furnishing all pipe, pipe fitting, joint materials, concrete encasement, materials, tools, equipment, labor and incidentals necessary to complete the work. No separate pay shall be made for wytes, tees, or bends.

- End of Specification -



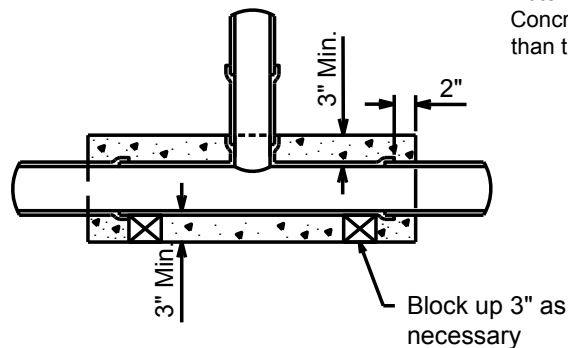
Note "A"

Where crossfall exists, elevation of top of stacks shall be shown on plans, as directed by the Engineer

No Dual Service Laterals Allowed On Single Stack

Stacks shall be required where the top of the sewer main is at a depth of eight feet (8') or greater, however, where stacks are required, they shall be shown on the plans, as directed by the Engineer, based on elevations of the sewer main, streets, natural ground and building to be serviced

VERTICAL STACK DETAIL



Note:

Concrete Encasement to be 2" greater than the full length of Tee

SECTION A-A

PROPERTY OF
THE CITY OF FAIR OAKS
RANCH

TYPICAL VERTICAL
STACK DETAIL

APPROVED
JANUARY 2019

REVISED

DD-860-01

SHEET
1 OF 1

ITEM NO. 862

ABANDONMENT OF SANITARY SEWER MAIN AND MANHOLES

862.1 DESCRIPTION: This item shall govern the abandonment of sanitary sewer mains and manholes specified in the contract documents. Generally, sanitary sewer mains 15 inches or larger in diameter and all abandoned sanitary sewer manholes are to be filled with a cementitious low strength material. The sanitary sewer facility shall be abandoned in accordance with the specifications outlined herein and in conformity with the limits shown in the contract documents.

Abandoning of sanitary sewer lines and manholes shall not occur until all existing sanitary sewer services have been transferred to another line and directed by the Inspector.

862.2 SUBMITTALS: Contractor shall submit manufacturer's product data, instructions, and recommendations.

862.3 MATERIALS: Materials for abandonment of sanitary sewer pipe and manholes.

1. Sanitary Sewer Pipe: A cement-based grout shall be used to fill the void of the existing sanitary sewer main. The grouting material must have strength of at least 100 psi, and shall have flow characteristics appropriate for filling a sanitary sewer main. The grout mix designed and method of installation shall be approved by the Engineer prior to beginning operation.
2. Material for Abandoning Manholes: The sanitary sewer manhole shall be filled to the top of the remaining concrete structure with the same material used to abandon the sanitary sewer main.

862.4 CONSTRUCTION: Abandonment of sanitary sewer lines shall be accomplished by installing the grout material with sufficient pressure and in numerous locations. The method of installation shall be able to meet the requirement of completely filling the existing sanitary sewer main and any voids adjacent to it. The method shall adequately provide for the removal and legal disposal of existing sewer materials in the system. The method shall provide for the release of air. When intermediate points are required to be constructed for the abandonment of the system, they shall be a part of the abandonment project process.

Sanitary sewer main that are smaller than 15 inches in diameter are generally not required to be grouted unless it is specified in the contract documents. Mains to be abandoned shall be grouted only if required by the contract documents and payment as per these specifications is provided.

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The concrete structure of the manhole shall be removed to a depth of 2 feet under proposed subgrade or finished ground elevation. Manhole rings and covers shall be removed and delivered to a facility within the limits of Fair Oaks Ranch designated by the Inspector.

862.5 **MEASUREMENT:** Grouting of abandoned sewer lines shall be measured by linear foot. Grouting of abandoned manholes shall be measured on the basis of each one complete in place.

862.6 **PAYMENT:** Payment for abandoning sewer lines shall be made on the contract unit price per linear foot complete in place. Said price shall be full compensation for furnishing all materials, labor, equipment, tools and incidentals necessary to complete the work. Unless otherwise shown in the contract documents, abandonment/grouting of manholes will not be a separate pay item.

- End of Specification -

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**ITEM NO. 864-S1
BYPASS PUMPING
SMALL DIAMETER SANITARY SEWERS**

8641 DESCRIPTION: The work covered by this item consists of bypass pumping operations for existing sanitary sewers less than 24-inches in diameter in order to temporarily reroute sanitary sewer flows to prevent a sanitary sewage overflow (SSO) and to provide adequate and reliable sanitary sewer flow at all times during construction, while the tasked scope of work is executed. The work also covered in this item is for the use of inflatable and mechanical pipe plugs. The use of inflatable / mechanical plugs in the water and sewer industry is the standard method to temporarily plug a pipe where permanent flow control devices are not available or are not operating as designed. An inherent danger exists with all inflatable products. If any conditions with this equipment exist that may jeopardize the safety of workers or others, do not use it.

This item includes all requirements for implementing a temporary pumping system for the purpose of diverting sanitary sewage flow around any construction-related activity to an approved reintroduction point within the sanitary sewer system. The Contractor shall minimize the health, safety, and regulatory risks by taking all reasonable measures to avoid an SSO. Therefore, Fair Oaks Ranch requires the Contractor to manage the flow of wastewater in a planned and proactive manner. Contractor shall be fully responsible for all damages and costs related to the installation, modification of existing manholes/structures, operation, and maintenance of Contractor's bypass pumping operations including damages, clean up, fines, penalties, and other related costs.

Bypass pumping systems shall be stationary systems consisting of portable pumps, piping, and appurtenances unless a "pump and haul" bypass system is accepted by Fair Oaks Ranch. Pump and haul bypass systems can use a relay system of vacuum trucks using a pump and haul approach to bypass sewage flows. Where pump and haul bypass systems are allowed the Contractor may elect to submit using a pump and haul bypass system for these locations or to use a stationary bypass system. All bypass systems shall comply with all the requirements of this section unless specifically noted otherwise.

The Contractor shall be responsible for the design of the bypass pumping plan and system. Contractor's bypass pumping system design shall be developed based upon the requirements of the Contract Documents.

The bypass system shall meet the requirements of all codes and regulatory agencies having jurisdiction

Pump and haul bypass systems shall not be allowed within the Edwards Aquifer Recharge Zone (EARZ) or for larger sanitary sewers with significant sewage bypass flows. Contractor shall provide for temporary measures to convey sewage flows and avoid sewage spills should a storm event occur that generates sanitary sewer flows in excess of Contractor's bypass pumping system.

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8642 REFERENCE STANDARDS:

Not Applicable

8643 SUBMITTALS:

1. All submittals shall be in accordance with Owner's requirements and shall be acknowledged by Owner prior to delivery.
2. For all projects requiring bypass pumping, the Contractor shall prepare and submit a Bypass Pumping Plan (BPP). The BPP shall be submitted a minimum of two weeks prior to commencing any portion of the proposed scope of work and shall be acknowledged by Fair Oaks Ranch prior to beginning Work. The BPP shall be signed and sealed by a professional engineer licensed in the State of Texas (Contractor's Engineer).
3. Contractor shall submit manufacturer's product data, instructions, recommendations, shop drawings, and necessary certifications in order for the proposed BPP to be reviewed and acknowledged.
4. The following shall be submitted as part of the BPP:
 - a. A cover letter containing the following information:
 - i. The project name and job number.
 - ii. The name and address of the Contractor.
 - iii. Contact information of the Contractor's project manager, superintendent, foreman/supervisor, safety professional, etc.
 - iv. A description and location of the planned bypass pumping work to be performed; include data for stationary and pump and haul bypass systems as applicable.
 - b. Emergency ("24/7") contact information for the bypass pumping subcontractor, if applicable. Make sure to include the name, cell phone number, and title of the person(s) onsite responsible for the bypass pumping operation.
 - c. The name, phone number, title, signature, and PE seal of the Contractor's Engineer preparing the BPP.
 - d. Copies of permits or other documents showing the Contractor has obtained all clearances necessary for installation and operation of the BPP.
 - e. If Contractor elects to use a combination of stationary bypass pumping and pump and haul for his bypass system, Contractor's BPP shall identify the quantity of flows that will be pumped and pumped and hauled for each type of bypass system along with the points where flows will be removed and reintroduced into the sanitary sewer system.

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- f. Certificate of Compliance that the BPP complies with all Fair Oaks Ranch and regulatory requirements and that all components have been designed by a professional engineer licensed in the State of Texas. The Contractor's Engineer shall review all components of the submitted BPP for adequacy to the Contractor's selected design flow conditions and insure that all bypass pumping system components are of adequate size, strength, meet the reliability criteria specified herein.
- g. A description of the maximum amount of sanitary sewer flows to be bypassed by the Contractor's bypass pumping system and how the flow conditions will be monitored during system operations (including all flow measurement devices, calculations, equipment, or other sources of how data was obtained).

If the bypass plan is not based on the maximum wet weather flow in the sanitary sewer, this description must include an explanation for how the contractor plans to monitor the weather for potential flows exceeding his bypass system capacity and how he will avoid having to bypass during wet weather events exceeding his bypass system capacity.
- h. Descriptions of all proposed bypass pumping components to be used. If applicable, describe all different bypass pumping phases. Include bypass pump(s) size(s) and capacity, as well as the size(s) and capacity of the suction/discharge piping. The description shall also include manhole(s)/structure(s) depth(s) and size(s) that will be used during the bypass pumping operation, sanitary sewer plugging method and type of plugs to be used, flowmeter installation locations, etc. Contractor shall provide Fair Oaks Ranch with adequate prior notification to allow Fair Oaks Ranch to witness installation and removal of all plugs.
- i. The date and time the bypass pumping is expected to begin and be completed. Indicate if bypass pumping will take place outside normal work hours which are between 8 am to 5 pm Mondays through Fridays (except for Fair Oaks Ranch observed holidays). Contractor shall reimburse Fair Oaks Ranch for the overtime costs required by bypass pumping testing outside of Fair Oaks Ranch normal work hours.
- j. The pump curves, showing operating range. This shall include the proposed system curve, addressing the pump operation in relation to the suction/discharge piping's alignment with respect to restriction and/or elevations.
- k. Suction and discharge piping material(s) and capacity to be used for the bypass pumping operation, including the material(s) for any bend(s) and/or valve(s) that will be used.
- l. A sketch showing the location of the pump(s) and the route of the suction, and

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discharge piping. If Contractor elects to use locations outside of the easements obtained by Fair Oaks Ranch, Contractor shall be solely responsible for obtaining the required easements and written documentation required for use of these locations. The sketch shall be dimensioned and all-inclusive showing all Fair Oaks Ranch manhole numbers that will be used for suction and discharge operations. If any other structure will be used for suction and/or discharge operations, then the nearest manhole(s) shall be labeled. The sketch shall include the name of any streets and/or major intersection in the area. All features possibly affected by the alignment of the BPP's components (driveways, vehicular traffic, residential or commercial dwellings (due to noise)) shall likewise be addressed. For pump and haul systems the sketch shall show the location of all system components along with the staging areas, haul routes, and an explanation of the expected cycle time of all aspects of the operation.

- m. Clear photographs of the manhole(s) interior that will be used for the bypass pumping operation, including pole camera photographs of pipes where plugs will be installed. All photographs will be labeled with the manhole number, date, and intended use of the manhole by the Contractor's BPP.
- n. A Traffic Control Plan that pertains solely to the bypass pumping operations. This may differ than the project's traffic control plan for the overall scope of work. The Traffic Control Plan shall include all required permits including street cut permits. Contractor shall maintain pedestrian and vehicular traffic and comply with ADA regulations for access to all residential and commercial property unless written approval is otherwise obtained from the property owner allowing for reduced access.
- o. An Emergency Plan detailing procedures to be followed in the event any portion of the bypass operation fails and causes either surcharging or an actual SSO. Contractor is herein advised that:
 - i. The existing sanitary sewer system may surcharge during certain storm events. The Contractor's BPP must recognize this potential and accommodate it with sufficient bypass capacity, restoration of flow through the sanitary sewer system, or other measures acceptable to Fair Oaks Ranch during these flow events. These measures shall be included in the submitted BPP.
 - ii. The Contractor's BPP cannot cause any excess surcharging (beyond that normally occurring within the existing sanitary sewer system at that flow event) that results in damage or SSOs.
 - iii. Any damage or SSOs during bypass pumping operations resulting from Contractor's bypass system shall be deemed a failure of BPP,

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and the Contractor must re-propose an improvement to their BPP for review and acknowledgment. A sanitary sewer surcharge is herein defined as any flows entering the manhole or structure (above the crown of the pipe). Excessive sanitary sewer surcharges are higher than normally occurring levels of surcharge levels resulting from the Contractor's BPP that result in damage or SSOs. Contractor shall be fully responsible for all damages and costs related to the installation, operation, and maintenance of Contractor's bypass pumping operations including damages, clean up, fines, penalties, and other related costs.

- iv. Contractor to include minimum equipment on hand for implementing and emergency plan. (i.e. spare pump, emergency power source.)
- p. Where bypass piping is installed within the floodplain of waterways subject to flooding, the Contractor shall submit an anchorage plan and calculations to ensure that piping is properly anchored. The pipe shall be capable of remaining in place during a 100-year storm event. Anchorage plan and calculations shall be designed and sealed by a professional engineer licensed in the State of Texas (Contractor's Engineer). This shall be the same PE that sealed the BPP Certificate of Compliance.
- q. For pump and haul system, submit copy of Hauler's Transporter Registration as issued by TCEQ under 30 TAC Chapter 312, Subchapter G.
- r. For pump and haul system, submit information on licensed disposal site to be used by the Contractor.
- s. Submit the checklist found at the end of this document confirming that all items required by this section are included in the BPP submittal.

EQUIPMENT AND MATERIALS: The Contractor shall provide all necessary pumping equipment, piping and all other necessary appurtenances in order to maintain adequate and reliable sanitary sewer flow in the sanitary sewer system (including any temporary manholes) at all times during construction for stationary pumping and pump and haul bypass pumping systems. All materials, equipment, etc., must be in good condition, and should not have visible damage such as cracks, holes, foreign material, blisters, etc.

1. Plugs.

Plugs must be selected and installed according to the size of the line to be plugged. Plugs shall be adequately secured and anchored to prevent plug movement or escape into the adjoining sanitary sewers should the plug fail. An additional plug (for each size of plug used) must be onsite and ready to be installed in the event a plug fails or becomes dislodged. Plug(s) will be visually examined by the Inspector

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and/or Engineer for defects that might lead to failure prior to being installed. Contractor shall immediately locate and remove any plug that has shifted its position, slipped within the pipe, dislodged, moved, or otherwise provided an indication that its suitability for use in plugging may be suspect or compromised. Contractor shall notify Fair Oaks Ranch of any plug that has provided an indication that its suitability for use in plugging may be suspect or compromised and allow Fair Oaks Ranch to observe plug removal and replacement. It is also imperative that the Contractor notify the Inspector at the completion of the work in order to verify that all plugs have been removed from the system.

- a. The Contractor shall provide all necessary equipment, plugs, hoses, gauges and necessary appurtenances to install the plug, maintain the plug during use and remove the plug at completion.
- b. All plugs must be in good condition, and shall not have visible damage such as cracks, holes, tears, cuts, punctures, abrasions, loose or damaged fittings, cracks in castings and excessive wear.
- c. All plugs 15-inches and larger shall have an air release valve for rupture protection.
- d. If the plug is damaged, it shall be immediately removed from the job-site.
- e. Contractor must be aware of the limitations associated with plugs.

2. Stationary Bypass Pumping Systems

- a. High-Density Polyethylene (HDPE) is the preferred pipe material for all bypass piping. HDPE shall be used when bypass discharge pipe will be going through streams, storm water culverts, the Edward's Aquifer Recharge Zone, and/or environmentally sensitive areas. At other locations, not within the Edward's Aquifer Recharge Zone, flexible discharge hose that is in good condition and does not leak, may be allowed subject to it acceptably passing testing.
- b. HDPE pipe must be assembled and joined using couplings, flanges or fusion welding in order to avoid joint leakage.
- c. HDPE fusion welding must be performed by personnel certified as fusion technician(s) by the manufacturer of HDPE pipe and/or fusing equipment. Fair Oaks Ranch shall examine welds prior to use in BPP operation.
- d. BPP shall indicate the proposed DR of the pipe to be used.

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- e. Rigid suction hose that is in good condition and does not leak may be allowed for withdrawal of flows from the suction point into the bypass pumps.
 - f. Pipe material other than HDPE shall be submitted to Fair Oaks Ranch for approval. Neither "Irrigation type" pipe nor glued PVC pipe will be permitted.
 - g. Any hoses or pipes that leak shall be removed and replaced with non-leaking hoses or pipes.
 - h. Pumps must be fully automatic self-priming units that do not require the use of foot valves or vacuum pumps to prime the system. No electric pumps will be allowed; all pumps must be diesel powered. Contractor shall provide suitable spill control and containment measures to avoid environmental contamination by pumps, fuels, or lubricants. All pumps shall be open impeller solids handling type pumps, capable of passing a minimum of 3-inch diameter solids. Contractor shall have one backup pump, equal in capacity to the largest pump in the system, connected into the bypass pumping system, and ready for operation in case any of the primary pumps fail. The backup pump shall not be used in Contractor's calculations for determining the pumping capacity requirements for the stated flow conditions above. Sound-attenuated pump enclosures shall be required on all projects where the bypass pumps are located within 50 feet of any residence, business, park, or other presence of people. Contractor shall provide sufficient sound attention measures to comply with City of Fair Oaks Ranch noise limitation requirements.
3. Pump and Haul Bypass Pumping Systems.
- Pump and haul bypass pumping systems shall use good-quality vacuum trucks, equipment, and materials from manufacturers commonly engaged in the manufacture, service, and repair of these types of sanitary sewer service trucks and equipment. All equipment shall be designed and manufactured for sanitary sewer service, shall function acceptably, be reliable, and free from leaks or other deleterious environmental impacts. All equipment proposed for use in pump and haul bypass pumping shall have been maintained per the manufacturer's recommendations. Equipment service records shall be made available at Fair Oaks Ranch request. Any hoses or pipes that leak shall be removed and replaced with non-leaking hoses or pipes.

8644 CONSTRUCTION: During construction, it will be the Contractor's responsibility to maintain a safe and secure environment at all times. All provisions and/or requirements of the BPP must be followed throughout the course of any bypass flow operations. Contractor must notify the Fair Oaks Ranch' Inspections Department 72 hours prior to commencing the bypass pumping operations.

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1. The Contractor shall have full time (24-hour), onsite qualified pump personnel including supervision for monitoring the entire bypass installation while it is in operation. The entire length of bypass piping shall be walked and inspected hourly to monitor for leaks. High-level alarm notification to cell phones shall not eliminate this requirement. Where bypass pumping systems exceed 1,500 feet in length or cannot be completely observed from the bypass pump location, at least one attendant shall be assigned to the pump operation, and one additional attendant shall be assigned to walk and monitor the pipeline.
2. Prior to installing any plugs, the Contractor and Fair Oaks Ranch shall inspect the existing pipe using a pole camera, for imperfections that might cause damage to the plug, cause the plug to not seal or function properly, or compromise the integrity of the pipe when the plug is inflated. The results of this inspection shall directly impact the planned plugging location(s). Afford Fair Oaks Ranch an opportunity to confirm that the location of plug(s) is acceptable.
3. Lines inserted into any manholes or structures shall be constructed with elbows, or be otherwise angled, to direct discharge along the most efficient path for entry into the downstream line without causing unnecessary turbulence of flow. The termination point of the discharge piping shall extend to the crown of the pipe housed within the manhole or structure receiving the bypassed flows.
4. Contractor shall provide continuous supply on-site fuel storage sufficient for 24-hour operation of the bypass pumping installation.
5. Contractor shall protect all components of the bypass operations from vandalism and vehicular damage by making the site secure.
6. Contractor shall minimize sanitary sewer odors by using lids, shroud covers, or any method accepted by the Inspector or Engineer.
7. Contractor shall be solely responsible for any and all damages to private and/or public property caused by, or during, the installation, operation, and/or removal of the bypass pumping system. Contractor shall be fully responsible for all damages and costs related to the installation, operation, and maintenance of Contractor's bypass pumping operations including damages, clean up, fines, penalties, and other related costs.
8. Once all work is completed and the bypass pumping operation is no longer required, the Contractor must disinfect and drain the entire BPP system in accordance with approved submittal.
9. Fair Oaks Ranch will not be responsible for additional traffic control measures that

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might be required by CoSA, Bexar County, TxDOT, or any other public entity having jurisdiction of the project location.

10. Flow Tracking

- a. Logs shall be downloaded from the Fair Oaks Ranch website (Fair Oaks Ranch.org) in order to continuously track all flows being bypassed.

11. Plug Installation

a. Safety

- i. The Contractor shall be solely responsible for the safe and effective use of plugs, including the proper combination of inflatable/mechanical plugs to block the sewer flow at both the upstream and downstream ends of a sewer bypass.
- ii. Inflatable plugs should be used only after receiving training as recommended by the manufacturer.
- iii. An inherent danger exists with all inflatable products. If any conditions with this equipment exist that may jeopardize the safety of workers or others corrective actions should be taken prior to the equipment use.

b. Plugs

- i. Plugs must be selected and installed in accordance with the manufacturers recommendations.
- ii. Plugs must also be selected and installed according to the size of the line to be plugged.
- iii. Spare plugs – Provide spare plugs on-site ready to be installed in the event a plug fails or becomes dislodged.
- iv. Plugs will be in good condition and reviewed by the Contractor for defects that might lead to failure prior to being installed. The Contractor shall sign the Plug Inspection form.
- v. Plugs must be removed from the system upon completion of the work.
- vi. Damages – The Contractor will be responsible for damages due to

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plugs being left in place or dislodged, including but not limited to:

1. Damages to Fair Oaks Ranch infrastructure or private property.
2. Costs associated with sanitary sewer overflows including: regulatory fines; sewage and debris cleanup; debris disposal at an appropriate landfill; disinfection of all surfaces which have come in contact with the sewage.
3. Costs associated with locating and retrieving lost or dislodged plugs.

8645 TESTING AND QUALITY CONTROL: Testing and quality control will be required for stationary bypass pumping and pump and haul bypass systems as indicated below. Contractor shall obtain and keep copies of all required permits on site prior to beginning Testing and throughout performance of the Work.

Contractor must prove to the Owner that the equipment, materials and all operational aspects and/or appurtenances related to the BPP are in good condition prior to commencing the bypass pumping operation. Failure to do so will result in the Contractor not being permitted to continue with any construction work requiring bypass pumping operations. Contractor must notify the Fair Oaks Ranch' Inspections Department 48 hours prior to commencing any testing. Any flows excessively surcharging the sanitary sewer system during the test and/or during actual bypass periods will deem the BPP to be unacceptable and must be revised and resubmitted for approval. There will be no separate pay item if this condition occurs during the timeframe in which bypass pumping test and/or operations are underway during the project. No testing of the bypass pumping operation shall be conducted between Thursday and Sunday, unless approved by Fair Oaks Ranch. If bypass pumping will take place outside normal work hours which are between 8 am to 5 pm Mondays through Fridays (except for Fair Oaks Ranch observed holidays), Contractor shall reimburse Fair Oaks Ranch for the overtime costs required by his bypass pumping testing outside of Fair Oaks Ranch normal work hours.

1. Stationary Bypass Pumping Systems

Discharge piping, joints and all accessories will be required to be hydrostatic tested. All piping, joints, and accessories shall be able to withstand at least twice the maximum system pressure or a minimum of 50 psi, whichever is greater.

For any bypass operations proposed a test run of at least 2 hours must be satisfactorily performed, prior to commencing any construction work. All testing shall be performed and approved by Fair Oaks Ranch. Contractor shall provide both a strobe light type high

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level alarm, as well as alarm notification to their cell phones, as well as other appointed personnel to be identified by Fair Oaks Ranch, and insure adequate alarm notification is attained prior to actual startup of the test period.

During the testing period, the Contractor shall install a Float Monitoring System in the upstream manhole and/or pipe to confirm that the bypass pumping flow data shown in their BPP remains applicable. The float monitoring system shall remain in the manhole and/or pipe for the duration of the bypass operation. The data collected during the test and duration of the bypass operation shall be provided to Fair Oaks Ranch for evaluation and recording. It will be required of the Contractor to have personnel remain onsite at the flow monitoring system in order to continuously record (every 30 minutes) the flows during both the test and actual bypass pumping periods. Contractor shall submit a copy of Testing Float Monitoring System Data log to Fair Oaks Ranch upon successful completion of test. Data log shall be in column format with each line entry indicating the time, elapsed time of test, level of flow indicated in manholes, total flow being pumped by the BPP system, and any comments pertaining to the test.

2. Pump and Haul Bypass Pumping Systems

Contractor shall perform a full scale demonstration test of his proposed pump and haul bypass system to prove that his system can be successfully used for bypass pumping at the proposed locations. Contractor's test shall use all of the equipment and staff that will operate the bypass pumping system during performance of the Work. Traffic control systems required during the Work shall be utilized during the test. Withdrawals and discharges of flow shall be from or into the manhole locations identified in the Contractor's BPP except for pump and haul system. This requirement is intended to demonstrate to Fair Oaks Ranch that the Contractor's proposed BPP is capable of providing satisfactory bypass pumping prior to Contractor beginning the Work, including the size and number of trucks and cycles times. Pump and haul system flow shall be disposed of in a TCEQ licensed facility and all manifests shall be kept and submitted to Fair Oaks Ranch. Disposal pump and haul flow in a nearby manhole is not acceptable.

3. Test Failure

Any failure of equipment, or activities associated with the bypass pumping operations contributing to either an excessive surcharge or SSO, shall be deemed a failed test. The test shall then be stopped and any necessary cleanup or reporting efforts performed. The BPP will need to be revised, resubmitted and acknowledged prior to the test initiating again. Any effort by Fair Oaks Ranch or other third parties to mitigate damages resulting from any surcharging or SSOs shall be the direct and sole responsibility of the Contractor. This includes any related fines, penalties, or damages to public or private property.

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4. Plug Testing

Plugs shall be tested prior to use. The inflatable plug shall be placed inside of a structurally sound pipe or conduit and inflated to its operating pressure and monitored for 24 hours to observe it holds the required pressure. This testing shall be performed in accordance with the manufacturer's recommendations. Inflating a plug when it is not constrained or overinflating the plug creates a risk of being injured by pieces of the plug exploding if it fails.

8646 MEASUREMENT AND PAYMENT: Measurement for the work specified herein will be by lump sum and as required by the contract documents. Payment of the "Lump Sum" bid for Bypass Pumping shall be in accordance with the following: Any effort required for multiple set-ups and operations shall be included in the lump sum price.

1. When initial set-up and operation of the bypass pumping system begins (including a successful test), 20% of the "Lump Sum" cost will be paid as applicable to the bypass system used; stationary bypass pumping or pump and haul bypass systems.
2. 60% of the "Lump Sum" cost will be paid over equal monthly payments (estimated from the BPP or other documentation approved by the Inspector) during the course of the bypass pumping operation as applicable to the bypass system used; stationary bypass pumping or pump and haul bypass systems.
3. 20% of the remaining "Lump Sum" cost will be paid upon an acceptable removal and/or disassembly of all components of the BPP, including site cleanup as applicable to the bypass system used; stationary bypass pumping or pump and haul bypass systems.
4. For multi-bypass pumping setups, payment will be proportional to the overall amount of the established bid line item.
5. Measurement of the work for pipe plugs shall be incidental to the work and will not have a separate pay item.

Any damages, repairs, etc., to private or public property will not be considered for any additional payment.

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BYPASS PUMPING PLAN SUBMITTAL CHECKLIST

- ☐ Cover Letter
- ☐ Certificate of Compliance signed and sealed by Contractor's Engineer
- ☐ Sanitary Sewer Flow Management Description
- ☐ Bypass Pumping Description
- ☐ Bypass Pumping Schedule
- ☐ Pump and System Curve Information
- ☐ Piping Information
- ☐ System Sketch
- ☐ Manhole and Pole Camera Photographs
- ☐ Traffic Control Plan (if necessary)
- ☐ Emergency Spill Response Plan
- ☐ Anchorage Design for Piping in Floodplain (if necessary)
- ☐ Floodplain Permits (if necessary)
- ☐ Street Cut Permits (if necessary)
- ☐ Other Permits (Contractor shall list as required)
- ☐ Anchorage Design for Piping in Floodplain (if necessary)
- ☐ Required Notifications (Contractor shall list as required)
- ☐ Contact List with Contact Information (Contractor shall list as required)
- ☐ Contractor's Engineer's PE Seal

- End of Specification -

**ITEM NO. 864-S2
BYPASS PUMPING
LARGE DIAMETER SANITARY SEWERS**

864.1 DESCRIPTION: The work covered by this item consists of bypass pumping operations for existing sanitary sewers 24-inches and larger in diameter in order to temporarily reroute sanitary sewer flows to prevent a sanitary sewage overflow (SSO) and to provide adequate and reliable sanitary sewer flow at all times during construction, while the tasked scope of work is executed. The work also covered in this item is for the use of inflatable and mechanical pipe plugs. The use of inflatable / mechanical plugs in the water and sewer industry is the standard method to temporarily plug a pipe where permanent flow control devices are not available or are not operating as designed. An inherent danger exists with all inflatable products. If any conditions with this equipment exist that may jeopardize the safety of workers or others, do not use it.

This item includes all requirements for implementing a temporary pumping system for the purpose of diverting sanitary sewage flow around any construction-related activity to an approved reintroduction point within the sanitary sewer system. The Contractor shall minimize the health, safety, and regulatory risks by taking all reasonable measures to avoid an SSO. Therefore, Fair Oaks Ranch requires the Contractor to manage the flow of wastewater in a planned and proactive manner. Contractor shall be fully responsible for all damages and costs related to the installation, modification of existing manholes/structures, operation, and maintenance of Contractor's bypass pumping operations including damages, clean up, fines, penalties, and other related costs.

Bypass pumping systems shall be stationary systems consisting of portable pumps, piping, and appurtenances unless a flow diversion bypass system is allowed on the Bypass Pumping Plan (BPP) sheet. Flow diversion bypass systems can use temporary gravity sewers (installed and removed by Contractor) to divert flows into an existing manhole identified in the BPP sheet. Where flow diversion bypass systems are allowed the Contractor may elect to submit using a flow diversion bypass system for these locations or to use a stationary bypass system. All bypass systems shall comply with all the requirements of this section unless specifically noted otherwise.

The Contractor shall be responsible for the design of Contractor's bypass pumping plan and system. Contractor's bypass pumping system design shall be developed based upon the data and requirements of the Contract Documents. The bypass system shall meet the requirements of all codes and regulatory agencies having jurisdiction. Fair Oaks Ranch will furnish data on the BPP sheet which will include:

1. Average daily flows
2. Maximum peak flow.

Contractor may rely upon the data provided in the Contract Documents for designing

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Contractor's bypass pumping system. Contractor shall provide for temporary measures to convey sewage flows and avoid sewage spills should a storm event occur that generates sanitary sewer flows in excess of Contractor's bypass pumping system. Contractor to include an emergency response plan in submittals. Plan should include measures for handling excess flows due to storm events. Plan needs to include additional emergency equipment and/or diversion plans and what measures will be taken to handle excess flows.

864.2 REFERENCE STANDARDS:

Not Applicable

864.3 SUBMITTALS:

1. All submittals shall be in accordance with Owner's requirements and shall be acknowledged by Owner prior to delivery.
2. For all projects requiring bypass pumping, the Contractor shall prepare and submit a BPP. The BPP shall be submitted a minimum of two weeks prior to commencing any portion of the proposed scope of work and shall be acknowledged accepted by Fair Oaks Ranch prior to beginning Work. The BPP shall be signed and sealed by a professional engineer licensed in the State of Texas (Contractor's Engineer).
3. Contractor shall submit manufacturer's product data, instructions, recommendations, shop drawings, and necessary certifications in order for the proposed Bypass Pumping Plan (BPP) to be reviewed and acknowledged.
4. The following shall be submitted as part of the BPP:
 - a. A cover letter containing the following information:
 - i. The project name and job number.
 - ii. The name and address of the Contractor.
 - iii. Contact information of the Contractor's project manager, superintendent, foreman/supervisor, safety professional, etc.
 - iv. A description and location of the planned bypass pumping work to be performed; include data for stationary and flow diversion bypass systems as applicable.
 - b. Emergency ("24/7") contact information for the bypass pumping sub-contractor, if applicable. Make sure to include the name, cell phone number, and title of the person(s) onsite responsible for the bypass pumping operation.
 - c. The name, phone number, title, signature, and PE seal of the Contractor's Engineer preparing the BPP.
 - d. Copies of permits or other documents showing the Contractor has obtained all clearances necessary for installation and operation of the BPP.

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- e. If flow diversion to existing sewers is proposed by Contractor all diversion flows shall be contained within pipes, use of excavated trenches are not allowable for diverting sanitary sewer flows.
- f. If Contractor elects to use a combination of stationary bypass pumping and flow diversion for his bypass system, Contractor's BPP shall identify the quantity of flows that will be pumped and flows diverted for each type of bypass system along with the points where flows will be removed and reintroduced into the sanitary sewer system.
- g. Certificate of Compliance that the BPP complies with all Fair Oaks Ranch and regulatory requirements and that all components have been designed by a professional engineer licensed in the State of Texas. The Contractor's Engineer shall review all components of the submitted BPP for adequacy to the Contractor's selected design flow conditions and insure that all bypass pumping system components are of adequate size, strength, meet the reliability criteria specified herein.
- h. A description of the maximum amount of sanitary sewer flows to be bypassed by the Contractor's bypass pumping system and how the flow conditions will be monitored during system operations (including all flow measurement devices, calculations, equipment, or other sources of how data was obtained). If the bypass plan is not based on the maximum wet weather flow in the sanitary sewer, this description must include an explanation for how the contractor plans to monitor the weather for potential flows exceeding his bypass system capacity and how he will avoid having to bypass during wet weather events exceeding his bypass system capacity.
- i. Descriptions of all proposed bypass pumping components to be used. If applicable, describe all different bypass pumping phases. Include bypass pump(s) size(s) and capacity, as well as the size(s) and capacity of the suction/discharge piping. The description shall also include manhole(s)/structure(s) depth(s) and size(s) that will be used during the bypass pumping operation, sanitary sewer plugging method and type of plugs to be used, flowmeter installation locations, etc. Where plugs greater than 24" are required, submit a Plug Use Plan (PUP) according to the requirements of Special Provision to this section. Contractor shall provide Fair Oaks Ranch with adequate prior notification to allow Fair Oaks Ranch to witness installation and removal of all plugs.
- j. Description of procedure for locating and recovering any lost plug using the required radio transmitter and receiver system.
- k. Description of minimum equipment on hand should an emergency plan be implemented, i.e. spare pump, emergency generator.

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- l. The date and time the bypass pumping is expected to begin and be completed. Indicate if bypass pumping will take place outside normal work hours which are between 8 am to 5 pm Mondays through Fridays (except for Fair Oaks Ranch observed holidays).
- m. The pump curves, showing operating range. This shall include the proposed system curve, addressing the pump operation in relation to the suction/discharge piping's alignment with respect to restriction and/or elevations.
- n. Suction, discharge, and diversion piping material(s) and capacity to be used for the bypass pumping operation, including the material(s) for any bend(s) and/or valve(s) that will be used.
- o. A sketch showing the location of the pump(s) and the route of the suction, discharge, and diversion piping. If Contractor elects to use locations outside of the easements obtained by Fair Oaks Ranch or locations that are not indicated for use on the BPP plan sheet, Contractor shall be solely responsible for obtaining the required easements and written documentation required for use of these locations, a copy shall be provided to Fair Oaks Ranch prior to Contractor's use. A sketch detailing proposed restoration of the suction and discharge points if the contractor proposed to make openings in the existing pipes or structures.
- p. If different than shown in contract documents, the new sketch shall be dimensioned and all-inclusive showing all Fair Oaks Ranch manhole numbers that will be used for suction and discharge operations. If any other structure will be used for suction and/or discharge operations, then the nearest manhole(s) shall be labeled. The sketch shall include the name of any streets and/or major intersection in the area. All features possibly affected by the alignment of the BPP's components (driveways, vehicular traffic, residential or commercial dwellings (due to noise)) shall likewise be addressed.
- q. Clear photographs of the manhole(s) interior that will be used for the bypass pumping operation, including pole camera photographs of pipes where plugs will be installed. All photographs will be labeled with the manhole number, date, and intended use of the manhole by the Contractor's BPP.
- r. A Traffic Control Plan that pertains solely to the bypass pumping operations. This may differ than the project's traffic control plan for the overall scope of work. The Traffic Control Plan shall include all required permits including street cut permits. Contractor shall maintain pedestrian and vehicular traffic and comply with ADA regulations for access to all residential and commercial property unless written approval is otherwise obtained from the property owner allowing for reduced access.
- s. An Emergency Plan detailing procedures to be followed in the event any portion of

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the bypass operation fails and causes either surcharging or an actual SSO. Contractor is herein advised that:

- i. The existing sanitary sewer system may surcharge during certain storm events. The Contractor's BPP must recognize this potential and accommodate it with sufficient bypass capacity, restoration of flow through the sanitary sewer system, or other measures acceptable to Fair Oaks Ranch during these flow events. These measures shall be included in the submitted BPP.
 - ii. The Contractor's BPP cannot cause any excess surcharging (beyond that normally occurring within the existing sanitary sewer system at that flow event) that results in damage or SSOs.
 - iii. Any damage or SSOs during bypass pumping operations resulting from Contractor's bypass system shall be deemed a failure of BPP, and the Contractor must re-propose an improvement to their BPP for review and acknowledgment. A sanitary sewer surcharge is herein defined as any flows entering the manhole or structure (above the crown of the pipe). Excessive sanitary sewer surcharges are higher than normally occurring levels of surcharge levels resulting from the Contractor's BPP that result in damage or SSOs. Contractor shall be fully responsible for all damages and costs related to the installation, operation, and maintenance of Contractor's bypass pumping operations including damages, clean up, fines, penalties, and other related costs.
 - t. Where bypass piping is installed within the floodplain of waterways subject to flooding, the Contractor shall submit an anchorage plan and calculations to ensure that piping is properly anchored. Flow diversion pipes shall have watertight seals at inlet and outlet connections with existing manholes or structures. The pipe shall be capable of remaining in place during a 100-year storm event. Anchorage plan and calculations shall be designed and sealed by a professional engineer licensed in the State of Texas (Contractor's Engineer). This shall be the same PE that sealed the BPP Certificate of Compliance.
 - u. Submit the checklist found at the end of this document confirming that all items required by this section are included in the BPP submittal.
5. For all projects requiring the use of pipe plugs on pipes the Contractor shall furnish a submittal containing manufacturer's product data, instructions, recommendations and a project Plug Use Plan (PUP). The PUP shall be submitted a minimum of two weeks prior to commencing any portion of the proposed scope of work.

The following shall be submitted with the PUP:

- a. A cover letter containing the following information;
 - i. The project name and job number;

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- ii. The name and address of the Contractor
 - iii. Contact information of the Contractor's project manager, superintendent, foreman/supervisor, safety professional, etc.
 - iv. Emergency (24/7) contact information for the staff responsible for operating and maintaining the plug. Include the name, phone number, email address and the person(s) onsite who is responsible for the project.
 - v. The name and contact information for the PUP preparer.
- b. Plug Plan
- i. The plan shall show where on the project site the contractor intends to use pipe plugs, including:
 - ii. manhole numbers;
 - iii. the upstream and downstream pipe diameters and pipe materials;
 - iv. pipe slopes;
 - v. pipe depth;
 - vi. pipe flow direction;
 - vii. known peak or surcharge flow data;
 - viii. types of plugs to be used;
 - ix. types of restraint used;
 - x. type of radio transmitting device.
- c. Calculations
- i. Provide calculations of the maximum anticipated head pressure on the plug and the resultant tensile force required to restrain the plug prior to plug inflation and during plug removal.
 - ii. Provide calculations of the required inflation pressure of the plug.
 - iii. Calculations shall be sealed and signed by a professional engineer licensed in the state of Texas in civil or mechanical engineering.
- d. Plug selection
- i. Detail the plug selection for each installation including given conditions, pipe size and anticipated pressure requirements. Include in this plan whether sleeves will be used.
- e. Plug inspection:
- i. Provide an inspection form detailing manufacturer's recommendations for plug inspection of plug condition before and after use; form to be signed by contractor staff responsible for plug installation prior to and after plug installation.
- f. Monitoring plan
- i. Provide a monitoring plan for observing the plug inflation pressure gauge and hoses. Monitoring shall be for 24-hours per day during the plug use duration.
 - ii. Provide a written response plan for when the plug loses pressure.
 - iii. Provide a plug retrieval plan.

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- g. Plug restraint details
 - i. Provide means and methods for anchoring, support and bracing appropriate for anticipated operating pressure conditions
 - ii. Size restraint (cable or chain) based on calculated loads using a safety factor of 4.
 - iii. Provide multiple tie-off locations for chain or wire cable restraint.
 - iv. Rope of any kind is not an acceptable material for plug restraint.
- h. Manufacturer's Literature
 - i. Provide manufacturer's literature on proper plug use and safety precautions, including available on-line training.

864.4 EQUIPMENT AND MATERIALS: The Contractor shall provide all necessary pumping equipment, piping and all other necessary appurtenances in order to maintain adequate and reliable sanitary sewer flow in the sanitary sewer system (including any temporary manholes) at all times during construction for stationary pumping and flow diversion bypass pumping systems. All materials, equipment, etc., must be in good condition, and should not have visible damage such as cracks, holes, foreign material, blisters, etc.

1. Plugs

Plugs must be selected and installed according to the size of the line to be plugged. Plugs shall be adequately secured and anchored to prevent plug movement or escape into the adjoining sanitary sewers should the plug fail. All plugs shall be equipped with a radio transmitter that will be used to locate any plug that has escaped in the adjacent system. The radio transmitter shall be designed for environment that it will be installed. The Contractor shall also provide and keep on site the matching radio receiver that will be used to locate any plug that is lost in the adjacent system.

An additional plug (for each size of plug used) must be onsite and ready to be installed in the event a plug fails or becomes dislodged. Plug(s) will be reviewed by the Inspector and/or Engineer for defects that might lead to failure prior to being installed. Contractor shall immediately locate and remove any plug that has shifted its position, slipped within the pipe, dislodged, moved, or otherwise provided an indication that its suitability for use in plugging may be suspect or compromised. Contractor shall notify Fair Oaks Ranch of any plug that has provided an indication that its suitability for use in plugging may be suspect or compromised and allow Fair Oaks Ranch to observe plug removal and replacement. It is also imperative that the Contractor notify the Inspector at the completion of the work in order to verify that all plugs have been removed from the system.

- a. The Contractor shall provide all necessary equipment, plugs, hoses, gauges and necessary appurtenances to install the plug, maintain the plug during use and remove the plug at completion.

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- b. All plugs must be in good condition, and shall not have visible damage such as cracks, holes, tears, cuts, punctures, abrasions, loose or damaged fittings, cracks in castings and excessive wear.
- c. All plugs 15-inches and larger shall have an air release valve for rupture protection.
- d. All plugs 24-inches in diameter and larger shall be equipped with a radio transmitter locating device that is activated by the plug losing air pressure. The locating transmitter device shall be effective to a depth of 65 feet, and have a battery life of 1,000 hours when operated in pulse mode after activation.
- e. All plugs 24-inches in diameter and larger shall have a protective sleeve.
- f. If the plug is damaged, do not use the plug and remove it from the jobsite.
- g. Contractor must be aware of the limitations associated with plugs.

2. Stationary Bypass Pumping System

- a. High-Density Polyethylene (HDPE) is the required pipe material for all bypass piping. HDPE shall be used when bypass discharge pipe will be going through streams, storm water culverts, the Edward's Aquifer Recharge Zone, environmentally sensitive areas, and all other locations.
- b. HDPE pipe must be assembled and joined using couplings, flanges or fusion welding in order to avoid joint leakage. Fair Oaks Ranch shall be notified in sufficient time to allow them to inspect the pipe joints during assembly. Fair Oaks Ranch shall be notified a minimum of 48 hours in advance of all fusing/joining operations.
- c. HDPE fusion welding must be performed by personnel certified as fusion technician(s) by the manufacturer of HDPE pipe and/or fusing equipment. Fair Oaks Ranch shall examine welds prior to use in BPP operation.
- d. BPP shall indicate the proposed DR of the pipe to be used.
- e. Any hoses or pipes that leak shall be removed and replaced with non-leaking hoses or pipes.
- f. Neither "Irrigation type" pipe nor glued PVC pipe will be permitted.

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- g. Disinfect and drain the entire BPP system in accordance with approved submittal.
- h. Pumps must be fully automatic self-priming units that do not require the use of foot-valves or vacuum pumps to prime the system. No electric pumps will be allowed; all pumps must be diesel powered. Contractor shall provide suitable spill control and containment measures to avoid environmental contamination by pumps, fuels, or lubricants. All pumps shall be open impeller solids handling type pumps, capable of passing a minimum of 3" diameter solids. Contractor shall have one backup pump, equal in capacity to the largest pump in the system, connected into the bypass pumping system, and ready for operation in case any of the primary pumps fail. The backup pump shall not be used in Contractor's calculations for determining the pumping capacity requirements for the stated flow conditions above. Sound-attenuated pump enclosures shall be required on all projects where the bypass pumps are located within 50 feet of any residence, business, park, or other presence of people. Contractor shall provide sufficient sound attention measures to comply with City of Fair Oaks Ranch noise limitation requirements.

864.5 CONSTRUCTION: During construction, it will be the Contractor's responsibility to maintain a safe and secure environment at all times. All provisions and/or requirements of the BPP must be followed throughout the course of any bypass flow operations. When working inside manhole or force main, the Contractor shall exercise caution and comply with OSHA requirements when working in the presence of sewer gases, combustible or oxygen-deficient atmospheres, and confined spaces. Contractor must notify the Fair Oaks Ranch' Inspections Department 72 hours prior to commencing the bypass pumping operations.

The Contractor shall insure that the temporary pumping system is properly maintained and a responsible operator shall be on hand at all times when pumps are operating.

1. The Contractor shall have full time (24-hour), onsite qualified pump personnel including supervision for monitoring the entire bypass installation while it is in operation. The entire length of bypass piping shall be walked and inspected hourly to monitor for leaks. High-level alarm notification to cell phones shall not eliminate this requirement. Where bypass pumping systems exceed 1,500 feet in length or cannot be completely observed from the bypass pump location, at least one attendant shall be assigned to the pump operation, and one additional attendant shall be assigned to walk and monitor the pipeline.
2. Prior to installing any plugs, the Contractor and Fair Oaks Ranch shall inspect the existing pipe using a pole camera, for imperfections that might cause damage to the plug, cause the plug to not seal and function properly, or compromise the integrity of the pipe

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when the plug is inflated. The results of this inspection shall directly impact the planned plugging location(s). Afford Fair Oaks Ranch an opportunity to confirm that the location of plug(s) is acceptable.

3. After installation of the plug, the Contractor shall monitor on daily basis the radio transmitter battery and radio signal strengths. If either are found to be below the manufacturer's requirements the radio transmitter shall be immediately replaced.
4. Lines inserted into any manholes or structures shall be constructed with elbows, or be otherwise angled, to direct discharge along the most efficient path for entry into the downstream line without causing unnecessary turbulence of flow. The termination point of the discharge piping shall extend to the crown of the pipe housed within the manhole or structure receiving the bypassed flows.
5. Contractor shall provide continuous supply on-site fuel storage sufficient for 24- hour operation of the bypass pumping installation.
6. Contractor shall protect all components of the bypass operations from vandalism and vehicular damage by making the site secure.
7. Contractor shall minimize sanitary sewer odors by using lids, shroud covers, or any method accepted by the Inspector or Engineer.
8. Contractor shall be solely responsible for any and all damages to private and/or public property caused by, or during, the installation, operation, and/or removal of the bypass pumping system. Contractor shall be fully responsible for all damages and costs related to the installation, operation, and maintenance of Contractor's bypass pumping operations including damages, clean up, fines, penalties, and other related costs.
9. Once all work is completed and the bypass pumping operation is no longer required, the Contractor must drain the entire sanitary sewer system flows into an existing Fair Oaks Ranch sanitary sewer manhole prior to disassembly and removal of the system from the construction site. The intent is to prevent spillage of sewage.
10. Fair Oaks Ranch will not be responsible for additional traffic control measures that might be required by CoSA, Bexar County, TxDOT, or any other public entity having jurisdiction of the project location.
11. Flow Tracking
 - a. Logs shall be downloaded from the Fair Oaks Ranch website (Fair Oaks Ranch.org) in order to continuously track all flows being bypassed.
12. Plug Installation
 - a. Safety

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- i. The Contractor shall be solely responsible for the safe and effective use of plugs, including the proper combination of inflatable/mechanical plugs to block the sewer flow at both the upstream and downstream ends of a sewer bypass.
 - ii. Inflatable plugs should be used only after receiving training as recommended by the manufacturer.
 - iii. An inherent danger exists with all inflatable products. If any conditions with this equipment exist that may jeopardize the safety of workers or others corrective actions should be taken prior to the equipment use.
- b. Plugs
- i. Plugs must be selected and installed in accordance with the manufacturers recommendations.
 - ii. Plugs must also be selected and installed according to the size of the line to be plugged.
 - iii. Spare plugs – Provide spare plugs on-site ready to be installed in the event a plug fails or becomes dislodged.
 - iv. Plugs will be in good condition and reviewed by the Contractor for defects that might lead to failure prior to being installed. The Contractor shall sign the Plug Inspection form.
 - v. Plugs must be removed from the system upon completion of the work.
 - vi. Damages – The Contractor will be responsible for damages due to plugs being left in place or dislodged, including but not limited to:
 - 1. Damages to Fair Oaks Ranch infrastructure or private property.
 - 2. Costs associated with sanitary sewer overflows including: regulatory fines; sewage and debris cleanup; debris disposal at an appropriate landfill; disinfection of all surfaces which have come in contact with the sewage.
 - 3. Costs associated with locating and retrieving lost or dislodged plugs.
 - 4. If the plug is damaged, it shall be immediately removed from the job-site.

864.6 TESTING AND QUALITY CONTROL: Testing and quality control will be required

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for all bypass pumping systems, stationary pumping and flow diversion systems, as indicated below. Contractor shall obtain and keep copies of all required permits on site prior to beginning Testing and throughout performance of the Work.

1. Contractor must prove to the Owner that the equipment, materials and all operational aspects and/or appurtenances related to the BPP are in good condition prior to commencing the bypass pumping operation. Failure to do so will result in the Contractor not being permitted to continue with any construction work requiring bypass pumping operations. Contractor must notify the Fair Oaks Ranch' Inspections Department 48 hours prior to commencing any testing. Any flows excessively surcharging the sanitary sewer system during the test and/or during actual bypass periods will deem the BPP to be unacceptable and must be revised and resubmitted for approval. There will be no separate pay item if this condition occurs during the timeframe in which bypass pumping test and/or operations are underway during the project. No testing of the bypass pumping operation shall be conducted between Thursday and Sunday, unless approved by Fair Oaks Ranch. If bypass pumping will take place outside normal work hours which are between 8 am to 5 pm Mondays through Fridays (except for Fair Oaks Ranch observed holidays), Contractor shall reimburse Fair Oaks Ranch for the overtime costs required by his bypass pumping testing outside of Fair Oaks Ranch normal work hours.
2. Discharge piping, joints and all accessories will be required to be hydrostatic tested. All piping, joints, and accessories shall be able to withstand at least twice the maximum system pressure or a minimum of 50 psi, whichever is greater.
3. For any bypass operations proposed a 24-hour test run must be satisfactorily performed prior to commencing any construction work. The Inspector must provide acknowledgment first. Contractor shall provide both a strobe light type high level alarm, as well as alarm notification to their cell phones, as well as other appointed personnel to be identified by Fair Oaks Ranch, and insure adequate alarm notification is attained prior to actual startup of the testperiod.
4. During the testing period, the Contractor shall install a Float Monitoring System in the upstream manhole and/or pipe to confirm that the bypass pumping flow data shown in their BPP remains applicable. The float monitoring system shall remain in the manhole and/or pipe for the duration of the bypass operation. The data collected during the test and duration of the bypass operation shall be provided to Fair Oaks Ranch for evaluation and recording. It will be required of the Contractor to have personnel remain onsite at the flow monitoring system in order to continuously record (every 30 minutes) the flows during both the test and actual bypass pumping periods. Contractor shall submit a copy of Testing Float Monitoring System Data log to Fair Oaks Ranch upon successful completion of test. Data log shall be in column format with each line entry indicating the time, elapsed time of test, level of flow indicated in manholes, total flow being pumped by the BPP system, and any comments pertaining to the test.

Any failure of equipment, or activities associated with the bypass pumping operations

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contributing to either an excessive surcharge or SSO, shall be deemed a failed test. The test shall then be stopped and any necessary cleanup or reporting efforts performed. The BPP will need to be revised, resubmitted and acknowledged prior to the test initiating again. Any effort by Fair Oaks Ranch or other third parties to mitigate damages resulting from any surcharging or SSOs shall be the direct and sole responsibility of the Contractor. This includes any related fines, penalties, or damages.

5. Plug Testing

- a. Plugs shall be tested prior to use. The inflatable plug shall be placed inside of a structurally sound pipe or conduit and inflated to its operating pressure and monitored for 24 hours to observe it holds the required pressure. This testing shall be performed in accordance with the manufacturer's recommendations. Inflating a plug when it is not constrained or overinflating the plug creates a risk of being injured by pieces of the plug exploding if it fails.

864.7 MEASUREMENT AND PAYMENT:

1. Measurement for the work specified herein will be by lump sum and as required by the contract documents. Payment of the "Lump Sum" bid for Bypass Pumping shall be in accordance with the following: Any effort required for multiple set-ups and operations shall be included in the lump sum price.
2. When initial set-up and operation of the bypass pumping system begins (including a successful test), 20% of the "Lump Sum" cost will be paid as applicable to stationary bypass pumping to include flow diversion if used.
3. 60% of the "Lump Sum" cost will be paid over equal monthly payments (estimated from the BPP or other documentation approved by the Inspector) during the course of the bypass pumping operation as applicable to stationary bypass pumping to include flow diversion if used.
4. 20% of the remaining "Lump Sum" cost will be paid upon an acceptable removal and/or disassembly of all components of the BPP, including site cleanup as applicable to stationary bypass pumping to include flow diversion if used.
5. For multi-bypass pumping setups, payment will be proportional to the overall amount of the established bid line item.
6. Any damages, repairs, etc., to private or public property will not be considered for any additional payment.
7. Measurement of the work for pipe plugs and transmitter shall be incidental to the work and will not have a separate pay item.

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BYPASS PUMPING PLAN SUBMITTAL CHECKLIST

- ☐ Cover Letter
- ☐ Certificate of Compliance signed and sealed by Contractor's Engineer
- ☐ Sanitary Sewer Flow Management Description
- ☐ Bypass Pumping Description (including Plug Use Plan)
- ☐ Bypass Pumping Schedule
- ☐ Pump and System Curve Information
- ☐ Piping Information
- ☐ System Sketch
- ☐ Manhole and Pole Camera Photographs
- ☐ Traffic Control Plan (if necessary)
- ☐ Emergency Spill Response Plan
- ☐ Anchorage Design for Piping in Floodplain (if necessary)
- ☐ Floodplain Permits (if necessary)
- ☐ Street Cut Permits (if necessary)
- ☐ Other Permits (Contractor shall list as required)
- ☐ Anchorage Design for Piping in Floodplain (if necessary)
- ☐ Required Notifications (Contractor shall list as required)
- ☐ Contact List with Contact Information (Contractor shall list as required)
- ☐ Contractor's Engineer's PE Seal

- End of Specification -

ITEM 866
SEWER MAIN TELEVISION INSPECTION

866.1 DESCRIPTION: The Contractor shall furnish all labor, materials, equipment, and incidentals to provide the televising and a NASSCO-(PACP) standard video, recorded in MPEG-1 format and written to DVD video, of sewer main and manholes utilizing a color, closed-circuit television inspection unit to determine their condition. The video shall include an inclinometer, visible on the video being viewed, noting the slope of the main being televised.

866.2 GENERAL: After completion of the work specified in the contract documents, and prior to placement of the final course of asphalt or other final surface, the newly constructed or rehabilitated sanitary sewer main shall be televised immediately upon cleaning. Televising shall be observed by the Inspector or Engineer and contractor, as the camera is run through the system. Any abnormalities such as, but not limited to, misaligned joints, cracked/defected pipe, rolled gaskets, shall be repaired by the Contractor solely at his expense. Sections requiring repair shall be re-televised to verify condition of repair. No additional compensation shall be provided for all needed repairs, re-cleaning, or re-televising efforts.

866.3 EXECUTION: The Contractor shall provide a DVD and log of the televised system for review and approval by the Inspector. If the Contractor provides a DVD of such poor quality that it cannot be properly evaluated, the Contractor shall re-televising as necessary and provide a DVD of good quality at no additional cost to Fair Oaks Ranch. If the Contractor cannot provide a DVD of such good quality that can be reviewed by Fair Oaks Ranch, Fair Oaks Ranch may elect to televise the line at the Contractor's expense.

The television unit shall also have the capability of displaying in color, on DVD, pipe inspection observations such as pipe defects, sags, points of root intrusion, offset joints, service connection locations, and any other relevant physical attributes. Each DVD shall be permanently labeled with the following:

1. Project name / Fair Oaks Ranch Job # / Work Order #;
2. Date of television inspection;
3. Station to station location and size of sanitary sewer;
4. Street/easement location;

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5. Name of Contractor;
6. Date DVD submitted;
7. DVD number;
8. Fair Oaks Ranch Inspector Name.

The Contractor shall provide a line diagram area sketch and written log for each completed segment of DVD sewer main describing the section being televised, flow and camera direction, position of service connections, description and location of failures, pipe condition, weather conditions, and other significant observations.

The television inspection equipment shall have an accurate footage counter which displays on the monitor the exact distance of the camera from the center of the starting manhole. A camera with rotating and panning lens capabilities is required. The camera height shall be centered in the conduit being televised. The speed of the camera through the conduit shall not exceed 40 feet per minute. The produced video shall also have an inclinometer that displays the slope of the sewer main being televised.

The Contractor shall be required to have all materials, equipment, and labor force necessary to complete all videotaping on the job site prior to isolating the sewer manhole segment and beginning videotaping operations.

Television inspection shall be done one section between two manholes at a time. Also the flow in the section being televised shall be bypassed if the line is in service and the flow exceeds 25% of the internal pipe diameter. When the depth of flow at the upstream manhole of the manhole section being worked is above the maximum allowable for television inspection, the flow can be reduced to allowable levels by performing bypass pumping, as approved by the Inspector.

The Contractor shall not be allowed to float the camera. There may be occasions during the televised inspection of a manhole section when the camera will be unable to pass an obstruction. At that time, and prior to proceeding, the Contractor shall contact the Inspector. If the length of sewer main cannot be televised because of obstructions, the Contractor shall clean the system as is necessary. If, in the opinion of the Inspector, the obstruction is attributed to a collapsed main or pipe deflection, televising shall be suspended, payment shall be made based on the actual televised length, and the remaining televising of the sewer line shall be continued upon successful correction of the blockage by the

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Contractor at his expense. No additional payment shall be made for additional setups required due to obstructions encountered during televising.

No lateral connections shall be made to the sanitary sewer main at the "12 o'clock" position. All lateral connections shall clearly indicate which side of the sanitary sewer main it was installed from.

The Contractor is solely responsible for any damage of sewer mains as a direct result of televising operations. Any repair shall also be the responsibility of the Contractor.

The method(s) used for securing passage of the camera are at the discretion of the Contractor, and as approved by the Inspector.

No sanitary sewer main televising effort shall commence until all pertinent permits or required approvals have been obtained by Fair Oaks Ranch.

No separate and/or additional payment will be made for any excavation, man entry, or any other method which may be required to retrieve video equipment that may have been hung up, destroyed, and/or lost during the operation.

866.4

SEWER MAIN BYPASS PUMPING: The Contractor shall perform bypass pumping operations in accordance with Item No. 864, "Bypass Pumping," and as outlined below.

The Contractor shall furnish all labor, supervision, tools, equipment, appliances, and materials to perform all operations in connection with bypass pumping of sewage flow for the purpose of preventing interference with the televising of the sanitary sewer manholes and mainlines as well as providing reliable sewer service to the occupants of the buildings being served.

The Contractor will be required to provide adequate pumping equipment and force mains in order to maintain reliable sanitary sewer service in all mains involved in the scope of the work. The Contractor shall notify the Inspector should a surcharge occur during the televising process which results in overflows of sewage. In case of bypass equipment failure, the Contractor shall discontinue all televising activities and release sewer flows until such time as equipment failure is corrected. The location of the pump(s), force main(s), and discharge points shall be approved by the Inspector and Engineer. Under no circumstances shall the flow be interrupted or stopped, such that damage is done to either private or public property, or sewage flows/overflows into a storm sewer or natural waterway.

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The Contractor shall provide bypass pumping of sewage around each segment(s) of main that is to be televised and shall be responsible for all required bulkheads, pumps, equipment, piping, and other related appurtenances to accomplish the sequence of pumping. A qualified person shall man the pumps, on-site, at all times during the bypass pumping operations.

All piping, joints, and accessories shall be designed to withstand the maximum bypass system pressure, or a minimum of 50 psi, whichever is greater. During bypass pumping operations, no sewage shall be leaked, dumped, or spilled into or onto any area outside of the existing sanitary sewer system. When bypass pumping operations are complete, all piping shall be drained into the sanitary sewer system prior to disassembly.

The Contractor shall demonstrate that the pumping system is in good working order and can successfully handle flows during cleaning and televising operations, prior to commencing with the cleaning and televising of the system.

866.5 MATERIALS REQUIRED FOR BYPASS OPERATION: The Contractor shall be required to have all materials, equipment, and labor necessary to complete the repair or replacement on the jobsite prior to isolating the sewer manhole or line segment and beginning bypass pumping operations.

866.6 TRAFFIC CONSIDERATIONS: The Contractor shall locate bypass pumping suction and discharge lines so as to not cause undue interference with the use of streets, private driveways, and alleys to include the possible temporary trenching of force mains at critical intersections. Traffic management shall be done under the approval of respective City, County, or State Traffic, Barricade, and Signalization Departments. The Contractor shall not initiate any effort to accommodate bypass pumping piping operations until specific written approval is given. There will be no separate pay item for this work.

866.7 PUMP OPERATIONS: The Contractor shall plug off and pump down the sewer manhole and/or main segment in the immediate work area and shall maintain the sanitary sewer system so that surcharging does not occur. The Contractor shall coordinate with all property owners to ensure that no damage will be caused to their property during any and all sewer rehabilitation work. The Contractor shall complete the televising as quickly as possible and shall satisfactorily meet all requirements prior to discontinuing bypass pumping operations and returning flow to the sewer manhole or main segment. The Contractor shall ensure that no damage will be caused to private property as a result of bypass pumping operations. Ingress and egress to adjacent properties shall be maintained at all times. Ramps, steel plates, or other methods shall be employed by the Contractor to facilitate traffic over surface piping. There will be no separate pay item for this work.

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In the event that sewage accidentally drains into the drainage system or is spilled within the project, the Contractor shall immediately stop the overflow, notify the Inspector, and take the necessary action in accordance with the approved bypass pumping plan to clean up and disinfect the spillage using an HTH, or other equal chemical, at no additional cost to Fair Oaks Ranch. Contractor related lapses to their bypass operations that result in any fines or penalties, will also be the sole responsibility to the contractor.

866.8

MEASUREMENT AND PAYMENT: Measurement and payment will be made for the work to be done on the basis of the unit bid price per linear foot of pipe diameters 8" through 15," 18" through 24," and 30" and larger and shall be considered full compensation for all labor, materials, equipment, tools, logging, cleaning, by pass pumping and incidentals necessary to complete the work, as illustrated below:

1. 866: Sewer Main Television Inspection
2. Category:
 - a. 8" through 15"
 - b. 18" through 24"
 - c. 30" and larger

- End of Specification -

ITEM NO. 868
SANITARY SEWER SYSTEM CLEANING

868.1 **SCOPE:** The Contractor shall furnish all labor, equipment, and materials necessary for cleaning the sanitary sewer system, including the removal of all debris/solids, sand, grease, grit, rock, etc. from the sewer mains, manholes, or structures to facilitate television inspection.

868.2 **DESCRIPTION:** The Contractor shall be required to have all materials, equipment, and labor necessary to complete the cleaning of the sanitary sewer system on the jobsite prior to isolating it for the cleaning process.

The Contractor shall only use the type of cleaning identified below to perform the necessary removal of all material which will not create hazards to health, property, affect downstream treatment plant processes, or damage to the sanitary sewer system.

The sanitary sewer mains, manholes, and structures shall be cleaned using mechanical, hydraulically-propelled, and/or high velocity sewer cleaning equipment. The cleaning process shall remove all debris, grease, sand, silts, solids, rags, rock, etc. from each sewer segment, including the manhole(s) or structures. Selection of cleaning equipment and the method for cleaning shall be based on the condition of the sanitary sewer lines at the time work commences and will be subject to Fair Oaks Ranch' pre-approval. All cleaning equipment and devices shall be operated by experienced personnel. Satisfactory precautions shall be taken to protect the sanitary sewer lines, manholes, or structures from damage that might be inflicted by the improper use of the cleaning process or equipment. Any damages done to a sewer line manhole, or structure by the Contractor shall be repaired by the Contractor at no additional cost and to the satisfaction of Fair Oaks Ranch. Cleaning shall also include the manhole or structure wall washing by a high pressure water jet.

1. Hydraulic Cleaning: Hydraulic-propelled devices which require a head of water to operate must utilize a collapsible dam. The dam must be easily collapsible to prevent damage to the sewer line, property, etc. When using hydraulically-propelled devices, precautions shall be taken to insure that the water pressure created does not cause damage or flood public or private property. The Contractor shall not increase the hydraulic gradient of the sanitary sewers beyond the elevation that could cause overflow of sewage into area waterways or laterals. The flow of wastewater present in the sanitary sewer line shall be utilized to provide necessary fluid for hydraulic cleaning devices whenever possible.

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2. **High Velocity Cleaning:** Cleaning equipment that uses a high velocity water jet for removing all debris shall be capable of producing a minimum volume of 50 gpm, with a pressure of 1,500 psi, for the sanitary sewer main and 3,500 psi for the (manhole) structure at the pump. Any variations to this pumping rate must be pre-approved by the Inspector. To prevent damage to older sewer lines and property, a pressure less than 1,500 psi can be used. A working pressure gauge shall be used on the discharge of all high pressure water pumps. The Contractor shall use, in addition to conventional nozzles, a nozzle which directs the cleaning force to the bottom of the pipe for sewers 18" and larger in diameter. The Contractor shall operate the equipment so that the pressurized nozzle continues to move at all times. The pressurized nozzle shall be turned off or reduced anytime the hose is on hold or delayed in order to prevent damage to the line.
3. **Mechanical Cleaning:** Mechanical cleaning, in addition to normal cleaning when required, shall be with approved equipment and accessories driven by power winching devices. The Contractor shall submit the equipment manufacturer's operational manual and guidelines to the Inspector, which shall be followed strictly unless modified by the Inspector. All equipment and devices shall be operated by experienced operators so that they do not damage the pipe in the process of cleaning. Buckets, scrapers, scooters, porcupines, kites, heavy duty brushes, and other debris-removing equipment/accessories shall be used as appropriate and necessary in the field, in conjunction with the approved power machines. The use of cleaning devices such as rods, metal pigs, porcupines, root Fair Oaks Ranch, snakes, scooters, sewer balls, kites, and other approved equipment, in conjunction with hand winching device, and/or gas, electric rod propelled devices, shall be considered normal cleaning equipment.

868.3

GENERAL REQUIREMENTS: In addition to the requirements specified herein, the Contractor shall maintain a clean work area and surrounding premises within the work limits so as to comply with Federal, State, and local environmental and anti-pollution laws, ordinances, codes, and regulations when cleaning and disposing of waste materials, debris, and rubbish. The contractor shall also keep the work and surrounding premises within work limits free of accumulations of dirt, dust, waste materials, debris, and rubbish. Suitable containers for storage of waste materials, debris, and rubbish shall be provided until time of disposal. It is the sole responsibility of the Contractor to secure a licensed legal dump site for the disposal of this material. Under no circumstances

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shall sewage or solids removed from the main or manhole be dumped on the ground, streets, ditches, catch basins, storm drains, or sanitary sewers. Cost for this item shall be included in the price bid for sanitary sewer system cleaning.

The Contractor may be required to demonstrate the performance capabilities of the cleaning equipment proposed for use on the project. If the results obtained by the proposed sanitary sewer system cleaning equipment are not satisfactory to the Inspector, the Contractor shall use different equipment and/or attachments, as required, to meet the requirements of the contract documents. More than one type of equipment/attachments may be required at any given location within the project scope. When hydraulic or high velocity cleaning equipment is used, a suitable sand trap, weir, dam, or suction shall be constructed in the downstream manhole in such a manner that all the solids and debris are trapped for removal.

Whenever hydraulically-propelled cleaning tools which depend upon water pressure to provide their cleaning force, or any tool which retard the flow of water in the sanitary sewer mains are used, precautions shall be taken to insure that the water pressure created does not cause any damage or flooding to public or private property being served by the manhole section involved. Any damage of property, as a result of flooding, shall be the sole liability and responsibility of the Contractor. The flow of wastewater present in the sanitary sewer system shall be utilized to provide necessary fluid for hydraulic cleaning devices whenever possible. When additional quantities of water from fire hydrants are necessary to avoid delay in normal working procedures, the water shall be conserved and not used unnecessarily. No fire hydrant shall be obstructed or used when there is a fire in the area. The Contractor shall be responsible for obtaining the water meter and all related charges for the set-up, including the water usage bills from respective water purveyor agency. All expenses shall be considered incidental to the cleaning of the existing sanitary sewer system.

868.4

MEASUREMENT AND PAYMENT: The Contractor shall be fully responsible and shall be paid for sewer system cleaning as part of Item No. 866, "Sewer Main Television Inspection" for furnishing all labor, hauling, materials, equipment, tools, debris disposal, inspection, and incidentals necessary to complete the work.

- End of Specification -

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**ITEM NO. 869
PROJECT SIGNS**

869.1 **DESCRIPTION:** This item shall consist of the providing, installing, maintaining and removing of two 4' X 8' project signs. The signs shall conform to the configuration and details indicated in Standard Drawing No. DD-869-01. These signs shall be installed at locations to be determined by the Inspector. Any additional signs required by other agencies (such as the City of Fair Oaks Ranch Public Works' Right-of-Way Division) shall also be installed as requested and directed by the Inspector.

The signs shall be erected at both ends of the project limits or as directed by the Inspector. They shall remain in place until such time that the project has been accepted and finalized.

869.2 **MATERIAL:** The signs shall be made of $\frac{3}{4}$ " plywood, grade A-C or better and each shall be mounted on two 4" X 4" X 12'-0" posts.

869.3 **INSTALLATION:** The installation will require embedding all posts a minimum of 3 feet below the ground.

869.4 **MEASUREMENT:** Measurement of the Item, "Project Signs" as specified herein, will not be measured for payment.

869.5 **PAYMENT:** No direct payment will be made to the contractor for the work and materials required in providing, installing, maintaining and removing the signs. Such work and materials shall be considered subsidiary to the several items of work for which unit prices are provided in the proposal.

- End of Specification -

PROJECT:

COST:

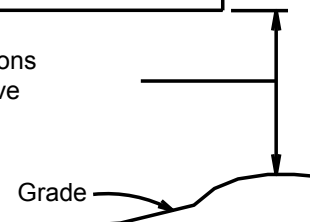
ENGINEER:

CONTRACTOR:

JOB NO:

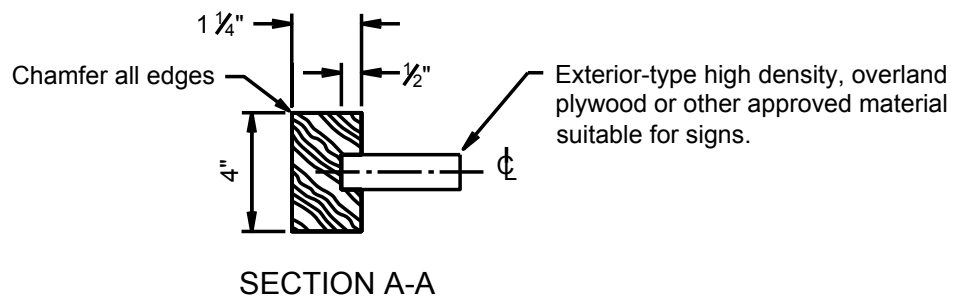
FOR INFORMATION CALL
210-698-0900

Provide adequate supports for sign (as site conditions may require) and keep sign a proper distance above prevailing grade to permit public viewing.



Notes:

- All lettering is black (sized to fit space)
- 4' x 8' sheet of 3/4" plywood, Grade A-C
- Signs to be placed in prominent location along a major thoroughfare within the project limits



PROPERTY OF THE CITY OF FAIR OAKS RANCH	PROJECT SIGN FOR CONSTRUCTION	APPROVED	REVISED
		JANUARY 2019	
		DD-869-01	SHEET 1 OF 1

ITEM NO. 900
RECONSTRUCTION OF SANITARY SEWER BY PIPE
BURSTING REPLACEMENT PROCESS

- 9001 DESCRIPTION:** This specification includes requirements to replace existing sanitary sewer mains by the pipe bursting method. The pipe bursting process involves the replacement of deteriorated gravity sewer pipe by installing a new sanitary sewer pipe within the burst/enlarged excavation of the existing sewer created using a static, hydraulic, or pneumatic hammer bursting head device, suitably sized to break the existing sewer main. Forward progress of the bursting head is aided by hydraulic equipment or other apparatus. The new replacement pipe is attached to the back of the bursting head and is pulled into the excavation during the bursting process.

The contractor shall provide equipment, planning, and job execution necessary to accomplish the work in an efficient manner and consistent with the objectives of these specifications, including preventing damage to existing infrastructure, maintaining pedestrian and vehicular access, and providing continual sewer service to customers.

9002 REFERENCED STANDARDS:

1. Fair Oaks Ranch(Fair Oaks Ranch):
 - a. Specifications for Water and Sanitary Sewer Construction(2018)
 - b. Fair Oaks Ranch Material Specifications
2. Texas Commission on Environmental Quality (TCEQ) Chapter 217 Design Criteria for Domestic Wastewater Systems
3. American Society for Testing and Materials (ASTM) International:
 - a. D1248, Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable.
 - b. D2657, Standard Practice for Heat Fusion Joining of Polyolefin Pipe and Fittings
 - c. D2837, Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products
 - d. D3350, Standard Specification for Polyethylene Plastic Pipe and Fittings Materials
 - e. F714, Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter

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- f. ASTM D 1238: Standard Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer
- g. ASTM D 1505: Standard Test Method for Density of Plastics by the Density-Gradient Technique
- h. ASTM D 790: Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
- i. ASTM D 638: Standard Test Method for Tensile Properties of Plastics
- j. ASTM D 1693: Standard Test Method for Environmental Stress-Cracking of Ethylene Plastics
- k. ASTM F2620: Standard Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings
- l. ASTM D 618: Standard Practice for Conditioning Plastics for Testing
- m. ASTM D 575: Standard Test Methods for Rubber Properties in Compression

9003 SUBMITTALS

- 1. Contractor shall submit manufacturer's product data, color options, instructions, recommendations, shop drawings, and certifications. All submittals shall meet Owner's requirements and be approved by the Owner prior to delivery.
- 2. Contractor to submit certification of training by the pipe bursting system manufacturer. Operators to be trained in the use of the pipe bursting equipment by an authorized representative of the equipment manufacturer. Training shall include handling and installation of pipe and use of fusing equipment.
- 3. Submittals should include design calculations, push/pull loads, thrust loads, a plan showing proposed method of installation including location of pits, direction of pulls, support of backstop, arrangements and position of jacks, pipe guides, installation details, and qualification certificate of installer.
- 4. Contractor to submit the following prior to start of construction:
 - a. Descriptions of the methods of modifying existing manholes if used for retrieval of the pipe bursting equipment
- 5. Contractor to submit contingency plan to include plans for the following:
 - a. Unforeseen obstruction(s) causing burst stoppage, such as unanticipated

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change(s) in host pipe material, repair section(s), concrete encasement(s) or cradles, buried or abandoned manhole(s) or changes in direction not depicted on Contract Drawings

- b. Substantial surface heave occurring due to the depth of the existing pipe versus the amount of upsizing or settlement.
 - c. Damage to existing service connections and to the replacement pipeline's structural integrity and methods of repair.
 - d. Damage to other existing utilities.
 - e. Loss of and return to line and grade.
 - f. Loss of bursting head.
6. Contractor to submit pre-and post-installation CCTV video DVD's and inspection reports. Post-installation reports and DVD's shall be made after pipe installation and re-connection of all laterals and immediately prior to the commissioning stage.

9004 MATERIALS:

- 1. High density polyethylene pipe (HDPE) related to pipe bursting or pipe crushing for a sanitary sewer main or related pipe liner rehabilitation:
 - a. Solid wall HDPE pipe that is in conformance with ASTM F714 and ASTM requirements stated herein.. HDPE pipe on this project shall further be required to have a minimum pipe stiffness of 46 psi for 12inch to 48inch diameter pipe and 115 psi for 8inch to 10inch diameters as required by Fair Oaks Ranch and TCEQ.
 - b. Pipe Manufacture: All pipe and fittings will be high density polyethylene pipe and made of virgin material. No rework except that obtained from the manufacturer's own production of the same formulation will be used. The liner material will be manufactured from a high density high molecular weight polyethylene compound which conforms to ASTM D1248 and meets the requirements for Type III, Class C, Grade P-34, Category 5, and has a Plastic Pipe Institute (PPI) rating of PE 3408.
 - c. The pipe produced from this resin will have a minimum cell Classification of 345434C (inner wall will be light in color) under ASTM D3350. A higher number cell classification limit which gives a desirable higher primary property, per ASTM D3350 may also be accepted by the Engineer at no extra cost to Fair Oaks Ranch.

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The value for the Hydrostatic Design basis will not be less than 1,600 psi (11.03 MPa) per ASTM D2837. Pipe will have ultraviolet protection.

- d. Pipe Color and Quality: For television inspection purposes, the polyethylene pipe will have light-colored grey interior; achieved with a homogenous, light-colored grey material throughout or with a fully bonded light-colored grey interior liner meeting specifications above indicated. All pipes shall be free of visible cracks, holes, foreign material, foreign inclusions, blisters, or other deleterious or injurious faults or defects. Pipe and fittings shall be as uniform as commercially practical in color, opacity, density, and other physical properties.
- e. For interior lined pipe, the liner will be a minimum of 10 mils thick and co-extruded. The bond between the layers will be strong and uniform. It will not be possible to separate the two layers with a probe or point of a knife blade (so that the layers separate cleanly at any point) nor will separation of the bond occur, between layers, during testing performed under the requirements of this specification.
- f. Pipe Diameter: Polyethylene plastic pipe will meet the applicable requirements of ASTM F714 Polyethylene (PE) Plastic Pipe (SDR- PR) Based on Outside Diameter, ASTM D1248, and ASTM D3550. Internal diameter of the pipe indicated on the plans will be the minimum allowable pipe size.
- g. Pipe Dimension Ratios: The minimum wall thickness of the polyethylene pipe will meet the following, as based on the deepest portion of a particular pipe pull, typically between manholes:

Depth of Cover (Feet)	Minimum SDR of Pipe 0 -
16.0	19
>16.1	17

Wall thickness shall be as indicated on the plans and will be in accordance with manufacturer.

- h. Force Mains: Where applicable, solid wall pipe for sanitary sewer force mains shall have a minimum working pressure rating of 150 psi, and an inside diameter equal to or greater than the nominal pipe size indicated in the contract documents.
- i. Augering Pipe: HDPE pipe is not approved in applications requiring augering of sewer pipe.
- j. Pipe Marking: Each standard and non-standard length of pipe or fitting shall be clearly marked with pipe size, pipe class, production code, material designation and other relevant identifying information.

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- k. Pipe Inspections: The Engineer and Inspector reserve the right to inspect pipes or witness pipe manufacturing. Such inspection shall in no way relieve the manufacturer of the responsibilities to provide products that comply with the applicable standards and these Specifications. Should the Engineer wish to witness the manufacture of specific pipes, the manufacturer shall provide the Engineer with adequate notice of when and where the production of those specific pipes will take place. Approval of the products or tests is not implied by the Engineer's decision not to inspect the manufacturing, testing, or finished pipes.

2. Acceptable Manufacturer

- a. Vendors must have approval through Fair Oaks Ranch Standards Committee prior to product use and must meet all requirements set forth in this Specification Item No. 900.

9005 CONSTRUCTION:

1. Location and number of insertion or launching pits will be chosen by the contractor, and will typically be located near existing or proposed manholes, P.I.'s in the line, at logical breaks in the construction phasing, or at locations to comply with access or maintenance requirements. Location of pits shall be included in plan submitted to and approved by owner.

Pits shall be placed and located to minimize the total number of pulls and maximize the length of pipe replaced per pull, within the constraints of maintaining service and access and other requirements. Use excavations at point repair locations for insertion pits where possible.

2. The Contractor shall utilize pipe bursting equipment with adequate pulling force to complete pulls in a timely manner. The contractor shall provide equipment on the pulling mechanism to verify the pulling force exerted on the pipe does not exceed the manufacturer's recommendation for allowable pulling force to prevent damage to the pipe. The pulling force may not exceed the following: 6 tons for 8.625 inch O.D.; 10 tons for 10.75 inch O.D.; 17 tons for 14 inch O.D.; 23 tons for 16 inch O.D.; 28 tons for 18 inch O.D. Allowable pulling force for all diameters shall be determined by the contractor depending on the pipe size, wall thickness, manufacturer, field conditions, pull distance, manhole integrity, bearing capacity of soils, adjacent infrastructure, related equipment and cable strength, and related considerations.
3. Equipment shall be configured with adequate knives or other appropriate devices to minimize interruptions in the installation process due to obstruction removal and other problems. Pipe shall be secured to the pulling/pushing device in accordance with standard practice. The diameter of the pulling/pushing head shall be equal or slightly greater than the pipe OD.

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4. Equipment used to perform the work will be located away from businesses or residents so as not to create a noise impact. Provide silencers or other approved devices to reduce machine noise, when it exceeds regulated limits.
5. The Contractor shall provide for the general safety of workers, pedestrians and traveling public throughout this project. Existing surface improvements and underground facilities and utilities shall also be protected. Damage caused by the Contractor shall be repaired at his own expense. Protection to be provided includes:
 - a. Provide barricades, warning lights and signs for excavations created by point repairs. Conform to requirements of TX DOT, City of Fair Oaks Ranch, and other entities specified in the contract documents.
 - b. Protection of Manholes: The Contractor will install all pulleys, rollers, bumpers, alignment control devices and other equipment required to protect existing manholes, and to protect the pipe from damage during installation. Lubrication may be used as recommended by the manufacturer. Under no circumstances will the pipes be stressed beyond their elastic limit.
 - c. Do not allow sand, debris, or runoff to enter sewer system. Verify location of all underground utilities and facilities potentially impacted by rehabilitation or other project activities, and take necessary precautions to provide protection from damage. Damage resulting from the Contractor shall be at his own cost and responsibility.
 - d. Protect the new pipe and components during all phases of work, including hauling, installation, entry into the launching pit, and prevention of scarring or gouging of the pipe or components.
6. Pipe shall be assembled and fused on the ground in sections equivalent to the length of the anticipated pull. During installation, all bending and loading of the pipe shall be in conformance with manufacturer's recommendations and shall not damage pipe.
7. Manholes shall be prepared to provide pipe installation at the lines and grades indicated in the contract documents. The invert in the manholes shall be removed as required to allow for pipe installation activities and to accommodate invert replacement. Manhole inverts shall be restored upon completion with 3,000 psi grout to establish a minimum 4-inch-thick bottom on the manhole after shaping per the contract documents.
8. Allow liner pipe to normalize to ambient temperatures as well as recover from imposed stretch before cutting to fit between manholes, sealing at manholes, and manhole invert shaping. Normalization usually takes at least 12 hours for polyethylene.
9. Cut liner so that it extends four inches into manhole. Make a smooth, vertical cut and

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slope area over top of exposed liner using non-shrink grout.

10. Seal the annular space between liner and sanitary sewer main at each manhole with a chemical seal and non-shrink grout. Place strips of oakum soaked in sealer (Scotchseal 5600 as manufactured by 3M Corporation or approved equal) in a band to form an effective water-tight gasket in the annular space between liner and existing opening in manhole. Make width of the sealing band a minimum of eight inches or the thickness of the manhole wall, whichever is greater.
11. Finish seal with a non-shrink grout placed around annular space from inside manhole. Apply grout in a band not less than six inches wide.
12. Reshape and smooth the manhole invert. Form a smooth transition with a reshaped invert and a raised manhole bench to eliminate sharp edges of liner pipe, concrete bench, and channeled invert. Build up and smooth invert of manhole to match flow line of new liner.
13. Solid wall pipe shall be produced with plain end construction for heat-joining (butt fusion) conforming to ASTM D2657.
14. The polyethylene pipe will be assembled and joined at the site using the thermal butt-fusion method to provide a leak proof and structurally sound joint. Threaded or solvent-cement joints and connections are not permitted. All equipment and procedures will be used in strict compliance with the manufacturer's recommendations. Fusing will be accomplished by personnel certified as fusion technicians by a manufacturer of polyethylene pipe and/or fusing equipment.
15. The butt-fused joint will be true alignment and will have uniform roll back beads resulting from the use of proper temperature and pressure. The joint surfaces will be smooth. The fused joint will be watertight and will have tensile strength equal to that of the pipe. All joints will be subject to acceptance by the Inspector prior to insertion. All defective joints will be cut out and replaced at no cost to Fair Oaks Ranch. Any section of the pipe with a gash, blister, abrasion, nick, scar, or other deleterious fault greater in depth than 10% of the wall thickness, will not be used and must be removed from the site. However, a defective area of the pipe may be cut out and the joint fused in accordance with the procedures stated above.
16. Pipe having defects that in the opinion of the Inspector indicate the pipe may be damaged, faulty, substandard, improperly manufactured, or have other defects as listed herein, will be discarded and not used. Defects warranting pipe rejection include the following: concentrated ridges, discoloration, excessive spot roughness, and pitting; insufficient or variable wall thickness; pipe damage from bending, crushing, stretching or other stress; pipe damage that impacts the pipe strength, the intended use, the internal diameter of the pipe, internal roughness characteristics; or any other defect of manufacturing or handling.

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17. Clamps and Gaskets: Clamps shall be stainless steel, including bolts and lugs as manufactured by JCM Industries Type 108, or other approved equal. Furnish full circle, universal clamp couplings with a minimum 3/16-inch-thick neoprene, grid-type gasket. Select clamps to fit outside diameter of pipe. Use minimum clamp length of 30 inches for replacement pipes O.D. of 10.75 inches (10inch nominal) or greater and 18 inches for replacement pipe O.D. less than 10.75 inches.
18. Terminal sections of pipe that are joined within the insertion pit will be connected with a full circle pipe repair clamp. The butt gap between pipe ends will not exceed ½inch.
19. Sewer services, service laterals shall be reconnected to the new pipe through small excavations from the surface. Inserta-Tee conforming to ASTM D3034 service connections, approved by Engineer and found in Fair Oaks Ranch' Material Specifications shall be used for service laterals. Approved saddles maybe used in in service laterals. Sewage flows from the upstream line and from the services are pumped as required to prevent overflows and provide continual sewer service. All excavations required for reconnecting and pumping service flows, entry pits, exit pits, obstruction removal, point repairs, among others, are to be kept to a minimum and all damage to surface and underground features, facilities, utilities and improvements are to be repaired. Area disturbed by construction shall be clean and restored per Fair Oaks Ranch specification Item No. 804. Seal between new pipe and existing service shall be water tight.

9006 TESTING

1. After the existing sewer is completely replaced, internally inspect with television camera and DVD video as required. The finished tape will be continuous over the entire length of the sewer between two manholes and be free from visual defects.
2. Defects which may affect the integrity or strength of the pipe in the opinion of the Engineer or Inspector will be repaired or the pipe replaced at the Contractor's sole expense.
3. The Contractor shall smoke test to verify all sewer service connections.
4. The following items are excerpted from 30 TAC § 217 requirements for gravity sewer construction testing. Compliance with these requirements is required unless the contractor obtains and provides written authorization from the TCEQ authorizing alternative testing and compliance procedures:
 - a. Testing of Installed Pipe: An infiltration, exfiltration or low- pressure air test shall be specified. Copies of all test results shall be made available to the executive director (TCEQ) upon request. Tests shall conform to the following requirements:

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- b. Infiltration or Exfiltration Tests: The total exfiltration as determined by a hydrostatic head test shall not exceed 50 gallons per inch diameter per mile of pipe per 24 hours at a minimum test head of two feet above the crown of the pipe at the upstream manhole. When pipes are installed below the groundwater level an infiltration test shall be used in lieu of the exfiltration test. The total infiltration, as determined by a hydrostatic head test, shall not exceed 50 gallons per inch diameter per mile of pipe per 24 hours at a minimum test head of two feet above the crown of the pipe at the upstream manhole, or at least two feet above existing groundwater level, whichever is greater. For construction within the 25-year flood plain, the infiltration or exfiltration shall not exceed 10 gallons per inch diameter per mile of pipe per 24 hours at the same minimum test head. If the quantity of infiltration or exfiltration exceeds the maximum quantity specified, remedial action shall be undertaken to reduce the infiltration or exfiltration to an amount within the limits specified.
- c. Low Pressure Air Test: The procedure for the low-pressure air test shall conform to the procedures described in ASTM C828, ASTM C924, ASTM F1417, or other appropriate procedures, except for testing times. The test times shall be as outlined in this section. For sections of pipe less than 36-inch average inside diameter, the following procedure shall apply unless the pipe is to be joint tested. The pipe shall be pressurized to 3.5 psi greater than the pressure exerted by groundwater above the pipe. Once the pressure is stabilized, the minimum time allowable for the pressure to drop from 3.5 pounds per square inch gauge to 2.5 pounds per square inch gauge shall be computed from the following equation:

$$T = 0.085DK/Q$$

where:

T	=	time for pressure to drop 1.0 pound per square inch gauge in seconds
K	=	0.000419xDxL, but not less than 1.0
L	=	length of line of same pipe size being tested, in feet
Q	=	rate of loss, 0.0015 cubic feet per minute per square foot internal surface shall be used
D	=	average inside pipe diameter, in inches

Since a K value of less than 1.0 shall not be used, there are minimum testing times for each pipe diameter as follows:

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d.

Pipe Diameter (Inches)	Minimum Time (Seconds)	Length for Minimum Time	Time for Longer Length (seconds)
6	340	398	0.855(L)
8	454	298	1.520(L)
10	567	239	2.374(L)
12	680	199	3.419(L)
15	850	159	5.342(L)
18	1020	133	7.693(L)
21	1190	114	10.471(L)
24	1360	100	13.676(L)

- e. The test may be stopped if no pressure loss has occurred during the first 25% of the calculated testing time. If any pressure loss or leakage has occurred during the first 25% of the testing period, then the test shall continue for the entire test duration as outlined above or until failure.
- f. Deflection Testing: Deflection tests shall be performed on all flexible pipes. For pipelines with inside diameters less than 24 inches, a rigid mandrel shall be used to measure deflection. Other methods shall provide a precision of $\pm$ two tenths of one percent (0.2 %) deflection. The test shall be conducted after the final backfill has been in place at least 30 days. No pipe shall exceed a deflection of five percent. If a pipe should fail to pass the deflection test, the problem shall be corrected and a second test shall be conducted after the final backfill has been in place an additional 30 days. The tests shall be performed without mechanical pulling devices. The design engineer should recognize that this is a maximum deflection criterion for all pipes and a deflection test less than five percent may be more appropriate for specific types and sizes of pipe. Upon completion of construction, the design engineer or other Texas Registered Professional Engineer appointed by the owner shall certify, to the Executive Director, that the entire installation has passed the deflection test. This certification may be made in conjunction with the notice of completion required in §217.1(e).(1) of this title (relating to General Provisions). This certification shall be provided for the Commission to consider the requirements of the approval have been met.
- g. Mandrel Sizing: The rigid mandrel shall have an outside diameter (O.D.) equal to 95% of the inside diameter (I.D) of the pipe. The inside diameter of the pipe, for the purpose of determining the outside diameter of the mandrel, shall be the average outside diameter minus two minimum wall thicknesses for O.D. controlled pipe and the average inside diameter for I.D. controlled pipe, all dimensions shall be per appropriate standard. Statistical or other "tolerance packages" shall not be considered in mandrel sizing.

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- h. Mandrel Design: The rigid mandrel shall be constructed of a metal or a rigid plastic material that can withstand 200 psi without being deformed. The mandrel shall have nine or more "runners" or "legs" as long as the total number of legs is an odd number. The barrel section of the mandrel shall have a length of at least 75% of the inside diameter of the pipe. A proving ring shall be provided and used for each size mandrel in use.
- i. Method Options: Adjustable or flexible mandrels are prohibited. A television inspection is not a substitute for the deflection test. A deflectometer may be approved for use on a case-by-case basis. Mandrels with removable legs or runners may be accepted on a case-by-case basis.

900.6 MEASUREMENT: All sewer pipes will be measured from center of manhole to center of manhole or end of main. Measurement will be continuous through any fittings in the main.

900.7 PAYMENT: Payment for items included in this specification shall be in accordance with the pay items listed below. Work included in these items shall include and the price provided by the Contractor will be considered as full compensation for furnishing and placing of all materials, labor, tools, and equipment; cleaning, preparation, repairs, obstruction removal, inspection; and phasing, protecting, work execution and any other work necessary to complete the project.

- a. Installed Pipe: The inserted pipe will be paid for per linear foot of pipe installed using pipe bursting crushing method for the pipe diameter, type, quantity, and depth specified and will include all pipe installation materials, all submittals, sealing materials at manholes and annulus (if required), launching pits, receiving pits, post testing, shoring, bedding, backfill, and all necessary, corresponding, and related work specified herein.
- b. Services: Locating and reconstruction of services and all connections of services will be paid for per each connection made, including fittings and pipe. Payment for abandoned services will be on a per each connection made basis.
- c. Point Repairs: Point repairs will be paid for on a per each basis, as needed. Extra length point repair will be paid based on the length of pipe replaced per repair beyond the length established for each single point repair item, as needed. Abandoned point repairs will be paid on a cubic yard basis, as needed.
- d. Obstruction Removal: Obstruction removal will be paid for on a per each basis, as needed.
- e. Storm Water Pollution Prevention and Erosion Control Plan: Payment for this item will be based on the items and quantities of control measures included in the proposal on the basis indicated in the respective specification sections.

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- f. Site Restoration: Except as associated with point repairs and obstruction removals, site restoration for all impacts to surface improvements will be on a linear foot basis of the rehabilitated line segment. For point repairs and obstruction removals, site repair will be on a per each basis.

- g. Television Inspection: Payment will be made for television inspection of the sewer line prior to pipe rehabilitation in accordance with Fair Oaks Ranch Specifications for Construction Item No. 866 “Sewer Main Television Inspection” and cleaning will be in accordance with Fair Oaks Ranch Specifications for Construction Item No. 868 “Sanitary Sewer System Cleaning”. There will be no additional or separate payment for “post- TV” video inspection, documentation, required submittals, and associated or related work.

- h. Bypass Pumping: Payment will be made in accordance with Fair Oaks Ranch Specifications for Construction Item No. 864-S1, “Bypass Pumping Small Diameter Sanitary Sewer” and Item No. 864-S2, (“Bypass Pumping Large Diameter Sanitary Sewer”. There will be no additional or separate payment for documentation, required submittals, and associated or related work.

- End of Specification -

ITEM NO. 901

**REHABILITATION OF SANITARY SEWER BY CURED-IN-PLACE
PIPE (HOT WATER OR STEAM CURED)**

901.1 DESCRIPTION

This specification includes requirements to rehabilitate existing sanitary sewers by the installation of a resin-impregnated flexible tube, which is formed to the original conduit. The lining is inserted via an existing manhole or other access and, depending on the system selected, is installed using one of the following insertion methods:

1. Water inversion – where the lining is inverted under the pressure of water and cured by circulating hot water.
2. Winched insertion – where the lining is winched into place and inflated against the sewer wall by either a removable bladder inverted into the lining under the pressure of water or a pre-positioned bladder, which is simply inflated. Curing is accomplished using circulated hot water.
3. Air inversion – where the lining is inverted under the pressure of air and cured by introducing steam.

901.2 REFERENCED STANDARDS: Reference standards cited in this Specification refer to the current reference standard published at the time of the latest revision date logged at the end of this Specification, unless a date is specifically cited

1. Fair Oaks Ranch (Fair Oaks Ranch):
 - a. Specifications for Water and Sanitary Sewer Construction (2018)
 - b. Fair Oaks Ranch Material Specifications
2. Texas Commission of Environmental Quality (TCEQ) Chapter 217 Design Criteria for Domestic Wastewater Systems
3. American Society for Testing and Materials (ASTM) International:
 - a. D543, Standard Practice for Evaluating the Resistance of Plastics to Chemical Reagents
 - b. D638, Standard Test Method for Tensile Properties of Plastics
 - c. D695, Standard Test Method for Compressive Properties of Rigid Plastics

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- d. D790, Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
- e. F1216, Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of Resin Impregnated Tube
- f. F1743, Standard Practice for Rehabilitation of Existing Pipelines and Conduits by Pulled-In-Place Installation of Cured-In-Place Thermosetting Resin Pipe
- g. F2019, Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Pulled in Place Installation of Glass Reinforced Plastic (GRP) Cured-in-Place Thermosetting Resin Pipe (CIPP)
- h. F2561, Standard Practice for Rehabilitation of a Sewer Service lateral and Its Connection to the Main Using a One Piece Lateral Cured-in-Place Liner
- i. D2990, Standard Test Methods for Tensile, Compressive and Flexural Creep and Creep-Rupture of Plastics
- j. D3567, Standard Practice for Determining Dimensions of Fiberglass (Glass-Fiber Reinforced Thermosetting Resin) Pipe and Fittings
- k. D3681, Standard Test Method for Chemical Resistance of “Fiberglass” (Glass Reinforced Thermosetting Resin) Pipe in a Deflected Condition
- l. D5813, Standard Specification for Cured-In-Place Thermosetting Resin Sewer Pipe

901.3 SUBMITTALS

The Contractor shall submit to Fair Oaks Ranch the following specifications, drawings, test results, and other data showing details of the fabrication and installation of the CIPP liner; these submittals shall be considered incidental to this project, unless a specific bid item for such is included in the project bid proposal:

- 1. Product specifications and technical data for the resin catalyst system, sealing materials, and liner tube.
- 2. Manufacturer provided information that describes the CIPP materials, curing

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speeds, curing installation processes, installation pressures, and temperature limitations.

3. Certified test results of physical properties testing and chemical resistance testing of the proposed resin material.
4. Complete design calculations for the liner thickness per ASTM F1216, for each manhole to manhole segment of main to be rehabilitated. The design calculations shall be signed and sealed by a professional Engineer registered in the State of Texas and certified by the manufacturer as to the compliance of the manufacturer's material to the values used in the calculations. Review of the calculations by the Owner or its Engineer shall not relieve the Contractor of any contractual obligations.
5. If a field wet-out procedure will be used for liner impregnation, submit a complete description of the proposed wet-out procedure with detailed information on equipment and material storage locations, resin volumes and/or weights, liner length, start times, finish times, resin injection locations, and any other pertinent data documenting the wet-out procedure. Provide plan indicating procedure for reconnection of laterals and pipe end seals.
6. Map that legibly shows proposed liner insertion location(s), construction staging area(s), and bypass pump and piping locations.
7. Traffic control plan (if required) in accordance with City of Fair Oaks Ranch Street Cut Policy or TxDOT (Traffic Coordination)."
8. Bypass pumping plan in accordance with Item No. 864-S1, "Bypass Pumping- Small Diameter Sanitary Sewer" or No. 864-S2, "Bypass Pumping-Large Diameter Sanitary Sewer".
9. Hydraulic flow capacity calculations with a copy of certification verifying Manning's roughness "n" value for the proposed liner.
10. Schedule of operations for each project or work order.
11. Liner curing parameter records.
12. Pre and post television inspection videos and logs on DVD in accordance with Item No. 866, "Sewer Main Television Inspection".
13. Physical samples. Samples removed for testing shall be individually labeled and logged with the following information:

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- a. Owner's Project number and title.
 - b. Sample number.
 - c. Segment number of line as noted on plans.
 - d. Date and time of sample.
 - e. Name of Contractor.
 - f. Name and location of firm performing testing on sample.
14. Certified test results of structural properties of CIPP samples for each segment installed under this contract.
 15. Log of pulling forces measured during insertion.
 16. Any other testing results or submittals specified in this document or required by applicable ASTM standards.

901.4 MATERIALS

1. Tube
 - a. The tube shall consist of one or more layers of absorbent needled felt fabric or an equivalent non-woven or woven material, or a combination thereof which meets the requirements of ASTM F1216 or ASTM F1743, Section 5. The tube shall be constructed to withstand installation pressures and curing temperatures, have sufficient strength to bridge missing pipe, and stretch to fit irregular pipe sections.
 - b. The impregnated tube shall have a uniform and homogenous thickness that when compressed at installation pressures will meet or exceed the design thickness.
 - c. The tube shall be sized that when installed will tightly fit the internal circumference and length of the original pipe. Allowance should be made for circumferential stretching during inversion.
 - d. The outside layer of the tube (before wet out) shall be coated with an impermeable, flexible membrane that will contain the resin and facilitate monitoring of resin saturation during the resin impregnation (wet out) procedure.
 - e. The tube shall be homogeneous across the entire wall thickness containing no intermediate or encapsulated elastomeric layers. No material shall be included in the tube that may cause delamination in the cured CIPP. No dry or unsaturated layers shall be evident.

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- f. The wall color of the interior pipe surface of CIPP after installation shall be a light reflective color so that a clear detailed examination with closed circuit television inspection equipment may be made.
 - g. Seams in the tube shall be stronger than the un-seamed felt and meet the requirements of ASTM D5813.
 - h. The outside of the tube shall be marked for distance at regular intervals along its entire length, not to exceed 5 ft. Such markings shall include the manufacturer's name or identifying symbol. The tubes must be manufactured in the USA.
- 2. Resin
 - a. The resin system shall be a corrosion resistant polyester, vinyl ester, or epoxy and catalyst system.
 - b. When properly cured, the tube composite meets the requirements of ASTM F1216, ASTM F1743 and ASTM F2019, the physical properties herein, and those that are to be utilized in the design of the CIPP for this project.
 - c. The resin shall produce CIPP that will comply with the structural and chemical resistance requirements of this specification.
- 3. Structural Requirements:
 - a. The CIPP shall be designed as per ASTM F1216, Appendix X1. The CIPP design shall assume no bonding to the original pipe wall.
 - b. The Contractor must have performed long-term testing for flexural creep of the CIPP pipe material installed by his Company. Such testing results are to be used to determine the long-term, time dependent flexural modulus to be utilized in the product design. This is a performance test of the materials (Tube and Resin) and general workmanship of the installation and curing. A percentage of the instantaneous flexural modulus value (as measured by ASTM D790 testing) will be used in design calculations for external buckling. The percentage, or the long-term creep retention value utilized, will be verified by this testing. Values in excess of 50% will not be applied unless substantiated by qualified third party test data. The materials utilized for the contracted project shall be of a quality equal to or better than the materials used in the long-term test with respect to the initial flexural modulus used in design.
 - c. The layers of the cured CIPP shall be uniformly bonded. It shall not

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be possible to separate any two layers with a probe or point of a knife blade so that the layers separate cleanly or the probe or knife blade moves freely between the layers. If separation of the layers occurs during testing of field samples, new samples will be cut from the work. Any reoccurrence may cause rejection of the work.

- d. The CIPP shall be classified as conforming to the following structural properties:

MINIMUM PHYSICAL PROPERTIES		
Property	Test Method	Cured Composite
Modulus of Elasticity	ASTM D790 (short term)	250,000 psi
Flexural Strength	ASTM D790	4,500 psi
Compressive Strength	ASTM D695	6,500 psi
Tensile Strength (for pressure pipe only)	ASTM D638	3,500 psi

- e. The required structural wall thickness shall be based as a minimum on the physical properties listed above, the design equations in ASTM F1216, Appendix X1 (as referenced by ASTM F2019), and the following design parameters:

- 1) Pipe condition: Fully deteriorated.
- 2) Minimum design safety factor: 2.0.
- 3) Percentage ovality of original pipe: 2.0%.
- 4) Soil density: 120 lbs/ft³.
- 5) Traffic Loads: HS-20-44 per AASHTO highway loading.
- 6) Soil Modulus: 500 psi.
- 7) Groundwater depth shall be ground surface at a minimum or the elevation of the 100 year floodplain water surface, whichever is greater”, in order to account for all reasonable anticipated future loadings;
- 8) Long Term Flexural Modulus Retention: 50%
- 9) Soil depth: maximum distance in feet measured between the crown of the pipe and the highest point of soil cover over the length of continuous CIPP section.
- 10) The liner shall be designed for a minimum fifty-year service life under continuous loading conditions.

- f. Contractor shall submit design calculations in accordance with ASTM F1216 that substantiate the CIPP wall thickness for each continuous length of CIPP installed. The required CIPP wall thickness shall be uniform from CIPP start point to CIPP finish

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point with no deviation in thickness.

4. Acceptable Manufacturer
 - a. Vendors must have approval through Fair Oaks Ranch Standards Committee prior to product use and must meet all requirements set forth in this Specification Item No. 901.

901.5 CONSTRUCTION

1. Installer Qualification Requirements
 - a. Installation of the CIPP products shall be performed by a work force that is experienced and certified in installation of the products. The installer shall be certified by the CIPP product manufacturer to have been trained and approved in the installation of their CIPP products and have a minimum of 3 years total experience with the product. The Contractor shall submit such certification of hot water or steam cured CIPP Installer to Owner. Contractor shall also submit to Owner at least five (5) recent references of the CIPP installer, indicating successful installation of proposed hot water or steam cured CIPP on projects of similar size and scope. Installer's project manager must have a minimum of 3 years of CIPP installation experience and must be on- site during the installation of the CIPP products
2. Installer Equipment Requirements
 - a. Installer shall only use hot water or steam curing equipment that has been certified and approved for use by the CIPP product manufacturer.
3. Public Notification
 - a. The Contractor shall maintain service usage throughout the duration of the project. In the event that a service will be out of service, the maximum amount of time of no service shall be 8 hours for any property served by the sewer. A public notification program shall be implemented, and shall as a minimum, require the Contractor to be responsible for contacting each home or business connected to the sanitary sewer informing them of the work to be conducted, when the sewer will be offline, and any alternative method of service that may be provided. The Contractor shall also provide the following:
 - b. Written notice to be delivered to each home or business two business days prior to the beginning of work being conducted on the section, and a local telephone number of the Contractor they can call to discuss the project or any problems which could arise.

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- c. Personal contact with any home or business which cannot be reconnected within the time stated in the written notice.
 - d. Inform Fair Oaks Ranch Inspection Department 48 hours prior to starting the work.
- 4. Protection
 - a. The Contractor shall provide for the general safety of workers, pedestrians and traveling public throughout the project. Existing surface improvements and underground facilities and utilities shall also be protected. Damage caused by the Contractor shall be repaired at his own expense. Protection to be provided shall include but not be limited to:
 - b. Provide barricades, warning lights and signs for excavations created by point repairs and/or excavation pits. Conform to requirements of TxDOT, City of Fair Oaks Ranch, Bexar County, or any other governing entity, and of contract documents.
 - c. Protection of Manholes/Structures: Install all pulleys, rollers, bumpers, alignment control devices and other equipment required to protect existing manholes/structures, and to protect the pipe from damage during installation. Lubrication may be used as recommended by the manufacturer. Under no circumstances will the liners be stressed beyond their elastic limit.
 - d. Do not allow sand, debris, or runoff to enter sewer system.
 - e. Verify location of all underground utilities and facilities potentially impacted by rehabilitation or other related project activities and take necessary precautions to provide protection from damage. Damage caused by the Contractor shall be his responsibility and repaired at no additional cost to Fair Oaks Ranch.
 - f. Protect the liner and components during all phases of work including, but not limited to hauling, installation, entry into the entry pit, and prevention of scarring or gouging of the liner, pipe or components.
 - g. Contractor will be responsible for monitoring weather prior to planning a CIPP tube insertion to account for a sufficient duration of tube wet out and insertion and curing in order to ensure that wet weather that will prevent access to the project site is accounted for. Contractor's failure to account for oncoming weather will be Contractor's sole responsibility which may extend to removal of damaged or improperly cured CIPP resulting from interrupted CIPP construction process.

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- h. Contractor shall notify owner 72 hours prior to liner wet out process for approval. Weather conditions and on-site conditions need to be considered.
 - i. One (1) hour prior to liner being installed, Contractor must televise host pipe with Inspector present to ensure no pipe condition changes have occurred.
- 5. Access Pit Location
 - a. Location and number of insertion or launching pits will be chosen by the Contractor and approved by Fair Oaks Ranch, and will typically be located at or near existing or proposed manholes or junction boxes, Points of Intersection (P.I.) in the line, at logical breaks in the construction phasing, or at locations to comply with access or maintenance requirements. The ends of the insertion excavation pit shall be sloped 2:1 or flatter, or proper shoring devices shall be used. Pits shall be placed and located to minimize the total number of pulls and maximize the length of CIPP, within the constraints of maintaining service and access and other requirements. When excess ground water is encountered, it shall be removed by the Contractor, and will be considered incidental to the project.
- 6. Sewage Bypass
 - a. A detailed bypass plan shall be submitted by contractor and approved by Engineer and Owner prior to starting work. The bypass plan shall be developed in accordance with Item No. 864-S1, "Bypass Pumping-Small Diameter Sanitary Sewers" or No. 864-S2, "Bypass Pumping-Large Diameter Sanitary Sewers".
- 7. Cleaning and Television Inspection
 - a. Before installing the new pipe, the existing sewer shall be cleaned and inspected per Item No. 866, "Sewer Main Television Inspection" and Item No. 868, "Sanitary Sewer System Cleaning". Notify Fair Oaks Ranch Inspection Department of any conditions which may prevent proper installation of the liner. All CCTV work will confirm active laterals and location.
- 8. Point Repairs and Obstruction Removal
 - a. Fair Oaks Ranch shall be notified and shall approve any point repair or obstruction removal before it is constructed. Point Repairs and Obstruction Removals shall conform to Item No. 1103, "Point Repairs and Obstruction Removals."
- 9. Pipe Leakage Control

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- a. Contractor shall stop infiltration or leakage into the existing pipeline to prevent contamination of resin in liner.
10. Operation
- a. CIPP installation shall be in accordance with ASTM F1216, Section 7, or ASTM F1743, Section 6, and manufacturer's recommendations with the following modifications:
 - b. Resin Impregnation – The quantity of resin used for tube impregnation shall be sufficient to fill the volume of air voids in the tube with additional allowances for polymerization shrinkage and the loss of resin through cracks and irregularities in the original pipe wall. A vacuum impregnation process shall be used. To ensure thorough resin saturation throughout the length of the felt tube, the point of vacuum shall be no further than 25 feet from the point of initial resin introduction.
 - c. After vacuum in the tube is established, a vacuum point shall be no further than 75 feet from the leading edge of the resin. The leading edge of the resin slug shall be as near to perpendicular as possible. A roller system shall be used to uniformly distribute the resin throughout the tube. If the installer uses an alternate method of resin impregnation, the method must produce the same results. Any alternate resin impregnation method must be proven.
 - d. Tube Insertion – The wetout tube shall be positioned in the pipeline using either inversion or a pull-in method. Under the inversion method, care shall be taken during the inversion process so as not to over-stress the tube. If pulled into place, a power winch should be utilized and care should be exercised not to damage the tube as a result of pull-in friction. The tube should be pulled-in or inverted through an existing manhole or approved access point and fully extended to the next designated manhole or termination point. The contractor shall install a gauge to monitor the pulling force of the pulled in tube. A written log shall be kept noting the pulling force and any fluctuations in the pulling force. The force shall not exceed the manufacturer's recommendations. Any occurrences exceeding the manufacturer's recommendations will be cause for rejection of work.
 - e. The manufacturer shall provide the minimum pressure required to hold the tube tight against the existing conduit, and the maximum allowable pressure so the tube is not damaged. These pressure ranges shall be maintained until the inversion has been completed. A temporary water meter shall be installed on the fire hydrant, if used for inversion process. The cost to coordinate and install the meter for construction purposes shall be at the Contractor's expense.

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- f. Temperature gauges shall be placed between the impregnated tube and the existing pipe at the invert level of each end to monitor the temperatures during the cure cycle. A written log shall be kept and submitted to the owner. Any invalid temperature readings not recommended from the manufacturer will be cause for rejection.
- g. The curing shall be accomplished by utilizing hot water or steam under hydrostatic pressure in accordance with the manufacturer's recommended cure schedule. After the tube is cured, the new pipe shall be cooled to a temperature below 100° F (38° C) before relieving the internal pressure within the section. In addition, care shall be taken during cool down so that a vacuum will not develop that may damage the newly installed pipe.
- h. The finished pipe shall be continuous over the entire length of an inversion run and be free of dry spots, lifts, and delaminations. If these conditions are present, the contractor shall remove and replace the CIPP in these areas at no cost to Fair Oaks Ranch.
- i. Branch connections or service reconnections shall be reopened without excavation, utilizing a remote controlled cutting device, monitored by a video TV camera. The Contractor shall certify he has a minimum of 2 complete working cutters plus spare key components on the site before each inversion. Unless otherwise directed by the owner or his authorized representative, all laterals will be reinstated. Open cut excavation for service reconnections will only be allowed if it has been approved in writing from a Fair Oaks Ranch Inspector. Service reconnections shall be in accordance with Item No. 1109, "Sanitary Sewer Lateral Stub Outs or Reconnections." Contractor shall provide all coupons removed as part of the reinstatement of service process to confirm that
 - a) the appropriate number of service connections has been made and
 - b) no coupons were left in the pipe to create an obstruction.

11. Clean Up

- a. Upon acceptance of the installation work and testing, the Contractor shall restore the project area affected by the operations to a condition at least equal to that existing prior to the work.

901.6 TESTING

1. Chemical Resistance - The CIPP shall meet the chemical resistance

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requirements of ASTM F1216, Appendix X2 except as modified herein. Table X2.1 of ASTM F1216 shall be modified as follows. It is required that CIPP samples with and without plastic coating meet these chemical testing requirements. Proof of chemical resistance test shall be provided to the Engineer at least 15 days prior to commencement of work.

<u>Chemical Solution</u>	<u>Concentration %</u>
Tap water	pH of 5 to 11
Acids	pH not less than 5.0
Gasoline	Total BETX limit of 100 mg/L
Oil & Grease	50 mg/L
Total Phosphorous	40 mg/L
Sodium Hydroxide and other bases	pH not higher than 11.0 Strong
Ferric Chloride	3 mg/L
Sodium Hypochlorite	3 mg/L

2. Hydraulic Capacity - The Contractor shall submit design calculations verifying that the CIPP shall have flow capacity equal to at least 100 percent of the existing pipe. Flow capacity calculation shall be based on Manning's formula using n (Manning's roughness coefficient) of 0.013 for existing sewer. The "n" value for CIPP used shall have been verified by an independent testing laboratory (third party testing) which the Contractor shall provide.
3. For each CIPP liner section installed, the Contractor shall obtain CIPP samples large enough to provide a minimum of three specimens and a recommended five specimens for flexural testing. CIPP samples shall be prepared and physical properties tested in accordance with ASTM F1216 or ASTM F1743, Section 8, using either method proposed. The properties must meet or exceed the values listed in Section 901.2.3.d. If test results do not meet the properties, Contractor shall remove and replace CIPP at no cost to Fair Oaks Ranch.
4. Visual inspection of the CIPP shall be in accordance with ASTM F1743, Section 8.6 and Item No. 866, "Sewer Main Television Inspection."

901.7 MEASUREMENT

All sewer pipes will be measured from center of manhole to center of manhole or end of main.

901.8 PAYMENT

Payment for items included in this specification shall be in accordance with the pay items listed below. Work included in these items shall include and the price

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provided by the Contractor will be considered as full compensation for furnishing and placement of all materials, labor, tools, equipment, testing, preparation, repairs, inspection, phasing, protection, work execution and any other work necessary to complete the project. Payment will be made under the following:

1. INSTALL CIPP SANITARY SEWER PIPE (HOT WATER OR STEAM CURED), ALL DEPTHS (PAY ITEM 901.1): The inserted pipe will be paid for at the contracted bid price per linear foot of pipe installed using the CIPP method complete in place for the type and size constructed. Said price shall be full compensation for furnishing all materials, all submittals, sealing materials at manholes/structures and annulus (if required), launching pits, receiving pits, post testing, shoring, bedding, backfilling, curing, site restoration, and all necessary, corresponding, and related work to complete the project. Site restoration (including but not limited to replacement of pavement, sidewalks, driveways, curbing, landscaping, sodding, etc.) will not be paid for separately and shall be considered subsidiary to the CIPP rehabilitation bid items.
2. SERVICE RECONNECTION: Measurement and payment for Sanitary Sewer Service Connections shall be made in accordance with Item No. 1109, "Sanitary Sewer Lateral Stub Outs or Reconnections."
3. POINT REPAIRS AND OBSTRUCTION REMOVAL: Measurement and payment for point repairs and obstruction removals shall be in accordance with Item No. 1103, "Point Repairs and Obstruction Removals."
4. EXTRA LENGTH POINT REPAIR, ALL DEPTHS: Measurement and payment for extra length point repairs shall be in accordance with Item No. 1103, "Point Repairs and Obstruction Removals."
5. BYPASS PUMPING: Payment will be made in accordance with Fair Oaks Ranch Specifications for Construction Item No. 864-S1 "Bypass Pumping-Small Diameter Sanitary Sewers" or No. 864-S2, "Bypass Pumping-Large Diameter Sanitary Sewers". There will be no additional or separate payment for documentation, required submittals, and associated or related work.
6. TELEVISION INSPECTION: Payment will be made for television inspection of the sewer line prior to pipe rehabilitation in accordance with Fair Oaks Ranch Specifications for Construction Item No. 866 "Sewer Main Television Inspection". There will be no additional or separate payment for "post-TV" video inspection, documentation, required submittals, and associated or related work.

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7. CLEANING: Payment will be made for cleaning in accordance with Fair Oaks Ranch Specifications for Construction Item No. 868 "Sanitary Sewer System Cleaning". There will be no additional or separate payment for documentation, required submittals, and associated or related work.

--End of Specification--

ITEM NO. 902
CONSTRUCTION SAFETY AND HEALTH PROGRAM

9021 **DESCRIPTION:** This item shall govern the preparation and implementation of the contractor's Construction Safety and Health Program for the specified project. The guidance document is not intended to be an all-inclusive listing of safety and health procedures. This guidance document outlines safety management credentials, general safety activities, procedures, and reporting requirements for the contractor to prepare a project specific Safety and Health Plan. The contractor shall prepare and implement their approved project specific Construction Safety and Health Plan throughout the construction phase of the project.

The contractor shall submit the project specific Construction Safety and Health Plan to a Fair Oaks Ranch safety representative prior to the beginning of the construction phase of the project. This plan will be reviewed for information outlined in the appendix of this specification in order to verify that the contractor recognizes the requirement to comply with OSHA regulations. The Fair Oaks Ranch Safety Representative will review for compliance and issue a concurrence/nonconcurrence on the Construction Safety and Health plan. When the plan complies with the requirements the concurrence shall be sent to the project engineer/inspector and documented on the Contractor Safety and Health Plan Tracking Log by the Fair Oaks Ranch safety representative. The Contractor shall be responsible for meeting or exceeding applicable OSHA requirements and implementing the plan during construction.

9022 **INTRODUCTION:** This Construction Safety and Health Program for Contractor's has been written to direct and control the activities of all persons performing and managing construction projects for Fair Oaks Ranch, in order to prevent accidents, injuries including equipment and property damage.

The term "Contractor" in this document refers to the general or prime Contractor for the specific construction project. It shall be noted that while the Contractor is responsible for the project safety program, subcontractors are required to work under the conditions of the Contractor's Construction Safety and Health Program.

The term "Construction Safety and Health Program" in this document refers to the Contractor's Project Specific Safety Plan. It is expected that each contractor will utilize their company's Construction Safety and Health plan as a foundation for the site-specific program.

The Construction Safety and Health Program is not intended to be an all-inclusive listing of safety and health procedures. It is a guidance document which outlines general safety activities, procedures, and reporting requirements to be implemented by the Contractor.

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Contractors working on Fair Oaks Ranch construction projects shall have their own safety and health plan, which complies with the Occupational Health & Safety Administration's (OSHA) requirements of a Construction Safety and Health Program and with all applicable regulations. Individuals working on Fair Oaks Ranch construction projects are responsible for knowing all safety rules, being alert and practicing good, sound judgment in the performance of their jobs, even if specific safety rules are omitted from the Construction Safety and Health Program. Subcontractors and their employees are responsible for following all requirements of the Construction Safety and Health Program. Guidance can be obtained at: <http://www.osha.gov/doc/outreachtraining/htmlfiles/osha2202.html>

Safety guidelines shall be understood and followed by all individuals while on the job site. Violation of these guidelines, either in job performance or in the letter of Construction Safety and Health Program, will result in work stoppage until safety requirements are properly fulfilled. The Contractor's project manager shall review the specific violation and identify/implement proper corrective action prior to continuance of the work activity for which the violation was identified.

The Contractor's Project Specific Construction Safety and Health Program shall be prepared and submitted to Fair Oaks Ranch prior to the Pre-Construction Conference and will be reviewed prior to the issuance of a notice to proceed with Construction Phase Activities.

9023

SAFETY RESPONSIBILITIES, AUTHORITY AND ACCOUNTABILITY:

The principal organizations involved in carrying out the Construction Safety and Health Program include the financing and regulatory agencies, the facility Owner/Operator, Fair Oaks Ranch, and its representative, the preparer of the construction documents (the Engineer), the Contractor Project Manager, the Safety & Environmental Health Professional (Representative), the Construction Contractor, and all Subcontractors. The responsibilities for each of these organizations and representatives are presented in the following paragraphs.

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REGULATORY AGENCIES: The primary agency with safety authority for the project is the Federal Occupational Safety and Health Administration (OSHA). OSHA requirements are published in 29 Code of Federal Regulations (CFR), Subtitle B, Chapter XVII, Part 1926, entitled, *Safety and Health Regulations for Construction*. The following sections describe regulations for most activities that will be conducted in constructing the water, sewer, chilled water, and recycled water systems:

1. Subpart A - General, Inspections, Administrative
2. Subpart B – General Interpretations, Rules
3. Subpart C – General Safety and Health Provisions
4. Subpart D - Health and Environmental Controls

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5. Subpart E - Personal Protective Equipment and Life Saving Equipment
6. Subpart G - Signs, Signals and Barricades
7. Subpart H - Materials Handling, Storage Use and Disposal
8. Subpart I – Tools, Hand and Power
9. Subpart J – Welding and Cutting
10. Subpart K – Electrical
11. Subpart L – Scaffolding
12. Subpart M – Fall Protection
13. Subpart N - Cranes, Derricks, Hoists, Elevators, and Conveyors
14. Subpart O – Motor Vehicles, Mechanized Equipment
15. Subpart P - Excavations, Trenching and Shoring
16. Subpart Q – Concrete and Masonry Construction
17. Subpart R – Steel Erection
18. Subpart S – Underground Construction
19. Subpart X – Ladders
20. Subpart Y – Commercial Diving Operations
21. Subpart Z – Toxic and Hazardous Substances

Also, 29 CFR, Subtitle B, Chapter XVII, Part 1910 covers safety activities related to health requirements, medical monitoring, and exposure limits to chemical substances. OSHA reserves the right to review any Construction Safety and Health Program and to accept or reject all or part of those documents. OSHA also has the authority to review safety records during or after construction to confirm that the project is being/was constructed in a safe manner and that it meets or exceeds all applicable safety standards requirements. Additional guidance can be obtained at:

http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9707

Agencies with secondary responsibilities for the project include, but are not limited to, the Texas Commission on Environmental Quality (TCEQ), the City of Fair Oaks Ranch (CoSA), the Texas Water Development Board (TWDB), Bexar County, and the Texas Department of Transportation (TxDOT), where construction occurs within a state right-of-way. Construction in a TxDOT right-of-way shall follow the 2004 Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges, which generally references OSHA requirements. Also, the Texas Manual on Uniform Traffic Devices shall be consulted for traffic safety guidance when working in public roadways.

Any of the above agencies may send representatives to the job site, without prior notice, which may inspect, review, or comment on safety issues during their visits. Fair Oaks Ranch requires that all Contractor job sites shall be immediately accessible to appropriate local, State, and Federal agency safety and environmental health officials.

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1. Fair Oaks Ranch: The Owner of the Water, Wastewater, and Recycle Water Systems and all associated design and construction is Fair Oaks Ranch (Fair Oaks Ranch). Fair Oaks Ranch requires that all Contractors have a project-specific safety and health plan and that it comply with OSHA regulations and this Construction Safety and Health Program. Once Fair Oaks Ranch has accepted the Construction Safety and Health Program, the Construction Contractor shall implement the plan. The Contractor will assure that its Subcontractors comply with all safety requirements, as Fair Oaks Ranch does not have a contractual relationship with the Subcontractors.
2. Contractor Project Manager: The Contractor Project Manager must be a “competent” person who has been designated as the field representative by the Contractor. A “competent” person is one that has been trained in excavation safety, work zone traffic control, confined space entry, and hazardous materials responsibilities and has the authority to take prompt, corrective measures to eliminate problems.

Competent person training and certification is required and is available by training programs such as the Texas Engineering Extension Service (TEEX) Construction Training Program, or similar programs offered by different agencies throughout the country. Additionally, this person must have authority to perform such duties as sign pay requests, negotiate change orders, etc.

The Project Manager’s primary responsibility is to conduct construction activities, in compliance with applicable OSHA safety regulations and Fair Oaks Ranch safety and environmental health requirements, to assure completion of the project according to contract documents. The Project Manager is also responsible for regular review of safety documentation and reports and forwarding such documents to Fair Oaks Ranch.

If the Project Manager observes a violation of a safe work practice, he or she shall take immediate appropriate corrective action and shall advise the Fair Oaks Ranch Construction Observer/Inspector (C.O.I.), of all corrective actions implemented. All violations and corrective action shall be documented in accordance with contract documents. The Project Manager shall be present during all Construction Activities on the project site. The Contractor shall also provide a list of alternate competent persons at the project site.

3. Safety and Environment Health Representative: Fair Oaks Ranch will designate a Fair Oaks Ranch Safety and Environmental Health Representative for the project. The overall responsibility of the Safety and Environmental Health Representative is to ensure that the Contractor and Subcontractors are executing construction in accordance with appropriate safety and environmental health regulations, and to perform the safety and environmental health review activities specified in the

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Construction Safety and Health Program.

There may be more than one (1) such representative assigned by Fair Oaks Ranch to a project. In such an event, the Fair Oaks Ranch Contractor Safety and Environmental Health Liaison shall take the lead.

The Safety and Environmental Health Representative will be available to advise the Project Manager and/or Fair Oaks Ranch "C.O.I." during random visits and/or by specific request. The Safety and Environmental Health Representative's duties include, but are not limited to:

- a. Performing safety evaluations of the work in-progress;
- b. Meeting and conferring in a supportive, inclusionary, manner with contractors regarding safe work-related matters;
- c. Reporting on safety observations to the Contractor's on-site supervisor and to the Fair Oaks Ranch Director of Safety & Environmental Health;
- d. Providing safety reports to Fair Oaks Ranch. Such reports will include results of observations with specified corrective measures;
- e. Monitoring site operations of the Prime Contractor and Subcontractors for compliance with applicable OSHA safety regulations and Fair Oaks Ranch requirements.

4. Construction Observer/Inspector: Fair Oaks Ranch will designate a Fair Oaks Ranch Construction Observer/Inspector - "C.O.I." for the project. The C.O.I. is the "Authorized Representative" of the owner (Fair Oaks Ranch) and will be assigned by the owner to observe and inspect any or all parts of the project and the materials to be used therein. The responsibility of the C.O.I. is to observe the Contractor and Subcontractors during construction activities in accordance with Fair Oaks Ranch directives, assuring completion of the project according to the plans and specifications, including the observation of the implementation and performance of the Project-Specific, OSHA- compliant, Construction Safety and Health Program.

If the C.O.I. observes a violation of a safe work practice, he or she shall immediately bring it to the attention of the Project Manager and/or the Fair Oaks Ranch Safety and Environmental Health Representative as soon as is practical as required.

The C.O.I. has the authority to direct the Contractor to stop work, at no additional cost to the contract, if the activity appears to place any

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personnel (Contractor's, Fair Oaks Ranch', subcontractors', or the general public) in a compromising and/or potentially dangerous situation.

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CONSTRUCTION CONTRACTOR: It is the Contractor's responsibility to ensure that all construction is carried out in a safe manner; that does not pose a threat to personal health or property. The Contractor's specific responsibilities include, but are not limited to the following:

- a. Preparation of a project-specific safety and health plan to be submitted to Fair Oaks Ranch for review;
 - b. Providing a safe workplace for all personnel on-site;
 - c. Enforcing the project-specific safety and health plan with all personnel and subcontractor personnel;
 - d. Educating and training construction personnel on safety and health requirements, safe equipment and vehicle operation and ensuring that all subcontractor personnel are adequately trained and informed;
 - e. Conducting routine safety meetings with on-site personnel and subcontractors;
 - f. Recording all incidents and reporting them to Fair Oaks Ranch;
 - g. Maintaining a drug-free workplace.
1. Safety and Health Activities – Administrative: Certain Safety and Environmental Health activities shall be routinely handled by the Contractor's representative. Safety supervision procedures such as conducting safety meetings, routine safe work inspection and reporting, training, education and notification of safety requirements and pre-qualifying employees based on physical capabilities shall serve to help prevent accidents, injuries, and property or equipment damage.
 2. Safety Meetings: Safety meetings shall be conducted to review past activities, plan for new or changed operations, review pertinent information on specific task-related hazards, and remind job personnel of the importance of working safely. A routine safety meeting schedule shall be specified in the Contractor's Construction Safety and Health Program.
 3. Safety Training and Education: Employees shall be afforded the appropriate safety and health training at the start of employment, and at intervals appropriate to maintain safety and health awareness in the

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performance of their jobs. This training is the responsibility of the Contractor and shall be administered by qualified personnel.

A minimum of two (2) employees at each job site, shall have certified First Aid and Cardio-Pulmonary Resuscitation (CPR) training to ensure adequate and immediate response to on-the-job injuries, illnesses and accidents. In addition, all training deemed necessary for the operation of equipment and performance of specific tasks shall be based on current manufacturers, OSHA, and Fair Oaks Ranch requirements. All supervisors shall be trained with respect to their responsibility to maintain a safe working environment and preparation and maintenance of safety and health documents.

Safety and health education and awareness training shall be promulgated by the Contractor, including the posting of OSHA and other applicable safety and health regulations and requirements. Such information shall inform employees at a project site not only what the safety and health requirements are, but also of what rights they have to a safe work environment.

4. Safety and Health Inspections: The Construction Safety and Health Program shall provide for frequent safety reviews of the job site, equipment, and materials to ensure compliance with the site's approved safety and health plan. These reviews shall be conducted by qualified (Contractor) personnel and shall be documented.

In addition, the Contractor's quality assurance personnel shall perform daily safety and environmental health reviews, as a part of their quality assurance activities. If safety and health deficiencies are identified in a review, a follow-up review shall be accomplished by the contractor's management to ensure the deficiency has been corrected within a reasonable amount of time. All deficiencies shall be corrected as soon as possible. Specific circumstances which require a separate safety evaluation include:

- a. When persons are working in an excavation, the excavation, adjacent areas, and protective systems shall be monitored continually throughout the work shift and as needed after rain or other hazard-increasing events. This monitoring shall be detailed in the Project-Specific Safety and Health Plan as a routine activity;
- b. All motor vehicles and mobile equipment shall be inspected at regular intervals by a representative of the Contractor. These safety inspections shall be documented, and files maintained. Such documentation shall be regularly reviewed by the Fair Oaks Ranch Safety

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and Environmental Health Representative, and may be reviewed by the Fair Oaks Ranch C.O.I.

5. Reporting: The Project Manager is responsible for reporting all safety-related incidents and accidents to Contractor Management, Fair Oaks Ranch C.O.I., and Fair Oaks Ranch Safety and Environmental Health Representative. All such incidents and accidents must be reported by the Project Manager as soon as is possible; meaning without undue delay or hesitation. Major accidents, which are reportable to OSHA directly, include: 1. a fatal injury and/or 2. three (3) or more persons admitted to a medical facility. Such major accidents shall be reported immediately.

Such reporting procedures shall be outlined in the Contractor's Construction Safety and Health Program. This procedure shall identify personnel and their phone numbers for such reporting.

All incidents or accidents shall require the contractor to revise and resubmit their construction safety and health plan for review of how said incident or accident was taken into consideration for future avoidance.

6. Physical Qualifications of Employees: All persons shall be physically, medically and emotionally qualified to perform the essential functions of their job description. Appropriate medical monitoring shall be conducted when required by law and whenever an accident or injury has occurred.

The provisions contained in 28 CFR, Part 36, entitled *The Americans with Disabilities Act*, prohibiting discrimination against any employee based on his or her disability, shall be adhered to.

7. Alcohol and Drug-Free Workplace: All persons working on Fair Oaks Ranch job sites are required to maintain an alcohol and drug-free workplace. At no time while on the premises may employees use, or be under the influence of, alcohol, narcotics, intoxicants or similar mind-altering substances. Any Contractor or Subcontractor who is aware of a person using the aforementioned substances shall take action consistent with applicable laws and regulations. Texas workers compensation insurance does not cover incidents, injuries or illnesses caused by the use of alcohol, narcotics, intoxicants or mind-altering substances.
8. Safety and Health Activities - Job Site: Certain safety and health activities apply more to specific tasks at the job site and are appropriate for supervisors as well as technicians. These activities include knowledge of project-specific safety and health requirements, use of personal protective equipment, safe operation of vehicles, and other equipment and proper hazard communication (HAZCOM) and emergency response actions.

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Guidance on specific task-related safety and health activities may be found in selected sections of the Fair Oaks Ranch Comprehensive Safety Program Policies and Procedures Manual, 29 CFR Parts 1926 and 1910, the Texas Hazard Communication Act, in the U.S. Army Corps of Engineers Safety and Health Requirements Manual EM 385-1-1, and at: <http://www.osha.gov/doc/outreachtraining/htmlfiles/osha2202.html>

9. Site-Specific Safety and Health Procedures: Safety and health procedures associated with specific activities (such as trenching, soil stockpiling, placement of pipe, tank installation, pump and other equipment installation etc...) shall be explicitly covered in the Contractor's Construction Safety and Health Program. The Contractor shall identify all activities associated with the construction of his/her project and describe safety and health procedures for any applicable activity. The minimum basic outline for a safety and health plan is provided in the Appendix. This safety and health plan will be reviewed and approved by Fair Oaks Ranch and shall include:
 - a. The Construction Contractor's "competent" person shall oversee safe work practices at the project site in accordance with applicable OSHA regulations;
 - b. Procedures for trenching and related activities shall follow the requirements of 29 CFR 1926, Subpart P, and Item 402 of TxDOT's 2004 *Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges* to prevent trench cave-ins and related injuries;
 - c. All crane operations and lifting of heavy or cumbersome objects, such as associated with tank installation, shall comply with 29 CFR 1926, Subpart N, to prevent personal injury and equipment damage;
 - d. Persons entering confined spaces shall have completed all proper training and understand how and when to sample and identify confined spaces according to 29 CFR 1910.146. A confined space rescue plan shall also be identified in the project-specific safety and health plan. Contractors should refer to the Fair Oaks Ranch' *Confined Space Entry Program* for Guidance;
 - e. Lockout/tagout procedures for electrical and mechanical equipment and hazards at each job site shall be identified and described in the project-specific safety and health plan. Contractors should refer to the Fair Oaks Ranch *Lockout/Tagout/Blankout Program* for guidance.

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- f. Procedures for traffic control safety according to Item 502 of TxDOT's 2004 *Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges*. Contractors should refer to the Fair Oaks Ranch *Work Zone Traffic Control Program* for guidance;
- g. Procedures related to storage and handling of hazardous materials;
- h. Procedures for utility awareness (including, but not limited to, the location and identification of utilities such as gas, electrical, telephone, water, sewer, recycle water, cable systems, etc.).

Personal Protective Equipment: The use of personal protective equipment (PPE) is an important step in preventing accidents, injuries and illnesses. PPE ranges from every day, mandatory protective equipment to fully-encapsulating equipment, depending on the specific task and job site. One circumstance which shall require a higher level of PPE is construction in areas of contaminated soils. Each Contractor, Subcontractor, and individual employee shall think through the job(s) to be performed and prepare a job hazard analysis (JHA) to identify the proper PPE. The project-specific Construction Safety and Health Program shall identify different types of PPE and how and when they will be used.

All persons working in, visiting and/or inspecting Fair Oaks Ranch job sites shall wear the proper PPE, regardless of their actual participation in the work being conducted. Contractors should refer to the Fair Oaks Ranch *Personal Protective Equipment Program* for guidance.

In general, the following types of PPE shall be provided by the Contractor and made available to all persons working at the Fair Oaks Ranch job sites:

- a. Head protection;
- b. Reflectorized vests or other clothing;
- c. Eye and face protection;
- d. Hearing protection;
- e. Safety-toed footwear;
- f. Hand and arm protection;
- g. Respiratory protection;

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- h. Fall protection;
- i. Protective clothing and other special body protection.

Contractor shall post notices directing personnel to use specific PPE, such as in that listed above; i.e.:

- a. All construction sites shall have signs posted instructing the use of hard hats. All hard hats used at Fair Oaks Ranch job sites shall conform with American National Standard Institute (ANSI) Code Z89.1;
- b. Areas where generators, jack hammers, etc., and other loud equipment or vehicles are in use, in excess of a potential exposure of 85 dBA, shall have signs posted requiring the use of the appropriate hearing protection.

- 10. Safe Operation of Construction Equipment: All vehicles and equipment shall be operated in a safe manner to prevent personal injury or equipment damage. The Contractor shall not permit untrained or unqualified personnel to operate any vehicles or equipment. Operators of any equipment or vehicles shall be able to read and understand the signs, signals and operating instructions in use. Seat belts shall be worn by vehicle operators and equipment operators if the equipment is so equipped.
- 11. Hazard Communication and Emergency Response: According to the Community Right-to-Know Act, 29 CFR 1910.1200, all persons on and off the job site must have access to information on hazardous materials and substances which are used or encountered in the workplace. Hazardous and regulated chemicals shall be labeled and material safety data sheets (MSDS) shall be available, if applicable. Contractors should refer to the Fair Oaks Ranch *Hazard Communication Program* for guidance.

Emergency telephone numbers and reporting instructions shall be conspicuously posted at all job sites. A reliable means of communication shall be provided from each job site to outside emergency responders.

- 12. First-Aid and Medical Services: Each job site shall be equipped with a first-aid kit, and other emergency equipment, supplied by the Contractor and/or each Subcontractor. Medical services and first-aid required by OSHA are described in 29 CFR 1926.50. Proper equipment for emergency transportation of an injured employee to a doctor or hospital shall be available. Maps, telephone numbers, and street addresses of the nearest emergency medical facility and/or hospital shall be identified in the Project-Specific Construction Safety and Health Program. This information shall be posted in a clear, accessible location available to all

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personnel on-site. This material must also be included in all training for contractor personnel.

13. On-Site Fire Prevention: The Contractor shall specify a fire protection and prevention plan within the project-specific Construction Safety and Health Program, and shall provide for all appropriate firefighting equipment required by 29 CFR 1926, Subpart F. The Contractor shall ensure clear access to all available firefighting equipment and shall maintain equipment at all times. The Contractor shall ensure that all on-site equipment is conspicuously located. Contractors should refer to the Fair Oaks Ranch *Hot Work Permit Program* for guidance.

Fire protection includes the provision of a water supply, extinguishers and other equipment, as well as, proper training and/or education. Fire prevention includes the identification of ignition sources, proper storage of equipment and materials which allows access to fire exits, storage and use of flammable and combustible liquids, and other activities to prevent fires from starting. Smoking shall be prohibited except in specifically- identified and posted locations on Fair Oaks Ranch job sites.

14. Electrical Safety: Guidance for on-site electrical safety procedures may be found in the National Electric Code (NEC), 29 CFR 1926, Subpart K, and in the U.S. Army Corps of Engineers Safety and Health Requirements Manual. In general, before any work is done, the Contractor shall determine whether any part of an electrical power circuit, exposed or concealed, is located such that performance of work could bring any person or equipment into contact with it. Persons working in areas of electrical circuits shall be protected by clearance procedures and grounding. Live parts of wiring or equipment shall be guarded to protect all persons or objects from harm. The Contractor shall assure that proper lockout and tagout procedures are followed. Only qualified Contractors' personnel, specifically trained in electrical work, are allowed to handle "live", or "potentially live" electrical equipment. Please refer to the Fair Oaks Ranch *Lockout/Tagout/Blankout Program* for guidance.
15. Safety Documentation: All safety and health activities shall be immediately documented by the Contractor. Copies of all documentation shall be maintained by the Contractor.
16. Routine Safety Inspections and Training: Routine safety and health inspections, and training activities, shall be recorded including the date, scope of the inspection or training, person performing the inspection or training, persons attending, and the name and signature of the person preparing the report. Forms for such reporting shall be developed by the Contractor. A current inspection and training file on each project shall be maintained by the Contractor.

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17. **Incident/Accident Reporting:** All incidents/accidents that occur to persons or property shall be investigated and reported by the Contractor on an incident/accident report form (Report form to be provided by the Contractor in his/her Project Specific Construction Safety and Health Program). Exposures to toxic materials and harmful physical agents shall also be documented by the Contractor in accordance with applicable regulations. The Contractor shall provide copies of incident/accident reports to Fair Oaks Ranch Construction Inspection Division and the Fair Oaks Ranch Safety and Environmental Health Representative.
18. **Workers Compensation Claims:** The Construction Contractor must provide a "Certificate of Coverage" to the owner showing statutory worker's compensation insurance coverage for all employees who will be performing construction of the project, for the duration of the project. The Construction Contractor shall post, on each project site, a conspicuous notice, written in the form prescribed by the Texas Worker's Compensation Commission, informing all persons providing services on the project that they are required to be covered; and stating how a person may verify coverage and report lack of coverage.

These requirements are a condition of the contract general conditions. Failure to comply with these requirements is a breach of contract by the Construction Contractor.

All Subcontractors must also have a "Certificate of Coverage" verifying Workers Compensation coverage. These "Certificates of Coverage" shall be presented by the Contractor to Fair Oaks Ranch prior to the beginning of any construction activities.

The Fair Oaks Ranch Risk Management Division must review and approve "Certificates of Coverage" prior to the beginning of construction.

9026 **MEASUREMENT:** Measurement of the Item, "Safety and Health Program," as specified herein, will not be measured for payment.

9027 **PAYMENT:** No direct payment shall be made for incidental cost associated with preparation and implementation of the Contractor's project specific Construction Safety and Health Program.

9028 **APPENDIX: MINIMUM BASIC OUTLINE FOR A CONTRACTOR'S SAFETY AND HEALTH PLAN**

The following outline may be used to develop a project-specific Contractor Construction Safety and Health Program. All safety and health plans must comply with this overall Construction Safety and Health Program. A "plan" shall

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be job-specific and, in addition to expected features, shall address any unusual or unique aspects of the job or activity for which it is written.

1. Signature Sheet: Provide the title, signature, and phone number of the following:
 - a. Plan preparer (i.e. Contractor safety and health staff person, QC);
 - b. Plan approval by the Contractor (i.e., president, regional representative).
2. Background Information: List the following information:
 - a. Contractor;
 - b. Contract number;
 - c. Project name;
 - d. Brief project description, description of work to be performed, and location;
 - e. Contractor and Subcontractor's accident experience (actual lost time injury frequency for the last 12 months and their most recent Worker's Compensation Experience Modifier);
 - f. List of activities or areas which will potentially require hazardous materials analysis and management.
3. Responsibilities and Lines of Authorities:
 - a. Identification and accountability of personnel responsible for safety and health – at both corporate and project level – including both prime and sub-contractors (contracts specifically requiring safety and health, or industrial hygiene, personnel shall include a copy of their resume for acceptance by Fair Oaks Ranch);
 - b. Lines of authority and levels of authorization, including liaison with Fair Oaks Ranch C.O.I.s and Safety and Environmental Health Representatives shall be specified.
4. Subcontractors and Suppliers: If any subcontractors will be used and for major material suppliers, please provide the following:
 - a. Identification of subcontractors and suppliers;

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- b. Means for controlling and coordinating subcontractors and suppliers;
- c. Safety and health responsibilities of subcontractors and suppliers.

5. Training:

- a. List subjects to be discussed with employees during project safety and health orientation;
- b. List mandatory training and certifications which are applicable to this project (e.g., confined space entry, crane operator, vehicle operator, HAZWOPER training and certification, personal protective equipment, to name a partial list) and any other applicable requirements for periodic retraining/recertification;
- c. Identify requirements for emergency response training;
- d. Outline requirements (who attends, when given, who will conduct etc.) for supervisory and employee safety meetings.

6. Safety and Health Inspections:

- a. Discuss who will conduct safety and health inspections; when inspections will be conducted; how the inspections will be recorded; address the deficiency tracking system, follow-up procedures, etc.;
- b. Discuss how any external inspections/certifications (such as by a third party) will be incorporated and responded to by the Contractor.

7. Safety and Health Expectations, Compliance and Incentive Programs: Please discuss the following:

- a. The Contractor's written safety and health plan goals, objectives, and incident / accident experience goals for this project;
- b. Written Contractor policies and procedures for managers and supervisors safety and health accountability;
- c. Policies and procedures regarding noncompliance with safety and health requirements (to include disciplinary actions for violation of safety and health requirements);

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- d. A brief description of the Contractor's safety incentive programs (if any);
 - e. Written Contractor and Subcontractor drug testing policies.
- 8. Accident Reporting: The Contractor shall designate the procedure (who, when, hows) for who completes the following:
 - a. Exposure data (man-hours worked);
 - b. Incident / accident investigations, reports and logs;
 - c. Immediate notification of major incidents / accidents and equipment damage.
- 9. Medical Support: Outline on-site medical support and off-site medical arrangements (See Page 14, First-Aid and Medical Services for details).
- 10. Personal Protection Equipment: Outline procedures (who, when, how) for conducting hazard assessments to determine engineering resolution, followed by proper use of personal protective equipment if unable to resolve through design. List all personal protective equipment which is available and shall be used for the subject project. Also list the PPE requirements, which will be posted on the job site.

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CONSTRUCTION SAFETY AND HEALTH PROGRAM

RECEIPT AND ACKNOWLEDGMENT PAGE

I will learn the hazards of the construction project and follow all appropriate safety and health rules and procedures as stated in my company safety and health program.

I will immediately report unsafe behaviors (acts) and hazardous conditions to my supervisor and/or Contractor Project Manager.

I understand that violation of appropriate safety and health guidelines can result in work stoppage until safety and health requirements are met.

I will report all accidents and related incidents to my supervisor and or the Contractor Project Manager.

I will wear the proper personal protective equipment, regardless of my direct participation in the hazard's of work being conducted.

I will assist the overall construction safety and health effort by personally demonstrating a "safe attitude" and by forming good work habits.

I am responsible for my own safety and health and that of my fellow coworkers.

Employee's Name

Date

Supervisor's Name

Date

This RECEIPT AND ACKNOWLEDGMENT PAGE must be signed by both the Contractor employee and his/her supervisor. The supervisor will then remove the signed acknowledgment from the Construction Safety and Health Program, make a copy for the project safety file and forward a copy to the Contractor Project Manager.

- End of Specification -

ITEM NO. 903
CONSTRUCTION QC/QA PROGRAM

903.1 DESCRIPTION: This item shall govern the preparation and implementation of the Contractor's Construction Quality Control/Quality Assurance (QC/QA) Program for the specified project. The enclosed guidance document, outlines general activities, procedures and reporting requirements for the contractor to prepare a project specific QC/QA Plan. The contractor shall prepare and implement their project specific QC/QA Plan throughout the construction phase of the project.

The contractor shall submit the project specific QC/QA Plan and receive approval of the plan by Fair Oaks Ranch prior to the beginning of the construction phase of the project.

The contents and obligations of both the contractor and Fair Oaks Ranch relative to the Quality Control and Quality Assurance Program, are further addressed below.

903.2 INTRODUCTION: This Construction Quality Control/Quality Assurance (QC/QA) Program has been written to define the activities of all persons performing, managing and administering construction for Fair Oaks Ranch (Fair Oaks Ranch) and is intended to be a positive contribution toward obtaining quality construction.

This Construction QC/QA Program is only a guidance document which outlines general activities, procedures and reporting requirements of Fair Oaks Ranch. Contractors shall have their own Quality Control (QC) Plan which complies with general requirements detailed in the Appendix.

903.3 QUALITY CONTROL: The primary function of Quality Control (QC) is to establish standards of quality for construction. The Contractor's plan defines procedures to manage and control his/her own activities, all Sub-contractor's activities, and all supplier's activities ensuring the completed project conforms to the intent of the Contract Documents.

The Contractor's QC plan is the foundation for quality work. It outlines the planned quality control procedures, and is vital to the Fair Oaks Ranch Construction QC/QA Program. The plan must be comprehensive, detailed, and logical if the Contractor's quality control system is to be effective.

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1. Objective: The Contractor has the contractual responsibility to manage construction quality and inspect the work. Control is an ongoing system of planning future activities. Inspection is the process by which on-going and completed work is reviewed. The objectives of QC are to see that the Contractor has adequately planned to begin a phase of work, to eliminate deficiencies, and to follow through in accomplishing the work in accordance with the Contract Documents. The objective of inspection is to see that the work is implemented in accordance with the intent of the Contract Documents.

The responsibility for quality control lies solely with the Contractor. The Contractor must continually strive to make improvements and to keep deficiencies from resulting in their finished work.

2. Contractor Responsibilities: As stated previously, QC is the Contractor's sole responsibility. This includes, but is not limited to, the following:
 - a. Providing the quality specified in the contract documents;
 - b. Implementing and maintaining an effective QC system;
 - c. Performance of all control activities and tests;
 - d. Completion of acceptable documentation of QC activities.

The Contractor shall place a "competent" person onsite to oversee the QC system. This person, along with an approved alternate, must have full authority to act for the Contractor on all QC matters and shall be on-site during all phases of Construction activities. The responsibilities include testing, materials, workmanship, methods, and techniques to provide that all work is constructed properly by qualified, competent, and professional craftsmen and/or tradesmen. A "competent" person is one that has been trained in excavation safety, work zone traffic control, confined space entry, and hazardous materials responsibilities. Additionally, this person must have authority to perform such duties as sign pay requests, negotiate change orders, etc.

Clear and effective communication between the Contractor, Engineer, and Inspector is vital to QC which is dependent on mutual cooperation. Effective QC requires the complete cooperation of the Contractor, Engineer, and Inspector.

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The Contractor has the responsibility to make themselves totally familiar with the nature and location of the work by site visits and investigations. The Contractor shall evaluate all general and local conditions which may affect work and/or costs. The Contractor has the responsibility to review the contract documents and request clarification where necessary. All of this is accomplished by asking questions during the bidding phase or submitting Request for Information (RFI) documents during construction.

3. Quality Control Plan: The Contractor shall develop a project specific Quality Control (QC) Plan. The Contractor's QC Plan will address all definable features of construction and unusual or unique aspects of the job or activity for which it is written. The primary function of the QC Plan is for a successful execution of a realistic construction plan, by control and inspection, to insure that the required standards of quality are met and to preclude problems resulting from poor quality and/or workmanship. The QC Plan will define procedures to manage and control the contractors' own operations, site conditions, workmanship and safety, as well as his subcontractors, suppliers, manufacturers, products, and services to produce work of a specified quality while completing a project that complies with the Contract Documents, on time, and within budget. The contractor has the contractual responsibility to control construction activities, quality, inspect the work, and prepare documentation as appropriate in a timely and efficient process.

The QC Plan shall be prepared in accordance with the following concepts. Quality Control should be divided into three sub-construction phases. Each control phase provides the opportunity to prevent problems, deficiencies and misunderstandings. The phases are as follows and are further detailed in the Appendix.

4. Preconstruction Phase: Those actions done in advance of construction; advance planning, shop drawings, lay out schedules, detailed sketches, test reports, mix designs, schedule of values (payment schedule for non-unit cost contracts), Contractor's Safety and Health program, and physical checks of materials on site comparing to approved submittals and contract requirements.
5. Construction Phase:
 - a. Initial Phase: The initial control of each separate feature or segment of work is made at the outset of the operation to assure a proper start-up of work and full compliance with all contract requirements. This is the phase in which the Contractor will

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establish acceptable standards of workmanship. The initial phase is the most logical time to resolve any difference of opinion or interpretation of plans, rather than when the work is in place.

- b. Follow-up Phase: Inspection and testing is made to determine continuation of compliance and workmanship standards established during preconstruction and initial phases. Follow-up inspections are more productive when they are preceded by thorough Preconstruction and Initial Phases and workmanship standards have been established prior to construction.

- 6. Construction Completion Phase: The last follow-up, or when any segment of work is complete, the contractor is to carefully examine the work, prepare a deficiency list of anything not completed or not conforming to the contract requirements. Work yet to be accomplished could include: paperwork/documentation, submittal of test results or other documents, certificates, diagrams, warranties, Operation and Maintenance Manuals, etc.

When deficiencies are found in the Contractor's quality control and/or implementation of the QC Plan, many actions can be taken depending on the circumstances. Such actions may include but are not limited to: improving the QC Plan, correcting deficient management, removing incompetent QC personnel, correcting defective work, refusing to allow work to continue in defective areas, and/or disallowing payment for the defective work. An aggressive and effective application of the Contractor's QC Plan can minimize or eliminate the need to take these actions.

The Contractor shall develop and submit, for review by Fair Oaks Ranch, a detailed project specific Quality Control Plan after receipt of Notice of Award and prior to the Preconstruction Conference. It shall be reviewed and formally accepted prior to the initiation of construction.

- 7. Documentation: The Contractor shall document all QC activities performed during the contract by the Contractor, subcontractors, testing laboratories, and vendors in accordance with the Contract Documents.

The Contractor shall prepare QC reports consisting of or considering the following items:

- a. Testing activities, control procedures, test results, nature of deficiencies, proposed remedial actions, and corrective procedures

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- instituted;
 - b. Reports shall reference specification section;
 - c. Reports shall also include subcontractor work;
 - d. Reports should concentrate on work items that have been completed and provide evidence of control activities;
 - e. Reports shall be submitted on a weekly basis, but always before request for payment on completed work;
 - f. Reports shall reflect accurate and precise QC actions taken.
8. Submittals: It is imperative that the Contractor's QC representative review all submittals.
- a. Typical types of submittals are:
 - (1) Testing Data;
 - (2) Shop Drawings;
 - (3) Work Schedules;
 - (4) Reports/Statements;
 - (5) Material or Product;
 - (6) Materials Samples;
 - (7) Materials Testing;
 - (8) Contractor's Safety and Health Program.
 - b. The primary responsibility for overall management and control of submittals lies with the Contractor.
 - c. All required submittals shall be provided in a timely manner, and according to Contract Documents, to allow for the review, approval, procurement, delivery, and QC preparatory phase of an item before it is needed for construction.

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9. Testing: Testing procedures described in the Contract Documents are another form of quality control to be performed at the sole expense and responsibility of the Contractor, ensuring delivery of an end product which meets the requirements in the contract.

Testing requirements and procedures shall include, but not be limited to, the following:

- a. An outline of proposed testing procedures developed and submitted prior to construction;
- b. Provide a listing of all required tests as specified in the contract, in addition to providing a listing of all non-specified testing procedures pending approvals;
- c. Specify who will be performing all required testing and at what frequencies;
- d. ASTM D3740-96 - Minimum Requirement for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as used in Engineering Design and Construction.

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QUALITY ASSURANCE: Quality Assurance (QA) is the means by which Fair Oaks Ranch assures that the completed project complies with the quality established by the construction contract documents. Fair Oaks Ranch assures that the Quality Control (QC) will be accomplished through reviews, observation and tests by QA personnel (Fair Oaks Ranch Construction Observer/Inspector, Engineer, or any other authorized Fair Oaks Ranch representative).

1. Quality Assurance Plan: An important tool in the success of the Construction QC/QA Program which will result in a qualitatively completed project is "partnering," which provides for the development of trust and effective communication between the Contractor, Engineer, and

Fair Oaks Ranch. Fair Oaks Ranch will initiate partnering on appropriate construction projects, shortly after the award of the contract.

Responsibilities of the QA personnel include, but are not limited to, the following:

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- a. Respond to Contractor's requests for information (RFI) in a clear and timely manner;
 - b. Require the materials and standard of workmanship specified in the contract documents;
 - c. Require from the beginning that the Contractor maintain the quality specified in the construction contract documents and detailed in the Contractor's QC Plan;
 - d. Deal only with authorized Contractor's representatives;
 - e. Advise the Contractor of and document deficiencies as discovered;
 - f. Follow up with the Contractor to assure deficiencies are corrected;
 - g. Establish and maintain throughout the project clear and effective communications with the Contractor;
 - h. Designate a Fair Oaks Ranch representative as the Contractor's single point of contact;
 - i. Identification and scheduling of training requirements for Fair Oaks Ranch personnel;
 - j. Identification of pre-award activities;
 - k. Identification of any special project requirements;
 - l. Establish procedures for QA tests at random and unannounced intervals;
 - m. Review qualifications of Contractor's identified quality control laboratory.
2. Specific Activities: Specific activities associated with QA include, but are not limited to, the following:
- a. QC Plan review and acceptance;
 - b. Pre-construction conference;
 - c. Partnering workshop (to be determined by Fair Oaks Ranch);

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- d. Coordination meetings;
 - e. Issuance of approved meeting minutes;
 - f. Submittal reviews and acceptance;
 - g. Assurance testing;
 - h. Acceptance of completed work;
 - i. Implementing approved Construction QC/QA Program
 - j. Implementing approved Safety and Health Program
3. QC's Plan Review and Acceptance: QC plan review shall include, but is not limited to, the following:
- a. Evaluation of the QC plan with regard to the contract document's requirements and determine overall compliance;
 - b. Identification of any problem areas needing change or clarification;
 - c. Determination if QC plans provide adequate control of defined segments of work;
 - d. Evaluation of QC staffing and organization for compliance with the intent of the contract documents;
 - e. Check the qualifications, training (Excavation/Safety competent person, work zone traffic control, confined space entry, hazardous materials), responsibilities, and authority (sign pay request, negotiate change orders) of Contractor's/Subcontractor's QC "competent" person;
 - f. Determination that QC plan adequately addresses submittals process;
 - g. Check proposed QC documentation formats.
4. Preconstruction Conference: This conference is a specific contract requirement and shall be held soon after contract award and prior to start of actual construction, contingent on receipt of contract documents specified in the General Conditions, including Contractor's QC Plan. The conference will address contract clauses covering quality control, testing,

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warranties, safety, personnel, and procedural items with discussions on specific rules and procedures. Specific responsibilities and authorities shall be presented and agreed upon so that the Contractor, Engineer, and Inspector will share the same understanding of the project scope and conditions.

5. Partnering Workshop: Shortly after the award of contract, the Contractor, Engineer and Inspector will participate in a Partnering Workshop (when deemed appropriate by Fair Oaks Ranch) that will be directed by a qualified facilitator and will result in a Partnering Charter for the specific construction project.
6. Coordination Meetings: These meetings are scheduled and conducted by Fair Oaks Ranch. They will be scheduled as required and/or prior to the start of a definable feature of work on the project. The primary purpose of these meetings is to establish a positive working relationship and to achieve a mutual agreement with the Contractor on the QC Plan and Safety Plan requirements.

The Coordination Meetings should address the following:

- a. Responsibilities of the “Competent Person”;
- b. Quality control concepts;
- c. Definable segments of the physical work;
- d. Correction of the QC plan, if necessary;
- e. Procedures to be followed if deficiencies are discovered;
- f. Testing and documentation;
- g. Procedures for making changes;
- h. Safety plan;
- i. Review list of Contractor submittals.

Fair Oaks Ranch is responsible for taking detailed conference minutes and for distribution of the minutes.

7. Submittal Review and Acceptance: Fair Oaks Ranch' responsibilities

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regarding submittals include, but are not limited to, the following:

- a. Review list of submittals, prepared by Contractor, against requirements of the Contract Documents;
 - b. Review Contractor's submittal control document for compliance with submittal schedules, review time and procurement lead times;
 - c. Check submittal control documents against construction schedule;
 - d. Continually monitor status of submittals;
 - e. Respond to submittals in accordance with contract documents;
 - f. Enforce submittal requirements of the contract documents.
8. Assurance Testing: Quality Assurance (QA) testing is necessary to assure a quality project. Fair Oaks Ranch performs QA testing to verify that QC testing is accomplishing the specified objectives. QA testing can be performed by either Fair Oaks Ranch personnel or an independent testing laboratory.

Specific scope and objectives include:

- a. Review Contractor's proposed QC testing methodology, quantity of tests, and laboratory or Contractor's equipment certifications contained in the QC plan;
- b. Review reports of QC tests performed and document corrective actions taken for any problem area;
- c. Verify QC testing by random and unannounced tests that repeat the Contractor's QC tests.

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COMPLETION OF WORK: In order to properly complete a quality project, defined procedures are necessary. Activities involving QC/QA personnel include, but are not limited to, the following:

1. Participation in preliminary and final inspections;
2. Prepare deficiency "punchlist";

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3. Completion of “punchlist” deficiencies;
4. Review and approve Contractor's redline drawings;
5. Submittal of approved Operation and Maintenance manuals;
6. Completion of Operation and Maintenance training;
7. Submittal of specified spare parts;
8. Submittal of Contractor warranty information.

903.6

Fair Oaks Ranch OPTIONS IN THE QC/QA PROGRAM: The QC/QA program will be successful only if all parties, the Contractor, Engineer, and Fair Oaks Ranch, are committed to “Quality of Excellence.” Preparation of high quality design documents by Fair Oaks Ranch and the Engineer provide the basis for high quality construction. Contractor Quality Control is the key to providing an excellent product. Fair Oaks Ranch' cost for providing, maintaining, and replacing its infrastructure continues to escalate. Fair Oaks Ranch' core values dictate the pursuit of excellence and the elimination of poor quality, incompetency and unsafe processes and products.

Proper QC by the Contractor can prevent adverse Fair Oaks Ranch actions. The contract documents contain clauses that provide means for enforcing contract compliance. Available means include, but are not limited to:

1. Require the Contractor to remove and replace deficient materials and/or workmanship;
2. Withhold payment;
3. Require removal of unqualified personnel;
4. Stop work until deficiencies are corrected;
5. Default the Contract;
6. Enforce liquidation damages;
7. Disqualification from bidding on future Fair Oaks Ranch projects.

Such drastic actions are not desirous and would be necessary only when all other amenable avenues of partnering have failed. As originally stated, Quality is more than meeting the minimum requirements of the contract

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documents. Quality is also complying with Fair Oaks Ranch core values and providing legendary service. And this requires the complete and full commitment to quality by all parties of this partnership.

903.7 MEASUREMENT: Measurement of the Item, "Construction QC/QA Program," as specified herein, will not be measured for payment.

903.8 PAYMENTS: No direct payment shall be made for incidental cost associated with preparation and implementation of the Contractors project specific QC/QA Program.

903.9 APPENDIX: MINIMUM BASIC OUTLINE FOR A CONTRACTOR QC PLAN.

The following general outline shall be used by the contractor to develop a project specific QC Plan. All QC Plans must comply with the overall Construction QC/QA Program. This QC Plan must be approved by Fair Oaks Ranch prior to the beginning of construction.

1. PRECONSTRUCTION PHASE:

a. QC ORGANIZATION:

- (1) List of personnel / chain of authority;
- (2) Qualifications of QC personnel (including sub-contractors, suppliers, manufacturers);
- (3) Name and qualifications of "Competent Person," and alternate.

b. DEFINABLE CONSTRUCTION FEATURES:

- (1) List of definable features / items (identified by Fair Oaks Ranch specification numbers);
- (2) Schedule of Values for all definable features shall be submitted and approved prior to submittal of first pay request.

c. GENERAL ADMINISTRATIVE PROCEDURES:

- (1) Identify all responsible personnel (Contractor authorized representatives to sign Contract Documents, Pay Request,

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Change Orders, etc.);

- (2) Identify all construction forms / procedures required (in accordance with Fair Oaks Ranch Construction Phase Procedures guidance manual);
- (3) Identify all Fair Oaks Ranch personnel, Engineer, etc. responsible for the review or acceptance of submittals and construction activities.

d. CONTRACTOR COORDINATION WITH OTHER AGENCIES:

- (1) Identify all agencies and a contact person from each agency, as appropriate (including but not limited to: City of Fair Oaks Ranch Departments, Bexar County Departments, Texas Department of Transportation, Texas Commission on Environmental Quality, San Antonio Water System, etc.);
- (2) Identify all existing utilities / field conditions as appropriate (including but not limited to: Fair Oaks Ranch, CPS Energy, AT&T Telephone, Time Warner Cable, etc.).

e. SUBMITTALS:

- (1) Identify as appropriate, including but not limited to: all definitions, procedures, product data, shop drawings, samples, manufacturers certificates/warranties, etc.;
- (2) Prepare a schedule of specified submittals to be submitted for review/approval (verify all material and contract requirements);
- (3) Identify Fair Oaks Ranch personnel, Engineer, etc. responsible for the review and acceptance of project submittals;
- (4) Prepare a Construction Safety and Health Program (contractor and sub-contractors) in accordance with Fair Oaks Ranch Construction Safety and Health Program guidance document;
- (5) Testing laboratory services (to be used by

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contractor): submit data for review and approval of laboratory as specified in the contract documents;

(6) Material testing:

- (a) Attach testing analysis data of materials to be used on the project to the appropriate material submittal.
- (b) Submit a QC testing plan (example backfill material, roadway construction material compaction testing, pipe testing, motors/pumps tests, other tests as required or appropriate).

2. CONSTRUCTION PHASE: Prepare written procedures with respect to issues including:

a. CONSTRUCTION SEQUENCING

Construction Schedule: include, but not limited to: bar graphs, phasing plan, network diagrams, critical path item identification, equipment/material/supplies delivery impact, narrative reports, etc.).

b. SHOP DRAWING LOGS

c. SUBMITTAL LOGS

d. REQUEST FOR INFORMATION LOGS

e. TRAFFIC CONTROL PLANS

f. COORDINATE USE OF OWNERS PREMISES: Including, but not limited to, layout of temporary facilities, temporary utilities and controls, security, field office and storage facilities, operation of owners valves, facilities, tie-ins, by-pass pumping, flow diversion or interruption of owner's facilities. etc.

g. PREPARATION OF RIGHT OF WAY

h. TEMPORARY CONTROLS: Including but not limited to: erosion and sedimentation controls, dust control, construction noise control, etc.

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- i. SURVEYING
 - j. DELIVERY, STORAGE, INSPECTION AND INSTALLATION OF MATERIALS AND EQUIPMENT
 - k. TESTING OF ON-SITE MATERIALS AND EQUIPMENT
 - l. MANUFACTURERS FIELD SERVICES
 - m. TRAINING SCHEDULE
 - n. STARTING OF SYSTEMS
3. Construction Completion Phase: Prepare written procedures with respect to issues including, but not limited to:
- a. EQUIPMENT TRAINING
 - b. MANUFACTURERS INSPECTION/ACCEPTANCE REPORTS (as applicable).
 - c. DEFICIENCY PUNCH LISTS
 - d. REMOVAL OF UTILITIES, FACILITIES AND CONTROLS
Plan and coordinate with proper personnel and/or agencies.
 - e. COORDINATE SYSTEM OPERATION TURN-OVER TO OWNER
 - f. COMPLETE ALL POST CONSTRUCTION DOCUMENTATION/ADMINISTRATION (as required by contract)
 - g. PROJECT RECORD DOCUMENTS:
 - (1) Maintain records and documents throughout construction process.
 - (2) Prepare final submittals on items required (include but not limited to: as-built drawings, specifications and addenda, approved shop drawings, material samples, construction photographs, change orders, contract modifications, testing and analysis records, survey data, construction reports such

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as daily reports, monthly reports, payroll records, and safety data such as MSDS, safety meetings, incident reports, etc.).

- End of Specification -

ITEM NO. 904
CONSTRUCTION PHASE PROCEDURES

904.1 **DESCRIPTION:** This item shall govern the implementation of the Construction Phase Procedures for construction projects. The Construction Phase Procedures is a guidance document written to help direct and control activities during the construction phase of projects. This Construction Phase Procedures manual is not intended to be a step-by-step procedure. Instead, it is a document which outlines general activities, procedures, and requirements by Fair Oaks Ranch to be implemented by Fair Oaks Ranch and the Contractor throughout the Construction Phase of a project

904.2 **INTRODUCTION:** Contractors and subcontractors working on Fair Oaks Ranch Construction Projects are required to know all contract document requirements for their project. This manual was designed to cover most issues involved large construction projects. The size, scope, and/or technical complexity of the individual project will determine the extent the procedures in the manual are utilized. Many routine Fair Oaks Ranch projects will not necessarily require use of every form listed in this manual. For projects being managed by Consultants, whether hired by Fair Oaks Ranch or private entities, it is allowable to use their pre-established forms and documents, so long as they demonstrate adherence to the general format of this manual and meet the general intent of the requirement.

1. Quality Control/Quality Assurance: Fair Oaks Ranch has established a Construction Quality Control and Quality Assurance (QC/QA) Program. The Construction QC/QA Program has been written and distributed to facilitate the direction and control of entities and persons performing and managing construction for the Fair Oaks Ranch Construction Projects. The Contractor is herein directed to Item No. 903, "Construction QC/QA Program," for a summary of both the Contractor's and Fair Oaks Ranch' respective expectations and responsibilities.
2. Partnering: Fair Oaks Ranch is committed to promoting partnering with all parties associated with a Construction Project. Shortly after the award of the contract, Fair Oaks Ranch will invite the Contractor and Consultants to participate in a Partnering Workshop Session, when considered in the best interest of the Construction Project.

Pre-Construction Meeting: A Pre-Construction Meeting will be sponsored by Fair Oaks Ranch shortly after award of the project. The meeting is designed to review the various administrative procedures and actions

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required by all involved parties. Depending upon the project scope and technical requirements, the meeting may be conducted jointly with the Partnering workshop, or held separately. In order to ensure all pertinent issues are covered during the meeting, Fair Oaks Ranch has developed a Pre-Construction checklist (Form 18).

3. Safety: Fair Oaks Ranch is committed to ensuring that safety is a priority on Fair Oaks Ranch Construction Projects. A Construction Safety and Health Program has been prepared and distributed to help prevent accidents, injuries, and damage to equipment and property. The Construction Safety and Health Program is not intended to be an all-inclusive listing of safety procedures, rather it is a guidance document. The Contractor is herein directed to Item No. 902, "Health and Safety Program," for a summary of both the Contractor's and Fair Oaks Ranch' respective expectations and responsibilities

904.3

RESPONSIBILITIES AND COMMUNICATION: The Construction Observer/Inspector (COI) is the individual who has been designated as the field representative of Fair Oaks Ranch. The COI's primary responsibility is to observe construction activities, in accordance with Fair Oaks Ranch directives, to assure completion of the project according to the contract documents. The COI and/or their Supervisor are also responsible for regular review of safety documentation and reports and forwarding such documents to Fair Oaks Ranch. If the COI observes or perceives an unsafe work practice, he or she shall bring it to the attention of the Contractor's representative, and the Fair Oaks Ranch Safety Officer.

The COI is responsible for coordinating between the various parties involved in the project, including the various departments within Fair Oaks Ranch, and is the Contractor's primary point of contact on the project. Consequently, all communications will be directed through the COI by all the project participants.

The matrix shown herein lists the general responsibilities of various construction phase activities. The procedures in this document are based on the matrix. The contract and construction documents for each individual project shall be reviewed and the procedures and responsibilities adjusted according to the specific contents therein.

Note: when the term "COI" is used in this document, it refers to the overall Fair Oaks Ranch Construction Inspection office. The term collectively means a combination of the individual Construction Inspector assigned to this project, another Construction Inspector temporarily assigned to oversee the project during the absence of the designated Inspector, his/her Area Supervisor, personnel in the Construction Inspection Administrative office, the Construction Inspection Project Engineer, the Manager of Construction Inspection, etc. Internal Fair Oaks Ranch policies and procedures dictate the appropriate individual referenced as the

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“COI.”

1. Written Correspondence: General correspondence to the contractor will be signed by the COI and/or the appropriate Construction Inspection personnel pertaining to legal and contracting issues.

The routing of data and information to outside organizations, without the need of a cover letter, will have a Transmittal Form (Form 1). Written communications internal to Fair Oaks Ranch will be prepared on the Memorandum Form (Form 2). Telephone conversations with the Contractor, Engineer, other Fair Oaks Ranch Representative, Suppliers, Subcontractors, Vendors, etc. will be noted on the Telephone Conversation Record (Form 3).

Written inquiries or questions on the Contract Documents from the contractor should be written on a Request For Information Form (Form 4). If the Contractor asks a verbal question, the COI will either provide a verbal response or request the contractor submit a Request for Information Form (Form 4). The COI will determine where the question should be forwarded. All questions to the Engineer will be faxed, emailed, or delivered the same day. The COI will monitor or prepare responses to minimize delays to the Contractor by maintaining a log of all Requests For Information (Log 1). The COI will forward the response to the Contractor when complete. The Contractor is required to review the response and return a copy of the form and indicate whether extra compensation is due. If the Contractor indicates extra compensation is due, the Construction Inspection office will review the response again and determine if the response should be amended.

A complete set of files will be maintained at the job site and/or Fair Oaks Ranch Construction Inspection office by the COI in accordance with the File Code System in the Appendix of this document. A copy of all sensitive documents will be forwarded to the Fair Oaks Ranch Construction Inspection Manager.

2. Electronic Communication: Electronic communication in the form of electronic mail (e-mail) is acceptable and should be used for most unofficial correspondence. Unofficial correspondence may be defined as transmittals, which do not require a signature. If correspondence is made via e-mail, hard copies do not need to follow. Hard copies of e-mail messages may be retained by the sender and may be printed by the recipient so that a record of the unofficial correspondence can be maintained. The recipient shall also return confirmation of e-mail receipt to the sender.

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3. Shop Drawings/Submittals: The Contractor is responsible for ensuring that all information is submitted in a timely manner to prevent construction delays. The Contractor will transmit 3 copies of the shop drawings to the COI using the prescribed cover sheet Transmittal of Contractor's Submittal Form (Form 5). The COI will log the shop drawings (Log 2). 1 copy will be sent to the Engineer, one copy to the appropriate Fair Oaks Ranch office for comment, and one copy will be retained by the COI with suspense date for follow-up. The copies will be delivered to the Design Engineer and Fair Oaks Ranch Engineer within 24 hours after the Contractor has made the submittal to the COI

The target date for the return of the documents from the Engineer shall be 10 calendar days from when the documents are submitted, even though contracts allows 20 calendar days. Before any shop drawings requiring "re-submittal" are returned to the Contractor, the Engineer and/or the COI will call the Contractor and give him/her an opportunity to correct the problems.

The Engineer will denote their respective comment(s) to the submitted documents and return their copy to the COI. The COI will consolidate the comments from Fair Oaks Ranch staff with the comments from the Engineer, retain one copy and return 1 formal response copy to the Contractor.

904.4

MEETINGS: The COI will assure that minutes for all project meetings are prepared. The Conference Memorandum Form (Form 6) will be used to document the meeting. A copy of the Conference Memorandum will be distributed to each attendant within seven working days of that meeting. Weekly meetings will follow the standard agenda below:

1. Corrections to Previous Minutes;
2. Unresolved Items;
3. Administrative Items;
4. Change Orders;
5. Shop Drawings;
6. Problems, Conflicts, & Observations;
7. Coordination With Owner and/or Other Contractors;

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- a. Bypasses and/or Shutdown
 - b. Other
8. Progress Since Last Meeting;
9. Planned Progress for Next Meeting;
10. Progress Schedule;
11. Other Business;
12. The latest copies of the Submittal Log and Request For Information Log will also be issued at each weekly meeting.

904.5

PROJECT REPORTS:

1. Daily Reports: The COI will prepare a Daily Construction Report Form (Form 7) by no later than 10:00 am the next working day. The reports will be maintained in the job files. The reports begin on the first contract day so that the report number will correspond to contract day. This means that a report is to be prepared for every day including Saturdays, Sundays and holidays even if the Contractor doesn't work. The Fair Oaks Ranch Daily Log (Form FN016-4) is an allowable substitution. Consultant developed daily logs can be used if the same basic information is recordable.

The information recorded includes project title, contractor's name, Fair Oaks Ranch job number, day (Monday, Tuesday, Wednesday, etc.), date, Contractor work hours, report number, and weather conditions. Information recorded in the boxes includes the number and class (operators, carpenters, laborers, superintendent, foreman, clerical, electrician, etc.) of personnel for the Contractor and his Subcontractors working on the job site. This information can normally be determined from field observation and the Contractor's Daily Construction Report (Form 8). The number, description, and hours operated for all of the Contractor's and Subcontractor's equipment on the project site will also be recorded. The hours of operation do not have to be exact but, by observing the work, a reasonable estimate can be made. When Contractor's equipment arrives or departs from the project site, record the size, model number, or capacity in the "Work Performed" section. The information that is to be recorded under "The Work Performed" section is as follows:

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- a. Description and/or condition of materials and equipment delivered;
- b. Description of items rejected and reasons therefrom;
- c. Results of inspection tests which are not recorded on standard forms;
- d. Account of work accomplished during the day including location and quantity;
- e. Description of any deviations from plans and specifications, reasons for the deviations, and what was substituted;
- f. Record of specific instructions given to the contractor;
- g. Details of discussions, or controversies with anyone connected with the work such as the contractor or their representatives, suppliers, property owners, city, county, state, or federal government personnel;
- h. List of visitors to the project and their business connection;
- i. Details of any personal or property damage that may have occurred as a result of the contractor's negligence;
- j. Observations of the condition of foundations and other items of work which will be covered;
- k. References to important phone calls. (Details of all phone calls should be recorded on telephone conversation forms.).

The above information could become invaluable if the project becomes involved in any type of claims. The number of employees and delays to equipment operation often are critical items involved with claims.

- 2. Contractor's Daily Reports: The Contractor is required to submit a Daily Construction Report (Form 8) to the COI. The Contractor may use his own form as long as it provides the same information as the form (Form 8) enclosed in the Appendix. The Contractor may submit these Daily Construction Reports on a weekly basis.
- 3. Contractor's Payroll Reports: The Contractor must submit weekly compliance statements and payroll records directly to the Contract

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Administration Division of Fair Oaks Ranch so that they may be reviewed for compliance with Wage and Labor Standard Provisions.

4. Monthly Reports: Depending upon the scope, size, and/or complexity of the project, COI will prepare a Monthly Summary of Construction (Form 9) which will include a summary of progress payments, work progress, project work, delivery problems or delays, and potential modifications. The COI shall also review the record documents maintained by the Contractor and shall report completeness in the remarks section of the monthly report. The COI shall submit 2 copies of the report with the Contractor's pay request to Fair Oaks Ranch.
5. Water Use Logs: The contractor shall prepare a monthly summary of water usage using the Unmetered Water Use Log (Log 8) and the Contractor Tank Truck Water Use Log (Log 9). These reports should accompany the monthly invoices and are required before Fair Oaks Ranch will process any payments.

904.6

SAFETY: The Fair Oaks Ranch Project Construction Program and Health and Safety Program is not intended to be an all-inclusive listing of safety procedures. It is a guidance document which outlines general safety activities, procedures, and reporting requirements to be implemented by the Contractor. Contractors working on Fair Oaks Ranch Construction Projects shall have their own Project Specific Safety Plan which complies with the general requirements of the Safety and Health Program and all applicable regulations. Individuals working on Fair Oaks Ranch Construction Projects are responsible for knowing all safety rules, being alert and practicing good, sound judgment in the performance of their jobs, even if specific safety rules are omitted from either this Fair Oaks Ranch Construction Program and Safety and Health Program or the Contractor's project-specific safety and health plan. Subcontractors and their employees are responsible for following all requirements of the Contractor's project-specific safety and health plan.

Safety guidelines shall be understood and followed by all individuals while on the job site. Violation of safety and health guidelines, either in job performance or in the letter of the project-specific safety plan, may result in work stoppage until safety requirements are properly fulfilled.

904.7

QUALITY CONTROL/QUALITY ASSURANCE: An important tool in the success of construction projects is the implementation of a Construction QC/QA Program. Partnering will result in a quality completed project and provides for the development of trust and effective communication between the Contractor, Engineer, and Fair Oaks Ranch.

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1. **Quality Control:** Quality Control (QC) is the Contractor's means of assuring conformity with the contract documents by defining procedures to manage and control his/her own activities, all Subcontractor's activities, and all suppliers' activities during construction. These procedures will be outlined in the Contractor's project-specific QC Plan, the foundation for quality work. The Contractor's QC plan shall be received and formally accepted before any construction begins. In some cases, this requirement can be met by an interim plan. As part of its QC activities, the Contractor shall document activities performed by the Contractor, Subcontractors, testing laboratories and vendors in accordance with the contract documents. It is imperative that the Contractor's QC representative review all submittals to make sure all requirements are met.
2. **Testing:** Proper testing procedures, as described in the construction contract documents, are forms of quality control to be performed by the Contractor ensuring delivery of an end product which meets the requirements in the contract documents. Testing requirements and procedures shall include but not be limited to the following:
 - a. Outline proposed testing procedures prior to construction;
 - b. Provide a listing of all required tests as specified in the contract, in addition to providing a listing of all non-specified testing procedures pending approvals;
 - c. Specify whether the tests are to be performed by an independent, Fair Oaks Ranch approved, certified testing laboratory or by the Contractor with approved certified equipment and procedures or by others (subcontractors or suppliers);
 - d. Follow ASTM D3740-96 - Minimum Requirement for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as used in Engineering Design and Construction;
 - e. Pipe Testing events will be recorded on a Pipe Leak Test Record (Form 10) and entered on the Pipe Testing Log (Log 3). Other pertinent testing forms may apply. The COI will advise accordingly.

All QC-related activities and costs are the sole responsibility of the Contractor.

3. **Quality Assurance:** Quality Assurance (QA) is the means by which Fair Oaks Ranch

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assures that the project work complies with the quality established by the construction contract documents. QA will be achieved through a QA Plan which serves as a management tool to establish processes and procedures involving the Fair Oaks Ranch and Consultant organization, staffing, training, pre- award activities and construction observation. The QA Plan will identify Quality Assurance personnel, special project requirements and construction administration and observation tasks so as to assure that a consistent process is followed by QA personnel. Fair Oaks Ranch COI will perform QA through a combination of routine and random site inspections.

The QA representatives will review and accept the QC Plan and arrange and coordinate construction conferences, partnering workshops and other overall project meetings. The QA representatives will also document and review quality control activities. While QC testing will be completed by the Contractor, QA testing will be conducted by Fair Oaks Ranch through the COI. Finally, once all QC activities have been met and verified through the QA process, Fair Oaks Ranch will start the acceptance process of the completed work.

All QA-related activities and costs are the sole responsibility of Fair Oaks Ranch.

904.8 PHOTOGRAPHS: The COI will take photographs to document the progress of the project.

904.9 CONSTRUCTION PROJECT SIGNS: The Contractor will provide and erect two construction project signs in a visible area of the specific project. The location of the project signs will be approved by the COI. The construction project signs shall meet specifications and guidelines as outlined in Item No. 869, "Project Signs." The Contractor is herein referred to Fair Oaks Ranch Standard Drawing No. DD-869-01.

904.10 CHANGES:

1. Change Orders: Changes may be initiated by the Contractor, Engineer, or the COI. When Fair Oaks Ranch or the Engineer initiates a change, a Request for Proposal Form (Form 11) will be prepared which describes the nature and justification for the change. The RFP will be forwarded by the COI to the Contractor for pricing. Each RFP shall be sequentially numbered and its status shall be documented on the Change Order Proposal Log (Log 4). When the Contractor initiates the change, the Contractor shall request the next sequential number for the quotation and then submit the quotation to the COI.

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Upon receipt of the quotation from the Contractor, the COI will record the appropriate information on the Change Order Proposal Log. The COI shall participate, with other Fair Oaks Ranch representatives as appropriate, in negotiation of equitable Change Orders with the Contractor. After negotiations have been complete and the results accepted by Fair Oaks Ranch management, a Change Order Form (Form 12) will be prepared for processing. The Change Order Log (Log 5) is used to record information pertaining to the status of each Change Order.

The COI will send 6 copies to the Contractor for processing. The Contractor shall return 5 executed copies to Fair Oaks Ranch Construction Inspection for processing.

Change Orders for an aggregate amount greater than a positive or negative change of \$25,000.00 or that need additional contingency funds authorization, require approval by the Fair Oaks Ranch Board of Trustees (Board). The Board normally meets twice a month on the first and third Tuesday of each month. During the summer, the Board typically meets once a month. Due to the required review procedures for changes that must meet the Board for approval, the entire process from final agreement on the scope and price to Board approval can take 6 to 8 weeks. Changes less than \$25,000.00 may be processed by Fair Oaks Ranch staff without Board approval, if sufficient contingency funds are available. For change orders exceeding \$25,000.00 and requiring immediate action, Fair Oaks Ranch staff may submit a ratification request through the engineering group so all affected additional work may proceed in order to prevent unnecessary delays.

2. Pricing Changes: For some changes, it may be advantageous for work to be performed on a time and materials basis. For this method, the Contractor will track all employee hours, equipment hours, and quantity of materials used. This information must be recorded each day on the Daily Time & Material Record Form (Form 14) or a similar form provided by the Contractor. The COI is required to monitor the work and check the forms submitted each day by the Contractor for accuracy. The General Conditions of the Contract Documents outline what type of overhead and profit that the Contractor may add for this type of charge. This method of pricing changes is not desirable because it places an extra administrative burden on the Contractor and COI and doesn't provide the Contractor with an incentive to work efficiently. Therefore, this pricing method must first be approved by the COI.

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904.11

PAYMENTS:

1. Progress Payments: During the latter part of each month as the work progresses the COI and Contractor shall determine the cost of the labor and materials and/or the quantities incorporated into the work during that month. They will also determine the actual invoiced cost of Contractor- acquired materials stored on the Project site and/or within off-site storage facilities either owned or leased by the Contractor and approved by Fair Oaks Ranch. The COI will review the draft quantities and percentages (commonly called the “scratch sheet”) and determine if they are appropriate. The COI will also check the stored material list for new items and verify that materials are actually on site and that the invoice is attached to the estimate. The previous list of stored material items will be checked for consumption, and removal of items from the list. The COI and Contractor will meet to discuss the estimate and resolve any disputed items. When correct, the Contractor shall obtain signature from the Engineer and forward 8 sets of the Form 15 (Progress Payment) through Fair Oaks Ranch for processing. Fair Oaks Ranch will confirm that quantities, extensions, and totals are correct, and proceed with processing.

Upon receipt of the Payment Estimate Form (form 15), Fair Oaks Ranch will process as follows: Construction Inspection will review, sign, and forward to Contract Administration and update the Contract Summary Sheet (form 16); Contract Administration will review, sign, and forward the payment estimate to the Accounting Department. Payment estimates received in the Accounting Department after Tuesday afternoon, will not be prepared until the following Friday; checks are printed on Friday, provided that there are no holidays in that time. In the contract document's General Conditions, it is stated that Fair Oaks Ranch will make payment within 30 days of receipt of a complete and accurate invoice at Contract Administration's Office.

2. Semi-Final Payments: Upon completion of all work, an inspection will be performed by Fair Oaks Ranch and an Inspection Letter of Conditional Approval will be issued. This letter will include a punch list of all items, if any, which must be completed before final acceptance of the work. The Contractor and COI will then prepare a semi-final payment request, which includes a recapitulation of project costs. The semi-final pay request will list the original contract amount, the total value of the work to date which was figured in the recapitulation of project cost, less the retainage and previous payments, and finally the total amount due for the semi-final payment. Payment procedures will follow the same protocol as the progress payment procedures outlined above.
3. Final Payment: Upon final completion of all work (including punch list items), a final Certificate of Acceptance will be issued by Fair Oaks Ranch. The

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Contractor and COI will then prepare the Final Payment Request. Along with the Final Payment Request, the Contractor shall submit a notarized affidavit in duplicate stating under oath that all subcontractors, vendors, and other persons or firms who have furnished or performed labor or furnished materials for the work have been fully paid or satisfactorily secured. Such affidavit shall bear or be accompanied by a statement, signed by the surety company who provided the Payment Bond for the work, to the effect that said surety company consents to final payment to the Contractor being made by Fair Oaks Ranch. Fair Oaks Ranch will then release the retainage and make final payment to the Contractor. Payment procedures will follow the same protocol as progress payment and semi-final payment procedures described above.

904.12 SPARE PARTS: The Contractor will review the specifications and develop a list of all required spare parts and forward to the COI for verification. The list will be included on the Spare Parts Transfer Log (Log 6) prepared by the Contractor. Each package will have a tag or label with all the required information completed and placed on it. The Spare Parts Transmittal Form (Form 17) will be completed when the spare parts are ready to be turned over to the Fair Oaks Ranch operations staff. Separate forms will be used for spare parts from each specification section. A package and Spare Parts Transmittal Form for all parts from a specification section must be completed before the parts will be accepted from the Contractor (no partial submissions for a specification section will be accepted). The COI will verify that each submission is complete and correct before it is turned over to Fair Oaks Ranch operations staff.

904.13 PROJECT COMPLETION: When the Contractor is nearing completion of a phase of the project, the Contractor will develop a preliminary punchlist of the items that are deficient on the project. Items may be added to the list as additional review of the project continues. When all or most of the items on the preliminary punchlist are corrected, the Contractor will request the Substantial Completion Inspection. The Substantial Completion Inspection will be conducted with representatives from the Contractor, Fair Oaks Ranch, Engineer, Texas Water Development Board (if applicable) and any other appropriate personnel. During this inspection, the final punchlist will be developed. No additional items will be added to the list after this inspection, unless agreed to by all parties. Any items discovered after the final list will be considered warranty items. The COI will list any known administrative items remaining such as warranties, bonds, Record Documents, etc. The final punchlist will be attached to the Certificate of Substantial Completion issued by Fair Oaks Ranch.

When the Contractor has completed the items on the final punchlist, a final inspection will be scheduled for representatives of the Contractor, COI, Engineer,

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and any other appropriate organizations. The Final Inspection is intended to verify that the Contractor has corrected all of the items on the final punchlist. Fair Oaks Ranch COI will use the Water Acceptance Checklist (Form 20) and Sewer Acceptance Checklist (Form 21) to ensure the work on these utilities meets the contract document requirements. The Contractor will submit his final pay estimate, request release of retainage, and lien release. The Engineer will review the information and make a recommendation to Fair Oaks Ranch. The request for release of retainage will be forwarded within the timeframe established by the general conditions and through the same channels as the pay estimates. Fair Oaks Ranch Contract Administration will issue final acceptance and payment. See the Project Closeout Process (Form 19) for the typical steps and actions necessary to close out the administrative requirements on the project.

904.14 **START UP:** Prior to initiation of start up of any new or rehabilitated facilities, the Contractor will review the contract documents and prepare a checklist of requirements for the facility's start-up operation. This checklist of requirements will be verified by the COI. This will include a Training Log (Log 7) of the training required by manufacturers. The COI will coordinate with Fair Oaks Ranch operations staff and the Contractor for the date and time of the training. As the training is completed, it will be added to the log.

When the Manufacturer's Representative reviews the installation of his equipment, the representative must certify the installation in writing before Fair Oaks Ranch personnel will accept responsibility for the operation of the equipment.

The Contractor is required to develop a Start Up Plan prior to placing the facility(ies) into operation. The plan must be submitted in advance of start up to allow review by the COI, Engineer, and Fair Oaks Ranch operations staff. After all parties have reviewed the initial plan, a meeting will be held to discuss the plan and all parties' review comments, as appropriate. The Contractor will revise the plan, per the comments agreed upon at the meeting, and will then resubmit. After review of the revised plan another meeting may be appropriate. This process will continue until an acceptable plan is developed and accepted.

Before start up is to begin, another meeting will be held to discuss the final plan and assure that everyone understands the schedule and responsibilities for startup.

904.15 **MEASUREMENT:** Measurement of the Item, "Construction Phase Procedures," as specified herein, will not be measured for payment.

904.16 **PAYMENT:** No direct payment shall be made for incidental cost associated with preparation and implementation of the Construction Phase Procedures.

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904.17

APPENDIX

FILE SYSTEM	
1.0 CORRESPONDENCE (Letters, Memos, TCRs) 1.1 Contractor 1.2 Engineer 1.3 Fair Oaks Ranch 1.4 Request for Information 2.0 MEETINGS 3.0 DESIGN REFERENCE DATA 4.0 PROGRESS PAYMENTS 4.1 Contractor 4.2 Engineer 4.3 Other Consultants 5.0 LEGAL (Contracts, Bonds, Insurance, Notice to Proceed, Sub Approval, EEO, etc.) 5.1 Contractor 5.2 Engineer 5.3 Other Consultants 6.0 PROGRESS REPORTS (CPM Schedule, Monthly Reports) 6.1 Contractor 6.2 Engineer 6.3 Fair Oaks Ranch 7.0 CHANGES 7.1 Change Proposal Log 7.1.1 Change Proposal No. 1 7.2 Change Order Log 7.2.1 Change Order No. 1 7.3 Directives 7.3.1 Directive No. 1 7.4 Claims Log 7.4.1 Claim No. 1	8.0 TESTING REPORTS 8.1 Concrete 8.2 Soil 8.3 Piping 8.4 Miscellaneous 9.0 DAILY REPORTS 9.1 Daily Reports 9.2 Safety Reports 9.3 Photos 9.4 Materials Storage Recommendations 10.0 STARTUP 10.1 Schedules/Plans 10.2 Training 10.3 Manufacturer's certifications 10.4 Spare Parts 10.5 O & M Manual Transfers 11.0 PROJECT COMPLETION 11.1 Punch List 11.2 Guarantees/Warranties 11.3 Final Inspection/Approval (Lien Release, Substantial Completion, Final Acceptance) 11.4 Record Documents 12.0 ONE YEAR CORRECTION PERIOD 12.1 Work Orders 12.2 Completed Work Orders 13.0 SHOP DRAWING SUMITTALS (Shop Drawings, O & M Manuals, Training Lesson Plans) 13.1 Submittal No. 1 14.0 LOGS

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INDEX TO FORMS	
Form No. 1	Transmittal
Form No. 2	Memorandum
Form No. 3	Telephone Conversation Record
Form No. 4	Request For Information
Form No. 5	Transmittal of Contractor's Submittal
Form No. 6	Conference Memorandum
Form No. 7	Daily Construction Report
Form No. 8	Contractor's Daily Construction Report
Form No. 9	Monthly Summary of Construction
Form No. 10	Pipe Leak Test Record
Form No. 11	Request For Proposal
Form No. 12	Change Order
Form No. 13	Work Change Directive
Form No. 14	Daily Time & Material Record
Form No. 15	Payment Estimate
Form No. 16	Contract Summary Sheet
Form No. 17	Spare Parts Transmittal
Form No. 18	Pre-Construction Checklist
Form No. 19	Project Closeout Process
Form No. 20	Water Acceptance Checklist
Form No. 21	Sewer Acceptance Checklist

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INDEX TO LOGS	
Log No. 1	Request For Information
Log No. 2	Shop Drawing Submittal
Log No. 3	Pipe Testing
Log No. 4	Change Order Proposal
Log No. 5	Change Order
Log No. 6	Spare Parts Transfer
Log No. 7	Training
Log No. 8	Contractor Unmetered Water Use Log
Log No. 9	Contractor Tank Truck Water Use Log

- End of Specification -

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**ITEM NO. 906
WATER USE ACCOUNTABILITY**

- 906.1** **DESCRIPTION:** This item shall govern the preparation and implementation of the Contractor's water use accountability program for the specified project. This specification is not intended to be an all-inclusive, but is a guide outlining the procedures to report water usage during a construction contract.
- 906.2** **MEASUREMENT:** Measurement of the Item, "Water Use Accountability" as specified herein, will not be measured for payment. The Contractor shall submit the project-specific water use log each month along with the monthly invoice. Forms are available at the Fair Oaks Ranch website (see logs 8 and 9). Each log shall record the estimated and/or actual use of water during that period. Monthly construction invoices will not be processed unless accompanied by a water use log. The forms include guidance on how to calculate the amount of water used. Include the estimated quantity of water used for: filling an empty water line, flushing through a fire hydrant, flushing through a blow-off, leaks, filling water tanks and trucks, curing an in-place pipe liner, etc.
- 906.3** **PAYMENT:** No direct payment shall be made for the incidental cost associated with preparation and submission of the Contractor's project specific water use logs. Monthly logs of water usage are required. The contractor is required to obtain a fire hydrant meter/backflow assembly from Fair Oaks Ranch Customer Service. A refundable deposit will be required. For all non-Fair Oaks Ranch work, the contractor shall be responsible for obtaining a fire hydrant meter from Fair Oaks Ranch Customer Service and establish an account to pay for actual water usage. Payment for these accounts are handled through normal Fair Oaks Ranch customer account procedures.

- End of Specification -

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**ITEM NO. 1015
SERVICE LINE BREAK/LEAK REPAIRS**

DESCRIPTION: This item shall consist of service line break and/or leak repairs performed in accordance with these specifications and as directed by the Inspector.

MATERIALS: The materials for a service line break/leak repairs shall conform to the specifications herein as well as contained within the latest applicable revisions of Fair Oaks Ranch' Material Specifications.

CONSTRUCTION: If during construction, certain water service lines break or if leaks occur within or immediately adjacent to the Contractor's specified area of construction operations, the Inspector may authorize the replacement and/or repair to be performed by the Contractor under the bid item 1015. If the Inspector authorizes a replacement of an existing service line the replacement will be in accordance to Item No. 824.

MEASUREMENT: Service Line Break/Leak Repairs will be measured by the unit of each such assembly of the various types and sizes of service lines, repair and tap clamps required to repair the service line break and or leak.

PAYMENT: Payment to the Contractor will be made in accordance with Item No. 1015 as contained in the bid proposal. However, the Contractor is cautioned that no payment will be made by Fair Oaks Ranch when particular breaks and/or leaks are a direct result of the Contractor's construction operations. Where encountered, payment to the Contractor for cutting and replacing pavements (any type), curbs, trench protection, sidewalks and sodding shall be considered subsidiary to the various items of work under Item No. 1015 of the bid proposal and no direct payment will be made. Such payment shall include any necessary hauling and disposition of surplus excavated material, and pumping of water.

- End of Specification -

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**ITEM NO. 1020
WATER MAIN BREAK/LEAK REPAIRS**

DESCRIPTION: This item shall consist of water main breaks and leak repairs performed in accordance with these specifications and as directed by the Engineer.

MATERIALS: The materials for a water main breaks/leak repairs shall conform to the specifications herein as well as contained within the latest applicable revisions of Fair Oaks Ranch' Material Specifications.

CONSTRUCTION: If during construction, certain water main breaks or if leaks occur within, or immediately adjacent to, the Contractor's specified area of construction operations, the Inspector may authorize the replacement and/or repair to be performed by the Contractor under the bid item 1020. The work involved shall consist of excavation, hauling of disposition material, dewatering, shut-down and isolation of the existing main if required, installation of the necessary repair clamps and or new water main (length to be determined by the Inspector) to include all necessary tie-ins, fittings, approved reaction blocking required, backfilling the excavation with approved materials; customer notification or service interruption where required. Cutting and replacing pavements (any type), curbs, sidewalks, trench protection, and sodding will be considered subsidiary to the work.

MEASUREMENT: Water main breaks/leak repair will be measured by the unit of each such assembly of the various types and sizes of water mains, services, repair and tap clamps required to repair the water main break and/or leak.

PAYMENT: Payment to the Contractor will be made in accordance with Item No. 1020 as contained in the bid proposal. However, the Contractor is cautioned that no payment will be made by Fair Oaks Ranch when particular breaks and/or leaks are a direct result of the Contractor's construction operations. Where encountered, payment to the Contractor for cutting and replacing pavements (any type), curbs, sidewalks and sodding shall be considered subsidiary to the various items of work under Item No. 1020 of the bid proposal and no direct payment will be made. Such payment shall include protective coating materials for bolts, nuts, ferrous surfaces, polyethylene sleeve where required and any pumping of water, necessary hauling, and disposition of surplus excavated material.

- End of Specification -

ITEM NO. 1100
SLIP-LINING SANITARY SEWERS

DESCRIPTION: This item shall consist of slip-lining sanitary sewer pipe, which is accomplished by pulling or pushing liner pipe into existing sewers by use of mechanical or hydraulic equipment. Once in place, liner pipe is allowed time to normalize and is then cut to fit between manholes. Annular spaces between liners and existing sewers are sealed at each manhole. Manhole inverts and benches are reworked and reshaped. Existing sewers remain in operation during slip-lining process, with sewage flow diverted around operations in progress.

SUBMITTALS: Contractor shall submit manufacturer's product data, instructions, recommendations, shop drawings, and certifications.

MATERIALS:

1. Manufactures:
 - a. Liner pipe systems shall be fiberglass reinforced plastic (FRP) or T- Lock Liner concrete pipe, as approved by Fair Oaks Ranch.
 - b. Acceptable manufacturer for FRP liner pipe: Shall conform to the specifications contained within the latest revision of Fair Oaks Ranch' Material Specifications.
 - c. Acceptable manufacturer for Amer-Plate T-Lock pipe: Ameron Protective Linings.
2. FRP Liner Pipe and Fittings:
 - a. Pipe, joints and fittings: ASTM D 3262-11, Type 1, Liner 2, Grade 3.
 - b. FRP Liner Pipe: Reinforced plastic mortar pipe manufactured by centrifugal casting process resulting in dense, nonporous, corrosion- resistant, consistent, composite structure. Minimum stiffness: 72 psi, measured in accordance to ASTM D2412-11.
Use with a stiffness of 72 psi where specified or shown in the contract documents.

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- c. Resin Systems: Thermosetting polyester epoxy resin, with or without filler, meeting ASTM D3262-11.
- d. Reinforcing Glass Fibers: Commercial grade E-type glass filaments, with binder and sizing compatible with impregnating resins.
- e. Filler: Sand with at least 98% silica content, and maximum moisture content of 0.2%.
- f. Joints: Low-profile FRP jacking bell-and-spigot joints or flush bell and spigot joints, with elastomeric sealing gaskets for watertight joints meeting ASTM D4161-01(2010).
- g. Dimensions and Tolerances:
 - (1) Pipe outside diameters and tolerances: Comply with ASTM D3262-11, Cast Iron Pipe Equivalent Outside Diameters, and table below.
 - (2) When possible, supply pipe in nominal lengths of 20 feet. Where radius curves in existing pipe or limitations in entry pit dimensions restrict pipe length, shorter lengths may be used. Engineer shall first approve of all proposed pipe joints that are shorter than 20 feet.
 - (3) Minimum FRP pipe outside diameters and minimum wall thicknesses:

Minimum Existing Sewer Nominal Diameter (inches)	Minimum Wall Liner O.D. (inches)	Minimum Wall Thickness 46 psi. Stiffness (inches)	Thickness 72 psi. Stiffness (inches)
21	19.50	0.42	0.48
24	21.60	0.46	0.53
30	25.80	0.54	0.63
36	32.00	0.66	0.77
42	38.30	0.78	0.91
48	44.50	0.90	1.05
54	50.80	1.02	1.19
60	57.10	1.14	1.33
66	62.90	1.26	1.47
72	69.20	1.38	1.61
78	75.40	1.50	1.75

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- (4) Fabricate pipe ends square to pipe axis plus or minus 0.25 inches, or plus or minus 0.5% of nominal diameter, whichever is greater.
 - h. Fittings:
 - (1) Flanges, elbows, reducers, tees, wyes and other fittings capable of withstanding operating conditions.
 - (2) Fabrication: Contact-molded or manufactured from mitered sections of pipe joined by glass-fiber-reinforced overlays.
- 1. Liner Pipe Seals at Manholes:
 - a. Sealer for annular spaces between liner pipes and host sewers at manholes: Oakum strips soaked in Scotchseal 5600, as manufactured by 3M Corporation, or approved equal found in Fair Oaks Ranch Material Specifications.
 - b. Non-Shrink Grout: Strong Seal's QSR patching material, or approved equal found in Fair Oaks Ranch Material Specifications.
- 2. Clamps and Gaskets: Stainless steel, including bolts and lugs, as manufactured by JCM Industries (Type 108) or pre-approved equal. Furnish full circle, universal clamp couplings with at least 3/16 inch thick neoprene grid-type gaskets. Select clamps to fit outside diameter of liner pipe as follows:

Liner Pipe O.D. (Inches)	Minimum Clamp Length (Inches)
7.125	15
8.625	18
10.750 or greater	30

- 3. Bedding Material: Comply with Item No. 804, "Excavation, Trenching, and Backfill."

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CONSTRUCTION

1. Obstruction Removal and Point Repair: Make point repairs and remove obstructions, such as roots, rocks and other debris, prior to installing liner pipe. Inspector is to first validate the need for either an obstruction removal or point repair. Refer to Item No. 1103, "Point Repairs and Obstruction Removals."
2. Bypass Pumping: Refer to Item No. 864, "Bypass Pumping."
3. Insertion or Access Pits:
 - a. Locate pits so that the total number is minimized and footage of liner pipe installed in a single pull is maximized. Where possible, use excavations at point repair locations for insertion pits.
 - b. Before excavating, check with various utility providers (e.g., CPS Energy, AT&T, Time Warner, etc.), and determine locations of utilities in or near the work area. Costs of utility repairs, temporary service and other costs arising out of damage to, or interruption of, utilities, resulting from operations under this Contract, shall be borne by Contractor at no additional cost to Fair Oaks Ranch.
 - c. Perform excavation and backfill in accordance with Item No. 804, "Excavation, Trenching and Backfill."
 - d. Perform excavation requiring trench safety in accordance with OSHA standards and Item No. 550, "Trench Excavation Safety Protection."
 - e. Install and operate necessary dewatering and surface water control measures.
4. FRP Liner Pipe Installation: FRP liner pipe may be pushed or pulled into existing sewers. Insert pipes, spigot end first, with bell end trailing. Apply pushing force to pipe wall end inside bell in accordance with manufacturer's instructions. Do not apply jacking loads to end of bell. Maximum allowable joint angular deflection is one degree.
5. Clamp Installation:
 - a. Where excavations for liner pipe insertion are made between two

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manholes, cut ends of liner pipe smooth, square to pipe axis. Join liner pipes with appropriately sized stainless steel universal clamp couplings. Butt together gap between ends of liner pipe with space between ends not exceeding 2 inches.

- b. Bedding: As specified in Item No. 804, "Trench Excavation and Backfill."
- 6. FRP Collar/Closure: Install FRP collar closure pieces in accordance with manufacturer's recommendations.
- 7. Field Quality Control: After liner installation, perform the following tests:
 - a. Service lateral connection test: After all service laterals have been completed for a particular sewer section, verify integrity of re-connections at points where they join liners and existing service lines by performing smoke test.
 - b. Refer to Item No. 849, "Air and Deflection Testing for Sanitary Sewers," for applicable test procedures.
- 8. Sealing Liner in Manhole:
 - a. Allow liner pipe to normalize to ambient temperatures and recover from imposed stretch before cutting to fit between manholes, sealing at manholes and shaping manhole invert. Allow at least 12 hours for normalization of polyethylene.
 - b. Cut liner so it extends 4 inches into manholes. Make smooth, vertical cuts and slope areas over top of exposed liner using non-shrink grout.
 - c. Seal annular spaces between liner and sanitary sewer main at each manhole with chemical seal and nonshrink grout. Place strips of oakum soaked in sealer in a band to form effective water-tight gasket in annular space between liner and existing pipes in manhole. Make width of the sealing band at least 12 inches, or one-half pipe diameter, whichever is greater.
 - d. Finish seal liner pipe to host pipe with non-shrink grout placed around annular space from inside manhole. Apply grout in a band measuring at least 6 inches wide. Obtain the Engineer's approval of

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sealing methods, including seal chemicals and materials.

- e. Use cementitious grout to form smooth transitions with reshaped inverts and raised manhole benches to eliminate sharp edges of liner pipe, concrete benches, and channeled inverts. Build up and smooth manhole invert to match flow line of new liner.

9. **Grouting Annular Space:**

- a. Provide grouting plan and obtain approval of grouting plan from Inspector before proceeding with the Work.
- b. Grout annular space between the outside of liner and inside of existing pipe for sewer pipe diameters 18 inches and larger, in accordance with Item No. 1101, "Slip-lining Grout."

10. **Post-Installation Video Recording:** Provide the Inspector with a NASSCO-(PACP) standard video, recorded in MPEG-1 format and written to a DVD, showing completed work, including condition of restored connections. Comply with Item Nos. 849, "Air and Deflection Testing for Sanitary Sewers," 866 "Sewer Main Television Inspection," and 868, "Sewer Main Cleaning." The DVD shall include good sound quality and identification of area being videoed, to include cross streets references, addresses, time and date. Each DVD shall be marked with the name and contract number, name of Contractor, and a description and location of view being recorded. The video shall include usage of an inclinometer, noting the slope at which the main was installed.

11. **Final Cleanup:** Upon completion of installation and testing, clean and restore project area affected by work of this Section. No separate pay item.

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MEASUREMENT AND PAYMENT:

1. Measurement for slip-lining is on a linear foot basis for installed liner pipe, measured from center line of upstream manhole to center line of downstream manhole. Depth range for payment is based on depth measured at sewer main from natural ground level to flow line of sanitary sewer for each pipeline segment.
2. Insertion pits, access pits, clamp installation, embedment (bedding, haunching and initial backfill), field quality control (testing), sealing liner at manholes, grouting annular space, building up, shaping and reworking manhole inverts and benches, and pre-installation and post-installation cleaning and television inspection of completed work are included in slip-lining unit price and not paid for separately.
3. Excavations initially begun as obstruction removals or point repairs which the Contractor later decides to use as insertion pits are considered as insertion pits and not paid for separately.
4. Trench safety systems, well pointing and other applicable bid items associated with insertion pits will be paid for at their respective contract unit prices.

- End of Specification -

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**ITEM NO. 1101
SLIP-LINING GROUT**

DESCRIPTION: This item shall consist of slip-lining grout which is accomplished by placing grout in the annular space between the slip-lining pipe and the host sewer. Completely fill the annular space without deflecting the pipe. Test grout equipment and procedures in accordance with approved submittals. Perform testing on the first pipeline segment to be grouted. Testing must be performed under observation by the Inspector. If the grout does not totally fill the annular space, adjust the procedure or the mix, and rerun the test on the first pipeline segment.

SUBMITTALS: Contractor shall submit manufacturer's product data, instructions, recommendations, shop drawings, and certifications.

MATERIALS:

1. Manufactures/Application: The applicator of the grout mix shall be certified by the grout mix manufacturer and approved by the Engineer. The certified applicator shall be regularly engaged in the placement of grout, including completion of pipeline grouting installations having at least 1,000 cubic yards in the past 3 years.
2. Materials:
 - a. Cement: Comply with ASTM C150/C150M-12. Pozzolans and other cementitious materials are permitted.
 - b. Fly Ash: Comply with ASTM C618-12a; either Type C or Type F shall be used.
 - c. Sand (if provided): comply with ASTM C144-11, except as modified below:

U.S. Standard Sieve Size	Percent Passing By Weight
No. 16	100
No. 30	60 – 85
No. 50	10 – 35
No. 100	5 – 25
No. 200	0 - 10

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- d. Water: Use potable water free from deleterious amounts of alkali, acid, and organic materials which would adversely affect the setting time or strength of the slip-lining grout.
- e. Admixtures: Admixtures shall be selected by the slip-lining grout manufacturer to meet performance requirements, improve pumpability, control set time and reduce segregation.
 - (1) Compressive Strength: The grout shall have a minimum penetration resistance of 100 psi in 24 hours, when tested in accordance with ASTM C403/C403M-08 and a minimum compressive strength of 300 psi in 28 days when tested in accordance of ASTM C495/C495M12 or C109/C109M-12.
 - (2) Performance Requirements: The Contractor shall submit the proposed grout mixes, methods, plans and criteria of the grouting operations. The grouting system shall have sufficient gauges, monitoring devices, and test to determine the effectiveness of the grouting operation and to ensure compliance with the liner pipe specifications and design parameters.
 - (3) Mix Designs: One or more mixes shall be developed to completely fill the annular space based upon, but not restricted to, the following requirements:
 - (a) Size of annular void;
 - (b) Void (size) of the surround soil;
 - (c) Absence or presence of groundwater;
 - (d) Sufficient strength and durability to prevent movement of the liner pipe;
 - (e) Provide adequate retardation;
 - (f) Provide less than 1 percent shrinkage by volume.

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- (4) Density/Viscosity - The Contractor shall design a grout mix with a density to prevent floating of the liner pipe. The apparent viscosity shall not exceed 20 seconds in accordance with ASTM C939-10, unless otherwise approved by the Engineer.

CONSTRUCTION:

- 1. At least 7 days prior to grouting, submit information on equipment, grout mixes and procedures. Shop drawings and product data shall include, but not be limited to, the following:
 - a. Detailed descriptions of equipment and operational procedures to accomplish the annular grouting operation, including mixing and pumping schedule, grouting pressures, rates of pumping, and methods for monitoring the effectiveness of the grouting;
 - b. Detailed descriptions and drawings indicating proposed locations, of surface mixing equipment, subsurface injection points, flowlines, waste grout recovery, grout pressure limiting equipment, bulkheads, and venting system. Show details of bulkhead design;
 - c. Qualifications and experience of grout mix applicator;
 - d. Grout mix design and trial mix tests, with set time, compressive strength, viscosity, and density test results;
 - e. Initial set time of the grout;
 - f. The 24 hour and 28 day minimum grout compressive strengths;
 - g. The grout working time, before a 15% change in density or viscosity occurs;
 - h. The proposed grouting method and resume of successful uses on previous projects;
 - i. The maximum injection pressures;
 - j. Proposed grout stage volumes;
 - k. Bulkhead designs;

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- l. Buoyant force calculations during grouting;
- m. Flow control;
- n. Provisions for service connections;
- o. Pressure gauge and recorder certifications;
- p. Vent location plans;
- q. Written concurrence that the Contractor had coordinated this work with the grout installer and the liner pipe manufacturer;
- r. For each different type of grout, or variations on procedure of installation, a complete package shall be submitted. The submittal shall include each of the above items and the sewer locations of conditions to which it applies. The Contractor shall notify the Engineer of any changes to be made in grout, mix, grouting procedures or installation.

2. Preparation:

- a. Notify the Inspector at least 24 hours in advance of grouting operations.
- b. Select and operate grouting equipment and carry out procedures with sufficient safety and care to avoid damage to existing underground utilities and structures.

3. Equipment:

- a. Mixers and Pumps: The materials shall be mixed in equipment of sufficient size and capacity to provide the desired amount of grout material for each stage in a single operation. The system shall mix the grout to a homogeneous consistency. Deliver grout to the injection point at a steady pressure with a nonpulsating centrifugal or triplex pump at the mix tank. Provide ways to increase or decrease the water-cement ratio and accurately measure grout component quantities, pumping pressures, and volumes pumped.
- b. Pressure Gauges:

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- (1) Pressure gauges shall be equipped with diaphragm seals, have a working range between 1.5 to 2.0 times the design grout pressure, and have an accuracy within 0.5% of full range.
- (2) Provide one pressure gauge at the point of injection and one pressure gauge at the grout pump.
- (3) Grouting shall not proceed without appropriate gauges in place and in working order.
- (4) Grout pressure gauge and recorder shall be installed immediately adjacent to each injection port. During grouting operations, the recorder shall continuously record the actual grouting pressure versus time on paper with ink. The gauge shall conform to an accuracy of ± 0.5 psi. The range of the gauge should not be more than 100 percent greater than the design grout pressure. Pressure gauges shall be instrument oil filled and attached to a saddle-type diaphragm seal (gauge saver) to prevent clogging with grout. All gauges shall be certified and calibrated in accordance with ANSI/ASME B40.100-2005, Grade 2A. The grout pressure recordings shall be identified as a minimum, with date, batch, and time of day grouting was performed and shall be submitted to the Inspector at the end of the work day that grouting was performed.

c. Procedure:

- (1) Place grout for a given pipeline segment between bulkheads. Place bulkheads at the ends of each pipeline segment to seal the annular space from sewer flow. Do not remove bulkheads until after grout has set.
- (2) Equip slipliner pipes with weirs to fill the pipes with water to prevent flotation during grouting operations.
- (3) Remove or control standing or running water in annular spaces to maintain the correct water ratio of the grout mixture. Grout the annular space by injecting grout from one end of the pipeline segment, allowing it to flow toward the other end. Vent the annular space to assure uniform filling of the void space.

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- (4) Limit pressure on the annular space to prevent damage to the liner; do not exceed 5 psi. Regardless of the pressure, Contractor shall be solely responsible for any damage or distortion to slipliner pipe due to grouting. At the bulkhead opposite to the point of grouting, provide and monitor an open-ended high point tap or equivalent vent.
- (5) Pump grout until grout within 0.3 pounds per gallon of specified grout injection density discharges from the end opposite the injection point. This procedure is intended to ensure that the grout is not diluted by extraneous water in the annulus.
- (6) The drilling of additional injection holes from the surface to facilitate grouting may be allowed, if approved by the Engineer.
- (7) Upon completion of slip-lining, but prior to grouting, bulkheading of the ends and appropriate venting shall be required. This is to seal the annular space from sewer flow to permit the grout to set and withstand the loads imposed by the grout and groundwater. The Contractor shall test the integrity of the installed liner pipe and constructed bulkheads for any leaks by performing the following:
 - (a) Dewater and inject dye water into the annular space (this will not be permitted if the crown or any portion of the host pipe is severely deteriorated to the point where water may escape through the host pipe).
 - (b) Pressurize the annular space to the maximum permissible grouting pressure per manufacturer's recommendation with approval of the Engineer.
 - (c) The Contractor shall submit a detailed plan to the Fair Oaks Ranch engineer that shows how the liner pipe will be held on the invert for a period of time long enough to allow the grout to set when buoyant uplift is a factor

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d. Pumping:

- (1) Design grout mix to be pumped through a 2 inch-diameter hose for a distance of 1,000 feet, with a maximum allowable pressure at point of placement of 5 psi. The cast density shall be 55 pcf, plus or minus 5 pcf. Minimum penetration resistance after 24 hours shall be 100 psi, in accordance with ASTM C403/C403M-08. The minimum compressive strength at 28 days shall be 300 psi in accordance with ASTM C495/C495M-12. Grout mix shall have less than 1% shrinkage by volume.
- (2) The application system shall have sufficient gages, monitoring devices and tests to determine the efficiency and effectiveness of the grouting work and to provide a means of accurately determining the amount of grout injected. Contractor shall be prepared to modify the operation should grouting not perform as proposed. Such modifications and changes shall be done in a timely manner to avoid unnecessary delay in completion of the Project.
- (3) No deleterious amounts of toxic or other poisonous substances shall be included in the grout mix nor otherwise injected underground.

4. Final Cleanup: No hardened grout is permitted in the slipliner pipe invert after completion of grouting operations.

5. Dewatering System Operation: Operate dewatering systems until the grouting of slipliner pipe is complete.

6. Testing:

a. Density/Viscosity: During placement of grout, measure density in accordance with ASTM C138/C138M-12a and C939-10, at least twice per hour. Adjust the mix as required to obtain the specified cast density.

b. Sampling:

- (1) Take 4 test specimens for each 100 cubic yards of grout, or for each 4 hours of placing.
- (2) Test in accordance with ASTM C495/C495M-12 except:

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- (a) Specimens shall be 3 inch by 6 inch cylinders covered after casting to prevent damage and loss of moisture. Moist-cure specimens for at least the first 7 days; perform at least one compressive strength test of each set of samples at 28 days.
- (b) Do not oven-dry specimens to be tested. Specimens may be tested at any age to monitor compressive strength. The material may require special handling and testing techniques.
- (c) The Contractor shall be required to perform a test on each type of grout and grout system proposed to be used. The test section to be grouted, and the size of the annular space considered for each type of grout system, shall be determined by the Inspector.
- (d) The contractor shall engage the services of an approved, nationally accredited, independent testing laboratory to certify that the proposed materials and methods comply with these requirements.

MEASUREMENT AND PAYMENT:

1. Unit Prices: No separate payment will be made for work performed under this section. Include the cost of such work in contract unit prices for slip- lining sanitary sewers.
2. Stipulated Price (Lump Sum): If the Contract is a Stipulated Price Contract, payment for work in this section is included in the total Stipulated Price.

No direct payment shall be made for incidental cost associated with the quality control testing of the grout, and all costs in connection therewith shall be included in the applicable contract price for the item to which the work pertains.

Any retesting costs attributed to substandard results shall be at the contractor's sole expense.

- End of Specification -

ITEM NO. 1103
POINT REPAIRS AND OBSTRUCTION REMOVALS

DESCRIPTION:

1. Repair of sanitary sewer lines by replacing short lengths of failed pipe with new pipe.
2. Repair of service laterals located within the utility easement or street right-of-way, when replacing short lengths of failed pipe with new pipe.
3. Obstruction removal by remote device or excavation.

MATERIALS:

1. Material of sanitary sewer pipe and lateral:

Materials for sanitary sewer pipe and laterals shall conform to Item No. 848, "Sanitary Sewers" and Item No. 854, "Sanitary Sewer Laterals." If point repair is located at a service connection, use a full-bodied fitting for the service connection. No field fabrications of fittings are allowed.
2. Jointing Material: Use flexible adapters secured with ½ inch stainless steel bands, as manufactured by Fernco, or approved equal. All flexible adapters shall be concrete encased to prevent movement or breakage of the steel bands.

CONSTRUCTION:

1. Point Repair:
 - a. Locate and replace small lengths of one or more pipe sections where isolated line failure has occurred due to settlement, corrosion, crushing, or separation of joints.
 - b. The Inspector may identify potential locations for point repair, but the Contractor is responsible for verifying all point repair locations.
 - c. Determine the location of service line repairs by smoke testing the sewer line between the manhole sections where the failed pipe is located. The Inspector will authorize the Contractor to make additional point repairs based on results of smoke testing.

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- d. Smoke testing shall not be performed within 24 hours of a rainfall event, or if ponding/ standing water is present on the ground or in the drainage channels in the area planned for smoke testing
 - e. Smoke testing shall be accomplished utilizing two minimum 1,750 CFM blowers designed specifically for smoke testing of sewers. Place blower on the upstream and downstream manhole of the line section to be tested. Place sandbags in the upstream and downstream manholes to isolate the section being tested and prevent the migration of smoke into sections not being tested. Utilize smoke bombs as necessary to ensure a continuous supply of smoke is provided for the entire duration of the test period.
 - f. Determine the location of point repairs by smoke testing or video inspection of the sewer line between the manhole sections where the failed pipe is located. The Inspector will authorize the Contractor to make additional point repairs.
 - g. The Inspector will authorize each point repair after failure points are located. Do not make point repairs without prior authorization of the Inspector. Perform point repairs only on those portions of service lines which are located in an easement or right-of-way; perform no repairs to service lines on private property.
 - h. Replace all identified damaged pipe for point repairs unless otherwise directed by the Inspector.
2. Obstruction Removal: Remove obstructions by one of the following methods:
- a. Obstruction removal by remote device:
 - (1) Protruding taps: Service laterals that protrude more than one inch into the sewer main.
 - (2) Other obstructions: Hanging gaskets, fixed debris, stabilized sand, hardened mineral deposits, roots, rust scale, tuberculation, etc.
 - b. Obstruction removal by excavation: Obstructions encountered during liner insertion that are removed by digging and exposing the damaged section of main.

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3. Submittals: Submit product data for each pipe product, fitting and jointing material.
4. Sequencing:
 - a. Before rehabilitating a section of sewer main between adjacent manholes, complete point repair and obstruction removal of that section.
 - b. Clean line and perform post-installation video inspection for each point repair on sewer mains not scheduled for rehabilitation.
 - c. Post-installation video inspection of service laterals having point repairs performed are required.
 - d. All approved post installation video shall be performed in conformance to Item No. 866, "Sewer Main Television Inspection."
5. Protection:
 - a. Provide barricades, warning lights and signs for excavations created by point repairs. Comply with Item No. 805; "Temporary Facilities and Controls."
 - b. Do not allow soil, sand, debris or runoff to enter sewer system.
6. Bypass Pumping:

Install and operate bypass pumping equipment as required to maintain sewage flow and to prevent backup or overflow. Comply with Item No. 864, "Bypass pumping."
7. Excavation:
 - a. Excavate and backfill trenches in accordance with Item No. 804, "Excavation, Trenching and Backfill."
 - b. Perform work in accordance with OSHA standards. Employ a trench safety system as required in Item No. 550, "Trench Excavation Safety Protection."
 - c. Remove and lawfully dispose of excess excavated material and debris from the work site daily.

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8. Typical Sequence of Point Repair:

- a. Perform pre-installation video inspection, if required, to verify location of sewer main point repair locations. Perform service testing between manholes to verify location of service lateral point repair locations.
- b. After the location of a point repair is determined, excavate the required length for the point repair.
- c. Prior to replacing a damaged section(s) of pipe, determine condition of the existing line on both sides of the point repair by lamping the main at least 10 feet in each direction. Determine whether additional lengths of main (beyond "minimum length" criteria) need replacement. Report need for additional replacement to Inspector and obtain authorization before proceeding.
- d. Remove the damaged section(s) pipe and replace with new pipe, shaping the bottom of the trench and placing the required pipe bedding so that the grade of the replaced pipe matches the grade of the existing main. Establish proper grade for the section(s) of pipe being replaced using methods acceptable to the Inspector.
- e. Connect the new pipe to existing main using flexible adapters. If joints cannot be made watertight using flexible adapters, place waterstop gaskets on each joint and encase in a reinforced concrete collar. Reconnect affected service connections or stacks using full-bodied fittings. No field fabrication of fittings is allowed.
- f. After completion of point repair, and prior to backfill, perform a smoke test to demonstrate satisfactory integrity of the repair, in the presence of the Inspector. Test as specified in Item No. 849, "Air Deflection Testing for Sanitary Sewers." Repair and retest sections that fail until repaired sections pass the test.
- g. Encase exposed pipe in cement stabilized sand.
- h. Backfill the excavation as specified in Item No. 804, "Excavation, Trenching and Backfill."
- i. Perform a post-installation video inspection as specified in Item No. 866, "Sewer Main Television Inspection." Point repairs that show offset joints, non-uniform grade, incorrect alignment, excessive deflection or similar conditions are considered defective work.

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Contractor shall replace pipe and bedding, as required, to correct defective work.

9. **Abandonment of Point Repair:**

- a. Notify the Inspector if a pipe is exposed by excavation and is found to be in good condition, not requiring a point repair. That point repair shall not be performed.
- b. Notify the Inspector if the pre-installation video inspection reveals that no point repair is required. The point repair shall not be performed.
- c. Backfill the excavation, replace pavement or sidewalk, and repair and seed or sod unpaved areas. No separate pay item.

10. **Obstruction Removal:**

- a. Remote Device: Remove obstructions identified on video of a sanitary sewer line segment which could cause a non-uniform liner pipe installation or obstruction of the liner during installation. Obtain authorization from the Inspector for obstruction removal with a remote device before proceeding.
- b. Use a power-driven cutting device (robotic cutter) to remove protruding taps. Cut protruding taps so that protrusions are no greater than $\frac{3}{4}$ inch. If a protruding tap cannot be removed by the cutting device, then a point repair may be performed. Obtain authorization from the Inspector before proceeding.
- c. To remove other obstructions, use a remote device. Pull or drive the device from manhole to manhole up to a continuous length of 500 feet using a solid steel mandrel, porcupine, root saw, bucket, robotic cutter or similar device to remove the obstruction. Select a device that is adequately sized to remove the obstruction.
- d. Use excavation as the method of obstruction removal when installation of the liner in the sanitary sewer is in progress. If during the liner insertion operation, a collapsed sewer, offset joint, or other obstruction is encountered which prevents or blocks the passage or insertion of the liner, notify the Inspector for authorization to excavate.
- e. Excavate at the point where there is an obstruction. Use a trench safety system as specified in Item No. 550, "Trench excavation

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Safety Protection."

- f. Break out the existing sanitary sewer pipe (carrier pipe) as directed by the Inspector. Remove only that amount of material which is causing the obstruction. Remove the minimum amount of carrier pipe.
- g. Under such conditions, replacement of the carrier pipe is not required. Do not disturb the existing sewer bedding during excavation. However, if embedment is disturbed during the obstruction removal procedure, place cement-stabilized sand or crushed stone beneath the liner. No Separate pay item.
- h. When the liner is completely in place, encase it with crushed stone or cement- stabilized sand.

MEASUREMENT AND PAYMENT:

1. Unit Prices - Point Repair:

- a. Measurement for sewer line point repair is on a unit price basis for each repair performed. Minimum length of pipe to be replaced for each repair, determined by depth of sewer line measured from natural ground to flow line at point of repair.
- b. 9 feet minimum length.
- c. Measurement for sewer line extra length point repair is on a linear foot basis in excess of minimum replacement length specified above.
- d. Payment for service lateral point repair is on a linear foot basis for all sizes of service laterals and for all depths (same unit price per linear foot, regardless of size and depth). No separate payment will be made for point repair done within the limits of a service lateral reconnection as defined in this Section. Minimum length of service lateral point repair is 3 feet.
- e. Measurement for hand excavation: When authorized by the Inspector in locations where excavation by machine is not suitable, no direct payment shall be made for hand excavation.
- f. Measurement for abandonment of point repair by excavation: No direct payment shall be made for abandonment of point repair.

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- g. Measurement for abandonment of point repair by video inspection: No direct payment shall be made for abandonment of point repair by video inspection.
- h. The cost of the following items of work are included in the unit prices for point repairs, and all associated work:
 - (1) Excavation, embedment and backfill;
 - (2) Hauling away and lawful disposal of excess excavated materials and debris;
 - (3) Pipe, pipe fittings, adapters and concrete collars;
 - (4) Smoke testing and any required retesting;
 - (5) Restoration of site improvements, including sodding;
 - (6) Post-cleaning video inspection;
 - (7) All other necessary work to complete.

2. Unit Price - Obstruction Removal:

- a. Obstruction removal by excavation will be paid per each obstruction removal performed. Obstruction removal can be submitted for payment when the obstruction has been cleared from the sewer line to be lined. Liner work must proceed at least 6 feet before payment for removal of another obstruction will be considered (i.e., all obstruction within a distance of 6 feet is considered to be part of the same obstruction.)
- b. Obstruction removal by remote device will be paid on a unit price basis, per manhole section, and shall include all obstruction removals within a manhole section.
- c. The cost of the following work items are included in the unit prices for obstruction removal by remote device or excavation:
 - (1) Cleaning of sanitary sewers due to broken pipe, roots, dirt, loose deposits, etc.;
 - (2) Post television inspection;
 - (3) Excavation, embedment and backfill;

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- (4) Hauling away and lawful disposal of excess excavated material and debris;
- (5) Restoration of site improvements, including sodding;
- (6) All other necessary effort to complete work.

Payment will not be made for obstruction removal if the existing sewer line, service line or tap is damaged and a point repair is required. Payment will not be made for removal of a protruding tap if the service reconnection is performed by excavation.

Removal of hard deposits, concrete, debris, pipes or any other material in a manhole, or that is accessible from the manhole wall, will be cleared under work items for rehabilitation of sanitary sewer pipes and manholes.

- 3. Stipulated Price (Lump Sum): If the Contract is a Stipulated Price Contract, payment for work in this Section is included in the total Stipulated Price.

- End of Specification -

**ITEM NO. 1109
SANITARY SEWER LATERAL
STUB OUTS OR RECONNECTIONS**

DESCRIPTION:

1. Installation of sanitary sewer lateral stub outs in sanitary sewer mains serving areas where service did not previously exist.
2. Reconnection of existing sanitary sewer lateral connections along parallel, replacement, or rehabilitated sanitary sewer mains.

SUBMITTALS: Contractor shall submit manufacturer's product data, instructions, recommendations, shop drawings, and certifications.

CONSTRUCTION:

1. Performance Requirements:
 - a. Provide a minimum of 72 hours' notice to customers whose sanitary sewer service will potentially be interrupted.
 - b. Accurately field locate service connections, whether in service or not, along the new, repaired, or rehabilitated sanitary sewer main. For parallel and replacement sewers, service connections may be located as pipe laying progresses from the downstream, to the upstream direction.
 - c. Properly disconnect existing connections from the sewer main and reconnect to the rehabilitated section of main, as described in this section.
 - d. Reconnect service connections, including those that go to unoccupied or abandoned buildings or to vacant lots, unless directed otherwise by the Inspector.
 - e. Complete reconnection of service lines within 24 hours after disconnection due to slip-lining, parallel, or replacement of sanitary sewer mains.
 - f. Reconnect services on cured-in-place liner(s) at 12 feet depth or less by the excavation method. The Inspector reserves the right to require service connections by excavation when a remote cut service connection damages the main or laterals.

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- g. Reconnection by the excavation method shall include the stack and fittings and required pipe length to reconnect service line.

2. Preparation:

- a. Determine the existing sewer lateral locations and number of existing service connections from closed-circuit television (CCTV) inspection DVD or from a field survey. Accurately field locate existing lateral connections, whether in service or not. Use existing lateral locations to connect or reconnect service lines to the main.
- b. For rehabilitated sanitary sewer mains, allow liner to normalize to ambient temperature and recover from imposed stretch. For cured-in-place liners, verify that liner is completely cured.
- c. For new parallel and replacement sanitary sewer mains, complete testing and acceptance of downstream sewers as applicable.

3. Reconnection by Excavation Method:

- a. Remove a portion of existing sanitary sewer main or carrier pipe to expose the liner pipe. Provide sufficient working space for installing a prefabricated pipe saddle.
- b. Carefully cut the liner pipe, making a hole to accept the stub out protruding from the underside of the saddle.
- c. Strap on the saddle using a stainless steel band on each side of the saddle. Tighten the bands to produce a watertight seal of the saddle gasket to the liner pipe.
- d. Remove and replace cracked, offset, or leaking service line for up to 5 feet, measured horizontally, from the center of the new main or liner.
- e. Make up the connection between new main or liner and lateral using PVC sewer pipe, with approved fittings and couplings.
- f. Encase the entire lateral connection in cement stabilized sand as shown in the contract documents.
- g. Test each lateral connection before backfilling.

4. Reconnection by Remote Method:

- a. Make service reconnections using remote-operated cutting tools on cured-in-place liners at depth greater than 12 feet.

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- b. Employ method and equipment that restore the service connection capacity to not less than 90 percent of original capacity.
 - c. Immediately open any missed lateral connections and repair any holes drilled in error using a method approved by the Inspector.
- 5. Reconnection on Parallel or Replacement Segments:
 - a. Install lateral connections on the sewer main.
 - b. Remove and replace cracked, offset or leaking lateral for up to 5 feet, measured horizontally, from the centerline of the sanitary sewer main.
 - c. Make up the connection between the main and the existing lateral using PVC sewer pipe, with approved couplings, as shown in the contract documents.
 - d. Test each lateral connection before backfilling.
 - e. Embed the lateral pipe and point of connection, as specified for the sanitary sewer main, as shown in the contract documents. Place and compact trench zone backfill in compliance with Item No. 550, "Trench Excavation Safety Protection."
- 6. Installation of New Service Stubs:
 - a. Install laterals on sanitary sewer main for each service connection. Provide the length of stub indicated in the contract documents. Install plug or cap on the upstream end of the service stub, as needed.
 - b. Test each lateral connection before backfilling.
 - c. Embed the lateral pipe and point of connection, as specified for sanitary sewer main, and as shown in the contract documents. Place and compact trench zone backfill in compliance with Item No. 550, "Trench Excavation Safety Protection." Install a minimum 2 foot length of magnetic locating tape along the axis of the service stub out and 9 to 12 inches above the crown of the pipe, at the end of the stub out.

MEASUREMENT AND PAYMENT:

- 1. Unit Prices:

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- a. Payment for sanitary sewer lateral stub outs or service reconnections with stacks located within 5 feet of the sanitary sewer main centerline, is on a unit price basis for each stub out or reconnection. Payment will be made for each lateral stub out or reconnection installed complete in place, including service connections, couplings, adapters, disconnecting existing services, reconnecting new service, fittings, excavation, backfill, and testing.
- b. Payment for sanitary sewer lateral stub outs or service reconnections without stacks located within 5 feet of the sanitary sewer main, is on a unit price basis for each stub or reconnection. Payment will be made for each lateral stub out or reconnection installed complete in place, including service connections, couplings, adapters, disconnecting existing services, reconnecting new service, fittings, excavation, backfill, and testing.
- c. Payment for sanitary sewer laterals more than 5 feet laterally from the sewer main shall be governed by Item No. 854, "Sanitary Sewer Laterals."
- d. One or more lateral connections discharging into a common point are considered one service connection. The Contractor shall not add lateral reconnections without approval of the Inspector. The Inspector may require laterals to be relocated to avoid having more than two lateral connections per reconnection.
- e. Protruding lateral connections, which must be removed to allow liner insertion, are paid as a lateral reconnection (when connected).
- f. No direct payment will be made for plugged abandonment of lateral connections. No separate payment will be made for abandonment of a lateral connection, unless excavation is required. No separate payment will be made for excavation of sanitary sewer laterals within the new or replacement sewer trench.
- g. No separate payment will be made for removal of existing sanitary lateral service stub outs.
- h. No separate payment will be made for a plugged and abandoned lateral connection, if the service to be abandoned is within 4 feet of an active connection. Payment for abandoned service connection will not be allowed.
- i. If a faulty remote cut is later corrected using the procedures specified for reconnection by excavation, only one reconnection will be allowed for payment.

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- j. No direct payment will be made for hand excavation and backfill when authorized by Inspector in locations where excavation by machine is not suitable.

- End of Specification -

ITEM NO. 1110

PROGRESS SCHEDULE

DESCRIPTION: This item shall govern the Contractor's responsibility to provide monthly construction schedules as specified herein for the work under this Contract. These schedules shall be developed as time-scaled network diagrams. Schedules include bar graphs, phasing plans, network diagrams, and narrative reports.

SUBMITTALS:

1. Contractor's Submittals:

- a. A preliminary schedule shall be submitted to the Inspector prior to, or immediately after, the Pre-Construction Conference, in bar graph form, based on the date of the Authorization to Proceed.
- b. The Contractor may submit to the Inspector a revised contractor phasing plan prior to the start of construction for review and approval. If the Inspector determines that the revised Contractor's Phasing Plan is not acceptable with respect to the best interest of Fair Oaks Ranch, then the Contractor shall proceed with the work in accordance with the Fair Oaks Ranch's Phasing Plan at no additional cost to the Fair Oaks Ranch.
- c. Within 10 days after receipt of Authorization to Proceed, Contractor shall submit for Fair Oaks Ranch's review, a detailed construction schedule, reflecting sequence of operations, milestones and commencing and completion dates of each item of work.
- d. Other work may be added to the progress schedule as requested or approved by the Inspector.
- e. At a minimum, the chart shall be maintained current by coloring or cross-hatching a length of bar to indicate the weekly progress towards completion.
- f. Three copies of the progress schedule shall be submitted each month with the monthly "scratch copy," until completion of the project. If updated progress schedules are not provided, monthly payments will be withheld.
- g. Updated copies of the progress schedule shall be available at the established progress meetings for review.
- h. Contractor shall submit a projection of estimated monthly payments through the life of the Contract. Initial projections shall be correlated with and provided

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at the same time as the Schedule of Values (if required). Projections shall be updated when requested by the Inspector.

2. Owner's Review:

- a. Within 10 days of submission of the schedule by Contractor, Contractor shall meet with the Inspector to participate in reviewing and revising the schedule as necessary. If revision of either form or content is necessary, Contractor shall revise and resubmit the progress schedule within five calendar days.
- b. The progress schedule shall be used by the Contractor for planning, organizing, directing, and executing all completion of work and for reporting progress of all remaining work.

3. Revisions and Updates:

- a. After the Owner's review of the progress schedule, if the Contractor desires to make changes in his method of executing the work, he shall notify the Inspector in writing, stating the reasons for the changes. If Fair Oaks Ranch considers these changes to be of a major nature, the Contractor may be required to revise and resubmit all the affected portions of the progress schedule.
- b. Updated progress schedules shall show all changes in activities and milestones including future changes that can be reasonably anticipated by the Contractor.
- c. At the established progress meetings, the most recently updated progress schedule will be reviewed by the Contractor and Inspector. The schedule and work will be reviewed:
 - (1) To identify those activities started and completed during the previous period;
 - (2) For remaining duration, from the date of update, required to complete each activity started, but not completed;
 - (3) For a review of remaining durations for selected activities not yet started;
 - (4) For the addition of change orders and proposed sequencing changes to the network diagram;
 - (5) For the interfacing of the work under this Contract with the work of other Contractors' or the connection to in-place work.

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- d. Following review of the progress schedule at the established meetings, the Contractor shall revise and resubmit the schedule, if any of the following conditions have developed:
 - (1) When a delay in completion of any work item or sequence of work items results in an indicated extension of the project completion;
 - (2) When delays in submittals or deliveries or work stoppages are encountered which make re-planning or rescheduling of the work necessary;
 - (3) When the schedule does not reasonably represent the actual prosecution and progress of the project.
 - e. The revised schedule shall be submitted to the Inspector within five calendar days and shall be accompanied by a written narrative report. The narrative report shall include a description of problem areas, current and anticipated delay factors and their estimated impact on performance of other activities and completion dates, and an explanation of corrective action taken or proposed.
 - f. All updated or revised schedules submitted after the original schedule shall be in the same detail as the original submittal.
4. Monthly Report: Contractor shall submit a copy of the current adjusted construction Progress Schedule showing the progress to the Work to date and a narrative report with every monthly "scratch copy." Failure to submit the progress schedule shall be considered cause for withholding any progress payments otherwise due under the Contract. See Section 7.2 of the GENERAL CONDITIONS for more information. The report shall list any construction activities that are behind schedule and discuss measures being taken to bring these activities back on schedule.

EXECUTION:

- 1. Network Diagram:
 - a. The network diagram shall show the order and interdependence of activities and sequence in which work is to be accomplished as planned by the Contractor. The diagram shall show how the start of a given activity is dependent upon completion of preceding activities and how its completion restricts the start of following activities.

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- b. The diagram shall be constructed in such a manner that sub- networks (relating to particular phases or portions of work) can be readily extracted or revised as required by the Owner. Sub- networks shall include, but are not limited to, the following portions of work:
 - (1) Shop drawings, received from Contractor, submitted to the Inspector, reviewed, and returned to the Contractor;
 - (2) Material and equipment order, manufacturer, delivery, installation, and check-out;
 - (3) Connection to the work of other Contractors' and to in-place work;
 - (4) Work requiring coordination with the work of other contractors;
 - (5) Performance tests and supervisory service activities;
 - (6) Piping activities;
 - (7) Construction of various facilities;
 - (8) Concrete placement sequence;
 - (9) Backfilling, grading, seeding, paving, etc;
 - (10) Plumbing activities;
 - (11) Subcontractor's items of work;
 - (12) Final cleaning.
- c. The network diagram shall show the following information related to activities:
 - (1) Activity number or label;
 - (2) Brief description of activity;
 - (3) Estimated duration, in working days, of each activity.
- d. In addition to showing all construction and coordination activities, the diagram shall show following events and milestones:

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- (1) Notice to Proceed;
 - (2) Connections to the work of other contractors and to in-place work;
 - (3) Ready for operation and Contract completion dates;
 - (4) Shutdowns;
 - (5) Intermediate milestones.
 - e. Detail of information shall be such that duration times of activities will generally range from 1 to 30 days with not over 2% of activities exceeding these limits. Activities which comprise separate portions of work shall be identified separately by coding.
 - f. Network diagram shall be drawn on 22 inch by 34 inch size sheets with flow of activities generally from left to right. Printing shall be suitable for half size (11" x 17").
 - g. The network diagram shall be time-scaled.
2. Mathematical Analysis:
- a. Contractor shall provide Owner with the following:
 - (1) The calendar used for the computation of dates specified showing the calendar dates of each working day. The calendar shall incorporate the Contractor's assumptions of working days with due consideration being given to legal statutory holidays, Saturdays and Sundays, and weather shutdowns;
 - (2) A listing of each submittal and update of Contractor's detailed construction schedule;
 - (3) List of representative symbols and codes used in preparation of the network diagram.
 - b. Analysis shall include:
 - (1) Calendar date and lists of activities in order of earliest start date;
 - (2) Separate lists of activities within a given sub-network grouped together and listed in order of their earliest start dates.

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3. Narrative Report: The narrative report shall include:
 - a. Contractor's transmittal letter;
 - b. Schedule narrative concerning completion and progress of all work according to the activity in the Contractor's construction schedule;
 - c. Description of any problem areas;
 - d. Current and anticipated delays, cause, corrective action to be taken, and impact of the delay on other activities, on milestones, and on completion dates;
 - e. Status of pending items such as permits, Contract modifications, and time extensions;
 - f. Progress relative to schedule and other project or scheduling concerns;
 - g. A discussion of coordination efforts and problems.
4. Log of Shop Drawing Submittals:
 - a. The log of shop drawing submittals shall consist of a complete listing of all shop drawings required by the Specifications with anticipated submission dates. Scheduled submission dates shall be consistent with the construction schedule.
 - b. The Contractor shall update the log monthly indicating submittal status. Status shall include all dates submitted and whether the submittal was acceptable or if re-submittal is necessary. Anticipated re-submittal dates shall be indicated.

DELAYS AND RECOVERY:

1. If it is determined by the Inspector that the Contractor is not maintaining anticipated progress, then the Owner may withhold approval of the monthly progress payment as outlined in Section 7.2 of the GENERAL CONDITIONS.
2. Wherever it becomes apparent from the current monthly progress evaluation and updated schedule data that any milestone interface completion dates and/or Contract completion dates will not be met, the Contractor shall take some or all of the following actions:

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- a. Increase construction manpower in such quantities and crafts as shall eliminate the backlog of work;
 - b. Increase the number of working hours per shift, shifts per day, work days per work week, or the amount of construction equipment, or any combination of the foregoing sufficient to eliminate the backlog of work;
 - c. Reschedule work items to achieve concurrency of accomplishment.
3. Under no circumstances will the addition of equipment or construction forces, increasing the working hours, or any other method, manner, or procedure to return to the current Contractor's construction schedule be considered jurisdiction for Contract modification, increased cost, or treated as an acceleration.

MEASUREMENT: There will be no measurement for payment of the Progress Schedule, as specified herein.

PAYMENT: No direct payment shall be made of any incidental costs associated with preparing and submitting the Progress Schedule, as specified herein.

- End of Specification -

ITEM NO. 1112
PROJECT RECORD DOCUMENTS

DESCRIPTION: Contractor shall maintain and provide the Inspector with project record documents as specified below. Daily logging and transmittal of record drawing information by accurately identifying all completed work is considered incidental and not eligible for additional payment.

1. Maintenance of Documents:
 - a. Maintain in Contractor's field office, in a clean, dry, legible condition, a complete set of the following: Contract Documents, including all addenda, approved Shop Drawings, Samples, Photographs, Change Orders, other Modifications of Contract, Test Records, Survey Data, and all other documents pertinent to Contractor's Work.
 - b. Provide files and racks for proper storage and easy access.
 - c. Make documents available at all times for inspection by Inspector and/or Engineer.
 - d. Record documents shall not be used for any other purpose and shall not be removed from the office without Inspector's approval.
2. Recording:
 - a. Label each document "PROJECT RECORD," in 2 inch high printed letters.
 - b. Keep record documents current and updated daily.
 - c. Do not permanently conceal any work until required information has been recorded.
 - d. Contract Documents: Legibly mark to record actual construction including:
 - (1) The depths of various elements of manhole foundation in relation to datum. This shall include the inclusion of surveyed inlet/outlet elevations for each structure installed;

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- (2) Horizontal and vertical location of installed underground utilities and surface appurtenances, referenced to permanent ground improvements;
 - (3) Field changes of dimensions and details to those originally referenced in the contract documents;
 - (4) Changes made by Change Orders or Field Change Directives;
 - (5) Dimensions and details not in original contract documents.
 - e. Specifications and Addenda - Legibly mark up each Section to record:
 - (1) Manufacturer, trade name, catalog number, and supplier of each product and item of equipment actually installed;
 - (2) Changes made by Change Orders or Field Change Directives;
 - (3) Other dimensions and details not in original contract documents.
 - f. Shop Drawings - Maintain as record documents and legibly annotate drawings to record changes made after review.
 - g. Record Documents are subject to submittal, review, and acceptance by the Inspector on a monthly basis and failure to accurately keep these documents current will result in the Inspector withholding the Contractor's monthly payment.
3. Record Drawings:
- a. Record drawings shall reflect completion of the installation of all equipment, piping, and other work by the Contractor. The drawings shall show the Work in plan and sections as required for clarity with reference dimensions and elevations for complete record drawings. The monthly record drawings shall be furnished to the Inspector at the time that the "scratch copy" stage of the pay estimate effort is conducted. If the Contractor does not furnish an accurate and approved progress record drawing, the monthly pay estimate will not be processed and payment will be withheld.

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4. The Contract Drawings may be used as a starting point in developing these drawings. Subcontractor and manufacturer drawings may be included in this drawing package. The drawing package must be fully integrated and include the necessary cross references between drawings. The drawing package shall include interconnection and termination details to equipment furnished under this Contract Submittal:
 - a. At each monthly "scratch copy" stage of the pay estimate, the Contractor shall deliver a complete set of reviewable and approvable monthly record drawings to the Inspector. Place all letter-sized material in a 3 ring binder which is neatly indexed by process and division number. Bind Contract drawings and shop drawings in rolls of convenient size for ease of handling.
 - b. Accompany the submittal with a transmittal letter in duplicate containing the following:
 - (1) Date;
 - (2) Project title and job number;
 - (3) Contractor's name and address;
 - (4) Title and number of each record document;
 - (5) Certification that each document as submitted is complete and accurate;
 - (6) Signature of Contractor, Engineer, and Inspector.

MEASUREMENT: There will be no measurement for payment of the Project Record Drawings, as specified herein.

PAYMENT: No direct payment shall be made of any incidental costs associated with preparing and submitting the Project Record Drawings, as specified herein.

- End of Specification -

ITEM NO. 1114
PRE-CONSTRUCTION VIDEO

DESCRIPTION: This item shall govern the Contractor's responsibility for the production of pre-construction videos with NASSCO-(PACP) standard video, recorded in MPEG-1 format and written to a DVD, as provided herein. Contractor shall provide a copy of the pre-construction DVD prior to commencement of the project by identifying the condition of all existing surface features within the project limits, including adjoining right-of-way features such as curbing, sidewalk, fencing, mailboxes, driveways, and trees/shrubs/grass. Contractor is to coordinate the video procedures with the Inspector prior to commencement of any work, including mobilization and preparation of right-of- way effort.

QUALITY: All videos shall be a NASSCO-(PACP) standard video, recorded in MPEG-1 format written to a DVD, and of good quality. The DVD shall include good sound quality; identification of area being videoed, to include cross streets references, addresses, time and date. Each DVD shall be marked with the name and contract number, name of Contractor, and a description and location of view being recorded.

EXECUTION: Prior to beginning the project, the contractor shall submit one copy of the completed DVD for the entire project prior to submission of request for mobilization for review and approval. Failure to submit DVD will result in denial of any request for payment under the Mobilization line item or Preparation of Right-of-Way.

MEASUREMENT: There will be no measurement for payment of the Pre- Construction Video, as specified herein.

PAYMENT: No direct payment shall be made of any incidental costs associated with preparing and submitting the Pre-Construction Video, as specified herein.

- End of Specification -

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ITEM NO. 3000
HANDLING ASBESTOS CEMENT PIPE

INTRODUCTION: This item shall govern the uncovering, dislodging, handling, removing, transporting, and disposing of asbestos cement (AC) pipe and other asbestos containing materials (ACM). AC pipe is also known as transite pipe. AC pipe typically contains from 15% to 20% chrysotile and crocidolite asbestos and is considered to be an asbestos- containing material. The disturbance and/or removal of this material is governed by the National Emissions Standards for Hazardous Air Pollutants (NESHAP) 40 Code of Federal Regulations (CFR) 61; by the Occupational Safety and Health Administration (OSHA) 29 CFR 1926.1101; the State of Texas Occupation Code, Chapter 1954 and Health and Safety Code Chapters 361 and 363; and the Texas Administrative Code (TAC), 25 TAC Chapter 295 and 30 TAC Chapter 330.3 and 330.171. The material is classified by definition under 40 CFR 61, Subpart M, Section 61.141 as Category II, non-friable ACM, unless, when dry, it can be crumbled, pulverized, or reduced to powder by hand pressure. At that time, it becomes classified as regulated ACM (RACM) and subject to regulation under Subpart M. It is the intent of this specification to define procedures that maintain the AC pipe in an intact state. Contractors shall not use procedures that subject the AC pipe to forces that will crumble, pulverize, or reduce to powder the AC pipe. By using procedures that have a low to no probability of fiber release, the pipe retains its classification as Category II, non-friable ACM. These procedures will protect workers from the health risk associated with airborne asbestos.

References to the City of Fair Oaks Ranch (COSA) pertain only to those joint bid projects, where joint jurisdiction occurs due to the contract's binding agreement. Definitions used and incorporated as part of this specification are located in Appendix One. Applicable standards and guidelines used and incorporated as part of this specification are located in Appendix Two.

GUIDANCE: If the project specifies an Asbestos Removal Work Plan (or, Asbestos Abatement Plan) be provided and approved as part of the project documents, the following guidelines should be used for the document to be considered acceptable. Refer to Appendix Three of this specification for more specific guidance of addressing an acceptable procedure for handling Fair Oaks Ranch AC pipe. Plans submitted with insufficient detail will be returned requesting more information be provided.

1. The governing documents for Fair Oaks Ranch asbestos-cement (AC) pipe are as follows:
 - a. U.S. Environmental Protection Agency (EPA), 40 Code of Federal Regulations (CFR) Part 61, Subpart M – National Emission Standards for Asbestos;
 - b. Occupational Safety and Health Administration (OSHA),

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29 CFR 1926.1101, Asbestos;

- c. The State of Texas Statute, Health and Safety Code, Chapter 363;
 - d. Texas Administrative Code (TAC) 30 TAC Chapter 330.
2. OSHA classifies the handling and removal of asbestos containing material (ACM) as Class II asbestos work. As such each contractor shall acknowledge that their program complies with OSHA standard 29 CFR 1926.1101 and shall describe how their program complies with that standard. It should be included in the contractor's submission meeting Fair Oaks Ranch Spec 902, Safety and Health Program.
3. Fair Oaks Ranch AC pipe is considered by the U.S. EPA as Category II, non-friable asbestos containing material (ACM). The Fair Oaks Ranch wants its pipe to retain that asbestos categorization. To accomplish that goal Fair Oaks Ranch requires that no force be applied to the pipe that would cause it to become crumbled, pulverized, or reduced to powder by hand pressure unless wet techniques are used when a force is applied. Once the pipe becomes crumbled, pulverized, or reduced to powder it becomes classified as regulated ACM. (40 CFR 61.141)
4. The plan submitted shall contain the following:
- a. The scope of work to be accomplished shall be described in detail. Be specific as to the involvement with the existing AC pipe. For example: abandoning/removing X feet of AC pipe; tying into one or more joint(s)/section(s) of an existing water main and replacing one or more joints/sections (X feet) of pipe to make the connection; removing X feet of buried AC pipe encased in concrete crossing a drainage way not accessible by road; or connecting to an existing joint/section of AC pipe by tapping into the AC pipe.
 - b. Detailed procedures that describe the methods/techniques to be employed to uncover, dislodge, handle, remove, secure, transport, and dispose of the AC pipe and any

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generated ACM waste. For illustrative purposes only the following is an example of the level of detail expected in a plan. The contractor could use them as a basis for preparing their plan. If the contractor employs this example, Fair Oaks Ranch requires greater site specific detail in the plan submitted.

DESCRIPTION: This item shall consist of the uncovering, dislodging, handling, removing, transporting, and disposing of AC pipe, joints, wrappings and other ACM. To comply with NESHAP and OSHA requirements, this project will require workers trained in using wet technique procedures to dislodge and remove AC pipe, AC pipe joints, valves (any type) containing ACM, and any surrounding soils that may contain ACM. The Contractor shall develop an Asbestos Removal Work Plan, herein referred to as “the Plan”, (see Appendix Three, Example Procedures) that provides specific and detailed procedures they and/or any of their subcontractors will follow to maintain the AC pipe in an intact state. The Plan shall specify the wet techniques to be followed when the pipe collars are dislodged. The Plan shall include procedures/actions to be followed if the intact AC pipe becomes broken and the possibility exists of asbestos fibers becoming airborne. By regulatory definition, if and when the pipe and/or collar are broken, they become a regulated ACM (RACM) and subject to NESHAP. The Plan shall state or reference procedures in the contractor’s Safety and health program document that they will follow to comply with the federal OSHA asbestos standard. Finally, the Plan shall contain provisions for the environmentally compliant disposal of the intact AC pipe and any RACM created during the removal process. The Plan shall be provided to Fair Oaks Ranch (Fair Oaks Ranch) at the pre-construction (pre-con) meeting for its review and approval prior to initiating uncovering operations to verify the contractor has met the contractual requirements. No handling and disposing of Fair Oaks Ranch AC pipe will begin without approval from Fair Oaks Ranch. Any ACM encountered that is not Fair Oaks Ranch pipe and not previously identified by Fair Oaks Ranch or shown on Fair Oaks Ranch plans will be not be authorized for disposal payment. Preparation and submission of the Plan shall be considered subsidiary to the work required and no direct payment will be made.

If the project is joint bid with COSA, the Plan shall also be submitted to COSA Environmental representatives for their review and approval, as required. The Contractor shall comply with the COSA and any other agencies requirements. Any uncovering, dislodging, handling, or disposing of AC pipe and associated written handling and removal plans, such as an abatement plan, required by another agency will be paid for by that agency using their specification/bid item number. Again, no handling and disposing of Fair Oaks Ranch AC pipe will begin without approval from Fair Oaks Ranch.

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To meet and/or exceed NESHAP and OSHA guidelines, the contractor may subcontract the AC pipe handling plan and work to an Environmental Protection Agency (EPA) accredited and Texas Department of State Health Services (DSHS) licensed asbestos abatement contractor, DSHS licensed asbestos consultant, and DSHS air monitoring technician.

NESHAP guidelines apply to facility projects in which the combined amount of regulated asbestos containing material (RACM) is at least 260 linear feet (LF) or 35 cubic feet or 160 square feet. This means that if the combined amount of RACM is at least 260 linear feet of the AC pipe, including AC collars, and it is expected to become or becomes crumbled, pulverized, or reduced to powder, then the project is subject to the NESHAP provisions of reporting and asbestos emission control paragraphs in 40 CFR Section 61.145. If the DSHS RACM limit of 260 LF is exceeded, the contractor is responsible for any DSHS administrative fees and fines. The contractor shall be responsible for submitting the DSHS notification with copies to Fair Oaks Ranch and COSA Environmental Division for joint bid projects.

If the scope of the project may involve the threshold amount (260 linear feet or greater), a Demolition/Renovation Notification Form will be sent to DSHS by the Contractor. This form shall be post-marked no later than 10 working days prior to the start of any asbestos handling work.

All projects involving AC pipe require that NESHAP and OSHA standards are met and/or exceeded. The contractor shall perform all work in a manner that meets or exceeds those standards. The contractor shall have and follow a written Plan that describes their detailed handling and disposal procedures of the AC pipe. The contractor shall submit copies of the Plan to Fair Oaks Ranch for review and approval and for joint bids, COSA Environmental representatives, as required. OSHA requires that during any ACM disturbance, regardless of amount, the asbestos worker(s) shall be protected from potential airborne asbestos exposure in excess of the permissible exposure limit or excursion limit as stipulated in 29 CFR 1926.1101.

MEASUREMENTS: Steel pipe will be measured by the linear foot.

1. At the Pre-construction Conference/Meeting the following shall be submitted for review and approval to Fair Oaks Ranch, and when applicable COSA Environmental representatives, as required:
 - a. The Plan in accordance with: NESHAP, OSHA, this Special Specifications, Item Number 3000, and State requirements. The number of copies submitted of the Plan is the same as the number of copies required under other bid submittal requirements with one copy being submitted

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electronically. The work plan shall provide detailed procedures for retaining the AC pipe's Category II, non-friable NESHAP classification. The contractor shall incorporate working with ACM and complying with mandated OSHA requirements for Class II, asbestos work in their project specific Safety and Health Plan. The guidance provided in these special specifications is not intended and does not constitute an asbestos abatement project design as described under 25 TAC, Chapter 295.

- b. Submit proof satisfactory to Fair Oaks Ranch, and as applicable, COSA Environmental representatives, that required permits, site location, and arrangements for transport and disposal of asbestos containing waste material (ACWM) have been made that meet Texas environmental statutes and regulations. Include the name of the transporter, their Texas asbestos transporter license number, and the name of the approved landfill where the AC pipe and ACM waste will be buried.
2. During Asbestos Handling and Disposal Activities: Submit copies to Fair Oaks Ranch and if applicable, COSA Environmental representatives of all transport manifests, trip tickets, and disposal receipts for all ACWM removed from the work area during the project. The Contractor will sign manifests as the Fair Oaks Ranch' representative (generator) for the AC pipe and provide copies to the Fair Oaks Ranch Construction Inspection Department for final payment.

CONSTRUCTION REQUIREMENTS:

1. The Work includes all work specified herein, to include mobilization and demobilization, labor, materials, overhead, profit, taxes, transportation, disposal fees, administrative fees, and incidental cost. Estimating areas, quantities, and weight are the sole responsibility of the Contractor.
2. The Contractor shall remove and double bag with 6-mil polyethylene sheeting to yield a total of at least 12-mil, the asbestos pipe in the trench or immediately when it comes out of the trench, seal, label, transport, and dispose of all Category II non-friable ACM and RACM in compliance with applicable current Federal, State and local regulations, laws, ordinances, rules, standards and regulatory agency recommended requirements.

The Contractor shall notify Fair Oaks Ranch and, if applicable COSA representatives, at least 72 hours prior to beginning

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uncovering, dislodging, handling, and removing the AC pipe. AC pipe uncovering, dislodging, handling, and/or removing shall be conducted during regular business hours, 8 a.m. to 5 p.m., Monday-Friday. No uncovering, dislodging, handling, and or removing of AC pipe outside of the normal business hours or during the weekend is allowed unless special circumstances require the contractor to do so and the work has been approved in writing at least 72 hours before the commencement of the work.

3. Time is of the essence in removing the ACM from the project area. All work must be completed within the time period specified in the contract. Fair Oaks Ranch, and if applicable COSA representative will be responsible for coordinating this work in high-density areas, such as schools, church facilities, and residential areas.
4. All notifications required to state regulatory agencies will be made by the Contractor with copies provided to Fair Oaks Ranch and as applicable, COSA representatives, including but not limited to the DSHS Demolition/Renovation Notification Form. If 260 linear feet or greater of RACM pipe will become crumbled, pulverized, or reduced to powder, the project is subject to NESHAP regulations and a Demolition/Renovation Notification Form will be sent to DSHS by the Contractor. This form will need to be post-marked no later than 10 working days prior to the start of any asbestos disturbance.
5. The Contractor shall have an on-site supervisor, who is an OSHA Competent Person, present on the job site at all times that the AC pipe work is in progress. This supervisor shall be thoroughly familiar with and experienced at asbestos pipe handling using wet techniques and shall be familiar with and shall enforce the use of all safety procedures and equipment. He/she shall be knowledgeable of all applicable EPA, OSHA, and DSHS asbestos requirements and guidelines.
6. The Contractor has: sole and primary responsibility for the “means and/or methods” of the work; an obligation to Fair Oaks Ranch to inspect all stages of the work; and sole responsibility to supervise the performance of the work. Certain work practices for AC pipe disturbance are prohibited as per Section 3000.5.C.
7. The Contractor shall be responsible for site safety and for taking all necessary precautions to protect the Contractor’s, Fair Oaks Ranch, and COSA personnel and the public from airborne asbestos exposure and/or injury. The Contractor shall be responsible for maintaining the integrity of the work area.

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8. The Contractor shall confine operations at the site to the area requiring interface with the AC pipe and the general site area in close proximity to the project. The Contractor will not unreasonably encumber the site with materials or equipment. If ACWMs are required to be stored overnight in a secured area, the waste material and waste containers shall be labeled according to OSHA and EPA, and the State of Texas requirements, & containerized to preclude unauthorized disturbance of the ACWMs.
9. The Contractor shall be responsible for obtaining and coordinating waste disposal and transport of ACWM to a Texas Commission on Environmental Quality (TCEQ) permitted asbestos waste landfill. Waste manifests shall be generated for the transport of the AC pipe and ACWMs from the project site to the landfill disposal site. The Contractor will sign the manifests as the Fair Oaks Ranch's representative (generator) for the AC pipe and provide copies to the Fair Oaks Ranch Construction Inspection Department for final payment.

SITE SECURITY: The Contractor shall demarcate the area of AC pipe interface ("regulated area") with barrier tape and warning signs, per OSHA regulation 29 CFR 1926.1101. Access to the regulated area will be limited to authorized personnel and visitors. The contractor shall identify in their site specific safety and health plan how they intend to limit access and who is authorized to be in the demarcated area.

AC PIPE HANDLING:

1. General: Any project involving AC pipe, the Contractor shall comply with OSHA standards and shall develop a Safety and Health Plan that complies with Fair Oaks Ranch Specification Item No. 902, "Construction Safety and Health Program requirements."
2. The Contractor shall uncover, dislodge, handle, remove, transport, and dispose of all AC pipe specified in the contract documents for this project using wet technique procedures. All work involving AC pipe and other ACM products must be addressed in the Plan. The Contractor shall take precautions to prevent damage to adjacent structures and material/finished material not required for AC pipe handling.
3. Prohibited Work Practices and Engineering Controls: Contractors shall not use procedures that subject the AC pipe to forces that will crumble, pulverize, or reduce to powder the AC pipe. The following work practices and engineering controls shall **not** be

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used for work related to AC pipe or for work which disturbs ACM, regardless of asbestos exposure or the results of Initial Exposure Assessments:

- a High-speed abrasive disc Fair Oaks Ranch and sanders not equipped with point of cut ventilator or enclosures with HEPA filtered exhaust air;
 - b Carbide-tipped cutting blades;
 - c Electrical drills, chisels, and rasps used to make field connections in AC pipe;
 - d Shell cutters used to cut entry holes in AC pipe;
 - e A hammer and chisel without using wet techniques to remove pipe connections;
 - f Compressed air used to remove asbestos or material containing asbestos;
 - g Dry sweeping, dry shoveling, or other dry clean-up of dust and ACM debris;
 - h Employee rotation as a means of reducing employee exposure to asbestos;
4. General Removal Work Practices: See Appendix Three for an example of the detailed general work practices a contractor could use in preparing an Asbestos Removal Work Plan. If the contractor uses the example, they must expand upon the provisions in the appendix to describe its specific procedures. The appendix is provided for illustrative purposes only. If the contractor employs this example, Fair Oaks Ranch requires greater site specific detail to be included in the Plan submitted for approval.
 5. Disposal bags for RACM shall be 6-mil polyethylene and labeled as required by EPA Regulation 40 CFR 61.150 (a)(1)(iv) or OSHA requirement 29 CFR 1926.1101(k)(8).
 6. Stick-on labels identifying the generator's name (Fair Oaks Ranch) and address and the project site location shall be applied to any asbestos waste disposal bag that contains RACM, as per EPA or OSHA and Department of Transportation requirements.
 7. Abandonment of AC water mains/pipes:

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- a. The Contractor is responsible for isolating the existing mains to remain in place by capping, plugging and blocking as necessary. The opening of an abandoned AC water main and all other openings or holes shall be blocked off by manually forcing cement grout or concrete into & around the openings in sufficient quantity to provide a permanent watertight seal. Abandonment of AC water mains will be considered subsidiary to the work required, and no direct payment will be made.
 - b. Abandonment of Valves that contain ACM: Valves to be abandoned in the execution of the work shall have the valve box and extension packed with sand to within eight inches (8") of the street surface. The remaining eight inches (8") shall be filled with 3,000 psi concrete or an equivalent sand-cement mix and finished flush with the adjacent pavement or ground surface. The valves covers shall be salvaged & returned to Fair Oaks Ranch. The abandonment of valves containing ACM will be considered subsidiary to the work required, and no direct payment will be made.
 - c. Verification of Removal & Clean-up Procedures: The Contractor's on-site Competent Person shall inspect the work area, verify, and certify that no residual AC pipe fragments and debris remain.
8. Disposal Procedures: Submit copies to Fair Oaks Ranch Environmental Division and, if applicable COSA Environmental representatives, of all transport manifests, trip tickets, and disposal receipts for all asbestos waste materials removed from the work area during the project. The Contractor will sign manifests as the Fair Oaks Ranch representative (generator) for the AC pipe and provide copies to Fair Oaks Ranch Construction Inspections for final payment.

PAYMENT: The work performed as prescribed by these items shall be paid for at the contract unit price bid per linear foot for "Removal, Transportation, and Disposal," which prices shall be full compensation for the work herein specified including the furnishing of all materials, equipment, tools and for the material disposal, submittals, and labor necessary to complete the work. No payment shall be made for the Plan.

BID ITEM: Removal, Transportation, and Disposal – Linear Foot

STANDARD PLAN NOTE: Asbestos Cement (AC) pipe, also known as transite pipe, contains asbestos-containing material (ACM) and is located

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within the project limits. Special waste management procedures and health and safety requirements are applicable when handling, removing, and disposing of this pipe. Payment for such work is to be made under Special Specification Item No 3000, “Special Specification for Handling Asbestos Cement Pipe.”

APPENDIX ONE: DEFINITIONS

As used anywhere in Item No. 3000, Specifications for Handling Asbestos-Cement Pipe, including all appendices, the following shall be defined to mean:

1. Amended Water: Water to which a surfactant (wetting agent) has been added to increase the ability of the liquid to penetrate ACM.
2. Approval: Means the Fair Oaks Ranch contract requirements have been met but does not mean that the Fair Oaks Ranch stipulates any written documents adequately comply with federal and state occupational safety and health regulatory requirements.
3. Asbestos: A group of naturally occurring silicate minerals and includes chrysotile, amosite, crocidolite, tremolite asbestos, anthophyllite asbestos, actinolite asbestos, and any of these minerals that has been chemically treated and/or altered.
4. Asbestos Containing Material (ACM): Material or products that contain more than 1.0% of any kind of asbestos.
5. Asbestos Containing Waste Material (ACWM): Asbestos containing material or asbestos contaminated objects requiring disposal.
6. Authorized Personnel: Any person authorized by the Contractor and required by work duties to be present in the regulated area.
7. Authorized Visitor: Fair Oaks Ranch representatives, and any representative of a regulatory or other agency having jurisdiction over the project.
8. Asbestos Consultant: A person licensed by the Texas Department of State Health Services to perform the following asbestos abatement related functions in public buildings:
 - a. Project design;
 - b. Asbestos surveys and condition assessment of ACM;

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- c. Asbestos Management Planning;
 - d. The collection of bulk material samples, airborne substance samples and the planning of sampling strategies;
 - e. Owner-representative services for asbestos abatement projects or O&M programs, including air monitoring and project management;
 - f. Consultation regarding regulatory compliance and all aspects of technical specifications and contract documents;
 - g. The selection, fit testing, and appropriate use of personal protection equipment & the development of asbestos related engineering controls.
9. Abatement Contractor: The company, agency, or entity licensed by the Texas Department of State Health Services that has been retained to perform asbestos abatement and other associated functions.
10. Class II Asbestos Work (OSHA Standard): Activities involving the removal of ACM, which is not thermal system insulation or surfacing material. This includes, but is not limited to, the removal of asbestos containing wallboard, floor tile and sheeting, roofing and siding shingles, and construction mastics.
11. Competent Person: An individual, who is capable of identifying existing asbestos hazards in the workplace, can select the appropriate control strategy for asbestos exposure, and who has the authority to take prompt corrective measures to eliminate them.
12. Friable Asbestos: Asbestos containing material, that when dry, can be crumbled, pulverized, or reduced to powder by hand pressure and includes previously non-friable material that has become damaged to the extent that, when dry, it may be crumbled, pulverized, or reduced to powder by hand pressure.
13. NESHAP: The National Emission Standards for Hazardous Air Pollutants (40 CFR Part 61).
14. OSHA: The Occupational Safety and Health Administration.
15. Regulated Area: An area established by the Contractor or employer to demarcate areas where asbestos work is conducted and any adjoining area where debris and waste from such asbestos work

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accumulate; and an area within which airborne concentrations of asbestos exceed or there is a reasonable possibility they may exceed the permissible exposure limit.

16. Regulated Asbestos Containing Material (RACM): (1) Friable asbestos material; (2) Category I non-friable ACM that has become friable; (3) Category I non-friable ACM that will be or has been subjected to sanding, grinding, cutting, or abrading; or, (4) Category II non-friable ACM that has a high probability of becoming or has become crumbled, pulverized, or reduced to powder by forces expected to act on the material in the course of the demolition or renovation operations regulated by 40 CFR Part 61, Subpart M.
17. Staging area: A pre-selected area where wrapped or containerized asbestos containing waste material will be placed prior to removal from the project site.
18. Surfactant: A chemical wetting agent added to water to improve penetration.
19. Uncovering operations: The use of mechanical, pneumatic, and/or manual procedures that disturb the material and/or soil above and/or around the AC pipe that would expose personnel to the AC pipe.

APPENDIX TWO: APPLICABLE STANDARDS AND GUIDELINES

All work under these specifications shall be done in strict accordance with all applicable Federal, State, and local regulations, standards, and codes governing asbestos disturbance, handling, removal and disposal. Work activities shall also comply with Fair Oaks Ranch and City of Fair Oaks Ranch Specifications related to safety and health.

The most recent edition of any relevant regulation, standard, or code shall be in effect. Where there is a conflict between the regulations, standards, codes, and/or these specifications, the most stringent requirements shall apply.

As a minimum, the Contractor shall comply with the applicable portions of the following:

1. Occupational Safety and Health Administration (OSHA) including but not limited to:

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- a. Title 29 Code of Federal Regulations (CFR) Section 1926 – Safety and Health Regulations for Construction
 - b. Title 29 CFR Section 1926.1101 – Safety and Health Regulations for Construction - Asbestos.
 - c. Title 29 CFR Section 1910.134 – Occupational Health and Safety Standards - Respiratory Protection.
 - d. Title 29 CFR Section 1910.1020 – Occupational Health and Safety Standards - Access to Employee Exposure and Medical Records.
 - e. Title 29 CFR Section 1910.1200 – Occupational Health and Safety Standards - Hazard Communication.
2. Environmental Protection Agency (EPA) including but not limited to: Title 40 Code of Federal Regulations Part 61 Subpart M – National Emission Standard for Asbestos.
3. Texas Statutes, including but not limited to:
 - a. Occupation Code, Chapter 1954, Asbestos Health Protection
 - b. Health and Safety Code Chapters 361 and 363, Solid Waste
4. Texas Administrative Code including but not limited to:
 - a. Department of State Health Services, Title 25, Chapter 295, Subchapter C – Texas Asbestos Health Protection.
 - b. Texas Administrative Code, Title 30, Chapter 330 Municipal Solid Waste.
5. Department of Transportation – Hazardous Materials Regulations 49 CFR, Parts 170 – 180.
6. Fair Oaks Ranch Specification 902 Safety and Health Program

APPENDIX THREE: EXAMPLE OF PROCEDURES FOR HANDLING Fair Oaks Ranch AC PIPE

The following is an example of procedures for handling Fair Oaks Ranch AC pipe. A contractor could use them as a basis for preparing an Asbestos Removal Work Plan. The contractor must expand upon the provisions of this

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appendix to describe its specific procedures. This appendix is provided for illustrative purposes only. The contractor is required to develop a site specific Asbestos Removal Work Plan that complies with the provisions of this specification. If the contractor employs this example, Fair Oaks Ranch will require greater site specific detail to be included in the plan submitted for approval.

Scope of Work: Describe the work and be specific as to the intended involvement with the existing AC pipe. For example: abandoning/removing X feet of AC pipe; tying into a section of an existing waterline and replacing one section (X feet) of pipe to make the connection; or connecting into an existing section of AC pipe by tapping into the AC pipe.

1. Excavation to Pipe:

- a. Excavate to within X inches/feet of the section of AC pipe to be replaced/removed. Depending upon the depth of the excavation, shoring may be needed following company procedures (provide or reference those procedures).
- b. Once the pipe is located, excavate (by machine or hand) on one/both sides of the pipe to expose the collars and pipe. Dig the earth from around the collars by hand to create a clearance space completely around the collar. DO NOT SCRAPE OR ABRASE THE PIPE WITH THE EXCAVATION DEVICE(S).
- c. Set up pumps to evacuate any residual water when the AC pipe is dislodged.

2. Wet Method Use:

- a. Make the amended water solution by mixing 1 ounce of a liquid detergent (Dawn, Joy, other) with 2 to 3 gallons of water in a 2 to 3 gallon mist sprayer. Other size sprayers may be used.
- b. Wet each portion of the pipe, normally just the collar, to be removed with the amended water (water/soap) solution.
- c. Use the mist sprayer to produce a “mist” application and continuously wet the collars throughout the wrapping, cracking, and removal process. A worker shall be assigned to and is responsible for this procedure during the entire dislodging process.

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3. Only Cracking AC Pipe Collars is Approved:

- a. Wrap wet towels/burlap/other defined absorbent material around the collar. Wrap the collar with at least two layers of 6-mil polyethylene sheeting to provide a total of at least 12-mil. It is recommended that additional poly be used on the collars to minimize possible tearing of the plastic.
- b. Place another layer of wet towels/burlap/ other defined absorbent material on the wrapped collar.
- c. Use the flat head end of a sledgehammer to crack the collar while continuously “misting” the collar. Strike the collar on the side of the section of pipe to be removed to prevent the remaining section of pipe from being broken.
- d. Put all of the pieces of collar into a 6-mil polyethylene waste bag. Look for small pieces that may have been generated during the cracking process, wet them, and place them in the waste bag.

NOTE: When the collars are cracked and removed from a shutdown waterline, residual water may drain from the dislodged AC pipe. Follow company safety procedures to control the water (provide or reference those procedures).

4. Double Bag All AC Waste Materials:

- a. All visible AC pipe materials including collars, towels, rubber gloves, gaskets, and other items suspected of containing asbestos shall be double bagged using two (2) 6-mil AC waste bags. The inner bag contents shall be mist sprayed with amended water or mixed with water from the trench prior to closing to maintain the contents wet. Close the bag when it is half full by twisting the top of the bag and sealing with moisture resistant tape.
- b. If the asbestos waste bag is small enough, it may be placed inside the section of intact pipe before the pipe is wrapped in at least two layers of 6-mil poly. If placing the waste bag inside the pipe, do not force it causing it to tear.

5. Removal of Pipe and Waste Bag from Trench:

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- a. All sections of “intact” pipe shall be wrapped in a minimum of two (2) layers of 6-mil poly sheets (12-mil total) while in the trench and lifted out of the trench using only nylon slings. If the trench contains water, the pipe shall be lifted out of the trench using only nylon slings and placed on a minimum of two (2) layers of 6-mil poly sheets (12-mil total) on the ground next to the trench.
- b. Wrap each pipe segment in at least 12-mil of poly and secure with tape.
- c. Lift the ACM waste bag(s) from the trench and move it/them to a secure location to prevent accidental contact with the bag(s) that would cause it/them to tear.

NOTE: Any valves, bends, tees, fittings, or other items that have AC pipe connected shall be wrapped whole as required with the same minimum total of 12-mil of poly material.

6. AC Pipe and Waste Storage/Transfer:

- a. Wrapped AC pipe and ACM waste bags shall be stored in a secure area away from traffic that could damage the wrapped pipe and/or waste bags while awaiting transport to the permitted landfill.
- b. If daily transport to a permitted landfill cannot be provided, a roll-off type dumpster/disposal container may be used to hold only the wrapped AC pipe and bagged RACM waste to prevent damage to the wrapping.
 - (1) DO NOT TOSS THE PIPE OR WASTE BAGS INTO THE ROLL-OFF OR DISPOSAL CONTAINER.
 - (2) DO NOT MIX SPOILS WITH THE AC WRAPPED PIPE AND AC WASTE.
- c. All wrapped or bagged materials shall be moved to the AC pipe/waste fenced holding area for storage. If a roll-off or other type disposal container is used, place the wrapped pipe and waste bags in the roll-off/container using methods that do not cause the wrapping/bagging to be torn.
- d. Any bagged or wrapped materials that are torn in handling shall be mended and taped. If the tear is too extensive for a

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simple tape repair, wrap/bag with an additional equivalent of 12-mil minimum thickness of poly wrap/bagging.

7. AC Pipe and Waste Disposal: The wrapped AC pipe and ACM bagged waste shall be transported to an approved AC waste landfill with the manifests being generated at the time of transfer. Include the name of the transporter, their Texas asbestos transporter license number, and the name of the permitted landfill where the AC pipe and ACM waste will be buried.

- End of Specification -