

APPENDIX A
TRENCHING GUIDELINES
NEW MEXICO DEPARTMENT OF GAME AND FISH

TRENCHING GUIDELINES

NEW MEXICO DEPARTMENT OF GAME AND FISH

September 2003

Open trenches and ditches can trap small mammals, amphibians and reptiles and can cause injury to large mammals. Periods of highest activity for many of these species include nighttime, summer months and wet weather. Implementing the following recommendations can minimize loss of wildlife.

- Keep trenching and back-filling crews close together, to minimize the amount of open trenches at any given time.
- Trench during the cooler months (October – March). However, there may be exceptions (e.g., critical wintering areas) that need to be assessed on a site-specific basis.
- Avoid leaving trenches open overnight. Where trenches cannot be back-filled immediately, escape ramps should be constructed at least every 90 meters. Escape ramps can be short lateral trenches or wooden planks sloping to the surface. The slope should be less than 45 degrees (1:1). Trenches that have been left open overnight should be inspected and animals removed prior to backfilling, especially where endangered species occur.

On a statewide basis there are numerous threatened, endangered or sensitive species potentially at risk by trenching operations. Project initiators should seek county species list to evaluate potential impact of projects. Risk to these species depends upon a wide variety of conditions at the trenching site, such as trench depth, side slope, soil characteristics, season, and precipitation events.

APPENDIX B
NEW MEXICO STANDARD SPECIFICATIONS FOR
PUBLIC WORKS CONSTRUCTION

SECTION 701
TRENCHING, EXCAVATION AND BACKFILL

701.1 GENERAL

Trench excavation and backfill for underground utilities, sanitary sewer, storm sewer, water lines, and appurtenances shall conform to these specifications or as specified in the Supplemental Technical Specifications or as authorized, in writing, by the ENGINEER.

701.2 REFERENCES

701.2.1 ASTM:

D-2487 D-2922
D-3017 D-4318

701.2.2 This Publication:

Section 207
Section 301
Section 302
Section 336
Section 337
Section 340

701.3 TERMINOLOGY

701.3.1 For the purpose of these specifications in this Section, the descriptive terms "flexible," "plastic" and "non-rigid" are similarly interchangeable as utilized in these specifications and appurtenant reference material.

701.3.2 Rigid pipe: shall be reinforced concrete, concrete cylinder, and vitrified clay pipes.

701.3.3 Flexible pipe shall be polyvinyl chloride, polyethylene, ductile iron, and corrugated metal pipes.

701.3.4 Standard Detail Drawings show the trench cross-sections which identify the meaning and limits of terminology used in these specifications for the terms "foundation, bedding, haunching, initial backfill, final backfill, embedment, pipe zone, cover, springline, and pipe width."

701.3.5 The Unified Soil Classification System in ASTM D2487 Shall be utilized for the purpose of material classifications. See Table 701.3.A for a listing of referenced soil classes.

701.4 NOTIFICATION OF FORTHCOMING WORK

701.4.1 To assure that the construction work progresses in a timely manner and that good public relations are maintained with the property owners, the following actions are considered essential:

D-422 D-698 D-1557 D-2321 701.4.1.1 Prior to the start of construction the CONTRACTOR shall assist the ENGINEER in notifying the adjacent property owners as to when construction will start, the estimated completion date, anticipated access blockages.

TABLE 701.3.A
EMBEDMENT SOILS CLASSIFICATIONS

SOILS CLASS	SOIL TYPE	DESCRIPTION
CLASS I SOILS*		Manufactured angular, granular material, ¼ to 1-1/2 inches (6 to 40 mm) size, including materials having regional significance such as crushed stone or rock, broken coral, crushed slag, cinders, or crushed shells, complying to the requirements of Class II soils.
CLASS II SOILS** CLASS II SOILS** CLASS II SOILS** CLASS II SOILS**	GW GP SW SP	Well-graded gravels and gravel-sand mixtures, little or no fines. 50% or more of coarse fraction retained on No. 4 sieve. More than 95% retained on No. 200 sieve. Clean. Poorly graded gravels and gravel-sand mixtures, little or no fines. 50% or more of coarse fraction retained on No. 4 sieve. More than 95% retained on No. 200 sieve. Clean. Well-graded sands and gravelly sands, little or no fines. More than 50% of coarse fraction passes No. 4 sieve. More than 95% retained on No. 200 sieve. Clean. Poorly graded sands and gravelly sands, little or no fines. More than 50% of coarse fraction passes No. 4 sieve. More than 95% retained on No. 200 sieve. Clean.
CLASS III SOILS*** CLASS III SOILS*** CLASS III SOILS*** CLASS III SOILS***	GM GC SM SC	Silty gravels, gravel-sand-silt mixtures. 50% or more of coarse fraction retained on No. 4 sieve. More than 50% retained on No. 200 sieve. Clayey gravels, gravel-sand-clay mixtures. 50% or more of coarse fraction retained on No. 4 sieve. More than 50% retained on No. 200 sieve. Silty sands, sand-silt mixtures. More than 50% of coarse fraction passes No. 4 sieve. More than 50% retained on No. 200 sieve. Clayey sands, sand-clay mixtures. More than 50% of coarse fraction passes No. 4 sieve. More than 50% retained on No. 200 sieve.
CLASS IV SOILS CLASS IV SOILS CLASS IV SOILS CLASS IV SOILS	ML CL MH CH	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands. Liquid limit 50% or less. 50% or more passes No. 200 sieve. Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays, Liquid limit 50% or less. 50% or more passes No. 200 sieve. Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts. Liquid limit greater than 50%. 50% or more passes No. 200 sieve. Inorganic clays of high plasticity, fat clays. Liquid limit greater than 50%. 50% or more passes No. 200 sieve.

CLASS V SOILS CLASS V SOILS CLASS V SOILS	OL OH PT	Organic silts and organic silty clays or low plasticity. Liquid limit 50% or less. 50% or more passes No. 200 sieve. Organic clays of medium to high plasticity. Liquid limit greater than 50%. 50% or more passes No. 200 sieve. Peat, muck and other highly organic soils.
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* Soils are as defined in ASTM D2487, except for Class I Soil which is defined in ASTM D2321

** In accordance with ASTM D2487, less than 5% passes No. 200 sieve.

*** In accordance with ASTM D2487, soils with 5% to 12% passing No. 200 sieve fall in a borderline classification that is more characteristic of Class II than of Class III.

701.4.1.2 Prior to the start of trenching operations, including pavement cutting and removal, the CONTRACTOR should coordinate with the ENGINEER any problem areas and involving traffic control, access to private properties, stockpiling of excavated materials, and other utility conflicts.

701.4.1.3 The CONTRACTOR shall provide the ENGINEER with the name and telephone number of at least two contact persons during non-working hours.

701.5 TRENCH SAFETY

The CONTRACTOR shall be responsible for maintaining all trenches in a safe condition; thereby protecting the workers and the general public. Trench slopes and other protection shall be in accordance with applicable regulations such as the Department of Labor's Occupational Safety and Health Administration Standards 29CFR Part 1926, subpart P or any applicable amendments.

701.6 BRACING EXCAVATIONS

701.6.1 Excavation for pipe shall normally be by open unsupported trenches unless local conditions warrant trench bracing.

701.6.2 Excavations shall be braced and sheeted. to provide complete safety to persons working therein and bracing shall comply with applicable Federal (OSHA), State and local laws and ordinances. Support systems for trenches in excess of 20 feet deep and adjacent to existing improvement or subject to vibrations or ground water shall be in accordance with OSHA regulations. The CONTRACTOR shall be fully responsible for sufficiency and adequacy of bracing excavations with respect to work under construction and adjacent utility lines and private property.

701.6.3 If the soil conditions within the trench area require support, the CONTRACTOR may elect to use tight sheeting, skeleton sheeting, stay bracing, trench jacks, or movable trench shield to support the trench during pipe laying operations, such as: bedding preparation, pipe laying, backfilling of haunches and initial zone.

701.6.4 No sheeting shall be permitted to remain in the trench except when, in the opinion of the ENGINEER, field conditions or type of sheeting or methods of construction used by the CONTRACTOR, warrant the supports must remain. The ENGINEER may opt to have the lower portion (within the pipe zone) of the sheeting to remain. If the CONTRACTOR plans on removing the sheeting, he shall submit method to the ENGINEER for approval to treat the void created by the removal of the sheeting within the pipe zone and below.

701.6.5 When a movable trench shield is used, the trailing half of the shield should be notched to the height of the top of the pipe. This will allow the haunch area of the pipe to be compacted properly to the wall of the trench. If the trench shield is not notched, a subtrench shall be excavated for pipe installation such that the bottom of the trench shield does not enter the pipe zone.

701.7 DEWATERING

701.7.1 Trenching and pipe laying operations may encounter standing water or ground water which would preclude the proper placing of bedding, backfilling, and laying pipe. The water shall be removed by pumps and associated equipment, such as well points, to lower the water level. Dewatering shall continue for a minimum 24 hours after placement of any concrete.

701.7.2 Dewatering operations shall remove the water to achieve a stable foundation for pipe embedment and backfilling. The ENGINEER shall determine if adequate foundation has been attained. The ground water shall be lowered to a minimum depth of 6 inches below pipe grades. Should over excavation be necessary due to unsuitable foundation conditions, the ground water shall be additionally lowered as necessary.

701.7.3 The CONTRACTOR shall submit a plan for approval by the ENGINEER as to how and where the waste water will be disposed. Waste water will not be discharged into traffic and pedestrian lanes or onto private properties.

701.7.4 The CONTRACTOR shall obtain permit from the New Mexico State Engineer prior to commencing dewatering operations.

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701.7.5 The CONTRACTOR shall also responsible for any adverse effect his dewatering operation has to private property, including providing temporary water to residences and/or business necessitated by the effect on private wells.

701.7.6 The CONTRACTOR shall arrange dewatering operation in a neat and orderly manner such that access to adjacent, properties is maintained, the discharge system does not leak and that any power generation complies with applicable noise limit regulations .

701.8 REMOVAL OF EXISTING PAVEMENT SIDEWALK, AND DRIVEWAY

701.8.1 Existing concrete pavement, sidewalk, or driveway removed in connection with construction shall be replaced , neatly sawed edges. Cuts shall be neat and to true straight lines with no shatter outside the removal area. If a saw cut would fall within 30 inches of a construction joint, cold joint, expansion joint, or edge, the concrete shall removed and replaced to the joint or edge. Concrete sidewalk and/or driveway may removed so that a minimum of 30-inch square is replaced. If the saw cut would fall within 12 inches of a score mark, the score mark.

701.8.2 Existing bituminous pavement removed in connection with construction shall be cut with a saw, pavement break cutting wheel, or other suitable tool approved by the ENGINEER. Care shall taken to assure that the edge of removed pavement does not vary from a straight line more than 2 inches from r mean.

701.8.3 Saw cutting shall be 1-1/2 inches in depth or 1/4 the thickness of the pavement, sidewalk, or driveway, whichever is greater. All saw cuts or other scoring shall be made perpendicular to the surface of the material to be cut.

701.8.4 Any unnecessarily irregular breakage or cracking caused by the CONTRACTOR shall be removed and replaced by the CONTRACTOR without added expense to the OWNER.

701.8.5 The CONTRACTOR shall be responsible for the disposal of removed materials.

701.8.6 Saw cutting is required on all concrete or asphalt paving on State maintained streets or roads.

701.8.7 Paving cuts for manholes and valve boxes and other utility appurtenances shall be square and at dimensions specified the Standard Detail Drawings or on the construction plans.

701.9 MAXIMUM LENGTH OF OPEN TRENCH

In developed areas, no more than 300 feet of trench shall be opened in advance of pipe laying operations. This distance may be reduced due to traffic control considerations. Backfilling shall begin as soon as pipe is laid and inspected and shall keep pace with the pipe laying. In advance of trenching operations in undeveloped areas, the CONTRACTOR shall submit in writing or on plans for the ENGINEER'S approval, the maximum length of trench that will be open at anyone time. Except by permission of the ENGINEER, the maximum length of open trench in anyone location where concrete structures are cast in -place will be that which is necessary to permit uninterrupted progress. Construction shall be pursued as follows: excavation, formwork, and setting of reinforcing steel, placing of floor slab, walls, and cover slab or arch shall follow each other without anyone of these operations preceding the next nearest operation by more than 200 feet. Failure by the CONTRACTOR to comply with the limitations specified herein or as may be specifically authorized by the ENGINEER may result in a written order from the ENGINEER to halt progress of the work until such time as compliance with this paragraph has been achieved and the work can be proceeded in an orderly sequence of operations.

701.10 WIDTH OF TRENCHES

Trench widths will vary according to the type of pipe used, size of pipe, depth of trench, and soil conditions, The minimum width requirements, indicated below, are for proper laying, aligning and jointing of pipe as well as trench grading, bedding preparation, and backfilling.

701.10.1 TRENCH WIDTH FOR RIGID PIPE MATERIALS: Trench widths from bottom of pipe to a point 12 inches above the top of the pipe shall be kept to the practical minimum required for properly laying, aligning, grading, jointing, and backfilling of the pipe, but no less width than pipe outside diameter plus 16 inches. For stable soils which will stand a vertical cut, the maximum trench width at a point 12 inches above the top of pipe or at a point 5 feet above the bottom of the trench, whichever is less, shall be as follows:

- The pipe outside diameter plus 2 feet for pipes 27 inches in diameter and smaller.
- 1.6 times the nominal diameter for pipes 30 inches in diameter or larger.

701.10.1.3 When soil will not stand vertical. the trench sides shall be sloped to provide not less than the outside diameter plus 16 inches at the pipe invert.

701.10.2 TRENCH WIDTH FOR NON-RIGID PIPES: The minimum clear width of the trench measured at the springline of the pipe should be 1 foot greater than the outside diameter of the pipe. The maximum clear width of the trench at a point 1 foot above the top of the pipe is equal to the pipe outside diameter plus 2 feet. If the maximum recommended

trench width must be exceeded or if the pipe is installed in a compacted embankment, then pipe embedment should be compacted to a point of at least 2-1/2 pipe diameters from the side of the pipe or to the trench walls.

701.11 ROCK EXCAVATION

701.11.1 Rock is defined as material which cannot be excavated without drilling and blasting. All stone or boulders less than 8 cubic feet in volume will be classified as earth; all larger boulders shall be classified as rock. If blasting is necessary to excavate such materials as shale, hardpan, soft sandstone, cemented gravel, or loose rock which normally can be classified as earth excavation, then this excavation shall be classified as rock excavation. Whenever a ledge of solid rock encountered with earth below it or where alternate layers of solid rock and earth occur, the earth shall be included in the allowance for rock when the thickness of the layer of earth is less than 12 inches, thus requiring it to be removed by blasting along with the ledges of rock. Blasting will be considered necessary when the soil and rock cannot be excavated at a rate of 50 cubic yards per hour by a competent operator with a back-hoe that has a minimum bucket curling force of 25,000 pounds (John Deere 690 or equivalent).

701.11.2 Whenever rock is encountered in the trench or elsewhere in any excavation required to be made, it shall be excavated to the line and grade as shown on the plans and within the limits described therein, unless otherwise authorized, in writing, by the ENGINEER.

701.11.3 For trenches, rock shall be excavated to a depth of 6 inches minimum below the outside bottom of the conduit except at points of rock and earth transitions at which points the rock shall be excavated to a minimum of 12 inches below the outside bottom of the conduit as shown on the detail sheets for trench cuts and backfill of rock. Any depression in the bottom of the trench caused by overshoot and/or excavating and being 6 inches or greater in depth from a theoretical bottom of trench grade shall be filled to the theoretical bottom of the trench with select soils. The trench shall be backfilled with select backfill material to a point 1 foot above the top of the conduit. The remainder of the trench shall be backfilled as specified herein. The complete trench backfill from the bottom through to the top of the subgrade shall meet the compaction and/or moisture requirements as specified herein.

701.11.4 BLASTING: Suitable weighted covering or mats shall be provided to confine all materials lifted by the blasting within the limits of the trench and to prevent injury of persons or damage to property. Blasting shall be under the supervision of a person qualified and experienced in the use and handling of explosives. All blasting operations shall be done in accordance with applicable local, state, and federal laws, ordinances, and codes regulating the transportation, storage, and use of explosives. Forty-eight hours prior to blasting operations, the CONTRACTOR shall notify the local law enforcement agency.

701.12 FOUNDATION

701.12.1 All pipe shall be bedded on a stable foundation in a trench which is completely free of water. The ENGINEER shall determine the adequacy of the foundation. Class V soils shall not be used as a foundation. If Class V soils are encountered at the bottom of the trench it shall be removed to the depth authorized by the ENGINEER and replaced with Class I, II or III soils.

701.12.2 Where an unstable foundation condition is encountered, it must be stabilized before laying pipe or alternative foundation methods utilized. The CONTRACTOR will be paid for foundation stabilization when required by the ENGINEER. Failure to notify the ENGINEER of an obvious unstable foundation condition prior to proceeding with placement of the pipe shall result in complete removal of the affected pipe, foundation stabilization, and replacement of the pipe at the CONTRACTOR'S expense.

701.12.3 Should the trench be inadvertently over-excavated below the foundation, the area of over-excavation shall be filled with select material in 6 inch lifts and compacted to a density of not less than 95 percent of maximum density, as determined by ASTM D 1557.

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701.12.4 Unless specifically approved in writing by the ENGINEER, the CONTRACTOR shall not proceed with pipe embedment in a trench where water is present or the foundation is saturated. Adequate dewatering, as specified in Section 701.7, shall be utilized.

701.13 PIPE EMBEDMENT

701.13.1 GENERAL:

701.13.1.1 The class of bedding used for each pipe shall be as shown on the plans or as specified in the Supplemental Technical Specifications.

701.13.1.2 The CONTRACTOR may request a change in the class of bedding required on a pipe, if authorized by the ENGINEER, all increase in the cost of labor and materials required to include upgrading of the pipe class will be at the CONTRACTOR'S expense with no additional cost to the OWNER.

701.13.2 RIGID PIPE EMBEDMENT:

701.13.2.1 The trenches shall be excavated in conformance with the trench width requirements in Section 701.10 and

701.13.2.2 Embedment material shall be Class I, II, III, or IV soils, or lean fill as specified in Section 207.

701.13.2.3 All soil in the embedment zone shall be placed in lifts not exceeding 8 inches in uncompacted depth, except that material along the side of the pipe shall not be placed above the spring line until the haunch area of the pipe is adequately filled and sliced such that no voids remain.

701.13.2.4 All soil shall be compacted to a density not less than 90 percent of maximum density, as determined by ASTM D 1557. The CONTRACTOR shall take care to assure that the pipe is not damaged or misaligned during compaction of the embedment.

701.13.3 FLEXIBLE PIPE EMBEDMENT:

701.13.3.1 Proper placement of soils in the embedment zone is extremely important in achieving a satisfactory installation of flexible pipe. The CONTRACTOR shall be aware that the soil classes have differing requirements relative to embedment. There are also differing requirements for embedment in dry and wet conditions (wet conditions meaning that the embedment zone will be subject to ground water).

701.13.3.2 Embedment material shall be Class I, II, or III soils, or lean fill as specified in Section 207.

701.13.3.3 Embedment soil shall be placed in lifts not exceeding 8 inches loose depth. The haunch shall be properly compacted by hand tampers utilizing due caution such that the pipe is not damaged or misaligned. Mechanical tampers shall not be utilized directly over the pipe in the embedment zone.

701.13.3.4 The CONTRACTOR may utilize acceptable on site soils in the embedment area which are in conformance with these specifications. The CONTRACTOR has the option of importing a different soil, however, additional compensation will only be allowed if the on site soils are Class IV or V.

701.13.3.5 Class I soil shall comply with the requirements of Section 302, AGGREGATE BASE COURSE.

701.13.3.6 Class II and III soils shall be compacted to a density of not less than 95 percent of maximum density in the embedment area, as determined by ASTM D 1557. The moisture content shall not exceed 5 percent above optimum.

701.14 FINAL BACKFILL

701.14.1 Final backfill shall consist of homogeneous soil except that boulders, frozen clumps, rubble, and Class V soils are excluded.

701.14.2 Final backfill shall be compacted to a density of not less than 90 percent of maximum density, as determined by ASTM D 1557 unless otherwise specified in the Contract Documents.

701.14.3 The upper portion of the final backfill may require specific soils and compaction in order to provide a suitable foundation for pavements, curb and gutter, sidewalk, or other type of structure.

701.15 COMPACTION METHODS

701.15.1 The CONTRACTOR shall be responsible for the compaction method utilized during foundation preparation, embedment placement, and final backfill except as otherwise specified herein or in the Supplemental Technical Specifications.

701.15.2 The use of mechanical vibratory compactors directly over the pipe is prohibited in the embedment area. Extreme care shall be taken when utilizing mechanical compactors in the haunch and initial backfill area in order to avoid damage to or misalignment of the pipe. The ENGINEER shall examine any damaged pipe and has the authority to direct that it be replaced with new pipe at no additional cost to the OWNER.

701.15.3 Flooding or jetting shall be allowed if the subsurface soils are compatible to its usage, as authorized by the ENGINEER. It shall not be used for compaction of flexible pipe, when the soil has a plastic limit of 7 or greater, and in areas of collapsible soils. The CONTRACTOR shall take any necessary precautions to minimize to negligible flotation of the pipe.

701.15.4 The CONTRACTOR shall, at the direction of the ENGINEER, excavate the compacted fill as necessary for the purpose of determining the adequacy of the compaction.

701.16 PAVEMENT

701.16.1 Either new street construction or pavement replacements shall satisfy the following design and construction requirements:

701.16.1.1 Unless permanent pavement is specified to be placed immediately, a temporary dust-free patch shall be placed wherever excavation is made through existing pavements, sidewalks, or driveways. The patch shall be placed, rolled, and maintained by the CONTRACTOR to provide a smooth surface for traffic until a permanent pavement is constructed within the time frame specified by the ENGINEER.

701.16.1.2 The subgrade preparation of the area to be paved shall be in accordance with Section 301 of these specifications. The asphalt pavement placed shall be in accordance with Section 336 and the concrete pavement shall be in accordance with Section 337. The placement of the other roadway items shall be in accordance with Section 340.

701.16.1.3 Material thickness for all pavement replacements within residential or arterial streets shall conform to the plans or the Standard Detail Drawings or match the existing pavement as authorized by the ENGINEER.

701.16.1.4 Pavement cuts of 8 ft. or more in width and 100 ft. or more in length shall be paved with a laydown machine.

701.16.1.5 When authorized by the ENGINEER, asphalt concrete base course may be used to replace surface course thickness requirements on streets that are scheduled for overlay.

701.16.1.6 The edges of all trenches at the base course level shall be neatly trimmed before beginning any paving replacement. All edges of the existing pavement adjacent to the trench cut shall be inspected. Undermined, broken, cracked, or unevenly cut portions shall be removed and the pavement edges retrimmed prior to pavement replacement. All vertical edges of the existing asphalt pavement adjacent to the trench cut and all surface areas for a width of at least 4 inches and no greater than 8 inches, shall be thoroughly cleaned and a tack coat applied prior to placing any hot mix asphalt. The finished surface of the pavement replacement shall be graded to conform to the existing contour both in cross section and profile.

701.16.1.7 Concrete pavement to replace cuts made in concrete paved streets, arterials, etc., shall conform to the Standard Detail Drawings for concrete pavement or in accordance with New Mexico Department of Transportation requirements where applicable.

701.16.1.8 When more than one-half of the surface area of a manhole, lamphole or valve box is found to extend into the area to receive a permanent asphaltic hot-mix surfacing and/or base pavement replacement, the existing pavement surrounding the manhole, lamphole, or valve box shall be removed to within those limits which will permit a permanent pavement replacement to be made in accordance with the approved plans.

701.16.1.9 Asphaltic hot mix shall not be placed upon the concrete collar, nor shall traffic be permitted upon the collar for at least 24 hours, or longer, if so directed by the ENGINEER. A tack coat of asphaltic emulsion may be applied after the concrete has taken its final set. During this time adequate barricading of the area shall be maintained by the CONTRACTOR.

701.16.1.10 If in the course of a pavement removal, a manhole, lamphole, and/or valve box is encountered and has a concrete collar about it and the collar is performing adequately, no special construction need be made in the permanent pavement replacement.

701.16.1.11 The CONTRACTOR shall make any small grade or alignment adjustment of the manhole, lamphole, and/or valve box encountered that is necessary to provide a smooth riding surface between the existing pavement and the patch and/or within the patch itself.

701.16.1.12 TESTING

701.16.1.12.1 A sample of each type of soil encountered shall be classified in accordance with the requirements of ASTM D2487, and the moisture density relationship determined in accordance either ASTM D698 or D1557, whichever is applicable.

701.16.1.12.2 A compaction test shall be taken for each 2 feet depth per 200 feet trench length or less, as directed by the ENGINEER. Compaction tests shall be taken in accordance with ASTM D2922 and D3017. Areas represented by non-complying tests shall be reworked and re-tested for compliance.

701.17 MEASUREMENT AND PAYMENT

701.17.1 TRENCHING, BACKFILLING, AND COMPACTION:

701.17.1.1 Trenching, backfilling, and compaction shall be combined into one unit and shall be measured and paid for as follows:

701.17.1.2 Measurement shall be made along the centerline of the pipe.

701.17.1.3 The unit of measurement shall be by the linear foot per pipe diameter per specified increment of depth.

701.17.1.4 The following depth increments will apply:

701.17.1.4.1 For water line installations the costs for trenching, backfilling and compaction shall be included in the unit price per linear foot of pipe per pipe diameter for maximum depth, such as: 4 to 14 inch diameter at 6 feet, 16 to 24 inch diameter pipe at 7 feet and all pipe larger than 24 inch at 8 feet. Separate payment will be specified in the Bid Proposal when required depths exceed the above depths.

701.17.1.4.2 For sewer installations the increments shall be 8 feet or less, 8 feet to 12 feet, 12 feet to 16 feet, 16 feet to 20 feet and thereafter at 4 foot intervals.

701.17.1.4.3 All depths shall be measured to the nearest foot.

701.17.1.5 All depths shall be measured from the invert of the pipe to the top of existing ground elevation. The existing ground elevation shall be the elevation of the surface that exists along the centerline of the pipe at the time of construction staking for said trenching.

701.17.1.5.1 Whenever a special pipe embedment detail is specified, on the plans, the trench depth shall be measured from the bottom of the embedment to the top of existing ground elevation. However, no additional trench depth shall be measured as a result of inadvertent over-excavation nor to accommodate trench dewatering.

701.17.1.6 Payment will be made at the unit price per linear foot per diameter of pipe per depth increment as specified in the Bid Proposal, and will include trenching, backfilling, and compaction for all trench zones. No additional payment will be made for compacted materials to bring trench backfill up to required depth.

701.17.2 OVER-EXCAVATION: Required over-excavation for foundation stabilization shall be measured by the cubic yard of material removed and replaced with compacted suitable material. Payment will be made at the unit price per cubic yard of compacted replacement material and shall include excavation, backfill material, and compaction.

701.17.3 ROCK EXCAVATION: Rock excavation will be measured by the cubic yard within the specified limits of the trench configuration. Blasting will be included in the rock excavation. Payment will be made at the unit price per cubic yard.

701.17.4 UNSUITABLE MATERIALS: Removal and disposal of unsuitable materials from the construction site shall be measured by the cubic yard of excavated material. Payment will be made at the unit price per cubic yard of excavated material.

701.17.5 PAVEMENT, SIDEWALK, AND DRIVEWAYS: Removal and disposal of existing pavement, sidewalks, and driveways will be measured by the square yard or square foot whichever is apropos. Payment will be made at the unit price per square yard or square foot as specified in the Bid Proposal.

701.17.6 SELECT MATERIALS: Where selected material is required in the backfilling operations, the quantity of material will be measured by the cubic yard of compacted material in place in the trench. Payment will be made at the unit price per cubic yard of select material as indicated above.

701.17.6.1 Whenever a special pipe embedment detail is specified, measurement and payment shall be as identified in the Bid Proposal.

701.17.7 DEWATERING: Dewatering operations for trench work shall be measured by the linear foot along the center-line of that portion of the trench which requires dewatering. Payment will be made at the unit price per linear foot of dewatered trench.

701.17.8 PAVEMENT:

701.17.8.1 Permanent or temporary pavement surfacing shall be measured and paid for in accordance with the paving section elements as defined under Section 300 for the specific item of work.

701.17.8.2 Permanent resurfacing or permanent surface patching will be measured on the basis of the square yard for new surfacing as provided in the applicable section of these specifications. For payment purposes, the normal maximum pavement cut width shall be as defined in the Table No. 701.17.8.2

TABLE No. 701.17.8.2

NORMAL MAXIMUM PAVEMENT CUT WIDTHS ALLOWED FOR PAYMENT PURPOSES

Soil Trench Pipe Max. Pavement

Stability Depth (TD) Size Cut Width

Stable. Soil Less than or equal ND less than or equal $0.0 + 2$ feet
stands in to 5 feet equal to 27"

a vert. cut

" Greater than 5' ND less than $TD + 2$ feet
or equal to 54"

" " ND greater than $1.6 \times ND +$
54" TD + 3'

Unstable. Soil does Any Any $2 \times TD + OD$
not stand in vert. cut

NOTES: 1. TD is trench depth; ND is nominal pipe diameter; and OD is outside pipe diameter.

2. Individual locations or conditions may warrant greater cut widths than those specified above. The ENGINEER shall authorize in writing the increase in the above pavement cut widths.

SECTION 801

INSTALLATION OF WATER TRANSMISSION, COLLECTOR
AND DISTRIBUTION LINES

801.1 GENERAL

The water facilities and materials, specified herein, are associated with water transmission, collector and distribution lines.

801.2 REFERENCES

801.2.1 American Water Works Association (Latest Edition) (AWWA):

- C110 American National Standard for Ductile-Iron and Gray-Iron Fittings, 3 in. through 48 in., for Water and Other Liquids
- C203 Coal-Tar Protective Coatings and Linings for Steel Water Pipelines -Enamel and Tape-Hot-Applied
- C206 Field Welding of Steel Water Pipe
- C207 Steel Pipe Flanges for Waterworks Service-Sizes 4 in. through 144 in.
- C502 Dry Barrel Fire Hydrants
- C504 Rubber-Seated Butterfly Valves
- C509 Resilient-Seated Gate Valves for Water and Sewerage Systems
- C600 Installation of Ductile-Iron Water Mains and Their Appurtenances
- C651 Disinfecting Water Mains
- C900 Polyvinyl Chloride (PVC) Pressure Pipe, 4 in. Through 12 in., for Water Distribution
- C905 Polyvinyl Chloride (PVC) Water Transmission Pipe Nominal Diameter 14 in. through 36 in.
- C909 Molecular Oriented Polyvinyl Chloride (PVCO), Pressure Pipe 4" - 12" for water distribution.
- M9 Concrete Pressure Pipe
- M23 PVC Pipe-Design and Installation

801.2.2 This Publication:

- SECTION 121 PLASTIC PIPE
- SECTION 127 STEEL WATER PIPE
- SECTION 128 CONCRETE CYLINDER PIPE
- SECTION 129 DUCTILE IRON PIPE
- SECTION 130 GRAY IRON AND DUCTILE IRON FITTINGS
- SECTION 340 PORTLAND CEMENT CONCRETE CURBS, GUTTERS, WALKS,DRIVEWAYS, ALLEY INTERSECTIONS, SLOPE PAVING, AND MEDIAN PAVING
- SECTION 343 REMOVAL AND DISPOSAL OF EXISTING PAVEMENT, CURBS, GUTTERS, SIDEWALKS & DRIVEPADS
- SECTION 701 TRENCHING, EXCAVATION AND

BACKFILL

SECTION 1502 SUBMITTALS

801.3 MATERIALS:

801.3.1 GENERAL:

801.3.1.1 The CONTRACTOR shall submit certification from the manufacturer of the pipe as specified in Section 1502 as to the pipe material and that the pipe meets or exceeds the required testing. Only pipe manufactured in the United States of America will be acceptable.

801.3.1.2 Main line pipe and fittings shall be as specified in the Reference Section in this publication as listed above or as specified in the Supplemental Technical Specifications and/or as authorized by the ENGINEER.

801.3.2 PIPE:

801.3.2.2 Limitations of pipe materials versus pipe sizes will be as follows, unless otherwise specified on the plans or Supplemental Technical Specifications:

<u>Pipe Type</u>	<u>Sizes</u>
Ductile Iron	3" thru 64"
Concrete Cylinder(AWWA C303)	16" and larger
Plastic (PVC)	4" thru 20"
Welded Steel Pipe (AWWA 200)	16" and larger

801.3.2.3 The type of pipe used shall be approved by the ENGINEER. Steel pipe will be used only where specified on the drawings. All pipe shall be of domestic manufacture and origin. Unless otherwise approved by the ENGINEER, all pipe installed shall be identical from valve to valve.

801.3.3 GATE VALVES:

801.3.3.1 Gate valves shall only be used for pipe sizes of 12 inches and smaller, unless otherwise noted on the plans or in the Supplemental Technical Specifications.

801.3.3.2 Resilient seat gate valve shall be used and shall conform to AWWA C 509. The gate valve shall be a non-rising stem type with inside screw and "O" ring seals. The valve shall have a standard hub which opens counter-clockwise. Type valve ends shall be mechanical joints, unless otherwise specified on the plans. "O" ring retainer shall be

secured with nuts and bolts.

801.3.3.3 The resilient seat shall be mechanically retained or bonded on the valve gate (wedge disc).

801.3.3.4 All brass or bronze parts used on gate valves shall comply with AWWA C 509.

801.3.3.5 The outside of the valve body shall be painted with coal tar enamel or corrosion-resistant coating. The inside shall be protected with corrosion resistant coating, approved for potable water.

801.3.3.6 The valve stem shall comply with AWWA C 509. The material for the valve stem shall be brass or bronze, and shall have a minimum yield strength of 20,000 psi and minimum tensile strength of 60,000 psi.

801.3.3.7 Gate valves shall have a 2 inch square operating hub nut. Gate valves in vaults with valve covers at ground level shall have a handwheel with the 2" nut welded to the center.

801.3.3.8 Maximum input torque to open and/or close the valve shall be 200 foot pounds for a 4-inch valve and 300 foot pounds for 6-inch under a working pressure of 200 psi.

801.3.3.9 No Project will be accepted by the OWNER until all valves are operational and accessible.

801.3.3.10 Before the Work will be accepted, the CONTRACTOR shall provide the ENGINEER with a completed "Water Valve Data Card", as shown on Pages 801-5 and 801-6. The ENGINEER shall forward the card to OWNER.

801.3.4 RUBBER SEATED BUTTERFLY VALVES:

801.3.4.1 Butterfly valves will be used for sizes of 14 inches and larger, and shall comply to AWWA C 504.

801.3.4.2 Only short body, Class 150B valves are acceptable. Wafer type valves are not acceptable. Valve ends may be either mechanical joint or flanged.

801.3.4.3 The rubber seat shall be field replaceable on valve sizes 24 inches and larger. The rubber seat may be mechanically retained or bonded on the disc or valve body.

801.3.4.4 Butterfly valves shall have a 3 inch square operating hub nut. Butterfly valves in vaults with valve covers at ground level shall have a handwheel with the 3" nut welded to the center.

801.3.4.5 The valve shaft and disc shall be installed horizontally. The valve disc shall pivot and rotate on the horizontal axis.

801.3.4.6 The maximum input torque to open and/or close the valve shall not exceed 150 foot pounds under a minimum working pressure of 150 psi, and the butterfly operator shall be compatible with this pressure. Maximum operating torques shall be in accordance with AWWA C 504, Table 1, Class 150B. The manufacturer of the valve shall be responsible for the operator.

801.3.4.7 No project will be accepted by the OWNER until all valves are operational and accessible.

801.3.4.8 Before the Work will be accepted, the CONTRACTOR shall provide the ENGINEER with a completed "Water Valve Data Card," as shown on pages 801-5 and 801-6. The ENGINEER shall forward the card to the OWNER.

801.3.5 VALVE BOXES: Valve boxes shall consist of Polyvinyl Chloride (PVC) C-900, or High Density Polyethylene Pipe, (HDPE), with corrugated exterior and smooth interior pipe cut to accommodate the required depth. No joints shall be allowed. Pipe diameter shall be 10 inches for valves in paved areas to accommodate the cover and lid specified here-in. The pipe shall be centered and placed true to vertical around the axis of the operating nut. Valve covers and lids for re-use water shall be different than those used for potable water, and shall be as shown on re-use project construction plans.

801.3.6 COMBINATION AIR AND VACUUM VALVES: Air and vacuum valves shall be the type and size shown on the plans.

801.3.7 FIRE HYDRANTS:

801.3.7.1 Fire hydrants and their extensions shall be in accordance with AWWA C 502, traffic type. Fire hydrants shall have one 5 1/4 inch diameter valve opening; 6 inch mechanical joint inlet connection; two 2 1/2 inch hose nozzle connections; and one 4 1/2 inch steamer nozzle with National Standard Fire Hose Coupling Screw Threads. Fire hydrants shall have a bronze or cast iron, pentagon, operating nut, be designed for 150 psi. working pressure service, and have a normal bury of 4 to 4 1/2 feet unless field conditions require a deeper bury, in which case extensions will be used so as to bring the bottom of the break-off flange 2 to 8 inches above the top of finish grade.

801.3.7.2 The pipe fittings and fire hydrants starting at the street main and ending at the fire hydrant itself shall be lying in a line perpendicular to the street's centerline or radially on a curvilinear installation. Fire hydrants shall have no more than 1/2 inch variation from a vertical line between the breakaway flange and the top of the fire hydrant.

801.3.7.4 Hydrants shall be dry barrel, post-type with compression main valve closing with pressure. They shall have a field lubrication capability. Hydrants shall have a bronze seat ring threaded into a bronze drain ring or bronze or cast iron bushing.

801.3.7.5 Exterior of hydrant, below the ground line, shall be coated with asphalt varnish, and the exterior painted from the top to a point one foot below the ground level flange, consisting of one coat rust inhibitive primer and one coat "chrome yellow" enamel. The bonnet shall then be painted with a reflectorized paint using a color as close to "chrome-yellow" as possible.

801.3.7.6 The bottom plate of the main valve shall be epoxy coated. The shoe of the fire hydrant shall have a 6-inch mechanical joint connection and the inside shall be epoxy coated to prevent corrosion. The nozzle shall be threaded in place and retained by stainless steel locks. Hydrant body shall be threaded to receive the threaded nozzle. Nozzle shall be secured by a stainless steel locking device.

801.3.7.7 Fire hydrant shall contain two drain outlets. The drain outlets shall be constructed of bronze. Hydrant shall be provided with a pentagon operating nut to open counter clockwise and shall have an anti-friction washer between the hold-down nut and the operating nut.

801.3.7.8 To prevent loss of brass operating nuts due to theft or vandalism, the following shall be included in or on the fire hydrant:

801.3.7.8.1 Attach OWNER approved anti-theft device to the hydrant; or

801.3.7.8.2 The bonnet must be removed in order to remove the operating nut; or

801.3.7.8.3 Use a cast iron operating nut.

801.3.7.9 Fire hydrants shall be installed at locations as shown on construction plans and in accordance with Standard Detail Drawings.

801.3.7.10 Fire hydrants shall be properly restrained in accordance with Section 130. If mechanical restraint is used, each joint on the hydrant leg shall also be restrained.

801.3.8 PRESSURE REDUCING VALVE (PRV): Pressure reducing valve shall be a globe pattern, flanged end, pressure Class 125. Submittals for approval shall be made to the ENGINEER and approval must be received before installation. The following items are required in the PRV:

801.3.8.1 Materials:

801.3.8.1.1 Main valve-cast iron with brass trim.

801.3.8.2 Pilot Control System:

801.3.8.2.1 Adjustment from 15 psi to 75 psi.

801.3.8.2.2 Shut-off cock on all pilot control system lines.

801.3.8.2.3 Inlet flow strainer.

801.3.8.2.4 Closing speed control.

801.3.8.2.5 Opening speed control.

801.3.8.2.6 Flow stabilizer.

801.3.8.2.7 Tubing shall be copper.

801.3.8.3 Installation shall be as per the construction plans. ENGINEER shall determine final settings on PRV.

801.3.8.4 Before the Work will be accepted, the CONTRACTOR shall provide the ENGINEER with a "Water Valve Data Card". The ENGINEER will forward the card to the OWNER.

801.3.9 TAPPING SLEEVES: (For other than Concrete Cylinder Pipe) For either taps greater than 2/3 line size, or size on size taps 12 inches or less, only approved, long body, fully gasketed tapping sleeves shall be allowed. During installation of the tapping sleeve, the pipe shall be fully supported to support the weight of the tapping sleeve and tapping machine.

801.3.9.1 Tapping sleeves of heavy welded steel bodies shall meet the following requirements:

801.3.9.1.1 Epoxy coated.

801.3.9.1.2 Bolts and nuts to be stainless steel.

801.3.9.1.3 Gaskets to be Buna-N rubber.

801.3.9.1.4 Flange to be flat face steel and comply with AWWA C-207.

801.3.9.1.5 Class D-ANSI 150 lbs. drilling.

801.3.9.1.6 Designed to sustain an operating pressure of 150 psi.

801.3.9.1.7 May be used on all water mains, 4" and larger.

801.3.9.2 Tapping sleeves of cast iron bodies shall meet the following requirements:

801.3.9.2.1 Mechanical joint type with a working pressure of 200 psi .

801.3.9.2.2 Outlet flange to be Class 125, ANSI B16.1.

801.3.9.2.3 Sleeves to include side and end gaskets of Buna-N rubber.

801.3.9.2.4 Eight high strength steel bolts and nuts to secure the halves of the sleeve to the pipe.

801.3.9.2.5 May be used on all water mains, 4" and larger.

801.3.9.3 Tapping sleeves of short sleeve cast iron shall meet the following requirements:

801.3.9.3.1 Working pressure of 150 psi.

801.3.9.3.2 Outlet flange to be Class 125, ANSI B16.1.

801.3.9.3.3 Outlet half to have an enclosed gasket in a groove for a pressure seal.

801.3.9.3.4 Four high strength steel bolts to secure halves of tapping sleeve to the pipe.

801.3.9.3.5 May be used on all water mains, 4" and larger.

801.4 WATER VALVE DATA CARD: Water Valve Data Card, as shown on pages 801-5 and 801-6 shall be prepared for all types of valves (Gate Valves, Butterfly Valves, Pressure Reducing Valves, Air Release Valves, etc.) according to the following instructions.

801.4.1 A Water Valve Data Card will be prepared for each valve installed.

801.4.2 The Valve Number will be assigned by the OWNER at a later date.

801.4.3 Valve Size is the nominal diameter of the valve, i.e., 6-inch, 14-inch or 48-inch. In the case of

compound valves give size of main valve and bypass valve, i.e., 24-inch and 4-inch, or 36-inch and 6-inch.

801.4.4 Valve Type is the general description of the valve, such as: Resilient-Seal Gate Valve, Butterfly Valve, Globe Valve, Check Valve, etc.

801.4.5 Make and Model refers to the manufacturer, make and model number to identify the valve for replacement parts. This information should be available from the shop drawings.

801.4.6 Number of Turns and Direction to Open is the number of revolutions of the operating nut to make the valve travel from fully closed to fully open, and the direction is either clockwise or counterclockwise, i.e., 54 turns counterclockwise. All standard valves shall open counterclockwise. Operation, turn count, and direction to open will be verified by the ENGINEER prior to installation.

801.4.7 Under Project Name is the assigned work order number.

801.4.8 Date Warranty Expires is the expiration date, under the contract, for requiring warranty repairs.

801.4.9 Street Location: Give both Block number and street name. For valves in intersections give both streets, i.e., 5200 San Mateo Blvd. NE and 3000 Candelaria NE.

801.4.10 The section on coordinate location shall be completed with information furnished by the ENGINEER.

801.4.11 All applicable items on the "Water Valve Data Card" should be filled in. However, accuracy is more unknown and cannot be determined, leave the space blank.

801.4.12 Depth to "Operator" is vertical distance from the top of actual valve operating nut to top of valve box cover.

801.5 FIRE HYDRANT DATA CARD
Fire Hydrant Data Card, as shown on page 801-8 shall be prepared for all installations of fire hydrants, according to the following instructions.

CARD NO. 801.4
 WATER VALVE DATA CARD
 (Front Side)

<u>MAP NO.</u>	<u>VALVE NO.</u>	<u>SIZE</u>	<u>TYPE</u> <input type="checkbox"/> -B.F.V. <input type="checkbox"/> -B.V. <input type="checkbox"/> -R.S.G.V.	<u>MAKE</u>	<u>MODEL</u>	<u>PROJECT</u>	<u>EMD</u> <input type="checkbox"/> -YES <input type="checkbox"/> -NO
		<u>URNS</u>					
CHECKED							
DATE							
CREW							

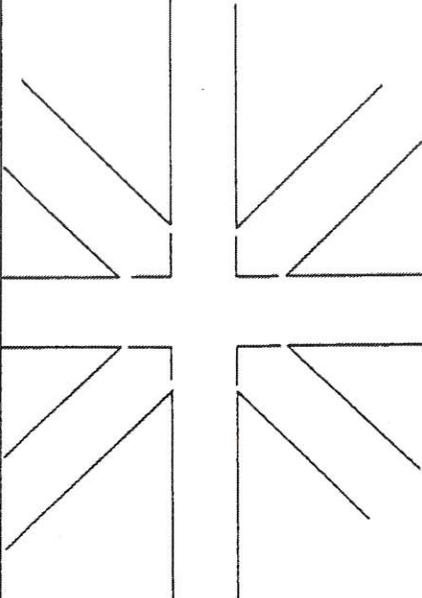
"CHECKED" CODE: L - LOST E - EXTENSION NEEDED C - NEEDS CLEANING
 B - BROKEN M - LID MISSING R - RAISE TO GRADE

WARRANTY EXPIRES _____ DEPTH TO OPER. _____ LOCATION _____

CONTRACTOR _____ EXTENSION LENGTH _____ SKETCH EXACT LOCATION BELOW _____

NOTES: 1. Available at Water Systems Division.
 2. Size 4 inches x 8 inches.

CARD NO. 801.4
 WATER VALVE DATA CARD
 (Reverse Side)

	<p>REFERENCE SYMBOLS</p> <ul style="list-style-type: none"> ◻ - SUBJECT VALVE ⊗ - OTHER VALVE (S) ○ - PRESSURE REDUCING VALVE ○ - AIR RELIEF VALVE ⊕ - FIRE HYDRANT — — — — — LINE VALVE IS FOR — — — — — OTHER WATER LINES 						
<p>INDICATE NORTH BY ARROW</p> 	<p>COORDINATES OF LID</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20px;">X</td> <td style="width: 100px;"> </td> </tr> <tr> <td>Y</td> <td> </td> </tr> <tr> <td>Z</td> <td> </td> </tr> </table>	X		Y		Z	
X							
Y							
Z							

801.5.1 Fire hydrant number will be assigned by the OWNER at a later date.

801.5.2 Fire hydrant type refers to the manufacturer's make and model.

801.5.3 Location. Indicate both block number and street name. At intersections indicate both street names.

801.5.4 Date installed. Indicate actual date the hydrant was installed.

801.5.5 Depth. Indicate the actual depth in feet of the lower barrel of the fire hydrant. This depth is measured from the shoe to the break-away flanges of the hydrant.

801.5.6 On the reverse side of the card indicate the location of fire hydrant on the sketch.

801.6 WATER LINE CONNECTIONS

801.6.1 GENERAL : All new water line tie-ins to the existing water system shall be directly inspected and approved by the ENGINEER. This includes non-pressurized or pressurized connections that will result in extension of the existing system.

801.7 LOCATIONS OF WATER MAINS AND SEWER LINES

801.7.1 Unless otherwise authorized by the ENGINEER, parallel water and sewer lines shall be installed at least 10 feet apart horizontally, and the water line shall be at a higher elevation than the sewer. Separate trenches will be required in all cases (this shall be effective even though one line has been installed prior to the other), and the water line shall be at least 18 inches above the sewer; when water and sewer lines cross each other, the water line shall be at least 18 inches above the sewer; otherwise the sewer shall be of pressure class pipe extending between manholes, or concrete encased for 10 feet on each side of the water line as shown in the Standard Detail Drawings. The crossings shall be arranged so that the sewer joints will be equidistant and as far as possible from the water main joints.

801.7.2 Water mains shall not be constructed under walkways, sidewalks, curbs and gutters, drivepads, or similar concrete structures by tunneling underneath them. Trenchless technologies may be allowed with prior approval by the OWNER. The CONTRACTOR will cut these structures by using a concrete saw or, at his option, he may remove and replace the section of the concrete

structure to the nearest full expansion joint or edge.

801.8 TRENCHING AND BACKFILLING

801.8.1 All trenching and backfilling shall be in full accordance with Section 701. The minimum cover over distribution lines shall be 3 feet, and 4 feet of cover over transmission and collector lines.

801.9 GENERAL INSTALLATION ITEMS

801.9.1 Trenching, bedding, and backfilling shall comply with the requirements set forth in Section 701.

801.9.2 Pipe and accessories shall be new and unused and shall be handled in such a manner as to insure delivery to the trench in sound, undamaged condition. Particular care shall be taken not to injure the pipe coating. No other pipe or material of any kind shall be placed inside of a pipe or fitting after the coating has been applied.

801.9.3 The interior of the pipe shall be thoroughly cleaned of foreign matter before being lowered into the trench and shall be kept clean during operations by plugging or other approved methods. When work is not in progress, open ends of pipes and fittings shall be securely closed so that no other substances will enter the pipes or fittings. Any section of the pipe found to be defective before or after laying shall be replaced with sound pipe without additional expense to the OWNER.

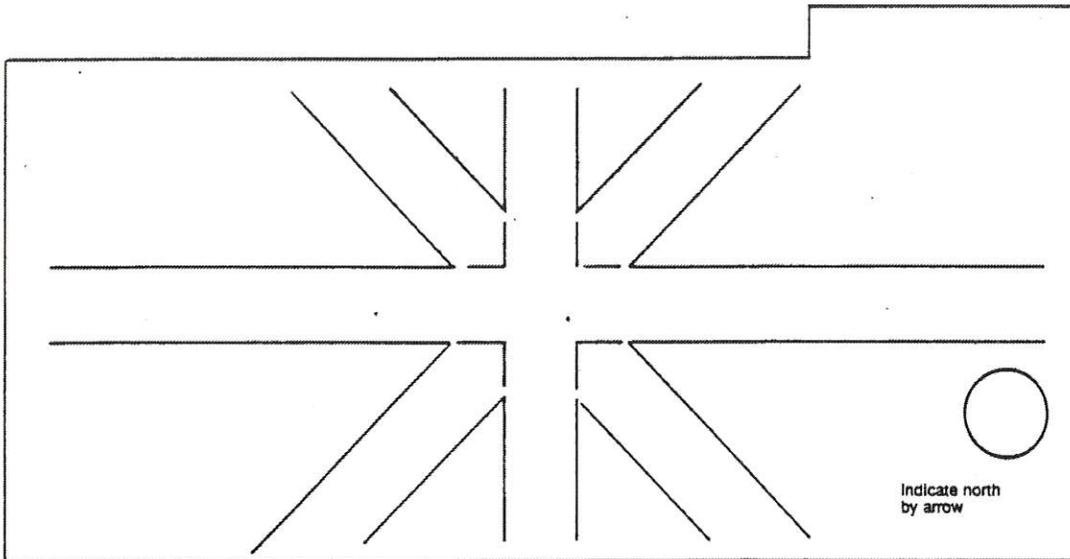
801.9.4 All nuts and bolts utilized in underground pipe connections shall be stainless steel, high strength cast iron or high grade, high strength steel. The full length of each section of pipe shall rest solidly upon the bed, with recesses excavated to accommodate bells and joints. Any pipe that has the grade or joint disturbed after laying shall be taken up and relaid. Pipes shall not be laid in water or when trench or weather conditions are unsuitable for the work except by as authorized by the ENGINEER. All unconnected ends of pipes shall have a valve, plug, or cap installed on it.

801.9.5 Pipe shall be laid to line and/or grade shown on the plans or as staked in the field. Changes in horizontal or vertical alignment of the pipe at a joint shall not exceed the manufacturer's recommended deflection for the type and size pipe being laid. When the change required is more than the recommended deflection, a fitting or several short joints of pipe shall be used. PVC pipe may not be deflected at the joints.

CARD NO. 801.5
 FIRE HYDRANT DATA CARD

															FIRE HYDRANT NUMBER															
INSP.																														
REP.																														
CREW																														
DATE																														
TYPE															LOCATION															
DATE INSTALLED															VALVES TO CLOSE FOR REPAIRS															
DEPTH															REMARKS															

FRONT SIDE



REVERSE SIDE

801.9.6 When new pipe is to be connected to an existing pipe or when crossing an existing pipe line, the CONTRACTOR shall excavate the existing lines well in advance of the laying of the new pipe line to enable the ENGINEER to verify their elevation and placement and to make any changes in grade and/or alignment of the new pipe line that may be required.

801.9.7 On all push-on-joints (bell and spigot, fluid-tite, and ring-tite) the rubber gasket shall be removed, cleaned, the groove cleaned, the gasket replaced, and the bell or plain end cleaned before jointing. The gasket and the bell or plain end of the pipe to be jointed shall both be lubricated with a suitable soft vegetable soap compound to facilitate jointing. Care shall be taken to insure that neither the bell or collar, or the pipe being jointed is damaged as it is being pushed home.

801.9.8 Flanged and mechanical joints shall be made with machine bolts and nuts of the proper size only. All components of these types of joints shall be cleaned before jointing. Only one (1) gasket will be permitted in a flange joint. In a mechanical joint the plain end pipe shall be fully seated before the gasket and gland is slipped up to the bell. Nuts on both types of joints shall be tightened by alternating nuts 180 degrees apart. The CONTRACTOR shall be responsible for assuring that proper torque is achieved and shall have a torque wrench available for verification by the ENGINEER.

801.9.9 When laying PVC pipe, a metalized detectable warning tape shall be installed a minimum of 1 foot above the top of pipe and 3 to 6 feet below the final surface. The tape shall be detectable with a standard metal pipe locator. The color of tape shall be safety precaution blue and will be inscribed at 10-foot intervals with the words, "CAUTION BURIED WATER LINE BELOW." Tape shall be 2 inches wide. The tape shall be constructed of material that is impervious to alkalis, acids, chemical reagents, and solvents found in the soils.

801.9.10 When laying pipe, Electronic Marker Disks (EMDs) shall be installed in accordance with Section 170.

801.10 SPECIFIC PIPE LAYING REQUIREMENTS

801.10.1 Ductile iron pipe shall be installed in accordance with AWWA C 600 and as herein specified.

801.10.2 Steel pipe shall be installed in accordance with AWWA C 206 for welded joint and as herein specified. All field welded joints shall have one coat of coal-tar enamel of 3/32 inch thickness.

801.10.3 Plastic pressure pipe shall be installed in accordance with AWWA M 23 and C 900 and/or manufacturer's printed recommendations, whichever is applicable. Where a conflict arises with this Specification, this Specification shall control. Trenching, embedment and backfill shall be specified in Section 701. A reference mark (a distinct circumferential line) is placed on the pipes spigot by the manufacturer to indicate the correct depth of the spigot penetration into the pipes gasket joint. If the pipe is seated too deep or too shallow, the pipe may buckle or separate due to thermal expansion/contraction, therefore particular attention must be exercised when jointing pipe. The reference mark must be showing and not farther than 1/2" from the leading edge of the bell. The CONTRACTOR shall verify that the manufacturer's reference mark is correct per manufacturer's literature.

801.10.4 All welded steel and concrete cylinder pipe shall have two small bond wires of low resistance, or other approved method, welded across the joint to make the joint electrically continuous. Where rigid joints are specified they shall be provided as specified herein. The outside joint recess shall be completely filled with a rich low shrinkage cement grout. The concrete surface in contact with the joint mortar shall be moistened with water just prior to pouring the joint recess. The mortar shall be poured into the joint recess against a waterproof paper or cloth diaper laid around and lapping the outside field joint. The diaper shall completely and snugly enclose the joint recess, being held in place by metal box strapping or wire. The mortar shall be poured into an opening slightly to one side on the top of the pipe and rodded by a flexible wire rod into place until it appears on the opposite side completely. After the joint recess has been filled with mortar, adjoining pipe sections shall not be disturbed. After the joint has been made, the concrete lining surfaces of the joint shall be moistened and the interior recess tightly jointed and troweled flush and smooth with the inside pipe surface. Grout for painting the interior joints shall be of a stiff consistency and shall have low shrinkage characteristics. In sizes of pipe smaller than 24", the mortar shall be buttered all around the shoulder inside the bell before the spigot is entered. A backing-up tool, such as an inflated rubber ball wrapped with burlap, shall be pulled through the joint to compact the mortar, completely fill the inside annular space and wipe off the excess mortar. Each joint will be inspected by the ENGINEER for proper and complete closure prior to final acceptance. Flanges shall be protected by "cocoon" type protection coating of coal-tar and felt in accordance with AWWA C 203. When moving individual pipe sections, the pipe shall be lifted using two web or belt type slings which support the pipe between the third and outside quarter points.

801.10.5 All fittings and valves shall be installed as per the type of joint as stated herein and/or as shown on the plans.

801.10.6 All couplings, clamps, sleeves, etc shall be installed as per the manufacturer's printed recommendations and as approved by the ENGINEER. The CONTRACTOR shall properly restrain all appurtenances as necessary.

801.10.7 All waterlines installed as part of a re-use system or other non-potable use shall be purple in color or shall be encased in purple PVC wrap.

801.11 CUTTING: The cutting of any type of pipe shall be done as per the manufacturer's printed recommendations, as approved by the ENGINEER. Care shall be taken in cutting any pipe that has an internal and/or external lining or coating.

801.12 BLOCKING AND RESTRAINED JOINTS

801.12.1 All restrained joints shall be by mechanical means unless directed or approved otherwise by the ENGINEER.

801.12.2 All tees, bends shall be restrained by mechanical means. Valves in runs need not be restrained, except that butterfly valves shall be flanged. Where rigid joints are called for on concrete cylinder pipe, the joints shall be flanged or field welded bell and spigot joints in accordance with the manufacturer's recommendation.

801.12.3 All caps and plugs on dead end lines will be mechanically restrained when feasible. Blocking may also be required when adequate restrain length is not available.

801.12.4 Where restrained joints on ductile iron pipe, or PVC pipe are called for on the plan, the mechanical restraining system employed shall conform to the recommendations of the pipe manufacturer. The restrained joint will be subject to the hydrostatic test specified herein.

801.13 RESTRAINING JOINTS FOR WELDED STEEL AND CONCRETE CYLINDER PIPE

801.13.1 Restrained joints in welded steel and concrete cylinder pipe for thrust restraint shall be produced by continuous welding the pipe joints and as shown on the plans.

801.13.2 Unless otherwise stated in the supplemental specifications the working pressure (operating plus transient) shall be 150 psi. The value for weight of overburden and the coefficient of friction

shall be stated in the supplemental specifications.

801.14 TAPS INTO EXISTING CONCRETE CYLINDER PIPE

801.14.1 OBJECTIVE: The intent of this Subsection is to establish procedural and design criteria for making taps into existing concrete cylinder pipe for water distribution line extensions, and will be applicable to 4-inch and larger size water taps.

801.14.2 NEW WATER LINES: No non-factory taps will be allowed on newly-installed concrete cylinder pipes.

801.14.3 EXISTING WATER LINES:

801.14.3.1 Taps to existing concrete cylinder pipe must be approved in writing by the OWNER. The requester shall provide the following information:

801.14.3.1.1 Justification for the tap,

801.14.3.1.2 Project name and number, if applicable,

801.14.3.1.3 Date tap required,

801.14.3.1.4 Name of the CONTRACTOR who will be making the tap.

801.14.3.2 The CONTRACTOR shall coordinate the work with the OWNER before commencing work. The OWNER shall inspect and approve the entire installation of the tap.

801.14.4 INSTALLATION OF FIELD TAP:

801.14.4.1 Installation of field taps on concrete cylinder pipe shall be no smaller than 4 in. and no larger than 2/3 diameter of pipe to be tapped. No "weld neck" or weld on outlets will be used.

801.14.4.2 For field taps larger than 2/3 of pipe diameter, a tee will be inserted into the line.

801.14.4.3 For field taps greater than 4 in. and less than 2/3 diameter of pipe to be tapped an approved tapping saddle will be used. Tapping saddles shall be approved by the ENGINEER

801.15 SALVAGED MATERIALS

All salvaged materials (pipe, fittings, valves and other water line appurtenances) shall be stockpiled on-site in a neat manner by the CONTRACTOR. The ENGINEER and a representative of OWNER will inspect the stockpiled materials for salvage fitness and direct the following disposition:

801.15.1 If the material is considered salvageable, the CONTRACTOR will be directed to deliver the material to the OWNER. The CONTRACTOR will be responsible for the loading, transportation and off-loading of the salvageable materials. When the materials are delivered, the CONTRACTOR shall obtain a signed receipt from the OWNER. Before final acceptance of the project, all signed receipts will be submitted to the ENGINEER for accounting purposes.

801.15.2 Materials that do not have salvageable value will be disposed of by the CONTRACTOR at no additional cost to the OWNER.

801.16 HYDROSTATIC TESTS:

801.16.1 The CONTRACTOR shall be required to perform hydrostatic tests in all water mains, laterals, dead ends, and service lines in accordance with AWWA C 600. The test shall be conducted in the presence of the ENGINEER or his authorized representative. The testing of the lines shall be done without being connected to existing lines unless approved by the ENGINEER. The CONTRACTOR shall provide all temporary plugs required. If connections to the existing lines are allowed by the ENGINEER, it is with the understanding that the CONTRACTOR assumes any and all responsibility in case of damage or failure of the existing system. Water used for disinfecting may be used for hydrostatic testing. Leakage through connections to the existing system, leaks in the existing lines, or leaking existing valves under the test pressure will invalidate the test. The lines shall be tested at 150 pounds, or 1.5 times the normal working pressure of the line, whichever is greater, for not less than two hours. All taps, gauges and necessary equipment shall be provided by the CONTRACTOR as approved by the ENGINEER, however, the ENGINEER may utilize gauges provided by himself if he so elects. Each section of the new line, between valves shall be tested to demonstrate that each valve will hold the test pressure. No installed pipe will be accepted if the leakage is greater than that determined by hydrostatic test sheet calculations in which L is the allowable leakage, in gallons per hour; S is the length of pipeline tested; D is the nominal diameter of the pipe in inches; and P is the test pressure in pounds per square inch gauge. During the test the test pressure should not lose more than 10 psig without being pumped back up to test pressure. The totals of the gallons of water required to hold the test pressure during the two hours and the amount of water required to return the line to the test pressure at the end of the test period is the total leakage. If the total leakage is less than the allowable, the line can be accepted. All visible leaks will be repaired regardless of the amount of leakage.

801.16.2 CONTRACTOR shall submit a testing plan to the ENGINEER for approval. In cases where a new main is being connected to an existing main without the installation of a new valve, the end of the new main shall be temporarily capped and blocked and a hydro-static test performed. Hydro-static tests should not be made such that an existing valve or existing main is included in the test section. Test Sheet on page 801-12 is the standard form which must be completed at the time of the test, signed by the ENGINEER and delivered to the OWNER prior to acceptance of the Project

801.17 DISINFECTING, FLUSHING, AND BACTERIA TESTING OF WATER LINES: New water lines shall be installed in such a manner as to not require cleaning by flushing. This shall require capping of stockpiled line, capping of lines at night and any other time work is not in progress, visual inspection of interior of lines, and cleaning as necessary, prior to placing in the trench. Every effort shall be made to prevent the entry of dirt and debris into pipelines under construction.

801.17.1 Mains shall be disinfected in accordance with AWWA C 651 or as required below with chlorine liquid solution, which is added by an approved method at one end of the lines as water is drawn through the lines and service connections. The chlorine solution shall remain in the line for at least 24 hours. The lines shall then be flushed until the chlorine residual is equal to the normal residual in the existing system or at 0.5 parts per million for unchlorinated water. Dry chlorine will not be used for disinfection of water lines. The flushed water will be disposed of by the CONTRACTOR appropriately.

801.17.2. Prior to the line being placed into service, bacteria samples shall be taken by the OWNER. Should results of the bacteriological analysis be unsatisfactory, the disinfection procedure shall be repeated.

801.17.3 The CONTRACTOR will be granted two free volumes of water for testing, disinfecting and flushing the new installation. All water used for testing, disinfecting and flushing shall be metered. If additional water is needed for these purposes, the water will be paid for by the CONTRACTOR at the current water rates. An approved backflow preventor system shall be used when withdrawing water from any waterlines and hydrants. Direct connection to the water system shall not be used for providing water for disinfecting, testing or flushing.

801.17.4 OWNER or the ENGINEER will collect the water sample to test the water in the existing lines at

TEST SHEET 801.16.2
HYDROSTATIC TEST

Test No.: _____

PROJECT NAME: _____

DATE: _____

PROJECT CONTRACTOR: _____

NUMBER: _____

LOCATION: _____

PIPE MATERIAL: _____ DIP _____ PVC _____ CCP _____ Fabricated Steel

Test: Length (S) = _____ ft.

Size (D) = _____ inches

Pressure (P) = _____ psi - gauge (average test pressure during the hydrostatic test)

Leakage Allowed (L_{ALL}) - _____ gal / hr (L_{ALL} = SD P / 133,200 per AWWA C600-99)

Basis: Only resilient seated gate valves and/or rubber seated butterfly valves are used. No metal seated valves are allowed.

Total Leakage Allowed for 2 hour Test Period: L_{ALL} * 2 hours = _____ gallons

Actual Amount of Water ADDED to maintain 150 psi ± 5 psi for 2 hours = _____ gallons

If actual amount of water added is LESS THAN total leakage allowed, test PASSED

If actual amount of water added is GREATER THAN total leakage allowed, test FAILED

_____ Test Passed

_____ Test Failed

Contractor

Date

Inspector

Date

Project Manager

Date

COMMENTS:

Note: See Section 801.16 for the Specification for test procedure. A0224B/D2376B

the point of delivery for assurance of clean and

potable water. The water in the existing lines will be used for testing and flushing.

801.18 INTERFERENCE WITH SERVICE AND SCHEDULE OR WORK

801.18.1 The CONTRACTOR shall obtain the permission of the ENGINEER before making any connections with existing mains. The required operation of existing valves will be performed by the OWNER as per Section 18.

801.18.2 Work shall be started after authorization of the ENGINEER and shall be completed in a prompt efficient manner in coordination and cooperation with other utilities concerned. 801.18.3 The CONTRACTOR will be required to arrange his construction program with a view of maintaining continuous service to water users, from existing facilities, to the fullest extent possible. He shall, at all times, withhold construction work, where any conflict in the service requirements occur.

801.19 NOTIFICATION OF COMPLETION

The CONTRACTOR shall notify the ENGINEER, in writing, when the CONTRACTOR has completed construction of a water line. This notification should be submitted immediately upon completion; the water line will not be placed in service by the OWNER before the sewer service and the street are in place and until the OWNER has received and accepted all adequate documentation submittals. OWNER shall consider, on a case by case basis, exceptions for fire protection purposes.

801.20 VALVE CAN REHABILITATION

801.20.1 The rehabilitation of existing valve cans as shown on the plans or as authorized by the ENGINEER shall include the following:

801.20.1.1 Removing the existing valve can and ring and cover and installing the new type can and cover.

801.20.1.2 Install a new concrete collar in paved and unpaved areas. Size and direction of the line should be noted on the collar.

801.20.1.3 The existing ring and cover shall be considered salvaged materials.

801.20.1.4 Removal and replacement of the pavement.

801.20.1.5 Excavation, backfill, and compaction.

801.20.1.6 All materials, labor, and equipment

necessary to do the work.

801.20.2 The work under this item shall be constructed per the Standard Detail Drawings.

801.21 DOCUMENTATION SUBMITTALS

801.21.1 At the time of the final inspection the following documentation will be submitted to the ENGINEER and OWNER:

801.21.1.1 Hydrostatic test data of the new water line system.

801.21.1.2 Microbiological test reports which were taken at representative locations along the system.

801.21.1.3 Fire hydrant and valve cards. All valves at that time shall be in the open position, unless otherwise authorized by the ENGINEER and OWNER.

801.21.1.4 A marked-up set of construction drawings reflecting as-built conditions. This does not supplant the requirements for record or as-built drawings.

801.22 MEASUREMENT AND PAYMENT

801.22.1 PIPE: Payment for all sizes and types of pipe shall be made on the basis of measurement per linear foot, including the length of fittings, valves, etc. The contract unit price of pipe shall include all jointing and coupling materials necessary for its installation and connections to other sections of pipe, except for fittings, valves or other appurtenances. The cost of hydrostatic testing, flushing and disinfecting of new water lines shall be included in the contract unit price for the item in place. Pipe locator tape for pipe shall be included in the contract unit price of the pipe.

801.22.2 DEPTH OF TRENCH:

801.22.2.1 The contract unit price for pipe and appurtenances in all cases shall include the trenching, installation, and compacted backfilling for trench cuts as specified in Section 701.

801.22.2.2 Payment for additional depth, below the specified limits shall be made on the contract unit price per vertical foot per linear foot, and shall include trenching, installation of pipe and appurtenances, and compacted backfilling in the deeper trench.

801.22.3 REMOVAL AND RELAY, RETURN, OR DISPOSAL OF PIPE:

801.22.3.1 The contract unit price for removal and relaying pipe shall include all labor and new gasket material necessary to remove and reinstall pipe in another location.

801.22.3.2 The payment for removing and the delivery 2-1/4 inch to 14 inch pipe to the Water Utility Division in the City Yard as salvage materials shall be made on the unit price per linear foot. Only cast iron or ductile iron pipe that is undamaged will be considered for salvage.

801.22.3.3 Where there is no salvage value of the pipe, the pipe shall be removed and disposed of by the CONTRACTOR. The payment for removal shall be made on a unit price per linear foot; there will be no additional cost to the OWNER for disposal.

801.22.3.4 The payments for removal and relaying, removal and return, or removal and disposal shall include trenching and compacted backfilling.

801.22.4 CAST IRON AND DUCTILE IRON FITTINGS:

801.22.4.1 All cast iron and ductile iron fittings shall be measured and paid for at the contract unit price per pound based on weights of an all mechanical joint ends fitting for the type and size of fitting used as specified in AWWA C 110, regardless of the type of ends on the fitting installed. The contract unit price per pound of fittings shall include all gaskets, glands, bolts and nuts required, no separate payment will be made for these items.

801.22.4.2 When the CONTRACTOR installs a OWNER-furnished fitting and replaces that fitting in the OWNER's inventory, the CONTRACTOR shall be paid the full contract unit price of that fitting as outlined above. If the CONTRACTOR does not replace the fitting in the OWNER's inventory the payment to the CONTRACTOR will be at the contract unit price of the fitting less the cost of the fitting itself.

801.22.4.3 Fitting insertion: The insertion of a fitting into an existing pipe line shall be measured and paid for at the contract unit price per pound based on weights of an all mechanical joint end fitting and if required an all mechanical joint connecting piece (coupling) of the type fitting and size used, as specified in AWWA C 110, regardless of the type of ends on the fitting and coupling installed. This payment shall include all compensation for the excavation, cutting and removal of the existing pipe, installation of the fitting and coupling, if required, the recutting of the existing pipe or new pipe installed between the fitting and coupling, and backfill and compaction complete in place. In addition to the

payment for the fitting insertion, the CONTRACTOR shall be paid for one each non-pressurized (wet) connection and if pavement, curb and gutter, sidewalk, drivepad, etc., are removed, these items will be paid for as part of the appropriate item.

801.22.5 REMOVAL AND RELAY, RETURN OR DISPOSAL OF PIPE APPURTENANCES:

801.22.5.1 The contract unit price for removal and relaying the appurtenances shall include all labor and new gasket material necessary to remove and reinstall the item in another location.

801.22.5.2 The payment for removing and returning 2 1/4 inch to 36 inch appurtenance to the OWNER as salvaged material shall be made on the contract unit price per each or unit price per pound. Only undamaged material will be considered for salvage.

801.22.5.3 Where there is no salvage value of the appurtenance, the item shall be removed and disposed of by the CONTRACTOR. The payment for removal shall be made on the contract unit price per each or contract unit price per pound; there will be no additional cost to the OWNER for disposal.

801.22.5.4 The payment for removal and relaying, removal and return, or removal and disposal shall include trenching and compacted backfilling.

801.22.5.5 Only cast iron or ductile iron appurtenances will be removed and relaid or removed and returned for salvage.

801.22.5.6 Fire hydrant relocation payment shall be the contract unit price per each for removal and reinstallation and shall include excavation, blocking, aggregate and compacted backfilling, as shown in the Standard Detail Drawings.

801.22.6 CONCRETE CYLINDER OR WELDED STEEL PIPE FITTINGS:

Concrete cylinder or welded steel pipe fittings, such as flanged outlets, bends, reducers, etc., shall be considered as incidental to the contract unit price for installation of the pipe, as shown on the construction plans.

801.22.7 COUPLINGS: The measurement for steel or cast iron couplings shall include payment for all gaskets, bolts, and incidental materials as may be needed for its complete installation. Payment shall be made on the contract unit price per each size of coupling required.

801.22.8 STEEL FITTINGS: Steel fittings shall only be used when authorized by the ENGINEER and

when needed to connect to an existing steel water line. Measurement and payment for steel fittings, when authorized, shall be made at the contract unit price per pound based on weights of an all mechanical joint ends fitting of the type fitting and size used, as specified in AWWA C 110. This payment shall include all fabrication and welding required on the fitting.

801.22.9 VALVE AND VALVE CANS:

801.22.9.1 Valves shall be measured and paid for at the contract unit price per each size of valve. The contract unit price for valves 24-inch and larger shall include the bypass valve, fittings and piping, complete in place.

801.22.9.2 Valve boxes shall be measured and paid for at the contract unit price per each per type of valve boxes, which payment shall include the concrete pad with stem extension when required, complete in place.

801.22.10 FIRE HYDRANTS: Fire hydrants shall be measured and paid for at the contract unit price per each per depth of bury, which payment shall include excavation, gravel drain pocket, mechanical restraining system or blocking, backfilling, and compaction complete in place.

801.22.11 VALVE BOX ADJUSTMENTS:

801.22.11.1 Valve box adjustment using the adjustment collar and insert shall be measured and paid for per each complete in place including the concrete pad.

801.22.11.2 When the adjustment height required on a valve box exceeds the height of the adjustment collar or the valve box has been previously adjusted, the valve box will have to be rehabilitated. Measurement and payment shall be made as specified under Valve Box Rehabilitation.

801.22.12 WATER LINE CONNECTIONS:

801.22.12.1 Nonpressurized Connections: Nonpressurized connections shall be measured and paid for at the contract unit price per each for any size or type of pipe, complete in place, which shall include any extra excavation required, shut-off coordination, the removal of any caps or plugs or the cutting of the existing pipe any number of times required to make the connection, drainage plan (if required), pumping or handling of the water, backfilling and compaction. Fittings shall be measured and paid for per pound as specified herein, including all types of couplings.

801.22.12.2 Pressurized Connection: Pressurized connections shall be measured and paid for at the contract unit price per each per location shown on the plans, complete in place, which shall include excavation, the cleaning or removal of existing pipe coatings and coverings, air testing, the tapping, any grouting required, backfilling and compaction. The installation of the tapping sleeve and gate valve is to be paid under separate item or as indicated on the plans.

801.22.12.3 Connection to Steel Water Lines: All connections to existing steel water lines shall be made by using a transition coupling. The measurement and payment for this type of connection shall be made per pound of fitting for a Mechanical-Joint Connecting Piece of the size used based on the weights specified in AWWA C 110.

801.22.13 THRUST RESTRAINTS:

801.22.13.1 CONCRETE BLOCKING: When concrete blocking is used as a substitute for a mechanically restrained joint as authorized by the ENGINEER, the blocking shall be measured and paid for at the contract unit price per cubic yard placed to the neat lines shown on the plans or per the Standard Detail Drawings.

801.22.13.2 RESTRAINING JOINTS FOR WELDED STEEL OR CONCRETE CYLINDER PIPE: Measurement and payment for this item shall be at the contract unit price per linear inch of circumferential weld, complete in place, including protective coating of the weld.

801.22.13.3 MECHANICALLY RESTRAINED JOINTS: Mechanically restrained joint assemblies shall be measured and paid for at the contract unit price per each assembly per size of the pipe per each type (pipe to pipe, pipe to mechanical joint, pipe to fitting, etc.) complete in place.

801.22.13.4 VALVE ANCHORAGE: No separate measurement nor payment shall be made for valve anchorage as per Standard Detail Drawing. The cost of this work shall be included with the cost of the valve.

801.22.14 PRESSURE REDUCING VALVE (PRV): Measurement and payment for furnishing and installing a PRV shall be made at the contract unit price per each per size, complete in place as shown on the plans or in the Standard Detail Drawings. The payment shall include all labor, equipment and material required for the excavation, the PRV, all bypass piping, fittings and valves both inside and outside the structure, the structure, backfilling and compaction.

801.22.15 AIR RELEASE VALVE (ARV): Measurement and payment for furnishing and installing an ARV shall be made at the contract unit price per each per size of ARV, complete in place as shown on the plans or in the Standard Detail Drawings. The payment shall include all labor, equipment and materials required for the excavation, ARV, piping, fittings, gate valve, can or structure, backfilling, and compaction.

801.22.16 VALVE BOX REHABILITATION: Valve box rehabilitation shall be measured and paid for at the contract unit price per each, complete in place which shall include the removal of the existing valve box, excavation, the new valve box installed, backfilling, compaction and the installation of the concrete collar.

801.22.17 CONCRETE STRUCTURES: The removal and replacement of concrete structures such as sidewalks, drive pads, and curb and gutters etc., required for the installation of water lines shall be measured and paid for as specified in Section 340 and 343.

801.22.18 BEDDING MATERIAL: No separate measurement nor payment shall be made for bedding material required when shown on the plans or when required due to the type of pipe supplied by the CONTRACTOR. The cost of the bedding material shall be included in the unit price of the pipe. If bedding material is not required by the conditions above but is required due to the conditions encountered during construction then the bedding material shall be measured and paid for as specified in Section 701.

801.22.19 SURPLUS MATERIALS: No separate measure nor payment will be made for the removal and disposal of surplus material generated by the pipe, bedding material or the use of lean fill.

SECTION 901

SANITARY SEWER COLLECTOR AND INTERCEPTOR FACILITIES

901.1 GENERAL

The construction items, specified in this section, are common to sanitary sewer collector and interceptor facilities.

901.2 REFERENCES

901.2.1 ASTM

C 43	D 2321
C 425	D 3034
C 443	F 679
C 478	F 794

901.2.2 AWWA

C 603

901.2.3 This publication per SECTIONS:

101	123
102	124
105	125
106	129
108	701
121	

901.3 MATERIALS

901.3.1 PIPE: Sewer line pipe and fittings shall be as specified in other sections, as follows:

Plastic Pipe	Section 121
Reinforced Concrete Pipe	Section 123
Reinforced Concrete Pressure Pipe	Section 124
Vitrified Clay Pipe	Section 125
Ductile Iron Pipe	Section 129

901.4 CERTIFICATION

The OWNER/ENGINEER will be supplied with a certification on each item or type of material required in the sewer line, as to that item meeting the specifications and/or the reference specifications before that item is installed.

901.5 INSTALLATION

901.5.1 GENERAL:

901.5.1.1 Pipe and appurtenances shall be new and unused. The type of pipe to be installed shall be as approved by these specifications or unless otherwise shown on the drawings. Pipe and appurtenances

shall be handled in such a manner as to insure delivery to the trench in sound, undamaged condition. Particular care shall be taken to prevent damage to any pipe coating.

901.5.1.2 The interior of the pipe shall be thoroughly cleaned of foreign material before being lowered into the trench and shall be kept clean during construction operations. When work is not in progress, the open ends of pipe shall be securely closed so that no foreign materials will enter the pipe. Any section of pipe found to be defective before or after laying shall be replaced with sound pipe, or repaired in a manner satisfactory to the ENGINEER, without additional expense to the OWNER.

901.5.1.3 The CONTRACTOR shall install a plug in the new sewer at any point of connection to an existing system. The plug shall remain in place until the ENGINEER authorizes its removal in writing. The CONTRACTOR shall not flush or otherwise discharge any flow into an existing system unless approved in writing by the ENGINEER.

901.5.1.4 Pipe shall be laid to line and grade as shown on the plans and as staked in the field. The bedding of the trench shall be graded and prepared to provide a firm and uniform bearing throughout the entire length of the pipe barrel. Suitable excavation shall be made to receive the bell of the pipe and the joint shall not bear upon the bottom of the trench. All adjustment to the line and grade shall be made by scraping away or filling in with pipe zone material under the body of the pipe, and not by wedging or blocking. When connections are to be made to any existing manhole, pipe, or other improvement, the actual elevation or position of which cannot be determined without excavation, the CONTRACTOR shall excavate for and expose the existing improvement before laying the connecting pipe or conduit. When existing underground improvements may reasonably be expected to conflict with the line or grade established for the new sewer line, the ENGINEER shall request the CONTRACTOR to excavate as necessary to expose and locate such potentially conflicting underground improvements prior to laying the new pipe. Any adjustment in line or grade which may be necessary to accomplish the intent of the plans will be made, and the CONTRACTOR will be paid for any additional work resulting from such change in line or grade in the manner provided for in the General Conditions.

901.5.1.5 Connections to existing manholes shall be made by core drilling through the manhole wall. The CONTRACTOR shall take care to avoid unnecessary damage to the existing manhole.

901.5.1.6 Pipe shall be laid upgrade in a continuous operation from structure to structure, with the socket or collar ends of the pipe upgrade unless otherwise permitted by the ENGINEER.

901.5.1.7 Sanitary sewer mains shall not be constructed under walkways, sidewalks, curbs and gutters, drivepads, or similar concrete structures by tunneling underneath them. The CONTRACTOR will cut these concrete structures by using a concrete saw or, at his option, he may remove the section of the concrete structure to the nearest full expansion joint or edge.

901.5.2 PLASTIC PIPE INSTALLATION:

901.5.2.1 Plastic sewer pipe shall be connected and placed in the trench in accordance with the manufacturer's recommendations. Where a conflict arises with this Specification, this Specification shall control. Trenching, embedment, and backfill shall be as specified in Section 701.

901.5.2.2 The reference mark (a distinct circumferential line) is placed on the pipes spigot end by the manufacturer to indicate the correct depth of spigot penetration into the pipe gasket joint. If the pipe is seated too deep or too shallow the pipe may buckle or separate due to thermal expansion/contraction. Spigot penetration shall be within 1/4" of the manufacturer's recommended mark.

901.5.2.3 For plastic pipe connection to manholes the CONTRACTOR shall install an appropriately sized press seal gasket, such as PS-10 by Press Seal Gasket Corporation, Large Diameter Waterstops for Concrete Manhole Adapters by Fernco, or approved equal. The gasket shall be installed per manufacturer's directions. No direct payment shall be made for this item; this cost shall be included in the pipe bid item price.

901.5.2.4 Not less than thirty (30) days after the installation and backfilling of plastic sewer pipe, including any service connections, the CONTRACTOR shall, in the presence of the ENGINEER, test deflection with a mandrel (GO - NO GO device). The mandrel shall be hand pulled. All pipe with deflections in excess of five percent of the base internal diameter, as determined by ASTM D 3034, ASTM F 679, or ASTM F 794, shall be excavated, pipe removed, new pipe installed,

backfilled, compacted and retested after an additional period of at least thirty days. Mandrels shall have 9 ribs and be only hand pulled through the test section. The CONTRACTOR shall furnish the mandrels. The length of the minimum radius portion of the mandrel shall not be less than the one-third of the nominal diameter of the pipe tested. The pipe shall be flushed and cleaned by the CONTRACTOR prior to testing. No flow will be permitted in the pipe while testing for deflections.

901.5.2.5 All expenses for trenching, removal of pipe, furnishing new pipe, installation of new pipe, compacted backfill, paving, and other related work that is required because of failure to meet deflection test requirements shall be borne by the CONTRACTOR.

901.5.2.6 Acceptance of plastic pipe sewers will be made only after these deflection test requirements have been met.

901.5.2.7 Minimum Diameters of Mandrels

901.5.2.7.1

<u>Nominal Pipe Size</u>	<u>Min. Mandrell Diam.</u>
8 in.	7.28 in.
10 in.	9.08 in.
12 in.	10.80 in.
15 in.	13.20 in.
18 in.	16.13 in.
21 in.	19.00 in.
24 in.	21.36 in.
27 in.	24.07 in.

901.6 JOINTS FOR PIPE

901.6.1 JOINTS FOR CLAY PIPE (FACTORY FABRICATED AND INSTALLED COMPRESSION-TYPE JOINTS FOR VITRIFIED CLAY PIPE):

901.6.1.1 Joint material shall be any one of the types specified in ASTM C 425 and shall meet all requirements of that specification and Section 125.

901.6.1.2 The CONTRACTOR shall furnish the ENGINEER complete information concerning the type and make of all joint material which he intends to use under the contract including certification that the joint material meets the requirements of these specifications.

901.6.1.3 In addition to all other tests required, the ENGINEER may select at random and perform the test on 2 joints for each 250 feet of pipe or fraction of each size of any lot of pipe to be tested.

901.6.1.4 The pipe joints shall not leak when subjected to the shear loading and hydrostatic tests as per ASTM C 425.

901.6.2 JOINT FOR CONCRETE PIPE:

901.6.2.1 The type of joint to be used shall be as shown on the drawings or as specified in the Supplementary Specifications.

901.6.2.2 Gasketed type of joints for circular reinforced concrete pipe shall be used (See Section 123).

901.6.2.3 Rubber gaskets for making compression type joints for circular concrete pipe shall be factory fabricated in accordance with ASTM C 443 and C 361; for circular pipes 12 inches in diameter and larger shall be rubber gasket and shall be handled, primed, installed, etc. in strict accordance with the manufacturer's recommendations.

901.6.2.4 The CONTRACTOR's attention is particularly called to ASTM C 443, regarding storage of gaskets.

901.6.2.5 The sealing of the plastic liner at the pipe joints shall be in strict accordance with Section 122.

901.6.2.6 The ends of the pipe shall be so formed that when the pipes are laid together and joined, they shall make a continuous and uniform line of pipe with a smooth and regular surface.

901.6.2.7 For elliptical or arch reinforced concrete pipe, the joints shall be tongue and groove. Mastic material, such as: RAMNEK, KENT SEAL, or approved equal, will be used to seal joints.

901.6.2.8 The CONTRACTOR shall furnish the ENGINEER complete information concerning the type and make of all joint material which he intends to use under the contract, including certification that the joint material meets the requirements of these specifications.

901.6.3 JOINT FOR PLASTIC SEWER PIPE (PVC):

901.6.3.1 Refer to ASTM D 2321 and ASTM F 794 for pipe laying and joining of pipe guidelines.

901.6.3.2 Prior to the laying of pipe, each pipe component shall be inspected for damage and

cleaned. Damaged components shall be rejected or repaired.

901.6.3.3 All joints will be assembled in accordance with manufacturer's published recommendations. If a lubricant is required to facilitate assembly, it shall have no detrimental effect on the gasket or on the pipe when subjected to prolonged exposure. Proper jointing may be verified by rotation of the spigot by hand or with a strap wrench. If unusual joining resistance is encountered or if the insertion mark does not reach the flush position, disassemble the joint components and repeat the assembly steps. Note that fitting bells may permit less insertion depth than pipe bells. When mechanical equipment is used to assemble joints, care should be taken to prevent over insertion.

901.7 TESTING FOR LEAKAGE

901.7.1 GENERAL:

901.7.1.1 Unless otherwise shown on the drawings or specifically deleted by the ENGINEER, in writing, all sanitary sewers shall be tested for leakage.

901.7.1.2 The CONTRACTOR may, at his option, Air Test the sanitary sewer line before backfilling the trench to aid the CONTRACTOR in checking the installation for any defects. Such testing is at the option of the CONTRACTOR and shall not constitute an acceptance test under these specifications.

901.7.1.3 The test for acceptance and compliance with these specifications shall be performed after the pipe zone backfilling has been completed. In the case of new sanitary sewer lines with house laterals included as an integral part of the project, the test for acceptance and compliance with these specifications shall be performed after the house laterals or stubs have been completed and backfilled. The CONTRACTOR has the option to leave the end of the service line exposed.

901.7.1.4 If the leakage, as shown by the test, is greater than allowed by these specifications, the pipe shall be overhauled by the CONTRACTOR at his expense and, if necessary, relaid until the pipe will satisfactorily pass the test.

901.7.1.5 The CONTRACTOR shall, at his own expense, furnish all water, material, tools and labor for making the test required. All tests shall be made under observation of the ENGINEER.

901.7.2 INFILTRATION TEST:

901.7.2.1 An Infiltration Test shall be used only when excessive ground water prevents satisfactory testing by either the Exfiltration Test or the Air Test. In addition, the Infiltration Test must be performed after backfilling, before any service connections are functioning and at a time when the ground water is over the entire section of pipe and at or near its maximum level.

901.7.2.2 The procedure for conducting an Infiltration Test shall be as follows:

901.7.2.2.1 The pipe section shall be cleaned.

901.7.2.2.2 Determine the groundwater table. The groundwater table shall be determined for each section of sanitary sewer tested.

901.7.2.2.3 Plug the upstream pipe outlet from upstream manhole of the sections being tested with a plug which will assure a tight seal against flow from the upstream portion of the sewer system. Also plug all house laterals and any other connections to the section being tested.

901.7.2.2.4 Install a 90 degree V-notch weir in the downstream manhole of the section being tested. Weir must be installed plumb and sealed to the pipe wall surface.

901.7.2.2.5 A sufficient period of time must be allowed to permit the infiltrated waters to collect and flow over the weir. Water shall flow over the weir for at least thirty minutes prior to taking measurements.

901.7.2.2.6 The head (H) of water flowing over the weir must be measured accurately and the measurement taken at least 18 inches upstream from the crest of the weir.

901.7.2.2.7 Discharge over the 90 degree V-notch weir shall be calculated according to:

$$Q = 3240 H^{2.5}$$

H = Head in inches

Q = Discharge in gallons per day

901.7.2.3 The allowable infiltration shall be 200 gallons per inch of pipe diameter per mile of pipe per day. When there is significantly more than two feet of groundwater above the top of the pipe at the highest point of the section being tested, ten percent additional infiltration above the permitted 200 gal/in.-dia/mi/day limit will be allowed for every 2 foot of additional head.

901.7.3 EXFILTRATION TEST

901.7.3.1 An Exfiltration Test may be conducted wherever the groundwater level is below the crown of the pipe at the highest elevation of the section of sanitary sewer being tested. If the groundwater level is above the crown of the pipe either the Air Test, properly adjusted, or Infiltration Test should be used.

901.7.3.2 The procedure for conducting an Exfiltration Test shall be as follows:

901.7.3.2.1 The pipe section shall be cleaned.

901.7.3.2.2 Plug the downstream pipe outlet to the manhole with a plug which will assure a tight seal against water leakage. Also plug all house laterals and any other connections to the section being tested.

901.7.3.2.3 If the upstream manhole is to be used as a reservoir for maintaining the pressure head on the sewer pipe, the inlet sewer pipe or pipes must be plugged. If a standpipe is to be used as a reservoir for maintaining the pressure head on the sewer pipe, the standpipe must be connected to the sewer pipe in the upstream manhole by a tightly sealed connection.

901.7.3.2.4 The amount of water (volume required to fill the section of sewer under test plus the manhole or standpipe) shall be calculated.

901.7.3.2.5 Water shall then be introduced through the manhole or standpipe. The amount of water introduced shall be metered. The amount of water introduced to fill the sewer should be approximately equal to the calculated amount. If the amount of water required to fill the sewer pipe is significantly greater than the calculated amount, it is an indication of a leak or leaks and consequent saturation of the backfill around the sewer pipe. Saturation of the backfill will invalidate the test.

901.7.3.2.6 The level of water in the manhole or standpipe shall be at least two feet above the crown of the pipe at the highest section of the section of sanitary sewer being tested.

901.7.3.2.7 After filling the pipe at least one hour shall be allowed for water absorption in the pipe. For some materials, up to six hours may be required. After the absorption period, the manhole or standpipe shall be refilled to the established measuring mark and the test begun.

901.7.3.2.8 If the upstream manhole is used as a reservoir for maintaining the pressure head on the sewer pipe, the difference in water surface elevation

from original to final level in a two hour period shall be used to calculate the water lost. The water lost in the two hour period shall be converted into gallons per day. If a standpipe is used as a reservoir for maintaining the pressure head on the sewer pipe, the stand-pipe shall be refilled periodically during the two hour test period to maintain an essentially constant head on the test section of pipe. The amount of water added shall be measured and shall be used to calculate the loss in gallons per day.

901.7.3.2.9 The allowable exfiltration shall be computed based upon the average pressure head above the crown of the pipe for the section tested as follows:

$$\text{Allowable leakage} = \frac{\sqrt{h}}{\sqrt{3}} 1 \times 200$$

Allowable leakage in gallons per inch of pipe diameter per mile of pipe per day.

h = average pressure head above the crown of the pipe, in feet (elevation of water at center of run)

901.7.3.2.10 When the upstream manhole is used as a reservoir for maintaining the pressure head, the allowable leakage from the manhole shall be added to the allowable leakage calculated for the sewer pipe.

901.7.3.2.11 If the sanitary sewer line fails to pass the Exfiltration Test, a re-test shall be permitted only after the groundwater conditions surrounding the pipe return to a condition similar to those existent at the beginning of the test period. The groundwater elevation shall be determined prior to initiation of the second test.

901.7.4 AIR TEST:

901.7.4.1 An Air Test may be conducted under all conditions of groundwater levels surrounding the sanitary sewer pipe. If the groundwater is above the crown of the pipe, the air pressure shall be increased by an increment equal to the pressure exerted by the groundwater over the pipe.

901.7.4.2 The procedure for conducting an Air Test shall be as follows:

901.7.4.2.1 Clean the pipe section (manhole to manhole reach of sewer) being tested by propelling a snug-fitting inflated ball, or other adequate method, through the pipe with water. It is important that the pipe be thoroughly wetted if consistent results are to be expected.

901.7.4.2.2 Plug all pipe outlets with pneumatic plugs. The pneumatic plugs shall be able to resist internal testing pressures without requiring external bracing. Give special attention to house laterals.

901.7.4.2.3 Determine the groundwater level surrounding the section of sewer under test. If the groundwater level is above the crown of the pipe, the test pressures shall be increased by 0.43 psig for each foot of water above the average elevation of the crown of the pipe. Test pressures shall not exceed 10 psig.

901.7.4.2.4 Introduce air slowly to the section of pipe under evaluation until the internal air pressure is raised to 4.0 psig plus any increase required by a high groundwater level.

901.7.4.2.5 Allow the air pressure to stabilize. Air may be added slowly to maintain a pressure in the 3.5 to 4.0 psig (plus groundwater allowance) for two minutes.

901.7.4.2.6 After the stabilization period, when the pressure reaches exactly 3.5 psig (plus groundwater allowance) the stopwatch is started and when the pressure reaches exactly 2.5 psig (plus groundwater allowance) the stopwatch is stopped.

901.7.4.2.7 If the time required for a one pound pressure drop is not less than the allowable time for the pipe section under test to lose air, the section shall pass the leakage test.

901.7.4.2.8 In all cases where an Air Test is conducted, the manholes shall be tested separately as previously specified.

901.7.4.2.9 All persons conducting an Air Test must be made aware of the fact that an Air Test may be dangerous if improperly conducted.

901.7.5 AIR TESTING TABLES: Tables 901.7.5.1 and 901.7.5.2 will be used to determine the required test duration for the section of line being tested.

TABLE 901.7.5.1

SPECIFICATION TIME REQUIRED FOR 1.0 PSIG PRESSURE
DROP FOR SIZE AND LENGTH OF PIPE
INDICATED FOR Q=0.0015

(A) Pipe Diameter (in.)	(B) Minimum Time (min:sec)	(C) Length for Minimum Time (ft)	(D) Time for Length (sec)	(E) Specification Time for Length (L) Shown (min:sec)								
				100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft	
4	3:46	597	.380 L	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46
6	5:40	398	.854 L	5:40	5:40	5:40	5:40	5:40	5:40	5:40	5:40	5:42
8	7:34	298	1.520 L	7:34	7:34	7:34	7:34	7:34	7:34	7:36	8:52	10:08
10	9:26	239	2.374 L	9:26	9:26	9:26	9:26	9:26	9:53	11:52	13:51	15:49
12	11:20	199	3.418 L	11:20	11:20	11:20	11:20	11:20	14:15	17:05	19:56	22:47
15	14:10	159	5.342 L	14:10	14:10	14:10	14:10	17:48	22:15	26:42	31:09	35:36
18	17:00	133	7.692 L	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41	64:10
21	19:50	114	10.470 L	19:50	26:10	34:54	43:37	52:21	61:00	69:48	78:31	87:14
24	22:40	99	13.674 L	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:33	113:57
27	25:30	88	17.306 L	28:51	43:16	57:41	72:07	86:32	100:57	115:22	129:48	144:23
30	28:20	80	21.366 L	35:37	53:25	71:13	89:02	106:50	124:38	142:26	160:15	178:03
33	31:10	72	25.852 L	43:05	64:38	86:10	107:43	129:16	150:43	172:21	193:53	215:25
36	34:00	66	30.768 L	51:17	76:55	102:34	128:12	153:50	179:29	205:07	230:46	256:24

Table from: UNI-B-6-79, "Recommended Practice for Low-Pressure Air Testing of Installed Sewer Pipe"; Uni-Bell Plastic Pipe Assoc.

TABLE 901.7.5.2

SPECIFICATION TIME REQUIRED FOR LOSS OF PRESSURE
FROM 3.5 PSIG TO 2.5 FOR SIZE AND
LENGTH OF PIPE INDICATED FOR Q=0.003

(A) Pipe Diameter (in.)	(B) Minimum Time (min:sec)	(C) Length for Minimum Time (ft)	(D) Time for length (sec)	(E) Specification Time for Length (L) Shown (min:sec)										
				100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft			
4	1:53	597	.190 L	1:53	1:53	1:53	1:53	1:53	1:53	1:53	1:53	1:53	1:53	1:53
6	2:50	398	.427 L	2:50	2:50	2:50	2:50	2:50	2:50	2:50	2:50	2:50	2:50	2:50
8	3:47	298	.760 L	3:47	3:47	3:47	3:47	3:47	3:47	3:47	3:47	3:47	3:47	3:47
10	4:43	239	1.187 L	4:43	4:43	4:43	4:43	4:43	4:43	4:43	4:43	4:43	4:43	4:43
12	5:40	199	1.709 L	5:40	5:40	5:40	5:40	5:40	5:40	5:40	5:40	5:40	5:40	5:40
15	7:05	159	2.671 L	7:05	7:05	7:05	7:05	7:05	7:05	7:05	7:05	7:05	7:05	7:05
18	8:30	133	3.846 L	8:30	9:37	12:49	16:01	19:14	22:26	23:38	28:51	39:16	51:17	64:54
21	9:55	114	5.235 L	9:55	13:05	17:27	21:49	26:11	30:32	34:54	39:16	45:35	51:17	64:54
24	11:20	99	6.837 L	11:24	17:57	22:48	28:30	34:11	39:53	45:35	51:17	64:54	80:07	96:57
27	12:45	88	8.653 L	14:25	21:38	28:51	36:04	43:16	50:30	57:42	64:54	80:07	96:57	115:23
30	14:10	80	10.683 L	17:48	26:43	35:37	44:31	53:25	62:19	71:13	80:07	96:57	115:23	135:24
33	15:35	72	12.926 L	21:33	32:19	43:56	53:52	64:38	75:24	86:10	96:57	115:23	135:24	157:05
36	17:00	66	15.384 L	25:39	38:28	51:17	64:06	76:55	89:44	102:3	115:23	135:24	157:05	183:54
39	18:25	61	18.054 L	30:57	45:09	60:11	75:14	90:16	105:1	120:2	135:24	157:05	183:54	210:44
42	19:50	57	20.039 L	34:54	52:21	69:48	87:15	104:4	122:0	139:3	157:05	183:54	210:44	228:33
								2	9	6				

Table from: WPCF Journal, Vol. 44, No. 4, April 1972; Ramseyer, "Testing New Sewer Pipe Installations"; pp. 557-564.

901.7.5.3 EXPLANATION AND USE OF TABLES

Explanation of Tables

Column A	Nominal diameter of pipe (any pipe material).
Column B	Minimum duration of air test regardless of length of line segment being tested. (e.g., 250' of 8" PVC: test duration 3 min. 47 sec.)
Column C	Length of Line associated with minimum duration of air test (Column B).
Column D	L = length of line in feet; product of computation yields duration of air test (e.g., 250' of 12" PVC where ground water is not present ([Table 901.7.5.1]: test duration--1.709 (250) = 427.25 sec. = 7 min. 8 sec.)
Column E	Duration of air test for given incremental lengths of line.

Use of Tables

Table 901.7.5.1 is based on an air loss rate of 0.003 cfm/sf of internal surface area. Use for line installations where ground water (and subsequent infiltration) is not present.

Table 901.7.5.2 is based on an air loss rate of 0.0015 cfm/sf of internal surface area. Use for line installations where ground water (and subsequent infiltration) is present

901.8 CLEANING AND INSPECTION

901.8.1 CLEANING: No pipe spalls, rocks, dirt, joint compounds, cement mortar and other trash or obstructions shall be left in a sewer pipe of any size or type. During the flushing operations the manhole outlet shall be bagged or plugged so that this debris will not be carried into or contaminate an existing or active line.

901.8.2 TELEVISION:

901.8.2.1 All completed sewer lines shall be inspected by a television camera before lines become operational or final acceptance of the installation.

901.8.2.2 After the CONTRACTOR has cleaned flushed and retrieved all debris in the line, the CONTRACTOR will notify the project engineer that the line is ready for television inspection. The CONTRACTOR in the presence of the ENGINEER or the engineer's representative shall televise the line with televising equipment specifically designed and constructed for sewerline visual inspection.

The television camera shall be of color and equipped with a rotating lens capable of 360-degree rotation with zoom focus and a wide-angle optical lens permitting spontaneous focal

adjustments, allowing viewing of service lateral connections, joints, pipe walls, etc.

A television report log, completed on the OWNER'S log form, shall be maintained during the television inspection. This log shall be completed to the OWNER'S satisfaction noting the location, project title, name of OWNER, date, type of pipe material, line size, location of services (live or stubouts), manhole or station numbers, and any abnormal or line defects within the line segment. The CONTRACTOR shall be responsible for subsequent televising when line repairs are required or when the previous televising is not satisfactory to the OWNER.

When the televising is complete, the CONTRACTOR shall turn over to the OWNER complete television report logs and the VHS videotape recordings.

901.9 MEASUREMENT AND PAYMENT

901.9.1 SANITARY SEWER PIPE: Installed pipe shall be measured and paid for as follows:

901.9.1.1 For straight lines the pipe length shall be the intervening distance between the centers of manholes along a line parallel to the pipe invert.

901.9.1.2 For curvilinear lines the pipe length shall be the intervening arc distance between the

centers of manholes along a line parallel to the pipe invert.

901.9.1.3 For lateral lines, such as from main or manhole to a storm inlet, the pipe length shall be the distance between the center of a manhole or centerline of the main to the interior wall face of the storm inlet along a line parallel to the pipe invert.

901.9.1.4 Payment for pipe will be in accordance with the unit price per linear foot per size and material as defined in the Bid Proposal, and shall include: pipe installed in the trench, jointing and coupling materials, and other materials necessary to connect to other sections of pipe, manholes, and other appurtenances.

901.9.2 CONNECTIONS: Connections, tying new sewer lines into existing manholes, shall be measured and paid for on a unit price per each within the size increments as specified in the Bid Proposal. Connections to the shelf section of the floor will not be considered for payment under this bid item.

901.9.3 VERTICAL OROPS: Vertical drops at manholes shall be measured by the linear foot of pipe from the invert of the sewer line to be dropped to the spring line of the receiving main. Payment will be made on the unit price per linear foot per size and type of pipe as specified in the Bid Proposal.

901.9.4 TESTING:

901.9.4.1 Infiltration, ex filtration, and air tests of sewer mains shall include sewer service lines to the property lines or right-of-way lines as installed per the construction plans. No payment will be made for the initial test or subsequent tests.

901.9.4.2 Television inspection is defined in Subsection 801.8.2.

901.9.4.3 There will be no payment for required testing of sanitary sewer manholes.

901.9.4.4 No payment will be made for deflection tests after the required waiting period for PVC sewer pipe installations.

901.9.5 REMOVAL AND DISPOSAL OF SEWER PIPE: Removal and disposal of sanitary or storm sewer lines shall be measured by the linear foot within the specified pipe size increments. Payment will be made on the unit price per linear foot of specified pipe size in the Bid Proposal. No payment will be made until delivery of salvageable materials is verified by Liquid Waste Division.

Trenching, backfilling, and pavement removal and replacement will be paid for based on the unit prices for each appropriate bid item in the Bid Proposal. If new pipe is to be installed in the same trench as the removed pipe, only one payment will be made for trenching, backfilling, and pavement removal and replacement.

SECTION 920

SANITARY AND STORM SEWER MANHOLES

920.1 GENERAL

This section contains items which are relative to the installation of sanitary and storm sewer manholes.

920.2 REFERENCES

920.2.1 ASTM

C 43	C 497
C 139	C 1557
C 478	

920.2.2 This publication

SECTION 101	SECTION 106
SECTION 102	SECTION 161
SECTION 105	

920.3 MANHOLE MATERIALS

Sewer manhole materials shall be as specified in other sections, as follows:

Portland Cement Concrete	Section 101
Steel Reinforcing	Section 102
Concrete Curing Compound	Section 105
Cement Mortar and Grout	Section 106
Gray Iron Castings	Section 161

920.4 MANHOLE CONSTRUCTION

920.4.1 GENERAL:

920.4.1.1 Soil Foundations for manhole base shall be compacted to a density of 95 percent of the maximum density per ASTM D 1557. Compaction limits shall be one foot beyond the perimeter of the concrete base and shall be a minimum of one foot in depth.

920.4.1.2 Manholes shall be constructed in accordance with the Standard Detail Drawings and as shown on the construction plans. Precast reinforced concrete units, concrete blocks or formed in place, reinforced concrete may be used to construct the manhole.

920.4.1.3 Invert elevation of the pipes entering or exiting the manhole and interior inverts shall not vary more than 0.05 foot from the elevations indicated on the construction plans.

920.4.1.4 All cement used for poured foundations, Mortar, fillets, grout, and concrete shelf construction shall be Type II or approved equal.

920.4.1.5 All concrete for formed in place foundations or bases, concrete shelves, and pipe supports shall be 3000 psi compressive strength concrete.

920.4.1.6 Depending on the size of the pipe, connections to existing and new manholes shall be made by either core drilling through the manhole wall, pre-formed for new precast units, or for large-size pipe the manhole wall may be removed by carefully chipping the wall segment which will permit entry of the pipe. In the latter operation, exposed manhole reinforcement should be bent and tied to the reinforcement of the pipe collar. If core drilling is not practical, the CONTRACTOR shall request the ENGINEER to authorize the chipping operation. During either operation the CONTRACTOR shall take care to avoid unnecessary damage to the manhole surfaces or walls.

920.4.2 PRECAST CONCRETE MANHOLES:

920.4.2.1 The vertical sections of the manhole may be of different dimensions in order that manholes of various depths can be readily assembled.

920.4.2.2 Concrete, used for precast bases, vertical sections, and eccentric cones, shall be 4000 psi compressive strength concrete.

920.4.2.3 Vertical sections of the manhole shall conform to the requirements of ASTM C 478.

920.4.2.4 The CONTRACTOR shall submit shop drawings of the precast base and eccentric cone to the ENGINEER for review and approval.

920.4.2.5 Circular precast manhole sections shall be provided with mastic gasket to seal joints between sections, such as RAM-NEK, KENT SEAL, or approved equal.

920.4.2.6 All lifting holes, except Type "C" manhole covers, and gaps at joints shall be filled with a nonshrink grout.

920.4.2.7 Precast concrete manhole bases may be used when approved by the ENGINEER. If approved, it shall be with the understanding that the CONTRACTOR shall be responsible for placing the bases at the specified elevation, location, and alignment.

920.4.3 FORMED INPLACE REINFORCED CONCRETE MANHOLE:

920.4.3.1 The CONTRACTOR shall submit preconstruction drawings of the proposed manholes to the ENGINEER for review and approval.

920.4.3.2 Concrete used for this type of manhole construction shall be 4000 psi compressive strength concrete.

920.4.3.3 If desired, a precast eccentric cone or a flat cover can be used.

920.4.4 CONCRETE BLOCK MANHOLE:

920.4.4.1 The CONTRACTOR shall submit preconstruction drawings of the proposed manhole to the ENGINEER for review and approval.

920.4.4.2 Concrete masonry units for the construction of this type of manhole shall conform to ASTM C 139 and the Standard Detail Drawings. All blocks shall be mortared into place.

920.4.4.3 Eccentric cone or flat-type cover shall be used.

920.4.5 TEE PIPE MANHOLE:

920.4.5.1 Tee pipe manholes will be used for all 4-foot-diameter mainline pipes and larger. Horizontal section of the tee pipe shall be the same class of pipe as the adjacent sections. The vertical sections shall comply with the requirements set forth in ASTM C 478.

920.4.5.2 Top of the vertical portion of tee pipe unit will extend a minimum of 18 inches above the outside diameter of the horizontal pipe. The 4-foot-diameter vertical section of the tee pipe shall be connected at the longitudinal center point of the horizontal pipe section. The minimum length of horizontal pipe section shall be 8 feet.

920.4.5.3 The CONTRACTOR shall submit to the ENGINEER for review and approval preconstruction shop drawings on the fabrication of the tee pipe section as developed by a precast reinforced concrete pipe manufacturer. Field fabrication of this eccentric pipe unit will not be accepted. Shop drawings for the eccentric cone will also be submitted for review and approval.

920.4.5.4 RAM-NEK, Kent Seal, or OWNER - approved equal sealants shall be used to seal the joints in the vertical portion of this manhole.

920.4.5.5 All lifting holes, except for Type "C" manhole covers, and gaps at joints shall be filled with a nonshrink grout.

920.4.5.6 Standard Detail Drawings show some of the components of the tee-type pipe manhole.

920.4.6 COATING OF MANHOLES:

920.4.6.1 Exterior of Manholes: Exterior coating of manholes shall be required in areas where ground water is present. The coating shall be a water-proofing type of bitumastic or asphaltic material, as approved by the ENGINEER. Application shall be in accordance with the manufacturer's published recommendations.

920.4.6.2 Interior of Manholes: Interior coating of manholes shall be required only when specified on the construction plans. The coating shall be an epoxy resin-type material, be an epoxy resin-type material such as: "Zebron," "Plastite 7122," or approved equal, and shall be capable of protecting the concrete from deterioration due to a gaseous environment. Application shall be in accordance with the manufacturer's published recommendations.

920.4.6.3 Plastering of Manholes: The work shall include the coating of the surface of existing block manholes with plaster as required on the plans.

920.4.7 MANHOLE STEPS:

920.4.7.1 Manhole steps shall be 1/2" diameter, grade 60, reinforcing rod completely encapsulated in copolymer polypropylene or corrosion resistant rubber compound. Steps shall be designed to be cast in place or hammered into holes in manhole walls.

920.4.7.2 Approved manhole steps of only one manufacturer model shall be used on any specific project and shall not be intermixed with other approved steps. Approved steps must bear the manufacturer name and model on the exposed surface of the step and shall be one of the following products or approved equals: M.A. Industries, Inc. -Model PS-2-PFS H. Bowen Co.-Bowco, Model 81213 or 93813 Delta Pipe Products -WEDG-LOK, Model W-II

920.4.7.3 The minimum width of step tread shall be 11 inches. Steps will be spaced uniformly in each manhole. Spacing may be between 12 inches to 16 inches on center. Lower step will be 12 inches above manhole shelf or top of main. The upper step shall be 6 inches below the top portion of the eccentric cone or 6 inches below the bottom

of the flat cover. Also the steps shall be aligned vertically with the opening of the cone or cover.

920.4.7.4 Steps shall be embedded in the manhole wall a minimum of 3" inches and protrude from the manhole interior surface a minimum of 4 3/4 inches.

920.4.7.5 Holes for step installation shall be drilled or precast per manufacturer's recommended size. or of sufficient size to allow for step insertion into the wall. Cast-in-place sockets or tapered holes recommended by the step manufacturer may be used with prior approval of ENGINEER. If the hole has been drilled too large, then the step shall be secured in place by using epoxy grout for the full depth of the drilled hole.

920.4.6 Acceptable manhole step installations must be capable of withstanding a 400 pound. horizontal, pull out load applied in accordance with ASTM C-497.

920.4.8 ADJUSTMENT BRICKS:

920.4.8.1 Manhole adjustment bricks shall conform to the requirements for manhole bricks. per ASTM C 32 for Grade MS.

920.4.8.2 Mortar shall be used to lay the bricks. as well as coating the interior and exterior surfaces of the laid brick. Thickness of the mortar coating shall be 1/2 inch.

920.4.9 MANHOLE FRAME AND COVER:

The manhole frame and cover for either the sanitary or storm sewer manholes shall conform to the specifications contained in Section 161.

920.5 TESTING OF SEWER MANHOLES:

920.5.1 All sanitary sewer manholes shall be tested for leakage by either a water exfiltration test or a vacuum test. Whichever test is utilized it is recommended that the test be performed prior to backfilling around the manhole and prior to placement of the manhole frame and cover. All inlet and outlet lines shall be properly plugged and the lift holes and barrel joints filled and sealed as specified. The CONTRACTOR shall be responsible for all materials and equipment necessary to perform the test and shall conduct the test in the presence of the ENGINEER or his representative. The CONTRACTOR has the option of performing a manhole test in increments appropriate to the depth of the manhole.

920.5.2 The water exfiltration test shall consist of filling the entire manhole with water to the bottom of the frame elevation. A stabilization period of one hour will be allowed for absorption. After which the manhole shall be refilled as necessary before starting the test. The test period shall be two (2) hours. After which the manhole shall be refilled, measuring the necessary quantity of water. The allowable leakage shall be 0.25 gallons per foot diameter per vertical foot per day, and is represented by the following formula:

$$V = 0.25 \text{ DHT}/24$$

where; V = Allowable loss in gallons

D = Manhole diameter in feet

H = Initial depth of water to invert in feet

T = Duration of test in hours

920.5.3 The vacuum test shall consist of utilizing an inflatable compression band, vacuum pump, gauges and appurtances specifically designed for vacuum testing. Test procedures shall be in accordance with the manufacturer's printed recommendations. The ENGINEER shall be the sole judge as to the adequacy of the equipment.

920.5.3.1 A vacuum of 10" Hg shall be placed in the manhole and the time measured for a drop to 8.5" Hg. The test shall be considered to be successful if the measured time exceeds the test period. Should the test fail, the man- hole shall be repaired as necessary and the test rerun. The test periods are:

920.5.3.2 Sixty (60) seconds for four (4) foot diameter manholes.

920.5.3.3 Seventy-five (75) seconds for five (5) foot diameter manholes.

920.5.3.4 Ninety (90) seconds for six (6) foot diameter manholes.

920.5.3.5 One hundred and Twenty (120) seconds for eight (8) foot diameter manholes.

920.5.4 Normally storm sewer manholes need not be tested unless specifically required by the project plans or supplemental technical specifications. However, if in the opinion of the ENGINEER, the workmanship or materials do not appear to be satisfactory, the ENGINEER may require that any storm sewer manhole be tested in a similar manner as that for a sanitary sewer manhole.

920.6 ABANDONMENT OF MANHOLES

920.6.1 Abandonment of manhole, which is part of a sewer line being abandoned, shall entail the following work and materials:

920.6.2 Manhole will not be removed but will be abandoned in place.

920.6.3 All manhole inlet and outlet lines shall be plugged with a 12-inch- thick concrete or concrete mortar plug.

920.6.4 Salvageable material shall be stockpiled on the job site. The CONTRACTOR shall contact the OWNER to arrange for a representative to inspect the materials for usability. Salvageable materials shall be transported by the CONTRACTOR as directed by the OWNER. CONTRACTOR will receive a receipt for the turned-in materials. Receipts will be submitted to the ENGINEER prior to final acceptance of the Project. Unusable materials will be disposed of by the CONTRACTOR.

920.6.5 Manhole bottom will be pulverized.

920.6.6 The manhole shall be filled with cement treated base (CTB) material to the bottom elevation of the asphalt base course of the pavement or to the ground surface level.

920.6.7 All labor, materials, and equipment necessary to complete this work shall be furnished by the CONTRACTOR.

920.6.8 For historical information the ENGINEER shall have a survey performed which will locate the abandoned manhole, relative to permanent survey markers.

920.7 SEWER MANHOLE REHABILITATION IN REPLACEMENT WORK

920.7.1 The work under this item shall be to replace the existing manhole frame and cover and to place a concrete pad around the existing manhole as required per the construction plans. This work will be done only when an existing manhole is encountered in the normal course of the replacement work that has a light- weight, vented, multi-holed manhole cover.

920.7.2 The work and materials shall include the following:

920.7.2.1 Remove any and all existing brick under frame and replace with new Grade MS brick as necessary to bring new frame and cover up to street grade.

920.7.2.2 Remove and replace existing concrete pad, or construct a new pad.

920.7.2.3 Remove existing steps and replace with new steps or, if steps are nonexistent, install new steps. Steps will be installed as per Subsection 815.4.7.

920.7.2.4 Remove and replace pavement.

920.7.2.5 Excavation and compaction of backfill as necessary.

920.7.2.6 All materials, labor, and equipment necessary to do the work under this item shall be furnished by the CONTRACTOR.

920.7.2.7 The work and materials under this item shall be done according to the manner set forth in the Standard Detail Drawings and other sections of these specifications.

920.7.3 Salvageable material shall be stockpiled on the job site. The CONTRACTOR shall contact the OWNER to arrange for a representative to inspect the materials for usability. Salvageable materials shall be transported by the CONTRACTOR as directed by OWNER. CONTRACTOR will receive a receipt for the turned-in materials. Receipts will be submitted to the ENGINEER prior to final acceptance of the Project. Unusable materials will be disposed of by the CONTRACTOR.

920.8 MEASUREMENT AND PAYMENT

920.8.1 NEW MANHOLES:

920.8.1.1 Type "C," "E," "F," or "G" manholes of 4-foot or 6-foot diameters shall be measured per each within the following increments of depth: 3 to 6 feet, 6 to 10 feet, and 10 to 14 feet. Manholes which are greater in depth than 1 foot shall be measured by the vertical foot. Measurements will be made to the nearest foot and will be from the manhole rim elevation to the manhole invert elevation.

920.8.1.2 Payment for manholes 14 feet deep or less will be made on the unit price per manhole diameter per depth increment as specified in the Bid Proposal. Payment for manhole depths which exceed 14 feet will be made on the unit price per manhole diameter per vertical foot. This payment is in addition to the manhole unit price for the portion above the 14 foot depth.

920.8.1.3 Type "A" or Tee-type manholes shall be measured and paid for by the methods described

in 920.8.1.1 and 920.8.1.2. Measurement will be from the invert of the main line to the manhole rim. Payment under this item will include the normal manhole costs described below, as well as any additional pipe costs for the precast tee and for the concrete cradle under the tee.

920.8.1.4 Payment for any type diameter or depth of manhole will include excavation, compacted backfilling, shelving, cover or cone, leveling bricks, frame and cover, and concrete pad or collar.

920.8.2 ELEVATION ADJUSTMENTS:

920.8.2.1 When a new manhole is installed, no measurement or payment will be made for rim elevation adjustments to conform to street surface grades.

920.8.2.2 The following measurements and payments for rim elevation adjustments on existing manholes will be made for indicated conditions:

920.8.2.2.1 Unit price per inch of adjustment ring for adjustment to manhole frame by the addition of adjustment ring.

920.8.2.2.2 Unit price per inch of leveling brick adjustment.

920.8.2.2.3 Unit price per manhole diameter per vertical foot of adjustment to cone and/or barrel.

920.8.2.3 As required, the following items will be included in the unit price per appropriate adjustment: pavement removal and replacement, excavation, compacted backfilling, concrete collar or pad, leveling bricks, adjusting rings, and/or frame and cover.

920.8.3 COATING OF MANHOLE: Plastering or epoxy coating for manholes shall be measured and paid for on the unit price per square foot of surface area covered.

920.8.4 MANHOLE STEPS: Unless otherwise shown on the Bid Proposal, the cost of manhole steps shall be incidental to the unit prices for construction of manholes of various types and depths.

920.8.5 ABANDONMENT OF MANHOLES: Measurement and payment for abandonment of a manhole shall be the unit price per manhole for defined work in Subsection 920.6.

920.8.6 MANHOLE REHABILITATION IN REPLACEMENT WORK: Work under this item shall be measured and paid for by the unit price per manhole for work specified in the Bid Proposal.

920.8.7 TESTING: There will be no payment for required testing of sewer manholes.

SECTION 925

VACUUM SEWER COLLECTOR, INTERCEPTOR AND FORCE MAIN FACILITIES

925.1 GENERAL: The construction items specified in this section are common to vacuum sewer facilities.

925.2 REFERENCES

925.2.1 American Society for Testing and Materials (ASTM) Standard Specifications, Latest Edition

- C478 Standard Specification for Precast Reinforced Concrete Manhole Sections
- D1557 Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort
- D1784 Standard Specification for Rigid Poly (PVC) Compounds and Chlorinated Poly (CPVC) Compounds
- D2241 Standard Specification for Poly (PVC) Pressure-Rated Pipe (SDR Series)
- D2564 Standard Specifications for Solvent Cements for Poly (PVC) Plastic Piping Systems
- D2665 Standard Specifications for Poly (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings
- D2672 Standard Specifications for Joints for IPS PVC Pipe Using Solvent Cement
- D3139 Standard Specifications for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals

925.2.1 This Publication, Latest Edition

- SECTION 101 PORTLAND CEMENT CONCRETE
- SECTION 102 STEEL REINFORCEMENT
- SECTION 105 CONCRETE CURING COMPOUND
- SECTION 106 CEMENT MORTAR AND GROUT
- SECTION 108 BRICK
- SECTION 121 PLASTIC PIPE
- SECTION 161 GRAY IRON CASTINGS
- SECTION 170 ELECTRONIC MARKER DISKS
- SECTION 701 TRENCHING, EXCAVATION AND BACKFILL
- SECTION 710 BOARING, DRILLING, AND JACKING
- SECTION 801 INSTALLATION OF WATER TRANSMISSION, COLLECTOR AND DISTRIBUTION LINES

925.3 MATERIALS

925.3.1 PIPE: All buried vacuum collector lines, branch lines, force mains, vacuum service laterals, and gravity service stubs shall be SDR21 rated PVC pipe conforming to ASTM D 2241, ASTM D 1784 Cell Classification 12454-B. Pipe and appurtenances shall be new and unused.

925.3.2 JOINTS: All joints shall conform to ASTM D 2672, using solvent cement; or ASTM D 3139 using elastomeric seals. This pipe must be certified by the manufacturer that pipe and seal will operate at 24 inches of mercury vacuum and withstand a vacuum test at 24 inches of mercury vacuum with a maximum loss of 1% of initial vacuum per hour for a 4 hour period.

925.3.3 FITTINGS

925.3.3.1 Fittings shall be Schedule 40 solvent weld drain, waste and vent pipe per ASTM D 2665.

925.3.3.2 Wye fittings and 45° ells shall be used throughout; except that a long radius 3" 90° ell may be used on the 3" suction line entering the vacuum valve and at the wye connection of the vacuum service lateral to the vacuum main. Tee fittings and short radius ells are prohibited exclusively.

925.3.4 SOLVENT CEMENT: Shall conform to ASTM D 2564; primer and cement shall not be of same color. Cement shall be gray in color.

925.3.5 MANHOLE SECTIONS: Manhole sections used for buffer tanks, vacuum division valve vaults, pig launchers, and air release valves shall be reinforced precast concrete manhole sections, 48" nominal diameter, conforming to the requirements of ASTM C 478.

925.3.6 MANHOLE JOINTS: Tongue and groove in precast wall; shall conform to Section 920, PRECAST CONCRETE MANHOLES.

925.3.7 MANHOLE FRAMES AND COVERS: Frames and covers for manholes used for buffer tanks, vacuum division valve vaults, pig launchers, and air release valves shall conform to this Publication, Section 161.4. The words "SEWER" shall be cast on the manhole cover.

925.3.8 CAST-IN-PLACE CONCRETE: Cast-in-place concrete used for footings, flotation collars, grade-level pads, mass concrete for buffer tanks, and other installations not otherwise addressed shall be air-entrained concrete in accordance with Sections 101, 102, and 105 of this Publication, with a compressive strength of 3500 psi. Type II Portland cement shall be used for all applications where the concrete will be in contact with sewage. See Section 1502, SUBMITTALS.

925.3.9 VALVES: Valves used for pig launchers and

vacuum division valves shall be mechanical joint gate valves conforming to Sections 801.3.3.1 through 801.3.3.9 of this Publication. Vacuum division valves shall be equipped with five-sided nuts, sockets and extension bars per Standard Drawing 2169.

925.3.10 AIR RELEASE VALVES: Air release valves shall be APCO or approved equal, the model number per the construction drawings.

925.3.11 VACUUM VALVES AND APPURTENANCES: Vacuum valves shall be per the construction drawings. Furnish all mechanical appurtenances required for a complete installation per manufacturer specifications. Vacuum valves and appurtenances are to be delivered to the OWNER's warehouse, unloaded, and stored as directed by the ENGINEER in complete packages.

925.3.12 VACUUM VALVE PITS

925.3.1.2.1 Vacuum valve pits shall be either "standard" or "deep" per the appropriate bid item.

925.3.1.2.2 The standard valve pit shall have a sump 30" deep and shall be per the construction drawings. The deep valve pit shall have a sump 54" deep and shall be per the construction drawings.

925.3.13 STAINLESS STEEL: Stainless steel for brackets and fasteners shall be AISI Type 304.

925.4 SUBMITTALS

925.4.1 The following shall be submitted for the ENGINEER'S approval prior to incorporation in the work of the corresponding item:

- a) Concrete Mix Design(s)
- b) Material and method of sealing pipe penetrations in buffer tank walls
- c) Pipe certification for vacuum service

925.4.2 The OWNER/ENGINEER will be supplied with a certificate of compliance for each item or type of material required in the system, as to that item meeting the specifications and/or the reference specifications before that item is installed.

925.4.3 The following records shall be maintained by the CONTRACTOR, shall be kept available at all times for inspection by the ENGINEER, and shall be submitted to the ENGINEER at his request or as provided in these Specifications.

925.4.3.1 Vacuum tests performed daily or as otherwise stipulated. These tests shall be recorded on

charts provided by the OWNER or in hard-board notebooks as stipulated herein depending on the type of test.

925.4.3.2 Record Drawing markups and related survey notebooks kept current by the CONTRACTOR to record work performed and to reflect any and all revisions made from the original drawings.

925.5 INSTALLATION

925.5.1 GENERAL

925.5.1.1 Handle pipe and appurtenances in such a manner as to insure delivery to the trench in sound, undamaged condition. Particular care shall be taken to prevent damage to any coating.

925.5.1.2 Prior to installation, store plastic pipe and protect from prolonged periods of sunlight per Section 121.

925.5.1.3 The interior of the pipe, pits, and all appurtenances shall be thoroughly cleaned of foreign material before being lowered into the trench and shall be kept clean during construction operations.

925.5.1.4 Install a plug in the new system at any point of connection to an existing system. The plug shall remain in place until the ENGINEER and OWNER authorize its removal in writing. The CONTRACTOR shall not flush or otherwise discharge any flow into an existing system unless approved in writing by the ENGINEER.

925.5.1.5 Perform trenching, backfilling, and compaction in accordance with Section 701.

925.5.2 PIPE INSTALLATION

925.5.2.1 All vacuum sewers shall be laid to line and grade as shown on the drawings with the use of construction laser beam equipment. All pipe which has been designed to slope downward shall slope uniformly downward, with a tolerance of no more than 0.01' per 20 feet of line. Abrupt sags or bellies will not be permitted. The elevation of each joint of pipe shall be recorded by the CONTRACTOR in bound field books which shall be submitted to the ENGINEER.

925.5.2.2 All sanitary sewer force mains shall be laid to line and grade as shown on the drawings with the use of construction laser beam equipment. Particular care shall be taken to avoid crests in the profile at locations other than those shown on the drawings. Elevations shall be recorded by the CONTRACTOR at 100-foot intervals, and at each change in grade, in bound field books which shall be submitted to the ENGINEER.

925.5.2.3 Handle and install pipe and fittings in accordance with manufacturer's recommendations.

925.5.2.4 Prevent entrance of dirt or foreign matter or damage to pipe lining or coating. Plug the pipe any time work is stopped.

925.5.2.5 No defective pieces are permitted. Defective pieces discovered after use will be removed and replaced with a sound piece.

925.5.2.6 Place bedding, embedment and backfill in accordance with Section 701 unless otherwise indicated on the drawings. The bedding of the trench shall be graded and prepared to provide a firm and uniform bearing throughout the entire length of the pipe. Suitable excavation shall be made to receive the bell of the pipe and the joint shall not bear upon the bottom of the trench. All adjustments to the line and grade shall be made by scraping away or filling in with pipe zone material under the body of the pipe, but not by wedging or blocking. When connections are to be made to any existing pipe, valve pit, or any other improvement, the actual elevation or position of which cannot be determined without excavation, excavate and expose the existing improvement before laying the connecting pipe or conduit. When existing underground improvements may reasonably be expected to conflict with the line or grade established for the new sewer line, the ENGINEER shall request the CONTRACTOR to excavate as necessary to expose such potentially conflicting underground improvements prior to laying the new pipe. Any adjustment in line or grade which may be necessary to accomplish the intent of the plans will be made, and the CONTRACTOR will be paid for any additional work resulting from such change in line or grade in the manner provided for in the GENERAL CONDITIONS.

925.5.2.7 Lay pipe upgrade in a continuous operation from structure to structure, with the socket ends of the pipe upgrade unless otherwise permitted by the ENGINEER.

925.5.2.8 Sanitary sewer mains shall not be constructed under walkways, sidewalks, curbs and gutters, drive pads, or similar concrete structures by tunneling underneath them. Cut concrete by using a concrete saw or, at the CONTRACTOR'S option, remove the entire section of concrete to the nearest full expansion joint or edge.

925.5.2.9 Place and hand-tamp fill to 95% of maximum dry density per ASTM D 1557, in entire space between the pipe or fitting and the trench walls.

925.5.2.10 Prior to completely backfilling the sewer excavation, install a green metalized plastic

tracer/warning tape 12" to 18" below finished grade.

925.5.2.11 Mark the ends of all wyes, branch lines, and gravity service stubs that are installed for future connections to the system. Attach a stainless steel marker with stainless wire to the stubout end and place the marker within 8" to 12" of finished surface for future relocation of stubout.

925.5.2.12 Provide pipe through casing with support skids as shown on the drawings and Standard Drawing No. 2380. Alternate support methods may be acceptable upon ENGINEER'S review and approval.

925.5.3 DIVISION VALVE AND GAGE TAP INSTALLATION: Division valves, vaults, and gage tap assemblies shall be installed per Standard Drawing No. 2170.

925.5.4 VACUUM VALVE PIT INSTALLATION

925.4.4.1 Install complete vacuum valve pits in accordance with manufacturer instructions and Standard Drawing No. 2165. Perform pressure testing on each valve pit assembly per the manufacturer instructions.

925.4.4.2 Stubouts for the gravity line from the collection sump should be 4" diameter, extended to the property line unless otherwise indicated. Each stub-out should have a stop glued in place 4" to 6" from the end inserted into the tank, to prevent it being pushed too far into the collection sump. A solvent welded 4" cap should be fitted and glued to each stub-out to prevent rocks and groundwater entering the sump prior to connection of the house gravity line. Expandable test plugs or rubber caps are not acceptable as temporary covers for gravity stub-outs.

925.5.5 SINGLE OR DOUBLE BUFFER TANK INSTALLATION

925.5.5.1 Install single or double buffer tank as shown on the drawings and Standard Drawing 2167 (single) or 2168 (double).

925.5.5.2 All pipe penetrations through the buffer tank walls shall be water tight. Submit manufacturer's literature on material and technique for sealing to the ENGINEER.

925.5.5.3 Install suction and sensor pipes as shown on the Standard Drawings. Attach these lines to the buffer tank side walls using Type 304 stainless steel brackets and fasteners. The 3" service lateral is to be stubbed into the buffer tank and capped or otherwise sealed until the vacuum valve is installed.

925.5.5.4 Install breather pipe through buffer tank

wall as shown on Standard Drawing No. 2166. This line is to be capped or otherwise sealed to prevent any infiltration of water during construction. It shall be tested in accordance with Breather Test Procedure, Paragraph 925.8.

925.5.5.5 Buffer tanks shall be tested after assembly. The entire buffer tank shall be tested as follows:

925.5.5.5.1 Stubouts, manhole boots, and pipe plugs shall be permanently secured to prevent movement while the vacuum is drawn.

925.5.5.5.2 Installation and operation of vacuum equipment and indicating devices shall be in accordance with manufacturer's recommendations.

925.5.5.5.3 Using CONTRACTOR furnished vacuum pump and gage, establish a measured vacuum of 10 inches of mercury in the buffer tank. Record the time for the vacuum to drop to nine inches of mercury.

925.5.5.5.4 The maximum allowable leakage rate for a four foot diameter manhole shall be in accordance with the following:

Min. Elapsed Time for a Pressure Manhole Depth Change of 1" Hg
10' or less 60 seconds
>10' but <15' 75 seconds
15' but <25' 90 seconds

925.5.5.5.5 If the buffer tank fails the test, necessary repairs shall be made and the vacuum test and repairs shall be repeated until the tank passes the test. The extent and type of repairs that may be allowed shall be subject to the approval of the ENGINEER. Leaks shall be repaired on the outside of the manhole unless otherwise approved by the ENGINEER.

925.5.5.5.6 If a buffer tank joint mastic is pulled out during the vacuum test, the manhole shall be disassembled and the mastic replaced.

925.5.5.5.7 Record test results on a calibrated chart recorder as described in Section 925.6, Field Quality Control.

925.5.6 INSTALLATION OF CASING FOR SANITARY SEWER VACUUM MAIN OR FORCE MAIN: Casing for sanitary sewer vacuum main or force main shall be per the drawings and Standard Drawing No. 2380 and per Section 710 of this Publication.

925.6 FIELD QUALITY CONTROL

925.6.1 Provide daily testing of all sewer mains and

lateral connections laid. Plug all open connections with rubber stoppers or temporary caps, fitted to the pipe by "no-hub" couplings. Using OWNER-furnished vacuum pump and chart recorder, apply a vacuum to 24 inches of mercury to the pipes with pump running continuously for 15 minutes to allow vacuum to stabilize before proceeding with test. There shall be no loss in excess of 1% of initial vacuum per hour for a two hour test period. As pipe is laid the new section shall be tested in addition to the previously laid pipe on that main.

925.6.2 Leave uncovered the sewer main pipe joints until after the daily vacuum test is complete so that any leaks can be easily located and repaired. Exposed joints shall be adequately restrained.

925.6.3 Two hour Vacuum Line Test Modification Provision: If the CONTRACTOR succeeds in meeting the daily 2-hour test for seven consecutive working days or two thousand feet of pipe, the ENGINEER may amend the procedure to allow the trench to be covered as work progresses rather than the trench being kept open all day as is the norm with the daily 2-hour test. Should a line fail the vacuum test while utilizing this test modification, the CONTRACTOR shall take whatever action is necessary at his cost to pass the test including the excavation of the trench, leak detection and line repair, and additional cleanup as required by the ENGINEER. After the failure, the CONTRACTOR must re-qualify as specified above. Note this test modification is optional, and as such, the CONTRACTOR assumes all liability in its use. Allowance of this modification by the ENGINEER is not considered acceptance of the sewer line or ability to withstand test vacuum pressures.

925.6.4 Installation and operation of vacuum equipment and indicating devices shall be in accordance with manufacturer's recommendations.

925.6.5 Required Final Acceptance Testing on complete system: Provide 48 hours notice to ENGINEER prior to test. Ensure all division valves are open prior to beginning of test. Subject the entire sewerage system to a vacuum of 24 inches mercury, and allow to stabilize for 15 minutes before proceeding with test. There shall be no loss greater than 1% of initial vacuum per hour over a four hour test period.

925.6.6 All daily testing and Final Acceptance Test shall be recorded on vacuum charts to be provided by the ENGINEER. These charts will not be considered valid unless witnessed by ENGINEER on test equipment at beginning and end of vacuum test period.

925.6.7 The ENGINEER will sign and date charts to verify witness of tests. This signature does not indicate acceptance of the system.

925.7 LINE FLUSHING

925.7.1 After acceptance testing, flush lines to remove debris and foreign materials that accumulated in the lines during construction.

925.7.1.1 Suggested procedure (This procedure requires the use of vacuum valves, coordination of installation by the OWNER is the responsibility of the CONTRACTOR):

925.7.1.1.1 Place system under vacuum to 24 inches mercury.

925.7.1.1.2 Add water to valve pits at extreme ends of system and cause vacuum valves to operate and draw water into piping system.

925.7.1.1.3 Utilize system vacuum to transport the water and debris to collection point. Continue procedure until water entering at collection point is free of contamination or debris. If vacuum station collection tank is used as collection point, monitor volume of liquid in tank and pump out as necessary by means other than system sewage pumps. After completion of flushing, clean collection tank of all collected debris.

925.7.1.1.4 Restore vacuum collection tank and collection system to permanent configuration and make ready to place into operation.

925.7.1.2 Alternate flushing procedures are subject to ENGINEER'S review and approval.

925.8 BREATHER TESTING

925.8.1 After entire breather assembly is complete from the above ground flexible extension to the interior of the valve vault or buffer chamber, it shall be pressure tested as follows:

925.8.1.1 Fabricate a test pipe using 3/4" PVC materials or approved equal; one end to be 3/4" male pipe thread, the opposite end to terminate with a 1/8" tubing connection.

925.8.1.2 Remove breather dome and install the test pipe in its place. Pressurize the breather assembly to a minimum 40" water gage as measured with a magnehelic gauge. The assembly shall remain at a constant pressure with no detectable leaks for a minimum of one minute in the presence of the on site inspector. A dated record of all testing of breather domes shall be maintained in a bound notebook, which shall be turned over to the ENGINEER upon completion of all work.

925.9 MEASUREMENT AND PAYMENT

925.9.1 SANITARY SEWER FORCE MAIN WITH BEDDING

925.9.1.1 Measurement shall be per linear foot measured horizontally along the centerline of pipeline and fittings from the collection/lift station interface to the point of discharge as shown on the construction drawings. No deduction from the total will be made for intermittent installations such as division valves, pig launchers, and associated manholes.

925.9.1.2 Payment will be in accordance with the unit price per linear foot per size and material as defined in the Bid Proposal, and shall include: unclassified excavation in open trench, backfilling, and compaction for all trench zones; hand digging; removing and replacing surface obstructions; discovery and protection of subsurface obstructions; shoring and bracing; hauling excavated material; restoration of disturbed areas not included in other pay items; all fittings, concrete thrust blocking or restrained joints; preparation of pipe subgrade; furnishing and placing granular bedding; trench dewatering; temporary connections; jointing and coupling materials; furnishing and installing pipe in open trench; flushing and cleaning the pipe; air and hydrostatic pressure testing; and all other labor, material, and equipment incidental thereto.

925.9.2 SANITARY SEWER FORCE MAIN PIG LAUNCHER

925.9.2.1 Measurement of installed pig launcher shall be per each unit installed as shown on the standard drawing.

925.9.2.2 Payment for the pig launchers will be in accordance with the unit price per each as defined in the Bid Proposal, and shall include: furnishing and installing all fittings, flanges, restraining glands, and harnesses; drilling and preparing precast manhole section for slotted opening including gaskets, sealants, and grout; furnishing and installing resilient seat gate valves; preparing and installing cast-in-place concrete footer and pad on finished ground including trenching, backfilling, and compaction, furnishing and installing reinforcing steel; furnishing and installing precast manhole sections including trenching, backfilling, and compaction, gaskets, frame and cover; furnishing and installing gravel bed for floor of manhole; and all other labor, material, and equipment incidental thereto.

925.9.3 BORE AND JACK, CASING FOR SANITARY SEWER VACUUM MAIN OR FORCE MAIN

925.9.3.1 Measurement shall be per linear foot, measured horizontally along the centerline of the encasement pipe actually installed for the work accomplished as shown on the standard drawing and on the drawings.

925.9.3.2 Payment will be in accordance with the unit price per linear foot as defined in the Bid Proposal, and shall include: trenching, unclassified excavation, backfilling, and compaction; furnishing and installing bored steel casing, casing insulators, and casing end seals; repair and replacement of existing roadway, bridge abutments, utilities, or any other structures damaged during boring and jacking operations; removal and disposal of waste material; providing grout for backfilling; inspections or permits; and all other labor, material, and equipment incidental thereto; except that the carrier pipe will be paid for under the appropriate bid item for vacuum main or force main.

925.9.4 SANITARY SEWER AIR RELEASE VALVE

925.9.4.1 Measurement shall be per each air release valve installed as shown on the drawings and the standard drawings.

925.9.4.2 Payment will be in accordance with the unit price per each as defined in the Bid Proposal, and shall include: furnishing and installing air release valve with all necessary fittings and appurtenances; drilling and preparing precast manhole section for slotted opening including gaskets, sealants, and grout; preparing and installing cast-in-place concrete footer and pad on finished ground including trenching, backfilling, and compaction, furnishing and installing reinforcing steel; furnishing and installing precast manhole sections including trenching, backfilling, and compaction, gaskets, frame, and cover; furnishing and installing gravel bed for floor of manhole; and all other labor, material, and equipment incidental thereto.

925.9.5 VACUUM SEWER DIVISION VALVES AND VAULT

925.9.5.1 Measurement shall be per each vacuum sewer division valves and vault installed as shown on the drawings and the standard drawing.

925.9.5.2 Payment will be in accordance with the unit price per each as defined in the Bid Proposal, and shall include: furnishing and installing resilient seat gate valve with all necessary fittings and appurtenances; furnishing the OWNER with one five sided extension socket with 6-foot long T-handle extension bar for every five valves installed; furnishing and installing the gage tap assembly consisting of rubber tubing, fittings, supports, tapping saddle, and all other appurtenances for measuring vacuum in vacuum main; drilling and preparing precast manhole section for slotted opening including gaskets, sealants, and grout; preparing and installing cast-in-place concrete footer and pad on finished ground including trenching, backfilling, and compaction, furnishing and installing reinforcing steel; furnishing and installing precast manhole sections including trenching, backfilling, and

compaction, gaskets, frame, and cover; furnishing and installing gravel bed for floor of manhole; and all other labor, material, and equipment incidental thereto.

925.9.6 VACUUM SEWER BUFFER TANK

925.9.6.1 Measurement shall be per each installed buffer tank (single or double per the respective bid item) as shown on the drawings and the standard drawings.

925.9.6.2 Payment will be in accordance with the unit price per each as defined in the Bid Proposal, and shall include: furnishing and installing all necessary equipment, including pipe and breather connections, breather vent piping and flexible breather pipe assembly; preparing and installing cast-in-place concrete footer and pad on finished ground including trenching, backfilling, and compaction, furnishing and installing reinforcing steel; furnishing and installing precast manhole sections including trenching, backfilling, and compaction, gaskets, frame, and cover; furnishing and installing all fittings, pipe, and all appurtenances; connection of the new or existing sanitary sewer gravity lines including drilling precast manhole sections, gaskets, sealants, and grout; furnishing and installing concrete grout for shelf; air and vacuum testing as required; and all other labor, material, and equipment incidental thereto.

925.9.7 INSTALLING VACUUM VALVE PIT

925.9.7.1 Measurement shall be per each vacuum pit (standard or deep, Type A or Type B per the respective bid item) installed as shown on the drawings and the standard drawings.

925.9.7.2 Payment will be in accordance with the unit price per each as defined in the Bid Proposal, and shall include: furnishing and installing all necessary equipment including unclassified excavation in open trench, backfilling, and compaction for all trench zones; hand digging; removing and replacing surface obstructions including fencing, landscaping, and all other obstructions; discovery and protection of subsurface obstructions; shoring and bracing; hauling excavated material, restoration of disturbed areas not included in other pay items; all fittings and concrete anti-flotation collar; installation of flexible breather pipe assembly and all appurtenances; stubouts for connection of gravity and vacuum lines; air, vacuum, and all other testing as required; and all other labor, material, and equipment incidental thereto.

925.9.8 VACUUM COLLECTION LINES AND VACUUM SERVICE LATERALS

925.9.8.1 Measurement of vacuum collection lines and vacuum service laterals shall be per linear foot measured horizontally along the centerline of pipeline

as shown on the drawings.

925.9.8.2 Payment will be in accordance with the unit price per linear foot per size and material as defined in the Bid Proposal, and shall include: unclassified excavation in open trench, backfilling, and compaction for all trench zones; hand digging; removing and replacing surface obstructions; discovery and protection of subsurface obstructions; shoring and bracing; hauling excavated material, restoration of disturbed areas not included in other pay items; all fittings, concrete thrust blocking or restrained joints; preparation of pipe subgrade; furnishing and placing granular bedding; trench dewatering; temporary connections; jointing and coupling materials; furnishing and installing pipe in open trench; flushing and cleaning the pipe; field quality control testing including daily vacuum testing of lines using OWNER furnished trailer mounted vacuum pump, breather testing, and all other testing required; making all required submittals; and all other labor, material, and equipment incidental thereto.

925.9.9 VACUUM VALVES AND APPURTENANCES: Measured and paid for per each as a separate pay item as included in the associated Vacuum Pit or Buffer Tank as specified and provided in the Bid Proposal.

SECTION 2100

STANDARD DETAILS FOR SEWER

DWG. NO.	TITLE
2101	MANHOLE TYPE "C"
2102	MANHOLE TYPE "E"
2107	CONCRETE MANHOLE COVER TYPE "C"
2110	MANHOLE FRAME AND COVERS
2111	MANHOLE ADJUSTMENT RING
2116	VERTICAL DROP AT MANHOLE
2117	VERTICAL CURVILINEAR SEWER AT MANHOLE
2118	SERVICE LINE CONNECTIONS AT MANHOLE
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APPENDIX C

SANTA FE COUNTY ORDINANCE 2003-01

**SANTA FE COUNTY
ORDINANCE 2003-01**

2316057

(REPLACING SANTA FE COUNTY ORDINANCE NO. 1994-2)

**AN ORDINANCE REGULATING PROCEDURES FOR
WORKING IN, DISTURBING AND REPAIRING COUNTY PROPERTY AND
RIGHTS OF WAY**

BE IT ORDAINED BY THE BOARD OF COUNTY COMMISSIONERS OF SANTA
FE, NEW MEXICO:

Section 1. Short Title

This Ordinance may be referred to as the Right of Way Use Ordinance.

Section 2. Purpose

The purpose of this Ordinance is to establish and define responsibilities and standards for the use of public property and rights of way, especially regarding road use, excavations and restorations thereof.

Section 3. Index

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Section 19.	EFFECTIVE DATE

Section 4. Definitions

- A. "Applicant" means any person required by this Ordinance to apply for a permit to make a road cut.
- B. "Boring," means the act of tunneling under the surface of the roadway or Right of Way.
- C. "Business day" means Monday through Friday.
- D. "Cultural Property" means a property as defined in the NM Cultural Properties Act 18-6-1 to 18-6-7 i.e., a structure, place, site or object having historic, archaeological, scientific, architectural or other significance.
- E. "County" means the County of Santa Fe, New Mexico as represented by its Board of County Commissioners.
- F. "County facilities project" means any road cut undertaken as a part of a project initiated by the County and includes related action taken by the utility company to further the County facilities project.
- G. "Emergency" means any situation or condition existing in which there is an interruption or disruption of gas, electricity, sewer, storm sewer, drainage structures, water, or telecommunications service to one or more customers being served by a utility company, or any situation or condition in which there is a danger of serious bodily injury, serious property damage, or prolonged disruption of service.
- H. "Excavation" means the act of making a hole, trench, or ditch, which penetrates through or under the surface in a public right of way or other public property, resulting in the removal of dirt, asphalt, concrete or other material.
- I. "Facilities" are and include, but are not limited to, plants, works, systems, improvements and equipment of the utility company such as pipes, electric substations, mains, conduits, transformers, wires, cables, poles, underground links, meters and concrete pedestals for any of the above and including postal service mail boxes.
- J. "Permit," means the written form provided by the County in which a person describes the use, excavation or road cut which will be performed on public property and in which are contained any special conditions required of the person by the County in the execution of the work. Permits are subject to the conditions and requirements contained in this Ordinance.
- K. "Permittee" means a person that has received a road cut permit from the County.

L. "Person" means any individual, estate, trust, receiver, cooperative association, club, corporation, utility company, firm, partnership, joint venture, syndicate or other entity.

M. "Public facility" means any designed, engineered, constructed road structures or engineered drainage facilities owned or maintained by the County located on public right of ways.

N. "Public right of way" or "public property" means those properties or sites within the County for which the County possesses a real property estate or interest, such as fee simple title, prescriptive easement or dedicated easement, and includes easements, right of ways, highways or roads, paved or unpaved, curbs, gutters, sidewalks, or other paved, unpaved, un-surfaced or concrete property which the County owns or maintains.

O. "Public Works Director" means the person employed by the County who is designated by the Board of County Commissioners to hold this position, and/or his designee.

P. "Road use" means any activity in or adjacent to the roadway that affects traffic and pedestrian flow.

Q. "Road cut" means the act of cutting a hole, trench, ditch or tunnel in, on, under, or through the surface of a public facility; or the act of drilling, boring, tunneling under or jacking up the surface of a public right of way.

R. "TCP" means a Traffic Control Plan or diagram showing the county how safe maintenance of traffic and Pedestrian flow will be conducted.

S. "Utility company" means any person, entity, or corporation, which provides water, sewer, electric, gas, telephone, or cable television services to five (5) or more hookups in the County. It also includes an independent contractor that has entered into a contract with the utility company to perform the road cut or excavation when the independent contractor is performing services for the utility company. Such an independent contractor must file a notarized affidavit with the County, executed by the utility company, setting forth the name, business address, and business telephone number of the independent contractor as an authorized agent of the utility company.

Section 5. Permit

A. Permit Application.

1. Every person desiring to make a road cut, bore or utilize Public right of way is required to obtain a permit. The applicant must be licensed and bonded, or the applicant must be a utility company or an agent for the utility company. In extenuating

circumstances where the applicant is a private party or not licensed, bonded or a utility company the applicant shall be required to comply with guidelines established by the Public Works Department. The person shall make written application on forms provided and approved by the Public Works Director prior to the performance of any road cut work or activity on public property. County staff has 5 days to review and process submitted applications.

2. No person shall make any road cut on public property or utilize Public right of way until the person or designated agent obtains an appropriate permit from the County, except in an emergency. In the event of an emergency, the person may proceed with such activity immediately but notify the County by phone that such an emergency is being repaired and thereafter file an application within two (2) business days. The application must state the description of the emergency and a summary of the repairs. The applicant must comply with any reasonable repair directions set forth by the County.

3. The applicant shall agree to the following; (a) complete all work required by this ordinance, covered by the permit; (b) complete any specific item required by the County in conjunction with the permit within five (5) days after written notice is given by the County to do so. The Public Works Department is authorized to grant an extension if necessary.

4. Evidence shall be presented that insurance requirements have been met in accordance with section 8, except for governmental agencies.

5. Evidence shall be presented that any "tie in" or "extension of utilities", is authorized by the applicable utility company, utility association or provider of services.

B. Faxing permit applications, Billing.

A utility company may file its application for a road cut, right of way use permit and all supporting information through the use of telecopy machine located in the County Public Works Office, in accordance with procedures established by the Public Works Director. An approved permit may be sent to the applicant in accordance with similar procedures. The Public Works Director, in his discretion, may allow a person to be billed for fees due and payable under the terms of this Ordinance on a monthly basis, provided the person is not more than sixty (60) days delinquent in payments due under this Ordinance. No further permits will be issued if payments are more than 60 days delinquent

C. Permit Fees.

The permit fees are set forth in Section 10.

D. Length of Road Cut; Number of Road Cuts, Use of Right of Way

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By issuance of a road cut permit, the County authorizes the cutting or excavation of a road or right of way by approved methods as listed in the New Mexico Standard Specifications for Public Works Construction and only for the single road cut specified on the permit. When the project involves the excavation of the road or right of way in a manner that runs roughly parallel to the roadway, the permit shall authorize up to six hundred (600) lineal feet of excavation.

Section 6. Excavations, Road Cuts Or Boring.

A. Purpose: It is the primary purpose of this ordinance to achieve maximum public use of public right-of-way, consistent with the laws of New Mexico and to insure that utility relocations on or in County rights of way are accomplished in accordance with New Mexico Statutes, Regulations and Federal Codes while providing for maximum public safety, maintenance of the roadways, and minimizing future conflicts between the County roadways, highway systems of New Mexico and utilities serving the general public in the County of Santa Fe.

B. Preferred means: In all circumstances, best efforts shall be made to install utility facilities using existing overhead facilities or bore under the roadway instead of excavating in an attempt to limit patches on the road surface. Road cuts shall be the least desirable means of utility facility installation.

C. Clearance of Vital Structures: Work under these provisions must be performed and conducted so as not to interfere with access to fire hydrants, fire stations, fire escapes, bridges, traffic control devices, and all other vital permanent structures or equipment.

D. General utility design requirements: Except when a higher degree of protection is required by industry or governmental codes, laws, or orders of the public authority having jurisdiction over the utility, all utility facility installations on, over, along or under the surface of the rights-of-way of County roadways, including attachments to highway structures shall, as a minimum, meet the following utility industry and governmental requirements:

(1) Electric power and communication facilities installations shall conform to the current applicable National Electric Safety Code.

(2) Water, sewage and other effluent lines shall conform to the requirements of the American Public Works Association, the American Water Works Association and County Standards.

(3) Pressure pipelines shall conform to the current applicable sections of the standard code of pressure piping of the American National Standards Institute, 49 CFR section 192, 193 and 195, and/or applicable industry codes.

(4) Liquid petroleum pipelines shall conform to the current applicable recommended practice of the American Petroleum Institute for pipeline crossings under railroads and highways.

(5) Any pipeline carrying hazardous commodities shall conform to the rules and regulations of the U.S. Department of Transportation governing the transmission of such materials. Pipelines located in casings, galleries, utility tunnels or highway structures shall be designed to withstand expected internal pressures, and to resist internal and external corrosion; casings or uncased pipelines shall be designed to withstand external pressures as well. Joints in carrier pipelines operating under pressure shall be of a mechanical or welded leak-proof construction. Ground-mounted utility facilities shall be of a design that minimizes, to the extent practicable, the impact on the scenic quality of the specific highway segment being traversed and or of a design approved by the Public Works Department. All utility installations on, over, along or under roadway rights-of-way, and attachments to roadway structures, shall be of durable materials, designed for a long service-life and relatively free from routine maintenance. On new installations or relocation of existing facilities, provisions shall be made for expansion of the facilities, particularly those underground or attached to highway structures. These provisions shall be planned so as to avoid interference with highway traffic when additional facilities are installed in the future.

(6) The facility owner shall be responsible for compliance with industry codes, the conditions and/or special provisions specified in the permit, applicable statutes and regulations of the State of New Mexico, and the U.S. Department of Transportation Code of Federal Regulations.

(7) The utility company shall be responsible for the design, construction, and maintenance of all facilities to be installed within Santa Fe County or public right of way. All elements of these facilities are subject to review and approval by the County Public Works Department, particularly the materials, location, and method of installation. The utility is responsible for, and will provide all measures as required to preserve the safe and free flow of traffic and the structural integrity of the roadway, roadway structures, ease of roadway maintenance and appearance of the roadway resulting from their installation. Prior to any utility work within the County or public right of way, The County Public Works Department shall approve all submitted traffic control plans.

E. Maintenance of Traffic and Pedestrian Flow.

The permittee shall maintain safe and adequate passage of vehicle and pedestrian traffic on all public property on which the permittee is conducting its activities under its permit. When a public facility has been closed or detoured because of the permittee's work, The Santa Fe County Public Works Department shall be notified by the permittee prior to removal of existing barricades and other traffic control devices.

F. Permittee's Obligation to Protect Property.

It is the permittee's responsibility to verify no known cultural properties exist in the permit area. Should known cultural properties occur in a permit area, a permit shall not be issued until the applicant submits notification from the State Historic Preservation Division certifying that said properties have received sufficient consideration. Should unknown cultural properties be encountered during work conducted under a permit, work in the immediate vicinity of the cultural property shall cease and the County shall be notified.

G. Restoration and Repair.

The permittee shall take whatever measures necessary to protect the road surface from damage by equipment used in the excavation process. Any damage to the road surface such as tearing or scaring of the pavement caused by the permittee's equipment shall be repaired to County requirements by the permittee. Traffic markings removed, as a part of the road cut shall be replaced by the permittee with materials similar to those originally displaced, in a place and in a manner satisfactory to the County. The permittee shall, at his own expense, support and protect all utilities which may be in any way affected by the road cut or other permitted work and do everything necessary to support, sustain and protect them under, over, along or across said work. Before commencing a road cut, the permittee shall ascertain the location of all utilities by notifying the New Mexico One Call System in or near the area of the proposed cut. The conformation number from the One Call System shall be listed on the permit prior to issuance of the permit. In the event said utilities are damaged, including damage to pipe coating or other encasement devices, the permittee shall immediately notify the facility owner of the damage. The permittee shall be liable for all costs associated with the damage and repair if the permittee was negligent and the facilities were properly marked and located. The permittee shall protect the road cut from surface water flows by appropriate diversions or ponding devices. The permittee shall repair asphalt or other road surfaces and other public facilities and public property to reasonable construction and engineering standards in order to approximate the condition that existed before the work.

H. Protection of Adjoining Property.

The permittee shall at all times and at his own expense preserve and protect from injury all private property adjoining the public property on which the road cut work is being performed by taking suitable measures for that purpose. Where in the protection of such property, it is necessary to enter upon private property for the purposes of taking appropriate protection measures, the permittee, shall unless otherwise provided by law, obtain appropriate permission from the owner of such private property to enter thereupon. The permittee must at his own expense shore up and protect all structures, facilities, walls, fences or other property that may be affected or damaged during the progress of the

road cut work and be responsible for all damages on other property resulting from his failure to properly protect and carry out such work.

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I. Care of Excavated Material.

All materials excavated and piled adjacent to the road cut or in any public place by the permittee must be piled and maintained so as to not endanger the public and those working in the excavation, and so as to cause as little inconvenience as possible to those persons using the public property and adjoining property. All material excavated must be laid completely along the side of the cut and kept trimmed so as to cause as little inconvenience as is reasonably possible to vehicle and pedestrian traffic. In order to expedite flow of traffic and to keep dirt and dust from spreading or flying, the permittee shall use guards or other methods and/ or shall water the excavated material.

J. Cleanup.

Each permittee shall thoroughly clean up from the public place all rubbish, excess earth, rock, asphalt, concrete, tree branches or limbs and other debris resulting from road cut work. All cleanup operations at the location of such road cuts are to be accomplished at the expense of the permittee. During the progress of work or immediately after completion of such work, the permittee shall clean up and remove all refuse, dirt and unused materials of any kind resulting from said work. Upon failure to do so, the County may cause to have such work done, and the permittee shall pay for such reasonable cost.

K. Protection of Water Course.

The permittee shall maintain all gutters, easement crossings and related drainage structures free-flowing and unobstructed for the full depth and width of the water course, or provide adequate substitutes for any such water course that are blocked by the road cut.

Section 7. Restoration Of Road Cuts.

A. Compaction.

Any person holding a road cut permit shall undertake to restore each road cut, in accordance with the reasonable compaction and restoration standards required by the County. This shall include both the backfilling of the road cut and the restoration of the surface. All backfill must be compacted to 95% density under the road surface, and 90% density outside the road surface. Certified nuclear density test results must be submitted to the Public Works Department within five (5) working days of completion of said work. Flow capacity and /or existing flow capacity shall not be altered without the written approval of the Public Works Director. For any person who does not submit compaction

test results to the County in a form and with results acceptable to the County, such person shall not be issued any future permits under this Ordinance until the person complies with this Ordinance, and the County may take such other actions as it deems necessary to assure compliance with this Section. The Public Works Director may waive the compaction tests for plow trenching only, provided the utility company demonstrates a method and operation of compaction acceptable to the Public Works Department.

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B. Resurfacing.

In those instances when a permittee cannot resurface a public place with concrete or asphalt because the air temperature or moisture content is below the minimum standards contained in the compaction and restoration standards or the weather conditions are such that the permittee is unable to resurface the public place within a reasonable time after the County's acceptance of any density tests, the permittee shall immediately check with Public Works Department concerning how and when the public facility shall be resurfaced. The County can require that the permittee cold patch the road cut on a temporary basis. The permittee shall restore the surface of the cut in accordance with reasonable compaction and restoration standards.

C. Cost.

The cost for restoration of the road surface shall be borne by the permittee.

D. County Performance.

If a permittee makes a road cut that is not resurfaced by the permittee within a reasonable time, and the County has not granted an extension of time, the County may, upon giving notice to the permittee, resurface the road cut and bill the permittee for the reasonable cost.

E. Safety.

It shall be the responsibility of the permittee restoring the public property to keep the road cut or surface opening safe for pedestrians, workers and vehicular traffic until the pavement surface or opening has been restored.

F. Extension of time.

Any time periods may be extended by the County due to weather conditions or other circumstances beyond the control of the permittee, with written or oral permission of the Public Works Director or his designee.

G. State Standards.

The permittee shall comply at all times with the appropriate construction standards set forth in New Mexico state statutes.

H. Restoration.

The permittee shall restore as practicably as possible, the affected property to the condition it was immediately prior to excavation or development. This includes but is not limited to depth of base course or other materials used on road surfaces. All materials shall be inspected and approved by the Public Works Department prior to use of any such materials. In the case of trenching in the right of way that exceeds six hundred (600) lineal feet the county recommends the responsible party document the condition of the surface by means of videotaping the proposed work area. The Public Works Department can require the seeding of disturbed areas to offset possible erosion that may result from the area being disturbed during excavation.

Section 8. Liability Insurance, Self Insurance and Bonding.

A. Certificate of Insurance.

No person other than a utility company shall make a road cut, enter a substructure opening, perform road cut work or utilize County right of way until filing with the County a certificate of insurance establishing that such person is adequately insured according to NM Tort Claims Act, NMSA 41-4-19, as amended against bodily injury or personal injury to any person, and against liability for damages, other than the work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom. Each insurance certificate shall provide that the County be given at least thirty (30) calendar days notice of cancellation in writing by the insurance company.

B. Form and Type.

A utility company shall at all times maintain insurance or may self insure against all risks and perils set forth above for the reasonable limits of liability set by the NMSA 41-4-19 as amended and the County, in a form and type acceptable to the County, which approval will not be unreasonably withheld.

C. Performance bonding.

A performance bond in the amount of fifteen thousand dollars (\$15,000.00) shall be kept on file at Public Works along with the contractor's license and insurance documents.

Section 9. Location and Relocation Of Facilities

The County expressly reserves the right to change the grade, install, relocate, or widen the public right of ways within the County and subject to all regulatory approvals, the facility owner shall relocate, at its own expense, its facilities and appurtenances in order to accommodate the paving, installation, relocation, widening, or changing of the grade or location of any such public right of way, including if necessary, relocating facilities to a sufficient distance within the right of ways and to permit a reasonable work area for machinery and individuals engaged in such work, or to protect the health, safety, or welfare of the public.

Section 10. Fees.

A permit fee of seventy-five dollars (\$75.00) shall be charged and collected for each proposed activity and for each permit issued up to 600 lineal feet. The seventy-five dollar (\$75) fee collected shall be distributed as follows: Sixty seven percent (67%) shall be designated to the County General Fund and Thirty three percent (33%) shall be designated to a road maintenance fund for repair of roadways. For permits in excess of 600 lineal feet the fee will be prorated by dividing the length by 600, then multiplying it by seventy-five dollars (\$75). Except for the Public Works Department, which is not required to obtain a permit for any of its projects, all other County departments shall be required to obtain a permit.

Section 11. Road Cut Warranty.

Any person or facility owner including a utility company making a road cut shall be required to correct defective materials and workmanship performed under each road cut permit for a period of three (3) years from the date the work performed under such permit is completed.

Section 12. Routing of Traffic.

A. When road cut work or use of the right of way is being performed, the person making the road cut or using the right of way shall take appropriate measures to maintain traffic conditions as near normal as practicable at all times so as to cause as little inconvenience as possible to the occupants of the abutting properties and to the public. All applicants shall submit with the permit application a TCP or traffic control plan for approval by the Public Works Director or his designee along with the permit application. No permits shall be issued without the submission of a traffic control plan unless waived by the County.

B. The County may require the permittee to notify various public agencies, emergency services and the public of proposed work prior to issuance of a permit or prior to commencement of the proposed work if Public Works decides it is necessary for public safety.

C. Warning signs shall be placed by the permittee near each road cut or substructure opening being entered so as to give adequate warning to vehicular and pedestrian traffic both night and day, and cones or other approved devices shall be placed to channel traffic. The traffic controls, including but not limited to the number, type, size and location of the signs shall be done in accordance with Manual on Uniform Traffic Control Devices (MUTCD) Part VI and reasonable traffic standards as directed by the Public Works Director or his designee.

D. The County may require the permittee to place a visible sign at each end of the construction area which is visible from a distance and sets forth the name of the person making the road cut, or in the case of a utility company, the name of the company together with a business telephone number to handle calls from the motoring public.

Section 13. Noise, Debris and Working Hours.

Each permittee shall conduct and carry out road cut work in such manner as to avoid unnecessary inconvenience and annoyance to the public and occupants of neighborhood property and in compliance with the County noise standards.

Section 14. Preservation of Survey Monuments.

Any survey monument set for the purpose of locating or preserving the lines of the road, property, subdivision, or a permanent survey, or a permanent survey bench mark within the County shall not be removed or disturbed without first obtaining written permission from the owner. Permission to remove or disturb such monuments, reference points or bench marks will be granted only upon the condition that the person apply for such permission and pay all expenses incident to the proper replacement of the monument.

Section 15. Non-Compliance by Permittee.

In the event a permittee fails to comply with the requirements of this Ordinance, the Public Works Director or his designee shall notify the permittee of non-compliance and stop all work until the permittee is in compliance. Written or verbal notice of non-compliance shall be issued. Following a hearing on the matter, a fee of three hundred dollars (\$300.00) may be assessed for non-compliance of this ordinance if the Public Works Director decides it is justified. The Public Works Director, his designee, County Fire Department, or County Safety Officer is authorized and empowered to suspend, revoke or refuse to issue any permit or future permit issued to a permittee provided that a hearing on the matter be conducted by the Public Works Director within five (5) business days of the suspension, revocation or refusal to issue the permit unless based on failure to adequately complete an application. The permittee shall be granted one appeal to the Public Works Director following the decision if the permittee makes written request to do so. The County of Santa Fe reserves the right to issue or revoke any permit for any reason

deemed reasonable by the Public Works Director or his designee. The County may also deny issuance of a permit to any applicant if there are delinquent compaction test results from previously performed road cuts.

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Section 16. Amendment To Ordinance 1993-8.

Sections 7 A, 7 E, 7 F, 8 B, and 9 of Santa Fe County Ordinance 1993-8 are hereby Repealed.

Section 17. New Pavement Fee and Penalty.

Any person, facility owner or utility excavating or cutting into new pavement (less than two yrs old) shall be charged a fee of two hundred dollars (\$200.00) to offset the impact of cutting the new pavement, which frequently leads to failure of new roadways installed by the County.

Section 18. Saving Clause.

If any of the sections, subsections, sentences, clauses, or phrases; of this Ordinance are for any reason held to be unconstitutional or invalid, the validity of the remaining portions of this Ordinance shall not be hereby affected since it is the express intent of the County Commission to pass each section, phrase, paragraph and word separately.

Section 19. Effective Date.

This ordinance shall take effect thirty days after the recording date.

SANTA FE COUNTY:

2316070

[Handwritten Signature]

Paul D. Duran, Chairperson
Santa Fe County Board of Commissioners

ATTEST:

[Handwritten Signature]

Rebecca Bustamante, County Clerk



APPROVED AS TO LEGAL FORM:

[Handwritten Signature]
for
Steve Kopelman, County Attorney

1-7-2003

Date

FINANCE DEPARTMENT APPROVAL:

[Handwritten Signature]

Katherine Miller, Finance Director

1-8-03

Date



1244 037
COUNTY OF SANTA FE
STATE OF NEW MEXICO
I HEREBY CERTIFY THAT THIS INSTRUMENT WAS FILED
FOR RECORD ON THE 16 DAY OF APRIL A.D.
2003 AT 11:07 O'CLOCK AM
AND WAS DULY RECORDED IN BOOK 2316
PAGE 057-070 OF THE RECORDS OF
SANTA FE COUNTY

WITNESS MY HAND AND SEAL OF OFFICE
REBECCA BUSTAMANTE
COUNTY CLERK, SANTA FE COUNTY, N.M.
[Handwritten Signature]
DEPUTY

APPENDIX D
SANTA FE COUNTY WATER UTILITIES

**D. DESIGN STANDARDS:
PUBLIC UTILITIES WATER AND WASTEWATER**

**Water Utilities Division
Water and Sewer Construction Standards and Specifications**

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D. DESIGN STANDARDS: PUBLIC UTILITIES WATER AND WASTEWATER

Section A General Provisions

A.1

Referenced Construction Specifications and Construction Drawings: The following specifications and drawings shall be included as a part of these specifications by this reference:

1. SFC Utilities Approved Standard Drawings and Notes.
2. American Water Standards Specifications (AWWA Specifications), latest published revision.
3. New Mexico Standard Specifications for Public Works Construction (NMAPWA Specifications) latest published revision.
4. New Mexico Department of Transportation Standards Specifications for road and bridge construction (NMDOT Specifications) latest published revision.
5. ASTM Standards
6. The following SFC Utilities Construction Specifications shall take precedence over referenced specifications in items #1 - #4 above.

A.2

Developer Construction: Developer installed public water distribution system improvements shall be done in accordance with the Water Service Agreement requirements. The developer and the developer's contractor are responsible for completing work in accordance with these specifications. The developer and the developers contractor shall be referred to herein as the Contractor for developer installed public water distribution systems. The term "Owner" as used in this document refers to the Developer.

A.2.1

Prior to final SFCU approval of the construction plans, a letter will be required from the Design Engineer indicating that they are providing the inspection and record drawing services for the project.

A.2.2

Prior to final acceptance for Operations and Maintenance of Public Water and Sewer infrastructure projects: Written certification in the form of a Certificate of Compliant Construction shall be provided to SFCU by the Design Engineer whose design supported the construction permit, certifying that that the constructed improvements have been properly inspected during construction and were installed in conformance with the original specifications or with approved written change orders. The construction of the water or sewer system improvements will be in compliance with the approved drawings and shall be observed and verified under the direction of an engineer registered in the State of New Mexico. This will include the submission of final record as-built drawings for the water and or sewer system in hard copy and pdf formats, all pressure test results, bacteria test results, and backfill compaction test results for review and approval by SFCU prior to final acceptance.

A.2.3

Construction shall be performed by a utility contractor properly licensed in New Mexico for water utilities installation, upon receiving all applicable construction permits, right of way use authorizations, and upon having met all applicable pre-construction requirements including a pre-construction meeting. A notice to proceed will be issued once all conditions have been met.



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A.2.4

The County will accept the project and adopt it as part of its infrastructure for operations and maintenance, upon verification that all requirements have been met to the County's satisfaction, and in compliance with the County-accepted engineering design, any pre-approved change orders, including the following:

- I. The water and or sewer system to be conveyed to the County shall be installed within a legally defined County Utility Easement; all easements that have been requested must be finalized and recorded prior to final acceptance of the project.
- II. The minimum warranty period upon completion of the project shall be one calendar year, commencing once the project has been accepted by the County Utilities Department.
- III. A final inspection by the Utilities Department Maintenance Division will also be required. Following this inspection, the contractor may have to perform additional work before the project is deemed complete. Punch lists will be generated as necessary.
- IV. Official completion of the water and wastewater utilities work shall be documented via a letter of acceptance issued by the County Utilities Department.

A.3

All construction work shall be monitored by SFC Utilities Supervising Engineer or designated representative for strict compliance with all applicable specifications, codes and standards. Contractor shall provide access to all water system facilities for inspection purposes and notify SFC Utilities Supervising Engineer prior to commencing work. Contractor shall notify SFC Utilities a minimum 24 hours in advance of work to be performed outside normal working hours.

Failure to provide access for inspection of work or to notify SFC Utilities of work to be performed after normal working hours shall result in said work being unacceptable to SFC Utilities until complete access and inspection is made. Contractor shall give the Supervising Engineer a minimum 24 hour advance notice of overtime work scheduled. SFC Utilities will provide overtime inspection as agreed by the supervising engineer in such instance where the overtime work is required for convenience or necessity of the public. Overtime inspection shall not be done solely for the Contractor's convenience.

Any overtime work shall be inspected by SFC Utilities on the following regular work day, in cases where SFC Utilities does not provide overtime inspection.

A.4

Interference with Service and Schedule of Work: Contractor shall be required to arrange his construction schedule with the intent of maintaining continuous service to SFC Utility users to the fullest extent possible from existing facilities. No outage shall exceed 4 hours unless coordinated directly with the SFC Utilities. Should a conflict between the contract work and service occur, Contractors shall as directed by the supervising engineer, discontinue the work.

Contractor shall have SFC Utility approval for any water shutoff and connections to existing mains prior to the scheduling of any construction. Contractor shall distribute shutoff notices to the general public as necessary. Contractor shall not operate an existing SFC Utilities valve or fire hydrant unless specifically authorized to do so and such operation shall be under the direction of SFC Utilities field personnel.

Contractor may be required to do work outside of normal working hours if SFC Utilities deems it necessary for the convenience of SFC Utility customers and the general public. When the Contractor is required to shutoff existing waterline to perform any wet connections, Contractor shall, as directed by SFC Utilities, notify each affected



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customer no less than 48 hours in advance of the anticipated service interruption. SFC Utilities will provide forms (need to create these “forms”??) detailing the information to be provided to affected customer. Also, Contractor and SFC Utilities shall determine when shutoff will be made so that a notice may be placed in the local newspaper by the Contractor. These actions shall be taken to give the water users ample time to arrange for a temporary supply of water.

A.5

Construction Water: Construction water shall be used in accordance with current County Water Ordinances. Contractor shall be required to pay for all potable and non-potable water used for construction purposes. If existing water of satisfactory quality for the construction needs can be found from other than the SFC Utilities source, Contractor may obtain his water from that source. SFCU does not issue hydrant meters.

A.6

Protection of Utilities and Property: During performance of the work, Contractor shall protect all utilities and property from damage. All utilities shall be spotted prior to any excavation work by Contractor. Contractor shall call New Mexico One Call (811) and request utilities location forty eight (48) hours prior to excavation in accordance with New Mexico One Call operating procedures.

The Contractor shall attempt to locate sewer laterals and other private service lines. Contractor shall contact property owners prior to construction and request location information. Any sewer or water laterals cut during excavation shall be repaired by Contractor at no additional cost to SFC Utilities. Payment for repairs of sewer and water services laterals shall be considered paid in the Construction price for water pipe in place.

A.7

Barricades and Signs: Any signs used by Contractor during performance of work shall conform to the Manual of Uniform Traffic Control Devices.

A.8

Work in Streets Right-of Way: All of Contractor’s construction work in street rights of way shall be done in strict accordance with the applicable controlling public agency’s construction specifications, rules, regulations and ordinances.

Contractor shall coordinate with proper public officials and receive approval from said officials prior to any street closing or detouring required due to the work to be performed. Permit costs are considered incidental and included as part of placing of pipe.

A.9

Maintenance of Traffic: Contractor shall maintain traffic flow(s) and accessibility to private property(s) as close to normal condition as possible. Contractor shall notify residents, city and state officials as appropriate of any driveway or road closure.

A.10

Environmental Issues: The Contractors obligation to obey environmental laws, EPA requirements in the latest Construction General Permit (CGP), Storm Water Pollution Prevention Plan (SWPPP) or standards is not limited by the following items.



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A.10.1 Protection of Vegetation: Contractor shall protect existing vegetation from removal or damage wherever possible. Contractor shall confine construction work to specified construction limits as shown on the drawing or defined in the specifications. Should Contractor damage or remove any vegetation outside the construction limits, Contractor shall restore the affected area to its original state at no expense to SFC Utilities or the Owner.

A.10.2 Re-vegetation of Disturbed Areas: Within the Santa Fe County boundary, contractor shall re-vegetate as required by the CGP and County ordinance(s).

A.10.3 Archaeological/Cultural Permits: Contractor shall not commence excavating within Santa Fe County without a permit issued by the Santa Fe County Land Use Department.

A.10.4 Slope Protection: Contractor shall comply with the conditions of Santa Fe County Terrain Management Ordinance where applicable.

A.10.5 Water Conservation: Contractor shall use reasonable efforts to conserve water during construction. Based on drought or other conditions, SFC Utilities may require Contractor to use effluent water, collect flushing water for reuse, or other water conservation construction methods.

A.10.6 Separation between Water and Sewer: Parallel water and sanitary sewer lines must be placed at least ten (10) feet apart horizontally, and the water line must be at a higher elevation than the sewer. If it is impossible to meet these criteria, the water and sewer will be placed in separate trenches at a horizontal separation approved by the SFC Utilities Supervising Engineer, and the water line shall be at least two (2) feet above the sewer. When water and sewer lines cross each other, the water line shall at least be two (2) feet above the sewer.

A.11 Soil Testing: Testing for soil compaction requirements, proctor analysis, and any other material testing shall be done by a testing lab with all material testing to be certified by a professional engineer registered in the State of New Mexico. Test locations and intervals shall be at the direction of SFC Utilities and shall be the contractor's responsibility to also comply with all testing necessary for all work done in public right-of-way per the controlling agency's requirements. At a minimum, one set of backfill density tests shall be performed for every 12" lift for each 200 linear feet of pipeline not located in a roadway. For pipelines and utilities in roadways the minimum testing shall be for each 100 linear feet. A copy of all testing shall be incidental to the pipe laying bid items.

A.12 Work in Railroad Right-of-Way: Contractor shall not work within railroad right-of way without a license issued by the railroad owning the right-of-way. All work done by the contractor shall comply with the requirements of the license.

A.13 All work within Santa Fe County Right of Way must adhere to all of the requirements as set forth in Santa Fe County Ordinance 2003-1, the Excavation/Restoration Ordinance.

A.13.1 Work in NMDOT Right-of-Way: All construction work in NMDOT Right-of-way shall be done in strict accordance with applicable NMDOT requirements as specified in the NMDOT Standard Specifications for Highway and Bridge



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Construction manual, 2007 edition and subsequent revisions, Railroad and Utility Unit. Traffic signs, warnings, and barricades, shall be provided by contractor and shall conform to NMDOT requirements. Work within NMDOT construction projects shall meet all applicable project specifications and requirements.

A.14

Restoration of Unpaved Driveways and Streets: Un-surfaced and gravel surfacing driveways and streets shall be left in the same or better condition as they existed prior to construction. Grading shall be done with the appropriate type of grading equipment. Payment for gravel surface replacement shall be limited to a maximum width of the trench width plus eight feet. Any necessary surface replacement and grading outside of the trench width plus eight feet shall be made by Contractor at no expense to SFC Utilities or the Owner. Easement areas shall be graded to match existing contours.

A.15

Certificate of Compliance: A Certificate of Compliance shall be furnished to SFC Utilities and the Owner by Contractor for all material that has specification requirements listed in the Contract or as directed by the Supervising Engineer. Certificate of compliance shall be signed and notarized by the material manufacturer stating that the material supplied for Work under the contract meets all required specifications.

A.16

Safety Standards: The contractor shall have a documented safety program and shall have a designated safety officer to provide surveillance for work performed on the SFC Utilities water or sewer systems. The contractor shall ensure that all subcontractors comply with the safety provisions. The contractor's safety program shall include all necessary training, personal protective equipment, and other safety equipment and procedures necessary for all types of work performed on the SFC Utilities water or sewer system.



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SECTION B INSTALLATION OF WATER MAINS AND SERVICES

B.1

General: Construction of public water mains for the SFC Utilities system will be in accordance with the New Mexico Standards Specifications for Public Works Construction published by the New Mexico Chapter of the American Public Works Association except as noted below. The SFC Utilities specifications take precedence over the APWA specification in the event of any conflict between the two documents. The DEVELOPER is responsible for obtaining a copy of the APWA specifications.

B.2

APWA Section 701 : Trenching, Excavation and Backfill: Section 701 of the APWA specifications will be used in the following exceptions:

Section 701.8: REMOVAL OF EXISTING PAVEMENT, SIDEWALK, AND DRIVEWAY: The CONTRACTOR is responsible for obtaining any required pavement, cutting permits. The Contractor must adhere to all requirements as set forth in Ordinance 2003-1, the Excavation/Restoration Ordinance for all work in SFC Right of Way.

Section 701.11.4: BLASTING: Replace this sentence: "Blasting shall be under the supervision of a person qualified and experienced in the use and handling of explosives." with: "Prior to any blasting, CONTRACTOR shall submit a Santa Fe County Blasting permit application to SFC Utilities and shall obtain any applicable Santa Fe County or City of Santa Fe Permits.

Section 701.13.3.4: Delete this Section and replace with: "The CONTRACTOR shall utilize acceptable native material in the embedment zone in conformance with these specifications. No additional compensation for importing a different material for the embedment zone will be allowed. The CONTRACTOR shall utilize acceptable native material in the compacted fill above the embedment zone in conformance with these specifications. Additional compensation for importing a different material for the compacted fill above the embedment zone will only be allowed if the native material is Class IV, Class V, or rock."

Section 701.14.1: Organic materials such as wood, roots, etc. Are also excluded from final backfill.

Section 701.14.2: Delete 90% and replace with 95%.

Section 701.15.4: Add the following to the end of this section: "For each lift of backfill, compaction tests will be taken as directed by SFC Utility. At a minimum, tests within road right of ways will be required 100 feet apart along pipe centerline at each 1 foot depth interval. At a minimum, tests not within road right of ways will be required 200 feet apart along pipe centerline at each 1 foot depth interval. Tests will be staggered horizontally from tests taken at lower lifts.

Section 701.17.3: Add the following to the end of this section: "No additional payment will be made for excavation or blasting beyond the specified limits of the trench configuration."

Section 701: Add this section: "Exploratory digging shall only be performed with written authorization from the SFC Utilities Supervising Engineer. Exploratory digging shall not be used for any type of work that is ordinarily a part of normal construction (i.e. locating existing utilities in advance of trenching and pipe laying, etc.)"



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Section 701: Add this section: "The Supervising Engineer must issue written approval authorizing the use of imported backfill outside the pipe embedment zone prior to use. The contractor shall submit Proctor Test analysis showing import material suitability prior to placement."

B.3

APWA Section 710 – Boring and Jacking: Section of the APWA specifications will be used with the following exceptions:

Section 710.3.1: Delete the last sentence in this section and replace with "The allowable tolerance as to grade and alignment of the installed casing shall not exceed 2 inches per hundred feet of casing length or as approved by SFC Utilities based on site conditions.

Section 710.3.2: Redwood skids are not acceptable. CONTRACTOR shall use prefabricated casing spacers shown on the Approved Materials List and install in accordance with SFC Utilities Standard Detail Drawings.

Carrier Pipe (Nominal Size)	Steel Casing Diameter and Wall Thickness
6"	14" Schedule 30
8"	16" Schedule 30
10"	18" Standard Class
12"	22" Standard Class
14"	26" Schedule 20
16"	28" Schedule 20
20"	30" 0.375" Wall
24"	36" 0.375" Wall
¾" – 2" Cu Tubing	4" Schedule 40 PVC
¾" – 2" Cu Tubing	4" Schedule 40 Steel

B.4

APWA Section 801 – Installation of Water Transmission, Collector and Distribution Lines:

Section 801 of the APWA specifications will be used with the following exceptions:

Section 801.2 Add the following references: AWWA C905, latest revision.

Section 801.3.1.2 Delete this section (US material preference)

Section 801.3.2.2 Delete this section and replace with the following: "CONTRACTOR shall install the pipe material shown on the SFC Utilities construction drawing".

Section 801.3.2.3 Delete the following sentence: "All pipe shall be of domestic manufacture and origin".

Section 801.3.4.8 CONTRACTOR will use the SFC Utilities valve card to meet the requirement of this section.

Section 801.3.7.1 National Standard Fire Hose Coupling Screw Threads shall be furnished. Also, normal bury depth for SFC Utilities is 4 ½ to 5 feet unless field conditions require a deeper bury.

Section 801.3.8.5 Add this section: "Repaint the fire hydrant bonnet with Wellborn Traffic Yellow, Sherwin Williams Utility Yellow, Rust-Oleum Safety Yellow, or SFC Utilities approved equivalent paint".

Section 801.3.8.6 All flushing hydrants, including standard fire hydrants and the 2-1/2" post type shall be painted with Wellborn Traffic Red, Sherwin Williams Safety Red, Rust-Oleum Safety Red, or SFCU approved equivalent paint.

Section 801.3.8.7 For reclaimed water systems, unless specifically designed to provide adequate flows for fire protection, there shall be no standard fire hydrants installed. All yard hydrants or



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dispensing points connected to a reclaimed water/effluent irrigation system shall be painted purple. All such hydrants shall be lockable, and a prominent sign placed next to them with the following text: "Non-Potable Water do not drink/Peligro-Agua No Es Para beber"

- Section 801.3.8.10 Add this section: "Santa Fe County Fire Department shall apply fire hydrant number decals to match the fire hydrant number assigned on the SFC Utility construction drawing using decals provided by SFCFD."
- Section 801.3.9 PRESSURE REDUCING VALVE: Delete this section. PRV Valve requirements will be shown on the SFC Utilities construction drawing.
- Section 801.3.10 TAPPING SLEEVES: Tapping sleeves will be as shown in Section C, Approved Materials.
- Section 801.4 WATER VALVE DATA CARD: Delete the water valve data card shown in the APWA specifications and use the water valve data card attached to these specifications.
- Section 801.5 FIRE HYDRANT DATA CARD: Delete the fire hydrant data card shown in the APWA specifications and use the fire hydrant data card attached to these specifications.
- Section 801.7.1 Add the following to the end of this section: "See the SFC Utilities Standard Detail Drawings for storm drain and other pipe crossing requirements."
- Section 801.8.1 The minimum cover over SFC Utilities pipe shall be 4 feet or as shown in the SFC Utilities project drawing.
- Section 801.9.3 Add the following to the end of this section: "End(s) of the pipe(s) shall be covered at all times except during actual work on the pipe."
- Section 801.9.5 Add the following to the end of this section: "Changes in horizontal or vertical alignment from the drawings or field staking shall be made only when approved by the Supervising Engineer".
- Section 801.9.10 Add this section: An insulated 12 gauge solid copper wire shall be laid along with the pipe for the purpose of locating the pipe. This continuous conductor wire shall be laid with terminations at terminal boxes, valve boxes, fire hydrants, or meter cans as directed by the SFC Utilities representative.
- Section 801.10.3 Replace the first sentence of this section with: "Plastic pressure pipe shall be installed in accordance with applicable sections of AWWA M 23, C 900 and C 905 and manufacturer's printed recommendations."
- Section 801.12.1 Replace this section with the following: "The CONTACTOR shall use mechanical thrust restraint devised at fitting and pipe joints. Concrete thrust blocking shall not be used unless specifically authorized by SFC Utilities. Dry blocking shall be used only when authorized by Supervising Engineer. Dry blocking is to be used only for tie-in to existing pipe where service restoration time does not allow for the use of poured concrete and thrust restraints are not feasible.
Concrete thrust blocking is to be placed in accordance with SFC Utilities Standard Detail Drawings. The concrete must have a minimum compressive strength of 3,000 psi. ($f'_c = 3,000$ psi) Compressive cylinder tests of concrete may be requested by the SFC Utilities representative and are included in the bid cost for thrust blocking. Fittings and bolts are to be covered with plastic prior to placement of concrete. Thrust blocking details for vertical bends will be provided by the SFC Utilities representative and will be based on site conditions.
Mechanical thrust restraints must be placed in accordance with the manufacturer's recommendations and provide the restrained lengths shown on SFC Utilities Standard Detail Drawings. Mechanical thrust restraints must be used where restrained pipe is



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called out on the construction drawings. Full lengths of pipe shall be placed next to the fittings in order to reduce the need for harness restraints, where possible.

Section 801.14: FLUSHING AND DISINFECTING WATER LINES: Disinfecting water mains shall be done in strict accordance with AWWA Specifications C651, latest revision, except as herein specified. Flushing shall be done prior to chlorination in such a manner so that the water being flushed travels throughout the main length. If no fire hydrant is installed as part of the main, then the flushing shall be done through adjacent existing fire hydrant or through a tap at a no extra pay. The procedure for applying chlorine will be in strict accordance with Section 5.2.3 of AWWA C651, latest revision. A tap shall be made by Contractor at no extra pay for insertion of the chlorine. This tap shall be located where it can be used as a house service in the future if possible and shall be located by the Supervising Engineer. Chlorine shall be inserted at a rate not less than 25 mg/l ppm of free chlorine by weight for a period of 24 hours. A different equivalent time/amount ratio may be used at the Supervising Engineer's option but for a time less than 24 hours. Payment for disinfection and bacteria testing shall be considered as paid for by the fixed unit price on pipe.

Section 801.21.1.5: Add this section: "Receipts or other acceptable documentation showing that all supplier and subcontractor invoices have been paid."

Section 801.22: Delete this section (Measurement and Payment provisions as specified in the contract documents shall be used).

B.5

APWA Section 802 – Installation of Water Service Lines: Section 802 of the APWA specifications is replaced by this section, SFC Utilities Standard Detail Drawings, the SFC Utility Approved Materials List and the Measurement and Payment provisions of this specification.

B.5.1 Tapping Table: The Following table shall be used to determine pipe tapping requirements

TAPPING TABLE

Main Size & Type	Size of Taps where No Saddle is Required	Size of Taps Requiring Tapping Saddle	Size of Taps Requiring Tapping Sleeve
2" CI	None	¾" – 1 ½"	2"
4" & Larger CI	¾" & 1"	1 ½" – 2"	Larger than 2"
4" & Larger AC	None	Up to and Including 2"	Larger than 2"
4" & Larger DI	¾" & 1"	1 1/2 " – 2"	Larger than 2"
4" & Larger PVC	None	Up to and Including 2"	Larger than 2"



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SECTION C APPROVED MATERIALS LIST

C.1

General: All materials used in the construction of water lines shall be approved for use in drinking water systems. Materials shall be approved for use in drinking water systems by recognized organizations or governmental authority.

All underground service line valves and fittings shall conform to the requirements of ANSI/AWWA C800, latest revision. All underground valves and fittings shall be equipped with compression connections. The compression connection shall provide conductance and have a stainless steel or bronze internal split grip ring that grips the service tubing when tightened by the nut on the outlet threads. No clamps with screw type connections are acceptable. All service line valves, fittings and tubing shall be suitable for use with 150 psi pressure. Soldered joints for buried applications are not allowed.

All materials used in water mains and services shall be rated for a minimum of 150 psi working pressure.

The latest revision of standards shall apply with regard to standards listed in AWWA and American Society of Testing and Materials, (ASTM) Standards as well as any other referenced national or industry standards.

The type of pipe, size, joints, gaskets, coating, linings, wall thickness, installation, and testing shall conform to the latest revision of the specifications as set forth below.

C.2

Ductile Iron Pipe: Pipe shall conform to ANSI/AWWA C150/A21.5, latest revision, and ANSI/AWWA C151/A21.51, latest revision.

Mechanical joints, push on joints, or flanged joints shall be used as shown on all drawings and/or Standard Details. Joints shall conform to all requirements of ANSI/AWWA C115/A21.15, latest revision, and/or ANSI/AWWA C153/A21.53, latest revision, and or ANSI/AWWA C115/A21.15, latest revision. Rubber gaskets shall be bituminous coated on the outside.

Pipe thickness shown in AWWA C151.A21.51, latest revision, Table 51.2 for a rated working pressure, minimum of 150 psi shall be used, unless otherwise noted, or required for flanged pipe.

Installation and hydrostatic testing of the main shall be in strict accordance with ANSI/AWWA C600, latest revision. Disinfection of the main shall conform to C651, latest revision, requirements.

C.3

PVC Pipe: Pipe shall be manufactured and tested in strict accordance with ANSI/AWWA C900, latest revision, for 4-inch through 12-inch pipe or ANSI/AWWA C905, latest revision, for 14-inch through 36-inch pipe.

The thickness class shall be DR-18, unless otherwise noted. Pipe shall have the approval of NSF and shall be imprinted with the seal and approval of NSF.

PVC pipe shall be installed according to all applicable AWWA standards, and in strict accordance with the pipe manufacture's recommendations.



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C.4

Iron Fittings: Ductile or grey iron fittings shall conform to ANSI/AWWA C110/21/10, latest revision, or C153/A21.53, latest revision. Grey iron fittings shall be rated for 250 psi working pressure for sizes up to 3 inch. Ductile iron fittings shall be rated for a 350 psi working pressure in sizes 3-24 inch and ductile iron flanged fittings shall be rated for a 250 psi working pressure in sizes 3-24 inch.

Fittings shall be outside coated with a petroleum asphaltic coating, approximately 1 mil thick. Fittings shall be lined with cement mortar lining in accordance with ANSI/AWWA C104/A21.4, latest revision. Rubber gaskets shall be in accordance with ANSI/AWWA C111/A21.11, latest revision.

Installation of iron fittings be in strict accordance to AWWA/C600, latest revision, requirements.

C.5

Mechanical Joint Retainers: Shall be the Mega lug as manufactured by EBAA Iron, Inc., Eastland, Texas or the Uni-Flange as manufactured by the Ford Meter Box Company, Inc., Wabash, Indiana.

For EBAA Iron, Inc. products the following shall be used: The series 2000 PV Mega lug shall be used for 4"-12" AWWA C900 PVC DR 18 pipe. The series 1100 PV Mega lug shall be used for and for 14"-30" AWWA C905 PVC pipe. The series 1100 Mega lug shall be used for Ductile Iron Pipe. Push on pipe joint harness devices shall be the series 1500 HV for AWWA C900 PVC, the series 1100 HV for AWWA C905 PVC, and series 1700 for Ductile Iron pipe.

For Ford Uni-Flang products shall be as follows: Series UFR1500-E-x-U shall be used for 4"-12" AWWA C900 PVC DR18 pipe. Series UFR1500-E-C shall be used for AWWA C905 14"-24" PVC pipe. Series UFR1400-D-x-U shall be used for Ductile Iron Pipe. Push on pipe joint harness devices shall be the series EFR1390-C-x-U for Ductile Iron pipe and AWWA C900 PVC.

C.6

Tapping Sleeves: Tapping sleeves (for taps other than size-on-size) shall have an epoxy lined and coated carbon steel A-36 body or an all stainless steel body; type 304 stainless steel bolts, hex nuts and plug; gasket suitable for water use; ANSI Class 150 flange. Tapping sleeves shall be manufactured by Romac Industries (Model 420 fabricated steel tapping sleeve), JCM (Model 412 fabricated steel tapping sleeve), Power seal (Model 3490 MJ stainless steel tapping sleeve with MJ outlet or AS stainless steel tapping sleeve with flange outlet), Ford (Model FTSC steel tapping sleeve or Model FTSS stainless steel tapping sleeve with stainless steel flange), or approved equal.

For size-on-size taps, a full wrap-around gasket and stainless steel full wrap-around tapping sleeve is required. The acceptable manufacturers are: Romac Industries (Model SST or Model SST-III stainless steel tapping sleeve), Power Seal (Model 3480 stainless steel tapping sleeve or Model 3490 MJ stainless steel tapping sleeve with MJ outlet or AS Stainless steel tapping sleeve with flange outlet), Ford (Model FTSS stainless steel tapping sleeve with stainless steel flange), or approved equal.

C.7

Gate Valves: Resilient seated gate valves shall be used wherever valves are called for on the drawings, unless otherwise noted. Resilient seated gate valves shall conform to AWWA C-509, latest edition, requirements; and shall be for 4" through 12" diameter N.R.S. (Non Rising Stem) A certified drawing shall be supplied by the manufacturer: The Manufacturer shall supply an affidavit of compliance to the above referenced AWWA



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specification. Records shall be provided showing that tests specified in Section 6 have been performed. Bolts and nuts shall conform to section 2.2.3 of AWWA C-509, latest edition.

Valve ends can be either flanged or mechanical and will be as specified at time of purchase. Valve shall come equipped with O ring seals. Valves shall open left (counter clockwise) as viewed from the top and valve markings shall be made as outlined in Paragraph 7.1 AWWA C-509, latest edition. Valves shall be furnished with interior coating in accordance with AWWA C550-90. 14" and 16" valves shall be of same specification or better and designed for 200 psi working pressure.

C.8

Butterfly Valves: Butterfly valves shall conform to AWWA C-504, latest edition. Valves furnished shall be equipped with a body style as specified on the drawings. Maximum non shock shutoff pressure shall be 150 psi and class 150B as defined in section 3.5 of C-504, latest edition. All affidavits of testing shall be furnished. CONTRACTOR shall verify the compatibility of the valve with pipe connecting pieces. Butterfly valves are to be used only in sizes 14" and larger or where specifically called for in the drawings.

Valve shaft seals shall be on the type utilizing a stuffing box and pull down pack gland. Valve body shall be ductile iron. Valve discs shall be of a noncorrosive alloy metal.

Valves furnished for buried service shall come equipped with a heavy duty valve operator.

Valves furnished for plant service shall be equipped with a geared actuator assembly with a hand wheel.

C.9

Valve Boxes: Valve boxes shall be five and one quarter inch (5 ¼") diameter shafts in 36 to 48 inch extension length to 69 inch extension lengths are required. Boxes shall have the screw-type length adjustment. Valve boxes shall be constructed of cast or ductile iron.

C.10

Fire Hydrants: Fire Hydrants shall be one of the following models:

Model	Manufacturer	Mfg Location
Kennedy Guardian	ITT Kennedy Valve	Elmira, New York
Mueller Super Centurion	Mueller Company	Decatur, Illinois
Mueller Super Centurion 250/HS	Mueller Company	Decatur, Illinois

C.11

Casing Spacers: Fabricated casing spacers for use on carrier pipe installation through casing conduits shall provide dielectric with polymer runners. Casing spacers with steel bands shall be coated with fusion bonded epoxy or PVC coatings for corrosion protection. Casing spacers shall be of the following models:

Model	Manufacturer	Mfg. Location
RACI Casing Spacers	Public Works Marketing Inc.,	Plano, TX



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C.12

Casing End Seals: Casing end seals shall be made of synthetic rubber and be either a pull or style or wrap around style. Stainless steel band clamps with 100% non metallic worm gear shall be furnished for clamping the seal to spacing and carrier pipes. A mastic seal strip shall be factory furnished along the edge of the wrap around style seal. Refer to Section E for the list of approved casing end seals.

Model	Manufacturer	Mfg. Location
Model Ac	Advance Products & Systems	Lafayette, Louisiana

C.13

Copper Service Pipe: Copper service pipe shall conform to ASTM B 88 and shall be Type K.

C.14

Water Service Materials: Water service materials manufacturers used in this section and referenced below:

Model	Manufacturer	Mfg. Location
Ford	The Ford Meter Box Co. Inc.,	Wabash, Indiana
Jones	James Jones Company	El Monte, California
DFW	DFW Plastics, Inc.	Bedford, Texas
Mueller	Mueller Company	Decatur, Illinois

C.15

Meter Boxes: Meter boxes shall be DFW Round Meter Pit as manufactured by DFW Plastics Inc., Mid-States Round Meter Pit, or SFC Utilities approved equivalent. The diameter and length shall be specified as set forth in the SFC Utilities Detail.

C.16

Meter Box Lids and Covers: Meter lids shall be made of plastic with the standard size pentagon bolt for the locking lid and shall be furnished with aluminum inner frost lids. Meter box covers shall be the following model and manufacturer for each size service as listed:

Meter Size	Cover Manufacturer & Model
¾" – 1"	Ford Meter Box Co. (FW3 Wabash Double Lid Cover with EXT-2 Extension Ring)
1-½" – 2"	Ford Meter Box Co. (MC-36-MB Monitor Cover – includes Inner Frost Lid)

Meter Box lids shall be the following model and manufacturer for each size service as listed:

Meter Size	Lid Manufacturer & Model
¾" – 1"	Nicor Inc. (Read Rite Lid Type "A"- H2O Load Rating)
¾" – 1"	Ford Meter Box Co. (WA3LP Locking Plastic Lid)
1-½" – 2"	Armorcast Products Co. (21-¾" Dia. Polymer Concrete Cover w. Worm Lock & Iron Recess)

Inner frost lids shall be the following model and manufacturer for each size service as listed:

Meter Size	Lid Manufacturer & Model
¾" – 1"	Ford Meter Box Co. (W3BA 11-½" Inner Aluminum Lid)
1-½" – 2"	Ford Meter Box Co. (MB 20" Inner Metal Lid)



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C.17

Meter Yokes: Yokes shall be constructed of cast iron. The meter yoke bar shall be painted. A 5/8" meter shall use 5/8" x 3/4" yoke; a 3/4" meter shall use 1" yokes, two (2) 1" x 3/4" meter adapters, and one (1) expansion connector, a 1" meter shall use 1" yoke and one (1) expansion connector. Yokes shall be the model and manufacturer as listed:

Manufacturer	Model for 5/8"	Model for 3/4"	Model for 1"
AY McDonald	14-2	14-4	14-4
Ford	Y 502	Y 504	Y 504
Jones	J 6201	J 6202	J 6202
Mueller	H-5020	H-5040	H-5040

C.18

Angle Valves: Angle valves shall be ball type compression connection for CTS tubing x locknut. (Locknut for yoke bar shall be used instead of a meter swivel.) Angle valves shall be the model and manufacturer as listed:

Manufacturer	Ball Style Model for 5/8"	Ball Style Model for 3/4" or 1"
AY McDonald	4602BYQ	4602BYQ
Jones	J-6417WSG	J-6417WSG
Ford	BA94-323 W-Q	BA94-444W-Q
Mueller	B-24273	B-24273

Include the following information for residential double meter services:

1. 5/8" Double Service Branch Piece
 - Acceptable Manufacturers: Jones (j-2613SG w/ dimensions of 1" x 7-1/2" x 3/4" MIP), Mueller (H-15363 1"x7-1/2" x 3/4" MIP) and Ford (U48-43-Q 1" x7- 1/2" x 3/4" MIP)
2. 5/8" Double Service Angle Valve
 - Acceptable Manufacturer: Mueller Co. Angle Ball Valve (B-24278 w/dimensions of 5/8" x 3/4" x 3/4" FIP) and Ford Angle Ball Yoke Valve (BA91-323W w/dimensions of 5/8" x 3/4" & 3/4" FIP).

C.19

Angle Cartridge with Dual Check Valve: Angle Cartridges shall be Dual Check Valve type. Angle Cartridges shall be the model and manufacturer listed:

Manufacturer	Model for 3/4"	Model for 1"	Model for 2"
Ford	HHCA92-323	HHCA92-444	HHFA31-777

C.20

Expansion Connectors: Expansion connectors shall be of the three piece design with composition gaskets. Plastic or rubber gaskets will not be accepted. Expansion connectors shall be the model and manufacturer as listed:

Manufacturer	Model for 5/8"	Model for 3/4"	Model for 1"
AY McDonald	14-2EHG		14-4 EHG
Ford	EC23	EC4*	EC4
Mueller	H-14234		H-14234



D. DESIGN STANDARDS: PUBLIC UTILITIES WATER AND WASTEWATER

*Two (2) Meter Adapters (Ford A24) also required.

C.21

Meter Settings, 1 -1/2" & 2": Prefabricated meter settings for 1 -1/2" & 2" meters shall be equipped with ball-type angle valves on the meter inlet and outlet sides and shall have a 24" rise and shall have FIP inlet and outlets and shall have a MIP by copper tubing compression adapter. Meter setter shall not have a bypass. Risers shall be positioned at least 2" away from the inner wall of the meter pit. Meter setting shall be the model and manufacturer as listed:

Manufacturer	Model for 1 ½" (Plug Valves)	Model for 2" (Plug Valves)
Ford	VV76-24-1166	VV77-24-1177
Jones	J02EFIPFIPBVBV24	J02FFIPFIPBVBV24
Mueller	H-1422-00-150	H-1422-00-200

Manufacturer	Model for 1 ½" (Ball Valves)	Model for 2" (Ball Valves)
AY McDonald	20-624WWFF 660	20-724WWFF 770

The adapter shall be the model and manufacturer as listed:

Manufacturer	Model for 1-1/2"	Model for 2"
Ford	C84-66	C84-77
Jones	J2605SG	J2605SG
Mueller	H-15428-150	H-15428-200

C.22

Corporation Stops: Corporation stops must be ball type with CC thread (AWWA tapered thread) inlet and compression connection on outlet (CTS – copper tube size). Iron pipe thread not acceptable. Corporation stops shall be the model and manufacturer as listed:

Manufacturer	Model Number
AY McDonald	4701BQ
Mueller	B-25008
Ford	FB1000-x-Q-K

C.23

Service Tapping Saddle: For PVC (C-900) installations: bronze parts are not acceptable. Service tapping saddle shall be stainless steel, double strap with iron body. The iron body shall have either epoxy coating (10-12 mills minimum) or nylon coating (10-12 mills minimum). Acceptable manufacturers are Smith-Blair, Ford and Mueller Co. Double band brass saddles with stainless steel bolts and band, style 202BS, as manufactured by Ford are also accepted.

For DIP/CIP installations: Direct tap with CC threads (AWWA tapered threads) is preferred. Iron pipe thread is not acceptable. Alternate exception is installation of stainless steel full circle tapped clamp with CC threads (AWWA tapered threads). All stainless steel to be: one section, two bolt minimum. Romac and JCM are acceptable manufacturers. Double band brass saddles with stainless steel bolts and band, style 202BSD, as manufactured by Ford are also accepted. When multiple taps are required the following spacing is approved: Minimum 12" horizontal spacing and vertical spacing shall alternate 75° and 85° from vertical.



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C.24

Service Tapped Couplings: Service tapped couplings shall have AWWA threads and shall be either cast iron, ductile iron or PVC and shall meet all requirements for fittings specified in Section C.

C.25

Prefabricated Meter Vault: Prefabricated meter vault shall consist of a vault body with open bottom, a double opening cover with a torsion lift and support mechanism. The vault body shall be manufactured of fiberglass-reinforced plastic. The covers shall be manufactured of polymer concrete. The torsion frame assembly shall be manufactured of hot-dipped galvanized steel. The cover shall be torsion assist polymer concrete consisting of two torsion assisted sides and a stationary center cover. The torsion assisted covers shall have the capability of opening 90 degrees and shall be secured in the closed position with hex-head bolt downs. The stationary center cover shall be secured with stainless steel hex-head bolts.

Polymer concrete covers shall be skid resistant with a 0.5 minimum coefficient of friction. Covers shall have lifting slots with stainless steel lifting pins. Vault body and cover assembly shall be designed to withstand 10,400 pound vertical load when installed at grade level. Vaults shall be manufactured by Armorcast Products Company, North Hollywood, California.

C.26

Air Release Valves: Air release valves shall be combination valves capable of releasing large quantities of air during filling of an empty pipe, and breaking vacuum during pipe draining by allowing the re-entry of large quantities of air, and releasing air accumulations under pipe operating pressure. The air release valves shall be Crispin Combination Air Valve (1" valve shall be Model 201C and 2" valve shall be Model 202C): or approved equal.

C.27

Utility Marking Posts: Utility marking post material shall be manufactured of fiberglass. The marking post shall be blue and have white labels on both sides with black lettering stating "CAUTION WATER PIPELINE/BEFORE DIGGING CLL NM ONE CALL 811 FOR LOCATES". Marking posts shall be constructed of resilient materials and shall not deteriorate with exposure to temperature extremes. Marking post colors shall not fade with exposure to sun, water, etc. Marking posts shall be 72" long by 4" wide. Acceptable manufacturers are Carsonite International. – Curv-Flex® (Early Branch, South Carolina) or Rhino-FiberCurve™ (Waseca, Minnesota).

C.28

All water mains and other pressure pipelines shall be buried with a continuous electrical tracing wire to enable future location of pipe. The tracing wire shall be an insulated #12 AWG solid conductor. Tracing wires shall be taped to the top of the pipe at 10-Foot intervals to prevent dislocation of the wire during backfilling. There shall be a Test Station for every 300 ft. run without a service or a hydrant.

The tracing wire shall be spliced and extended to an above or at grade Test Station near the base of fire hydrants, at valve boxes, and meter cans as directed by SFC Utilities representatives.

The Test Station shall be a 2-inch monitoring station as manufactured by Hadley Industries, Jackson, Michigan. The Test Station shall be furnished complete with a cast iron lid and a magnet for easy location with a line locator. A 12" by 12" by 4" deep concrete pad around the test box shall be provided for security.

The tracing wire shall be spliced using a 3-way low voltage tap connector, 3M-562 or equivalent. The splice shall be coated for corrosion protection using a general purpose tape sealant similar to Ray-Chem products, 1.5-inch



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wise, 0.012-inch thick spirally wrapping with 1-inch overlap at connector and wire. The tape sealant shall be covered with a layer of electrical tape as an outer wrap.

Bonding Wire for Line Tracing:

When the electrical continuity of two lengths of metal pipe is broken by a section of plastic pipe, the metal pipes at either end shall be bonded across the plastic pipe to restore the electrical continuity.

Bonding of the metal pipe shall be by means of cadwelds (exothermic) connectors and #4 AWG insulated copper wire. The wire ends and cadwelds shall be capped and sealed to prevent corrosion per Standard Details.

C.28.1

Electronic Marking System Devices (EMD's) Ball Markers are required on all sewer service (green) stub-out locations, casing bore ends or as required by SFCU, on all water line casing bore ends (blue), critical vertical offsets or as required by SFCU. Marker Balls shall be installed directly above the line being identified and in no circumstances shall the balls be buried deeper than 5-feet maximum. Acceptable materials are: 3M EMS Ball Markers; 1403-XR for water, 1404-XR for wastewater, and 1408-XR for reclaimed water systems.



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GENERAL NOTES

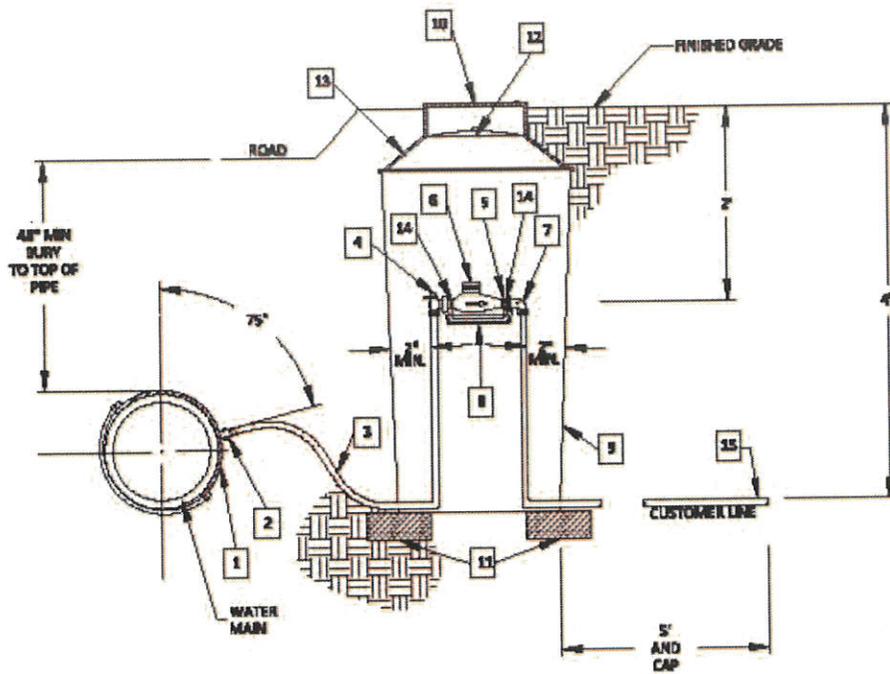
1. Contractor shall notify Santa Fe County (SFC) Utilities five (5) days prior to commencement of work.
2. Construction shall be done in accordance with the SFC Utilities construction standards and specification.
3. All easements shall be dedicated, cleared, graded and staked prior to water line installation.
4. All streets shall be cut to within $\pm 6"$ of final grade prior to water line installation.
5. Lot corners shall be staked prior to service line installation, curb, gutter and driveway aprons shall be installed prior to service line installation unless otherwise approved in writing by SFC Utilities.
6. Contractor (Developer) shall provide construction staking by a licensed New Mexico surveyor utilizing the appropriate Right-of Way maps, signed plats and SFC Utilities drawings.
7. Material submittals shall be approved by SFC Utilities prior to construction.
8. Contact New Mexico One Call at "811" two (2) working days in advance of construction for utility locates.
9. Pressure regulators shall be installed on all services downstream from the meter. Each residential service is required to install a pressure reducing valve (PRV), Watts #U5 or U5B in tandem with the meter or in its own vault box between the meter and the residence before any user service lines.
10. A minimum of 4 feet cover to top of pipe shall be maintained on all water mains and services.
11. Contractor shall submit as-built construction packet within five (5) days of completion of construction including: valve ties, as-built drawings, (including, but not limited to: fitting-to-fitting measurements, service-to-service measurements, center of main to center of service measurements, length of main installed, fittings installed, etc.) potability and pressure test results.
12. All valve boxes shall be brought up to grade after first course of asphalt and before final course of asphalt.
13. Fire hydrants shall be numbered using reflective numerals. The reflective numerals shall be applied by the Santa Fe County Fire Department at the completion of the project. Numbers shall be legible from the road. Prior to installing numbers, fire hydrant shall be painted per specifications on Page 7, Section B.4.
14. A mechanical restraint system shall be utilized on fittings and piping for thrust restraint. Concrete thrust blocking shall be used only for special conditions (E.G. Caps where main will be extended in the future) as specifically approved for SFC Utilities.
15. Any field changes to these plans require approval of both the design engineer and SFC Utilities.
16. Work on SFC Utilities facilities shall not begin until SFC Utilities has issued a NTP to the approved utility contractor.



D. DESIGN STANDARDS: PUBLIC UTILITIES WATER AND WASTEWATER

5/8" Single Service Detail	
<p>Item</p> <ol style="list-style-type: none"> 1. 3/4" Service Saddle: See C.23 2. 3/4" Corporation Stop: See C.22 (AWWA Tapered Thread) 3. 3/4" Copper Tubing (Type "K"): See C.13 4. 3/4" Angle Valve: See C.18 5. 3/4" Expansion Connection: See C.20 (5/8" x 3/4" M.T.R. Conn) 6. 5/8" x 3/4" Neptune T-10 Water Meter w/ E-coder R900i Register and Radio transmitter (Furnished & installed by SFC Utilities) 7. 3/4" Angle Cartridge w/ Dual Check Valve: See C.19 	<p>Item</p> <ol style="list-style-type: none"> 8. 3/4" Cast Iron Meter Yoke: See C.17 9. 20" Dia. X 36" Meter Box: See C.15 10. Polymer Lid (12-5/16" Dia.): See C.16 11. Blocks – Use as Directed by SFC Utilities 12. Inner Aluminum Frost Lid: See C.16 13. Double Lid Cover: See C.16 (20" Dia. X 11- 1/2" Dia. Inner Opening) 14. 3/4" Copper Tubing (Type "K"): See C.13

NOTE: See approved Construction Plans for Service Location Detail for Placement Dimensions and Directions.

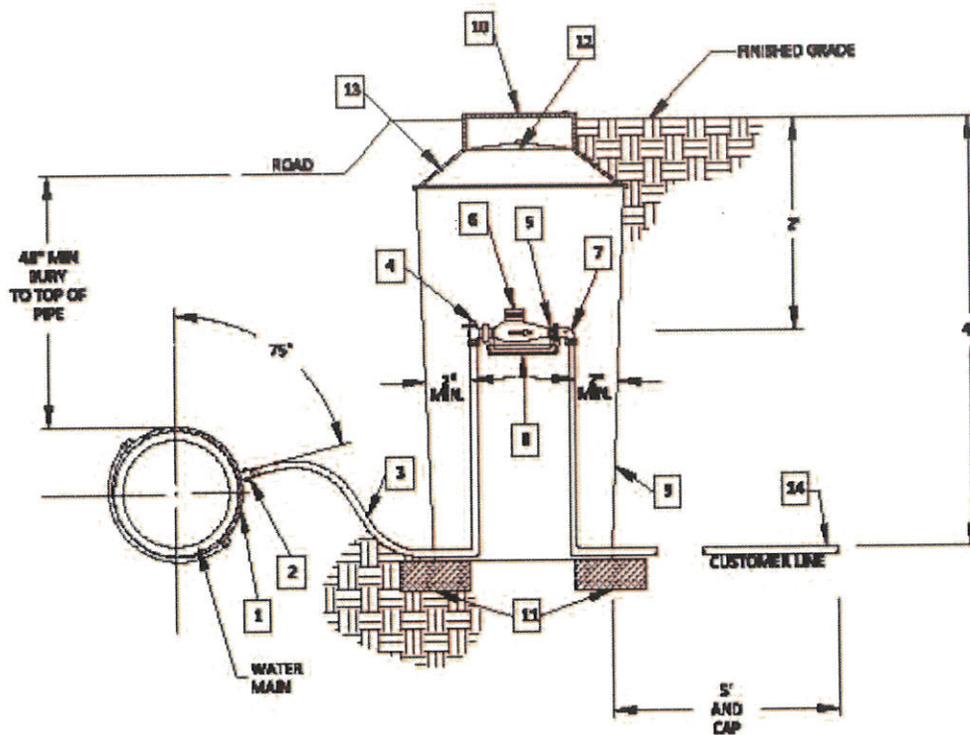


Santa Fe County Water Utilities
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D. DESIGN STANDARDS: PUBLIC UTILITIES WATER AND WASTEWATER

3/4" Single Service Detail	
<u>Item</u>	<u>Item</u>
1. 1" Service Saddle: See C.23	8. 1" Cast Iron Meter Yoke: See C.17
2. 1" Corporation Stop: See C.22 (AWWA Tapered Thread)	9. 24" Dia. X 36" Meter Box : See C.15
3. 1" Copper Tubing (Type "K"): See C.13	10. Polymer Lid (12-5/16" Dia.): See C.16
4. 1" Angle Valve: See C.18	11. Blocks – Use as Directed by SFC Utilities
5. 3/4" Expansion Connection: See C.20	12. Inner Aluminum Frost Lid: See C.16
6. 3/4" Neptune T-10 Water Meter w/ E-coder R900i Register and Radio transmitter (Furnished & installed by SFC Utilities)	13. Double Lid Cover: See C.16 (20" Dia. X 11- 1/2" Dia. Inner Opening) with Extension Ring (20" Dia. 24" Dia.)
7. 3/4" Angle Cartridge w/ Dual Check Valve: See C.19	14. 1" x 3/4" Meter Adapter
	15. 3/4" Copper Tubing (Type "K"): See C.13

NOTE: See approved Construction Plans for Service Location Detail for Placement Dimensions and Directions.



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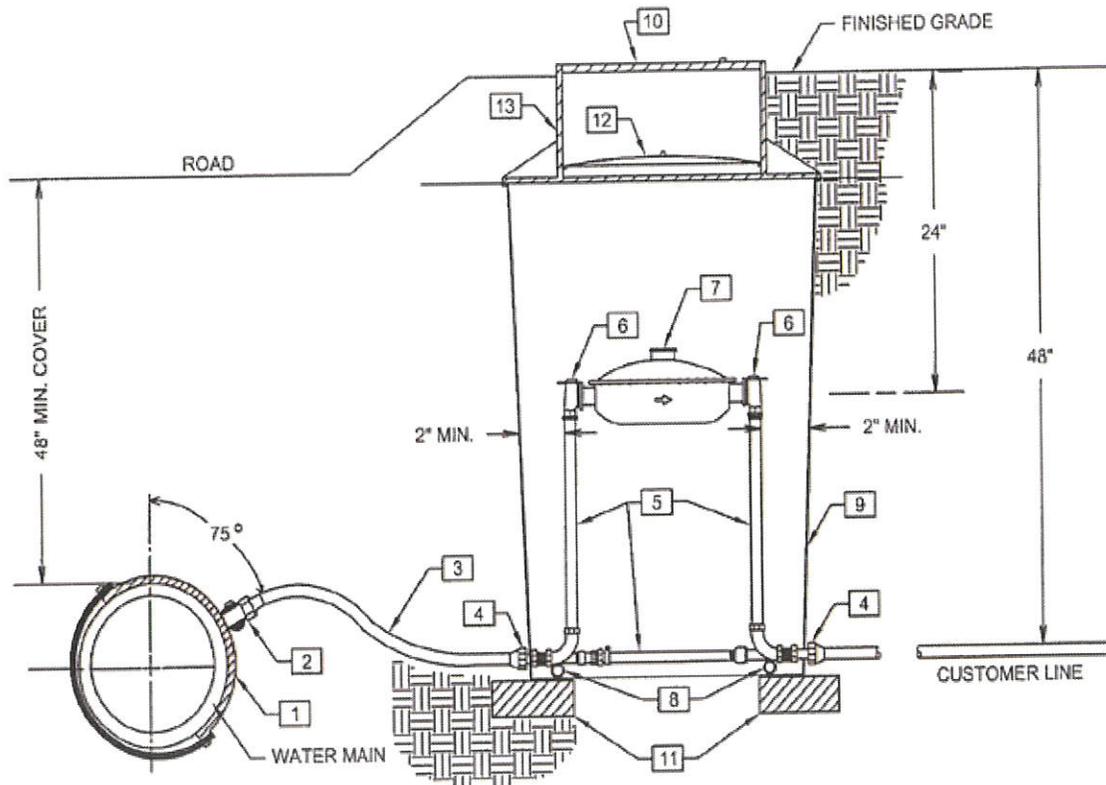
**D. DESIGN STANDARDS:
PUBLIC UTILITIES WATER AND WASTEWATER**

1" Single Service Detail	
<p><u>Item</u></p> <ol style="list-style-type: none"> 1. 1" Service Saddle: See C.23 2. 1" Corporation Stop: See C.22 (AWWA Tapered Thread) 3. 1" Copper Tubing (Type "K"): See C.13 4. 1" Angle Valve: See C.18 5. 1" Expansion Connection: See C.20 6. 1" Neptune T-10 Water Meter w/ E-coder R900i Register and Radio transmitter (Furnished & installed by SFC Utilities) 7. 1" Angle Cartridge w/ Dual Check Valve: See C.19 	<p><u>Item</u></p> <ol style="list-style-type: none"> 8. 1" Cast Iron Meter Yoke: See C.17 9. 24" Dia. X 36" Meter Box: See C.15 10. Polymer Lid (12-5/16" Dia.): See C.16 11. Blocks – Use as Directed by SFC Utilities 12. Inner Aluminum Frost Lid: See C.16 13. Double Lid Cover: See C.16 (20" Dia. X 11- 1/2" Dia. Inner Opening) with Extension Ring (20" Dia. 24" Dia.) 14. 1" Copper Tubing (Type "K"): See C.13

NOTE: See approved Construction Plans for Service Location Detail for Placement Dimensions and Directions.



D. DESIGN STANDARDS: PUBLIC UTILITIES WATER AND WASTEWATER



1-1/2" Single Service Detail

Item

1. 1-1/2" Service Saddle: See C.23
 2. 1-1/2" Corporation Stop: See C.22 (AWWA Tapered Thread)
 3. 1-1/2" Copper Tubing (Type "K"): See C.13
 4. 1-1/2" Adapter Coupling
 5. 1-1/2" Prefabricated Meter Setter (No By-Pass): See C-21
 6. 1-1/2" Ball Angle Valve: See C.18
 - 6A. 1-1/2" Angle Cartridge w/ Dual Check Valve: See C.19
- NOTE: CHANGE DETAIL #6 (OUTLET SIDE) TO #6A**

Item

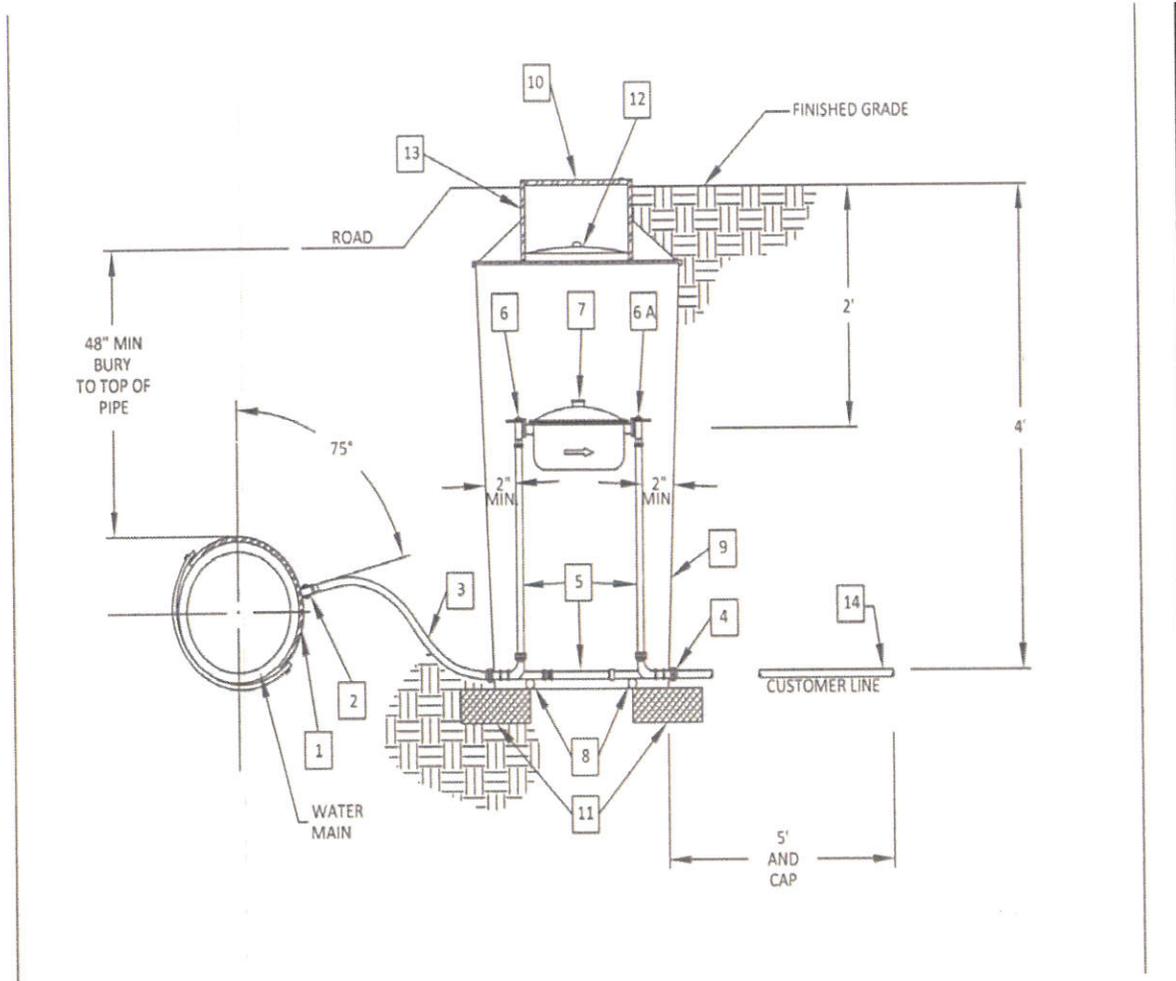
7. 1-1/2" Neptune T-10 Water Meter w/ E-coder R900i Register and Radio transmitter (Furnished & installed by SFC Utilities)
13" Flange-to-Flange Spacing
8. 1" Galvanized Pipe 24" Long
9. 36" Dia. X 36" Meter Box: See C.15
10. 20" Dia. Polymer Lid: See C.16
11. Blocks – Use as Directed by SFC Utilities
12. Inner Metal Frost Lid: See C.16
13. 36" Dia. X 20" Double Lid Cover: See C.16

NOTE: See approved Construction Plans for Service Location Detail for Placement Dimensions and Directions.



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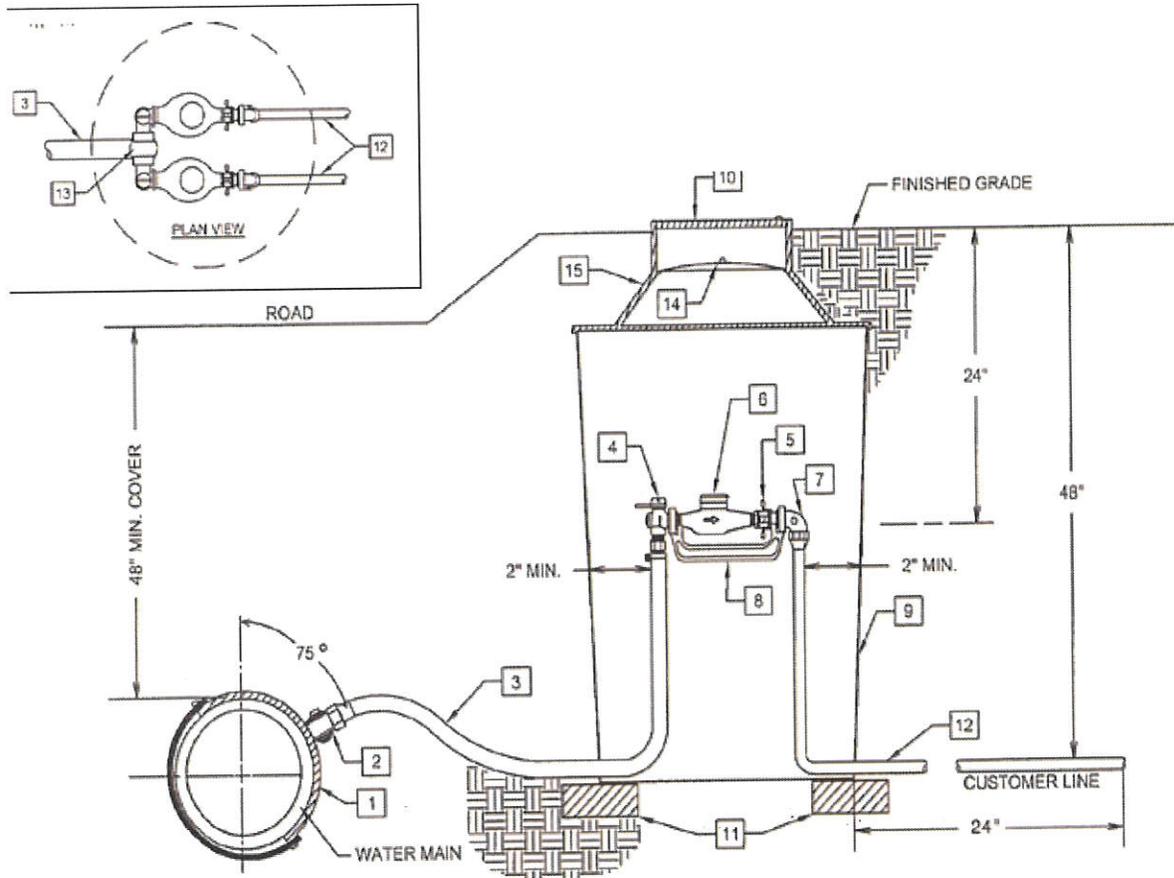
2" Single Service Detail

<u>Item</u>	<u>Item</u>
1. 2" Service Saddle: See C.23	7. 2" Neptune T-10 Water Meter w/ E-coder R900i Register and Radio transmitter (Furnished & installed by SFC Utilities)
2. 2" Corporation Stop: See C.22 (AWWA Tapered Thread)	8. 1" Galvanized Pipe 24" Long
3. 2" Copper Tubing (Type "K"): See C.13	9. 36" Dia. X 36" Meter Box: See C.15
4. 2" Adapter Coupling	10. 20" Dia. Polymer Lid: See C.16
5. 2" Prefabricated Meter Setter (No By-Pass): See C-21	11. Blocks – Use as Directed by SFC Utilities
6. 2" Ball Angle Valve: See C.18	12. Inner Metal Frost Lid: See C.16
6A. 2" Angle Cartridge w/ Dual Check Valve: See C.19	13. 36" Dia. X 20" Double Lid Cover: See C.16



D. DESIGN STANDARDS: PUBLIC UTILITIES WATER AND WASTEWATER

NOTE: See approved Construction Plans for Service Location Detail for Placement Dimensions and Directions.



5/8" Double Service Detail

Item

1. 1" Service Saddle: See C.23
2. 1" Corporation Stop: See C.22 (AWWA Tapered Thread)
3. 1" Copper Tubing (Type "K"): See C.13
4. 3/4" Angle Valve (2 Each): See C.18
5. 3/4" Expansion Connection (5/8" x 3/4" M.T.R. Conn.) (2 Each): See C.20
6. 5/8" x 3/4" Neptune T-10 Water Meter w/ E-coder R900i Register and Radio transmitter (Furnished & installed by SFC Utilities)
7. 3/4" Angle Cartridge w/ Dual Check Valve (2 Each): See C.19
8. 3/4" Cast Iron Meter Yoke (2 Each): See C.17

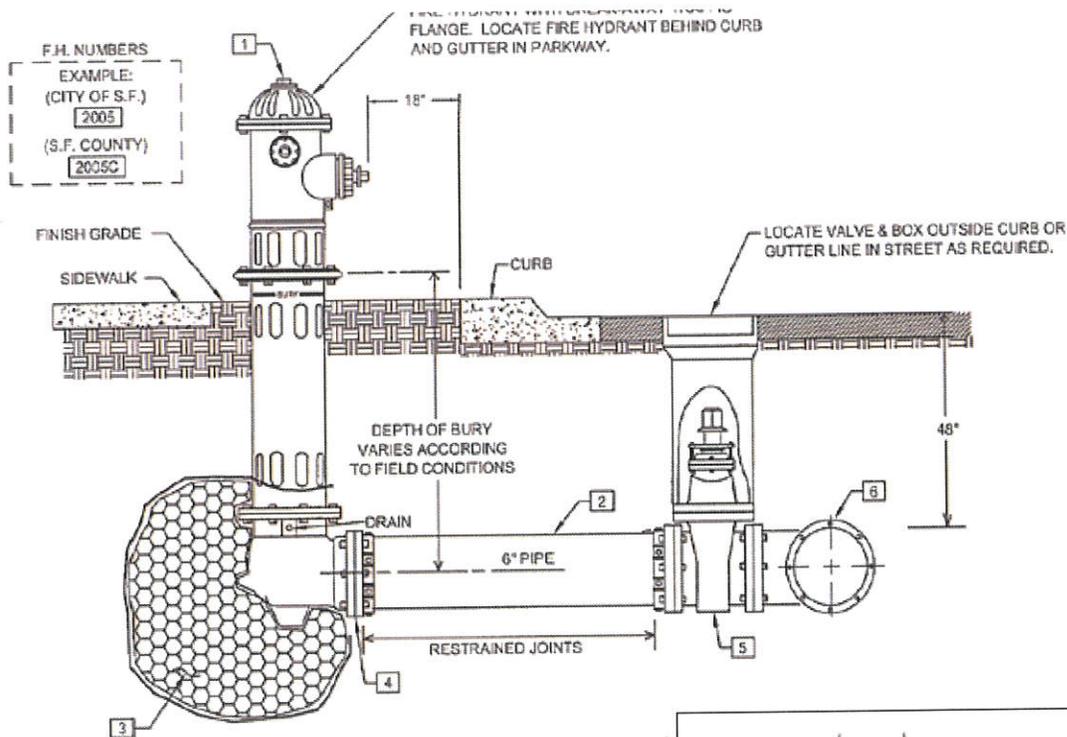
Item

9. 24" Dia. X 36" Meter Box: See C.15
10. Polymer Lid (12-5/16" Dia.): See C.16
11. Blocks – Use as Directed by SFC Utilities
12. 3/4" Copper Tubing (Type "K") (2 Each): See C.13
13. Branch Piece: See C.18.1
14. Inner Aluminum Frost Lid: See C.16
15. Double Lid Cover: See C.16 (20" Dia. X 11- 1/2" Dia. Inner Opening) with Extension Ring (20" Dia. 24" Dia.)

NOTE: See approved Construction Plans for Service Location Detail for Placement Dimensions and Directions.



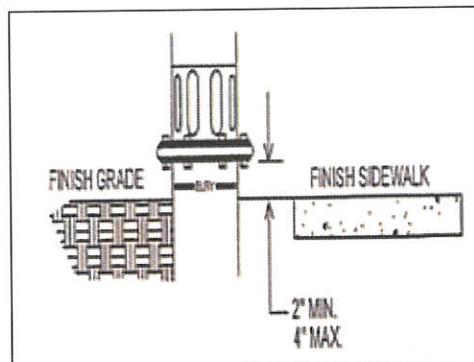
D. DESIGN STANDARDS: PUBLIC UTILITIES WATER AND WASTEWATER



Fire Hydrant Detail

Item

1. Fire Hydrant
2. 6" Pipe
3. 1/2" Cubic Yard 3/8" Gravel Drain w/10 ml. Plastic Sheet
4. 6" MJ Retainer & 6" Harness (If Required)
5. 6" MJ x FL Gate Valve & Box
6. Tee: MJ Run w/6" Flange Outlet



Construction Notes

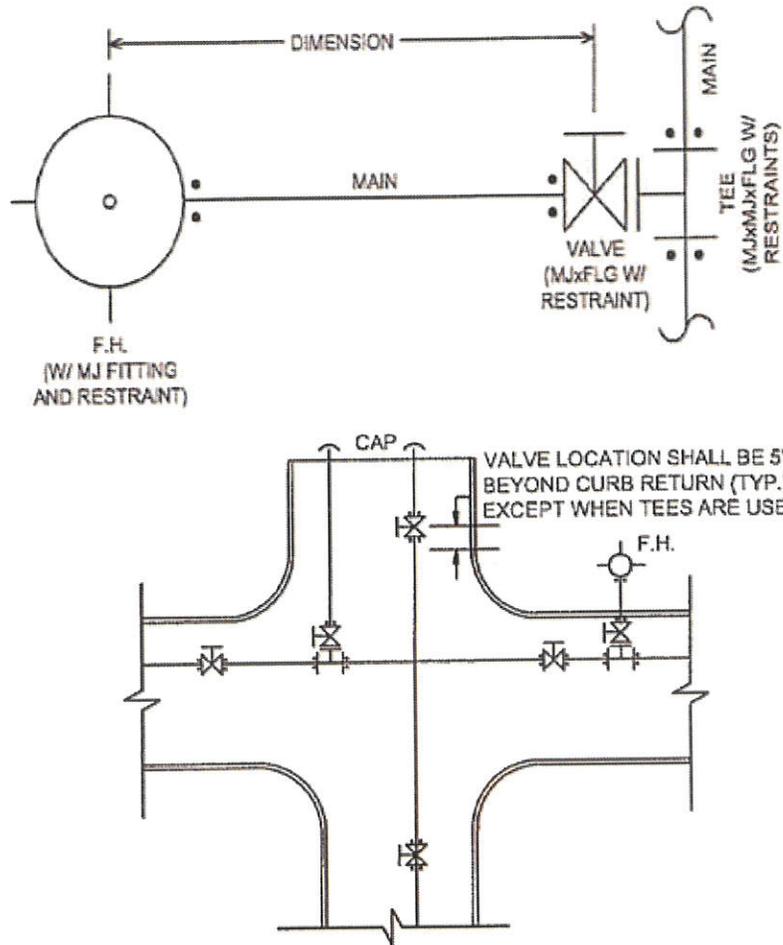
- A. Fire Hydrant shall not be installed near any structures and shall have a min. 36" clear space in all directions.
- B. Locate Hydrant 18" behind back of curb unless otherwise shown on plans or specifically directed by SFC Utilities. Hydrant to be set plumb and at proper elevation (elevation provided by developer) hydrant installed as part of a new development/extension shall be a standard 5' bury hydrant and shall be set to finished grade without the use of hydrant extensions (if an adjustment is required. Re-lay the water main and fire hydrant leg or install restrained offset as directed by SFC Utilities.)
- C. Weep holes must have 1/4" plugs removed and be free draining into gravel drain. Use fully restrained joint from the fire hydrant to the flanged connection on valve.
- D. See Tracing Wire Detail on Page 46.
- E. National Standard Fire Hose Coupling Screw Threads are required in Santa Fe County.
- F. Fire hydrant shall be painted and reflective numbers installed after installation, per specifications on Page 7, Section B.4.



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D. DESIGN STANDARDS: PUBLIC UTILITIES WATER AND WASTEWATER

NOTE: See approved Construction Plans for hydrant Location Detail for Placement Dimensions and Directions.



Valve Installation

1. Valves shall be located at road intersection with the intent of isolating the water distribution system with the N-1 rule or as approved by SFC Utilities.
2. Inline valves shall typically be installed five (5) feet beyond the curb return as shown in the detail and consist of mechanical joint fittings with restraints except when using tees, which shall have mechanical joint x flange fittings.
3. Valves on fire hydrant legs shall have mechanical joint x flange fittings and shall connect to fire hydrant tee with the flange fitting and the mechanical joint fitting shall have a restraint, as shown in the detail.
4. Valves on tees shall have valves and tees with mechanical joint x flange fittings. The mechanical joint fitting shall have a restraint as shown in the detail.

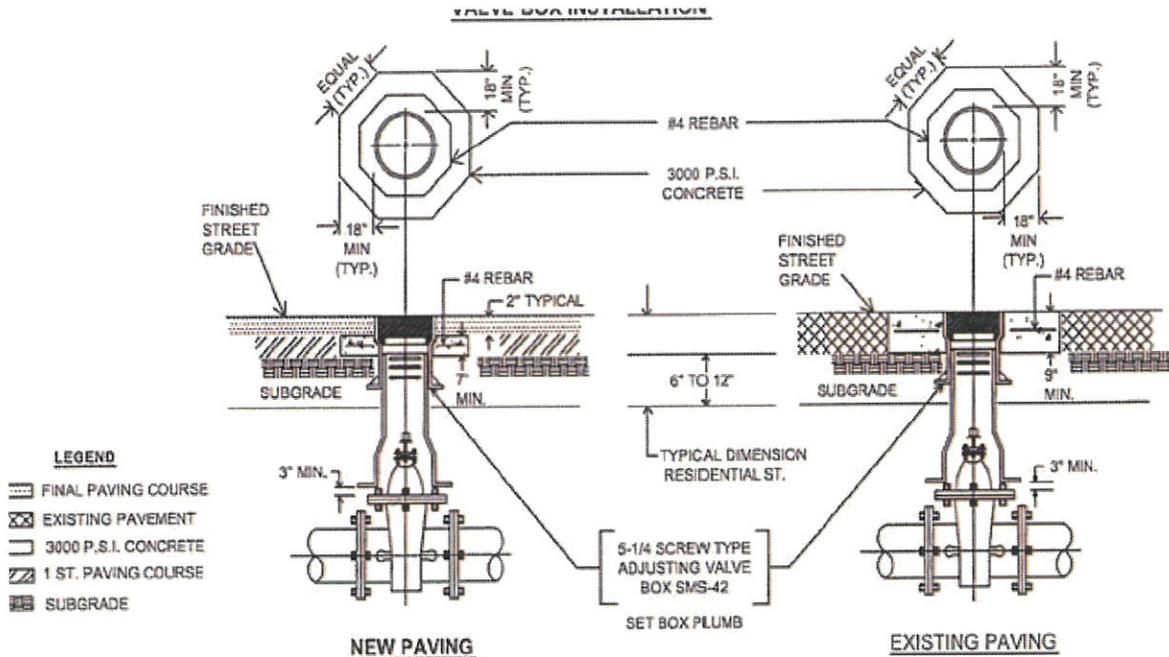
*Valve Box Installation on page 27

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D. DESIGN STANDARDS: PUBLIC UTILITIES WATER AND WASTEWATER



Valve Box Installation:

New Paving: Valve Boxes shall be installed and raised to grade in the following manner for new paving.

1. Valve box shall be installed over valve during main installation. Top of valve box shall be left below the top of sub grade until valve is ready to be raised to final grade.
2. When the valve box is ready to be raised, an octagon shape shall be cut-out around the valve box from the first paving lift (as shown in detail) the valve box shall be raised to the finished street grade; the soil around the valve box shall be thoroughly compacted in accordance with SFC standards; the concrete collar (consisting of 3,000 PSI concrete and #4 rebar) shall be poured flush with top of the first paving course (including hand rodding concrete to remove voids) and the valve box shall be protected from vehicular traffic for 24 hours. .

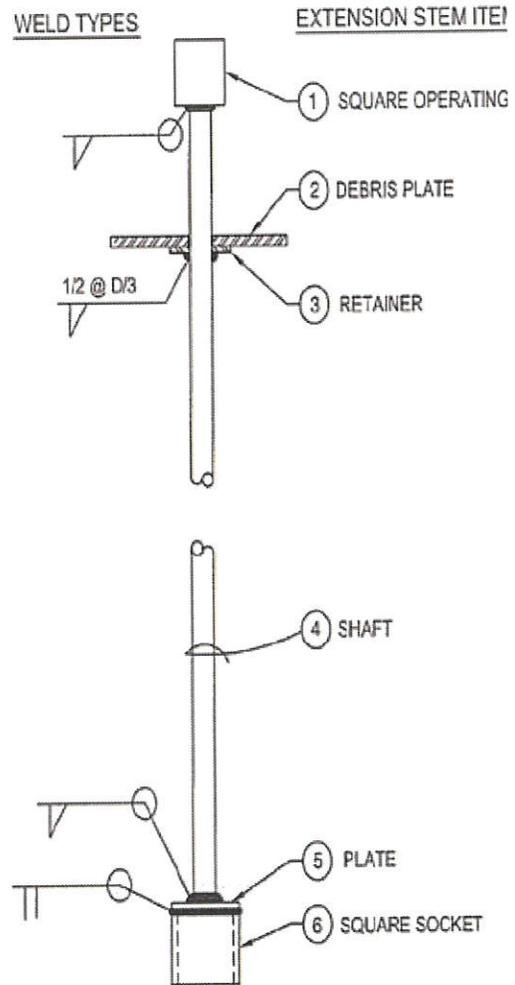
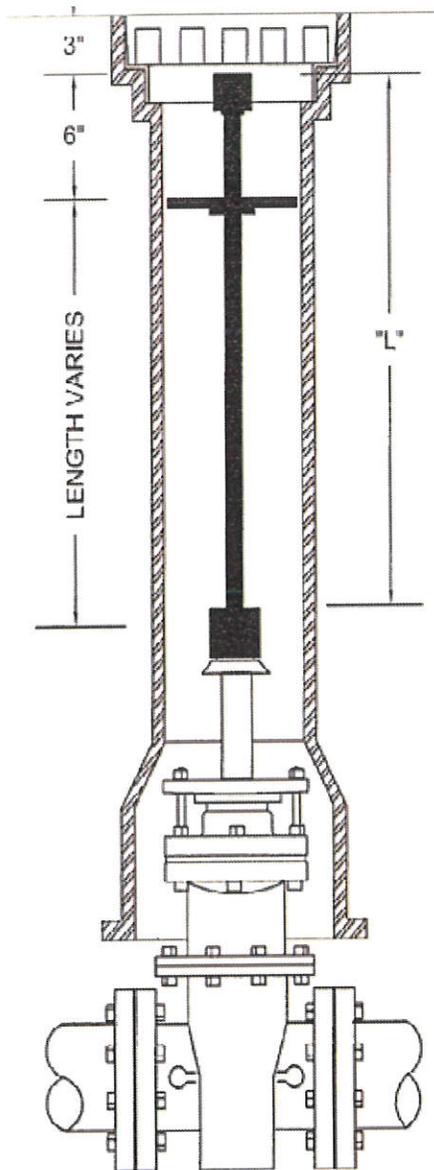
Existing Paving: Install valve boxes per "New Paving" (above) with the concrete collar poured flush with the finished grade of the existing paving with a smooth troweled finish. Note: If excavation over 42" square is required to adjust valve box to grade, "New Paving" concrete collar procedures shall be followed as well as any necessary paving shall be completed.

Unpaved Areas: In dirt or gravel streets, top of valve box and concrete collar shall be left 6" below the street grade. In other unpaved areas, valve box and concrete collar shall be left 2" above finished grade or as directed by SFC Utilities.

Protection of Valve Boxes: Valve boxes shall be protected from damage, loss and shall not be filled with dirt and debris. Valves must be accessible during construction with minimum excavation. Valves identified by SFC Utilities as key shut off valves shall remain at grade and protected during all phases of construction.



**D. DESIGN STANDARDS:
PUBLIC UTILITIES WATER AND WASTEWATER**



Valve Stem Extension Detail

Item

1. 2" x 2" x 2" Bar
2. 5" Dia. Plate 3/16" with 1-3/8" Dia. Hole
3. 1-3/8" Dia. Heavy Washer

Item

4. 1" Dia. Schedule 40 Steel Pipe (L < 6")
1-1/4" Dia Schedule 40 Steel Pipe (L > 6")
5. 2-1/2" x 2-1/2" x 1/4" Plate
6. 2-1/2" x 2-1/2" x 1/4" Tubing

NOTE: All steel to be saw or machine cut.



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D. DESIGN STANDARDS:
PUBLIC UTILITIES WATER AND WASTEWATER

THRUST RESTRAINT TABLE
BENDS, TEES, CAPS/VALVES, & REDUCERS
(RESTRAINED JOINT LENGTHS IN FEET)

DIAMETER (IN.)	HORIZONTAL BENDS						CAPS / PLUGS / VALVES L _R	SIZE (IN.) Lg/ Sm/ Run X Br.	TEES						REDUCERS L _R				
	11-1/4°		22-1/2°		45°				90°		Run		Branch			Run		Branch	
	L _R	FJO	L _R	FJO	L _R	FJO			L _R	FJO	L _R	FJO	L _R	FJO		L _R	FJO	L _R	FJO
4	2	FJO	2	5	12	34	4 X 4	FJC	28	5	8	10	FJO	N/A					
6	2		3	7	17	47	6 X 6	FJC	42	5	21	10	FJO	N/A					
8	2		4	9	23	62	6 X 4	FJC	26	5	FJO	10	FJO	24					
10	3		5	11	27	75	8 X 8	FJC	57	5	36	10	FJO	N/A					
12	3		6	13	32	88	8 X 6	FJC	40	5	13	10	FJO	26					
							8 X 4	FJC	23	5	FJO	10	FJO	45					
							10 X 10	FJC	69	5	48	10	21	N/A					
							10 X 8	FJC	55	5	29	10	FJO	25					
							10 X 6	FJC	39	5	4	10	FJO	46					
							10 X 4	FJC	21	5	FJO	10	FJO	61					
							12 X 12	FJC	83	5	61	10	34	N/A					
							12 X 10	FJC	68	5	42	10	10	43					
							12 X 8	FJC	54	5	22	10	FJO	47					
							12 X 6	FJC	37	5	FJO	10	FJO	64					
							12 X 4	FJC	18	5	FJO	10	FJO	77					

DIAMETER (IN.)	VERTICAL BENDS							
	11-1/4°		22-1/2°		45°		90°	
	L _R	TOPI/BOTTOM						
4	3/2	7/4	7/4	14/9	N/A	N/A		
6	5/3	9/6	20/12	N/A	N/A	N/A		
8	6/4	12/7	26/15	N/A	N/A	N/A		
10	7/4	15/9	31/18	N/A	N/A	N/A		
12	9/5	18/10	37/21	N/A	N/A	N/A		

Joint Restraint Table

Table: This table is based on the EBAA Iron Mega lug joint calculations program with the following input criteria: 3.5ft depth of bury (Conservative); trench type 4; PVC pipe material: GM soil type: 150 psi test pressure: 1.5 safety factor. Specific calculations for restrained lengths are required for conditions not covered by this table.

L_R: Length of restrained pipe, in feet, for each side of the fitting.

Minimum Restraint Length: A minimum restrained length of 5 ft. from the fitting joint is recommended. Vertical offsets shall be completely restrained between the top vertical fitting and the bottom vertical fitting.

FJO: Fitting joint Only – This includes at least a 1 ft. length of restrained pipe beyond the fitting joint.

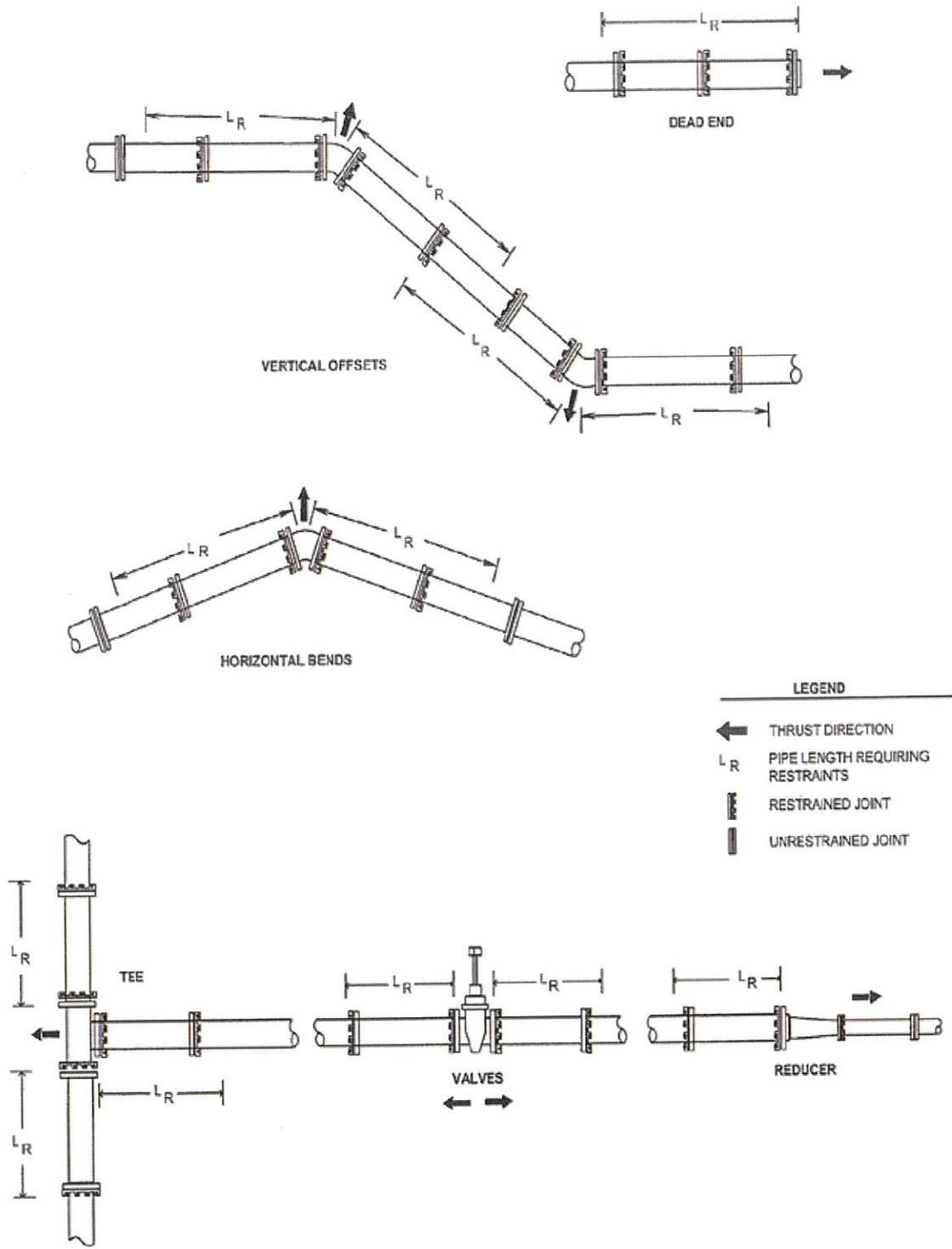
Vertical Offset: Use 11-1/2° bends or 22- 1/2° bends wherever possible due to the shorter restrained length requirements.

Caps/Plugs: Concrete blocking may be required by SFC Utilities on a case-by-case basis in addition to mechanical restraint.

Pipe Length: Piping shall be laid out to minimize pipe joints near fittings. Wherever possible, full 20ft. pipe lengths shall be utilized when connecting to fittings or valves. No pipe bell joints shall be used where fittings are less than 20 ft. apart.



D. DESIGN STANDARDS: PUBLIC UTILITIES WATER AND WASTEWATER

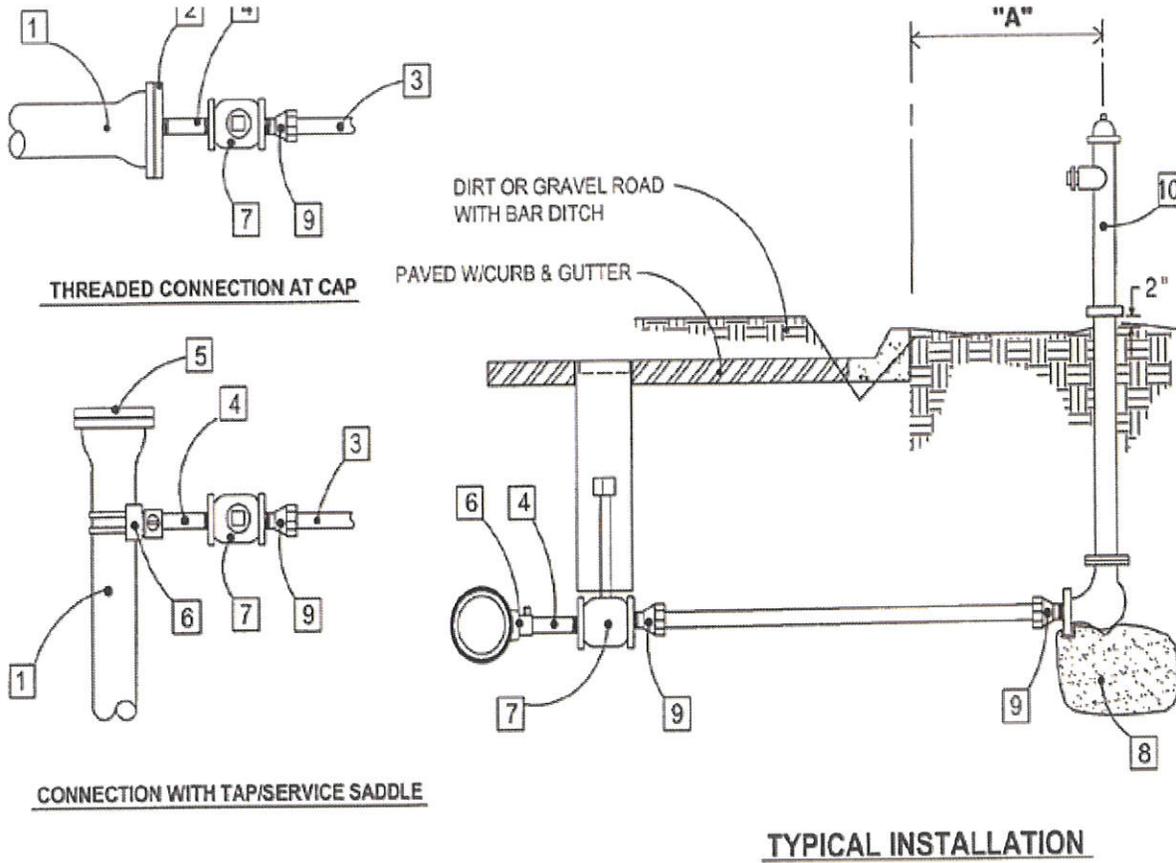


Joint Restraint Detail



Santa Fe County Water Utilities
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**D. DESIGN STANDARDS:
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CONNECTION AT MAIN

Flush Hydrant Detail	
<p>Item</p> <ol style="list-style-type: none"> 1. Restrained Dead End Main 2. MJ Cap/Plug with 2" Tap 3. 2" Type "K" Copper 4. 2" Brass Nipple 5. MJ Clamp / Plug 	<p>Item</p> <ol style="list-style-type: none"> 6. 2" Service Saddle with IPS Threads 7. 2" Heavy Duty Threaded Gate Valve with box. 8. 1/4 Yard of Gravel at Drain 9. Adapter: 2" Compression x 2" MIP 10. 2-1/4" Post Type Hydrant with National Standard Threads

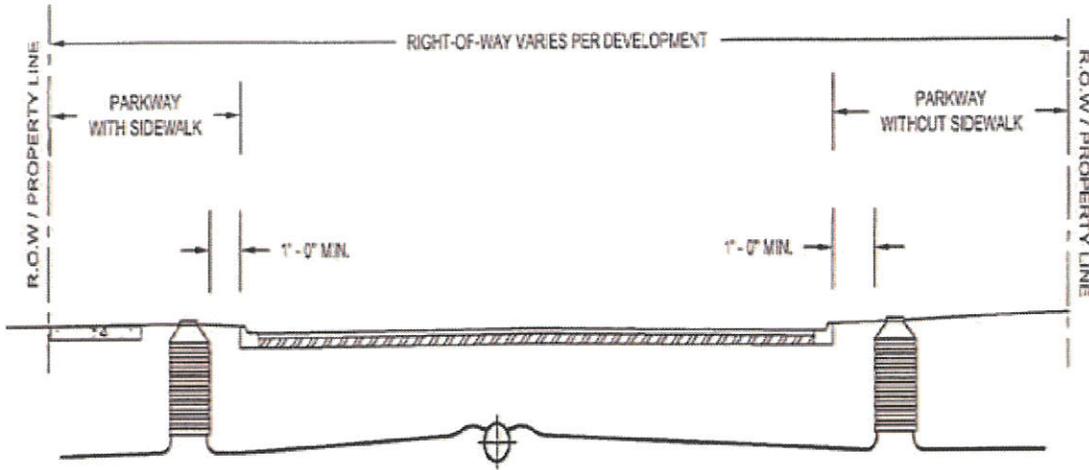
Construction Notes
<ol style="list-style-type: none"> 1. Dimension "A" is typical 18" back of curb to valve in paved areas and is minimum of 18" behind bar ditch in unpaved areas but can be extended up to 72" to fit field conditions.



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D. DESIGN STANDARDS: PUBLIC UTILITIES WATER AND WASTEWATER

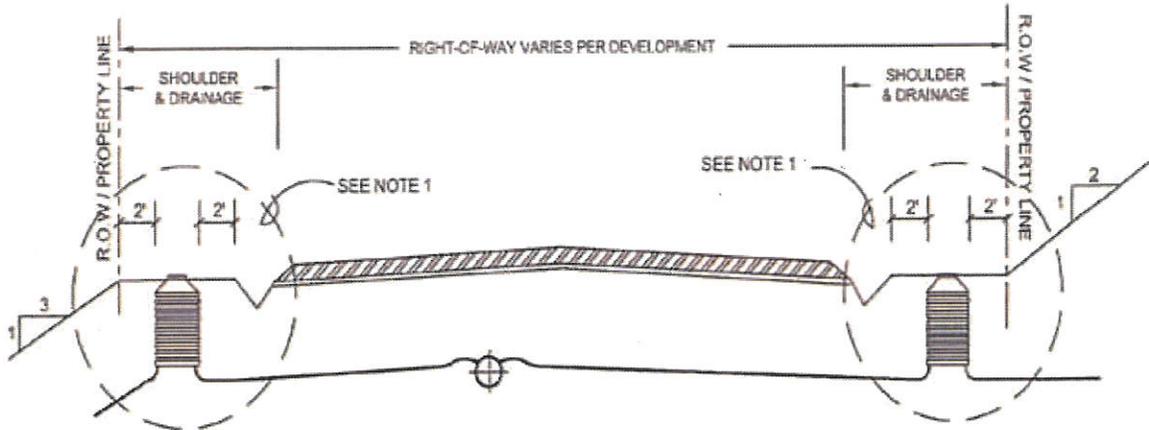
PAVED STREETS WITH CURB



Construction Notes

1. Meter cover to be flushed with top of curb.
2. Installation shall be run perpendicular to water main.

PAVED STREETS WITHOUT CURB



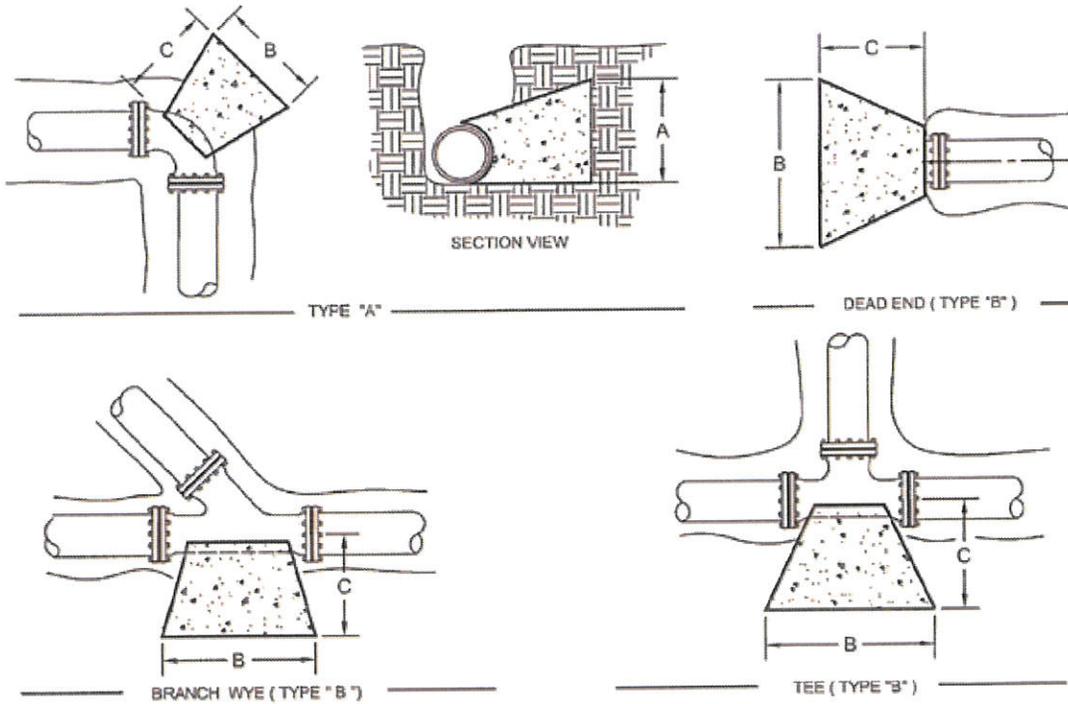
Construction Notes

1. Do not locate meter cans or fire hydrants in slopes unless approved by SFC Utilities and benching is provided as shown. A minimum bench of 2" shall be provided all around as shown.
2. Service installation shall be run perpendicular to water main.



D. DESIGN STANDARDS: PUBLIC UTILITIES WATER AND WASTEWATER

**Use Mechanically Restrained Fittings & Pipe Joints for Thrust
Restraint Unless Concrete Blocking is Specifically Called for by SFC Utility**



THRUST BLOCK SIZING TABLE

PIPE DIAMETER	TYPE "A" BENDS												TYPE "B" FITTINGS			
	11-1/4°			22-1/2°			45°			90°			A	B	C	
	A	B	C	A	B	C	A	B	C	A	B	C				
4"	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
6"	12	12	12	12	12	12	12	18	12	18	24	12	12	24	12	
8"	12	12	12	12	18	12	16	24	12	24	30	18	18	30	12	
10"	12	12	12	12	24	12	20	30	12	24	42	18	24	36	18	
12"	12	18	12	18	24	12	24	36	18	32	48	24	24	42	18	
14"	12	24	12	18	36	18	30	42	24	36	60	24	30	48	24	
16"	18	24	24	24	36	24	30	40	24	42	66	24	36	54	24	
18"	18	30	24	24	40	24	36	54	24	48	72	24	42	60	24	
20"	20	30	24	30	42	24	42	60	24	54	80	24	42	78	24	
24"	24	36	24	36	54	24	48	72	24	66	96	30	54	80	30	

1. TABLE BASED ON 200 P.S.I. (130 P.S.I. WORKING PRESSURE) AND 3000 LB/FT² ALLOWABLE SOIL BEARING PRESSURE.
2. USE TEE OUTLET DIAMETER TO DETERMINE THRUST BLOCK SIZING. USE BRANCH DIAMETER ON WYE TO DETERMINE THRUST BLOCK SIZING.
3. THE "C" DIMENSION LISTED IS A MINIMUM DIMENSION. CONCRETE BLOCKING MUST BE POURED TO THE UNDISTURBED SOIL OF THE TRENCH WALL.

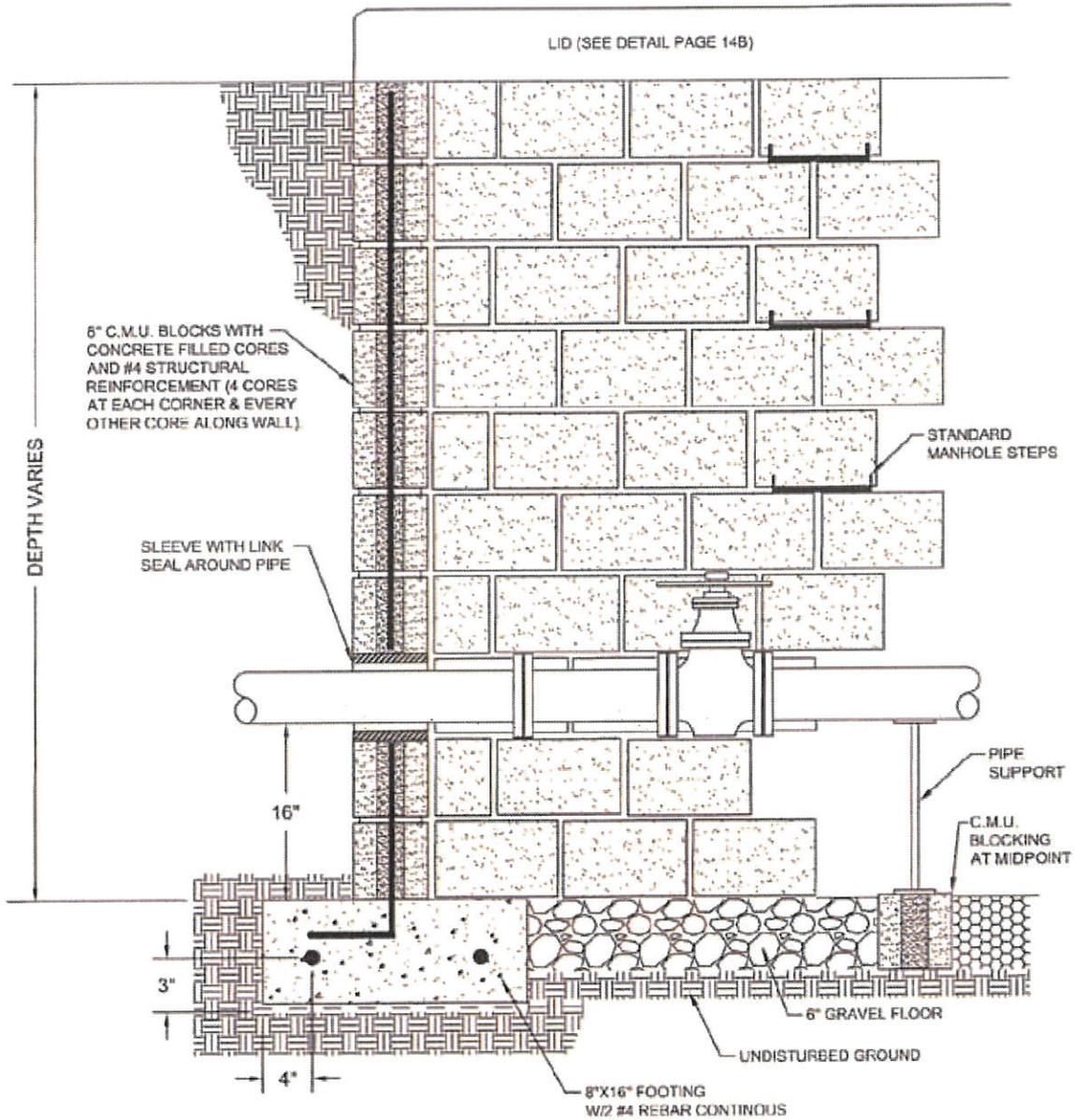
Concrete Thrust Blocking Detail



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**D. DESIGN STANDARDS:
PUBLIC UTILITIES WATER AND WASTEWATER**

Meter and PRV Vaults may be Cast in Place Concrete, CMU, Precast Concrete or Prefabricated per Section C.25 of the Approved Materials List

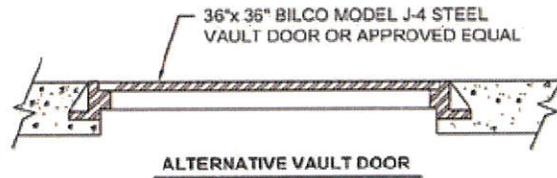
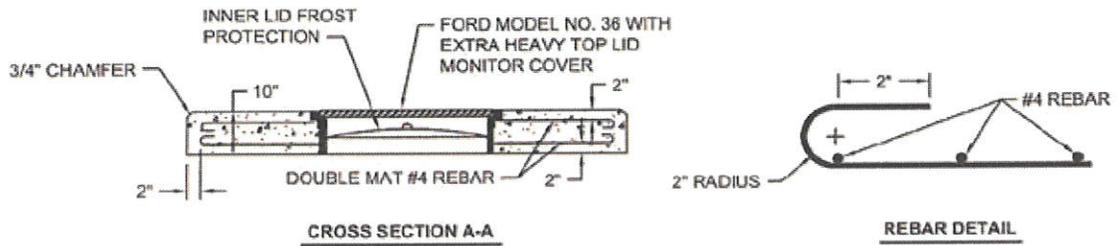
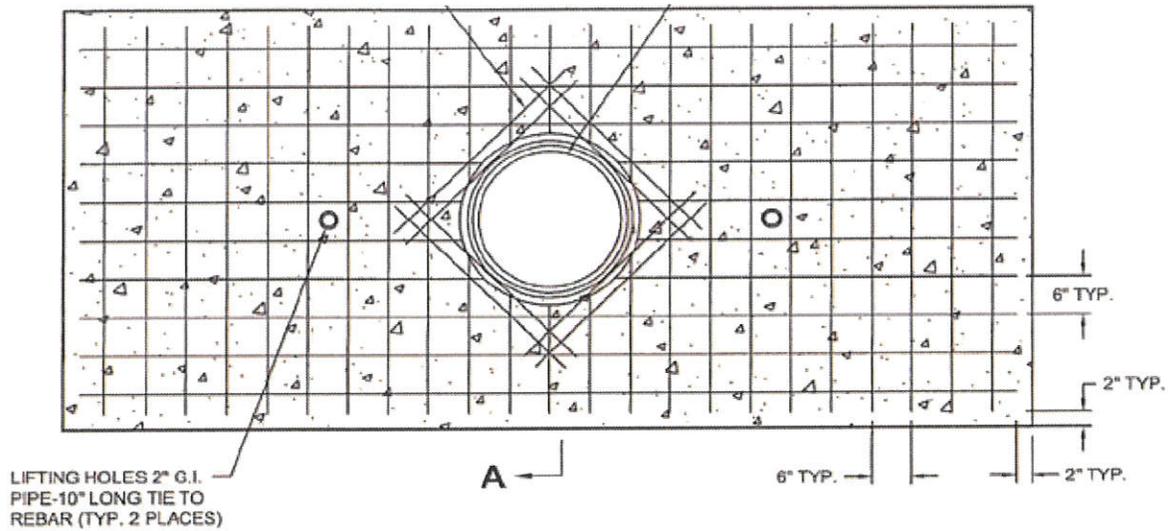


Vault Detail



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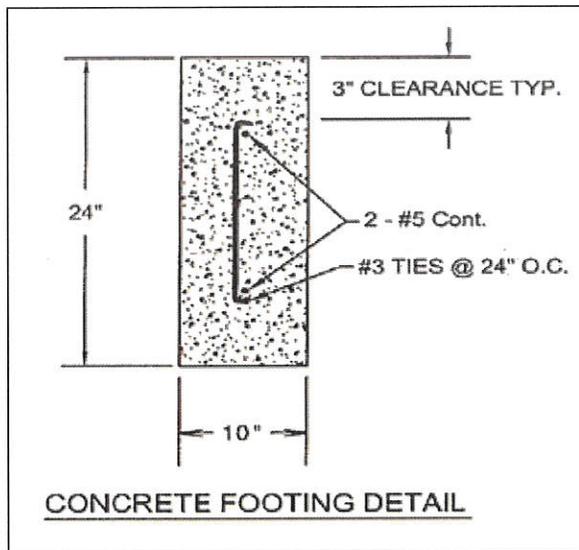
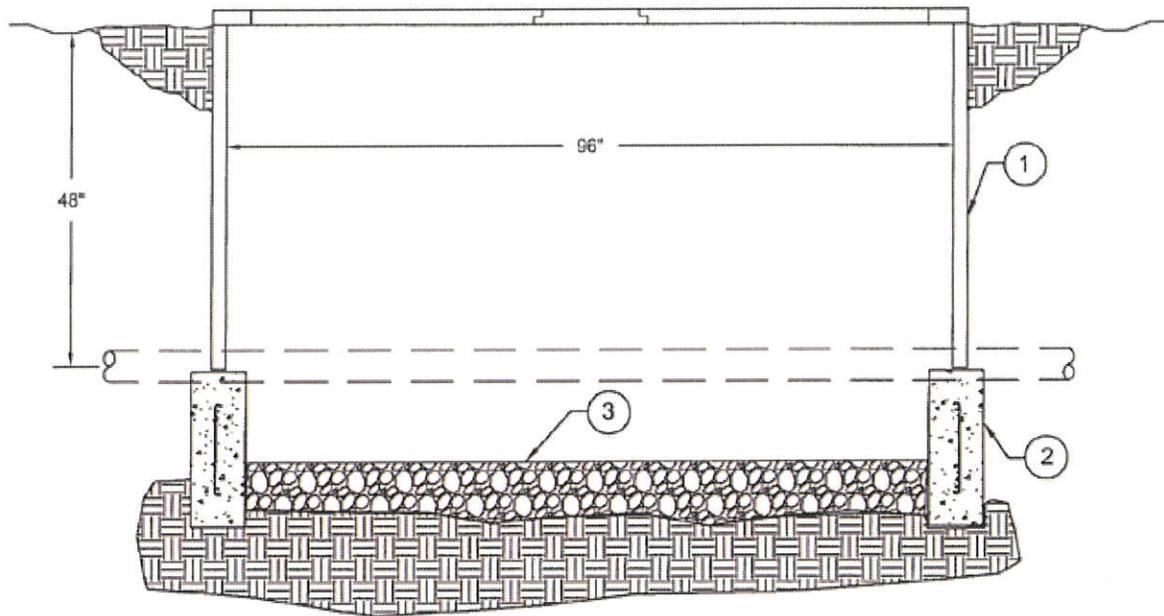
1. Lid to be cast into sections weighing a maximum of 4,000 lbs. Each section to have two (2) lifting holes.
2. This is a general detail. Each pit will have a specific detail drawing issued for construction.

Vault Lid Detail



Santa Fe County Water Utilities
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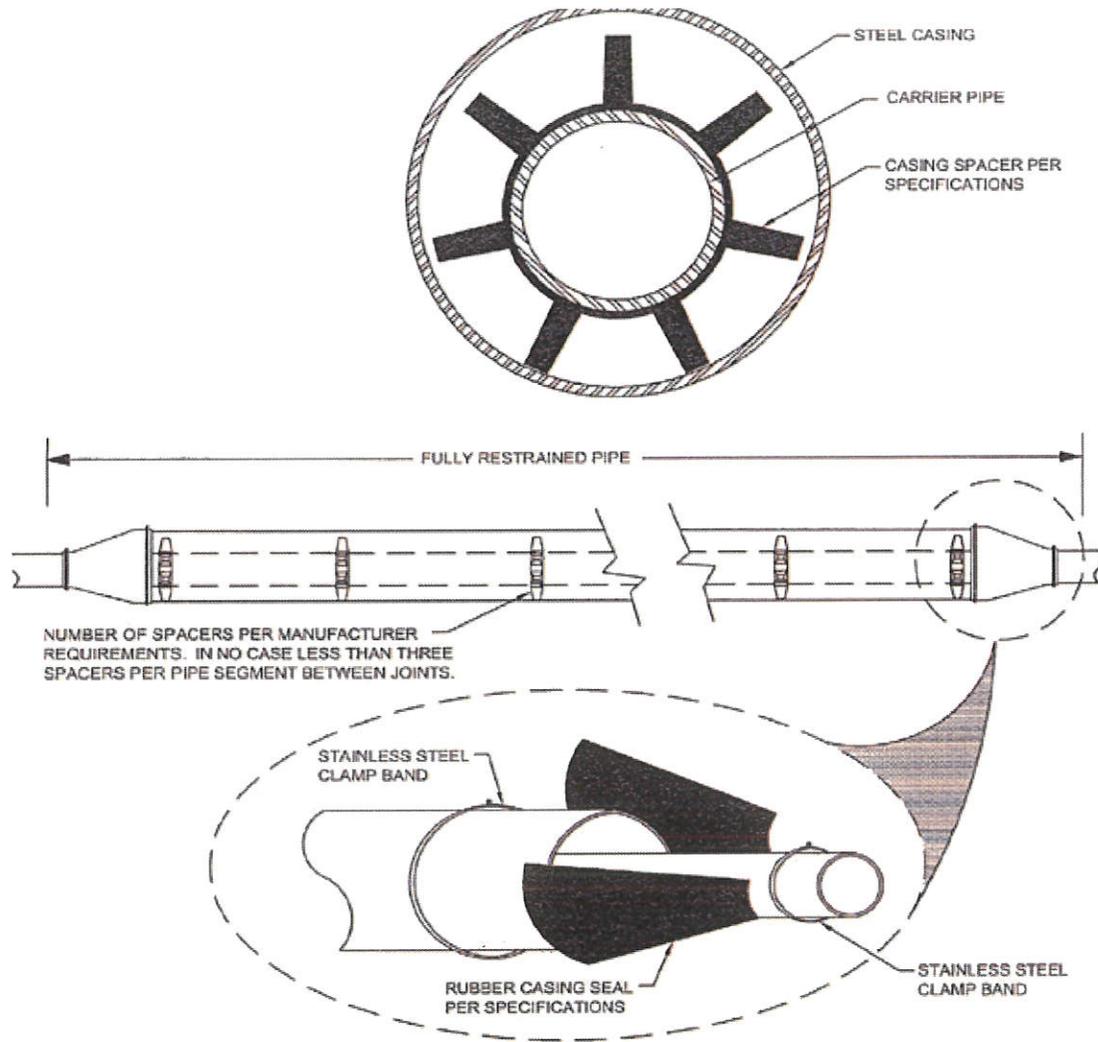
**D. DESIGN STANDARDS:
PUBLIC UTILITIES WATER AND WASTEWATER**



Prefabricated Vault Detail	
<p>Item</p> <ol style="list-style-type: none"> 1. Prefabricated Vault 48" x 96" x 48" (Per Section C.25 of the Approved Materials List) 2. Concrete Footing 	<p>Item</p> <ol style="list-style-type: none"> 3. Gravel Floor 3/4" Crushed – 6" Thick



D. DESIGN STANDARDS: PUBLIC UTILITIES WATER AND WASTEWATER



CASING SIZE VERSUS CARRIER SIZE

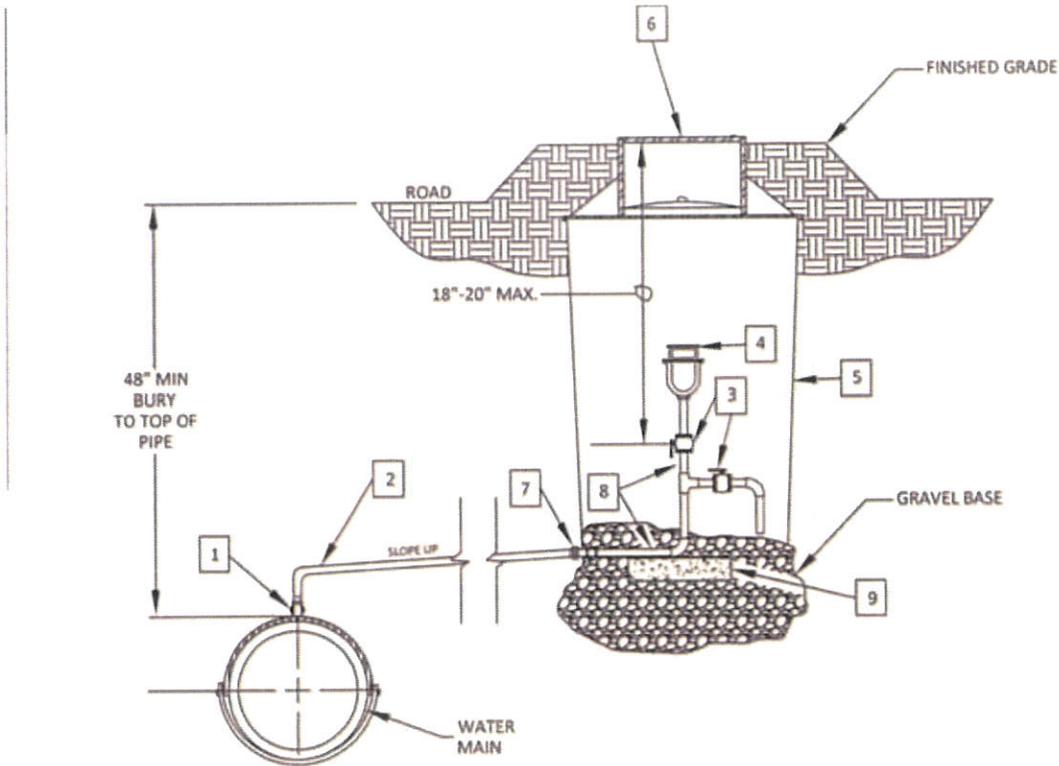
Carrier Pipe (Nominal Size)	Steel Casing Diameter and Wall Thickness
6"	14" Schedule 30
8"	16" Schedule 30
10"	18" Standard Class
12"	22" Standard Class
14"	26" Schedule 20
16"	28" Schedule 20
20"	30" 0.375" Wall
24"	36" 0.375" Wall
3/4"-2" Cu Tubing	4" Schedule 40 PVC
3/4"-2" Cu Tubing	4" Schedule 40 Steel

Pipe Casing Detail for Water or Sewer Projects



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Water and Sewer Construction Standards and Specifications

**D. DESIGN STANDARDS:
PUBLIC UTILITIES WATER AND WASTEWATER**



1" and 2" Air-Vacuum Valve Detail

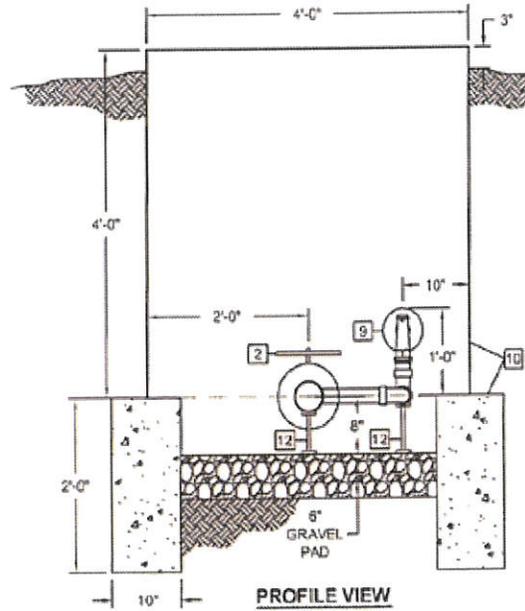
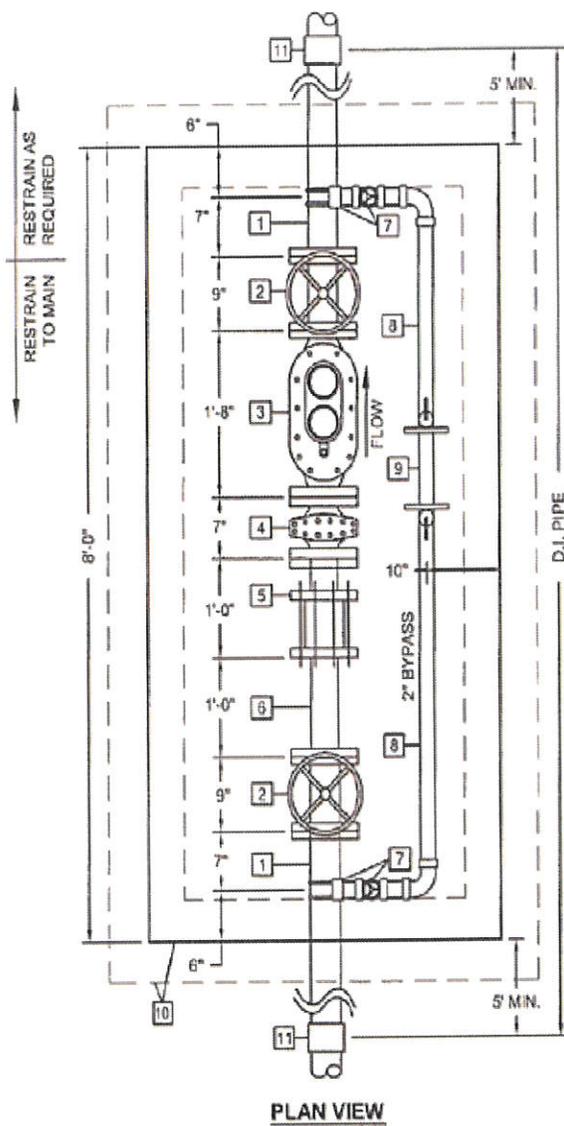
Item	Item
1. 1" or 2" Tapping Saddle 1" or 2" Corporation Cock (A.W.W.A Tapered Thread)	5. Follow specifications for a 2" single service Meter Box as shown on Page 24.
2. 1" or 2" Type "K" Copper	6. 20" Dia. Polymer Lid: See C.16
3. 1" or 2" Brass Ball Valve	7. 1" or 2" Adapter Coupling
4. 1" or 2" NPT Combination Air & Vacuum Unit Valve & Pressure Unit: Crespin 201C or 202C with Protect-top	8. 1" or 2" Threaded Brass Pipe
	9. 12"X12"X4" Concrete Block

Location: Where water main is installed in road, the air-vacuum valve installation shall be located on the pavement and out of bar ditch, but within right-of-way or easement.



Santa Fe County Water Utilities
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D. DESIGN STANDARDS: PUBLIC UTILITIES WATER AND WASTEWATER



Construction Notes

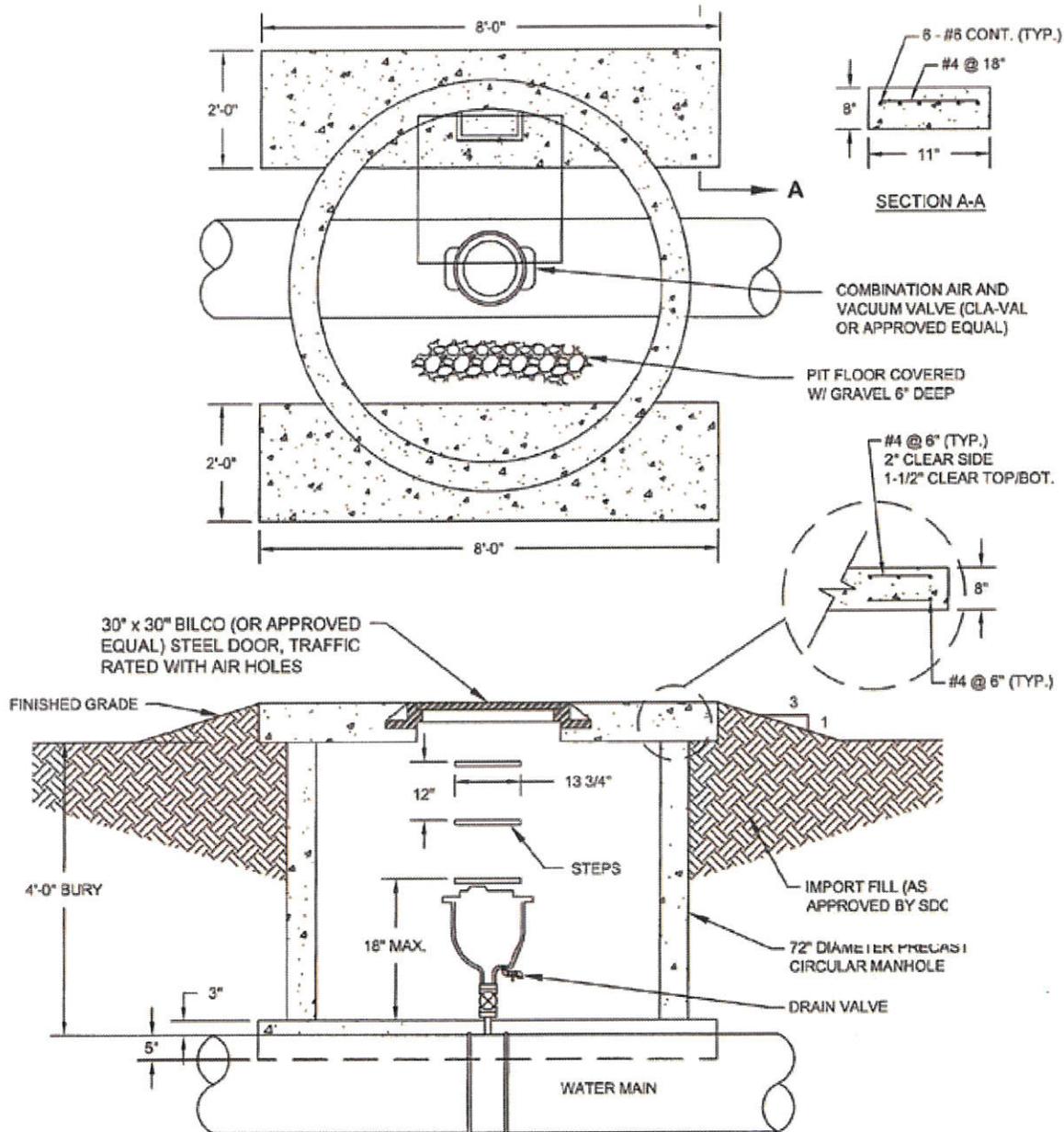
1. Contractor shall use 12"wx12"Lx6"H concrete block & pipe jack style support bolted into concrete w/lag bolts. Two (2) supports shall be installed for main line & two (2) supports shall be installed for bypass.
2. Contractor shall locate meter vault behind curb & cutter in area that is not subject to vehicular traffic.
3. Contractor shall slope grade away from the vault.
4. Contractor shall install compression fitting for 2" bypass piping.
5. Contractor shall install four (4) all threads at meter location to maintain meter opening and piping alignment.

4" Domestic Service Detail

Item	Item
1. 4" Flg x PE Connection Piece	8. 2" Type "K" Ridge Copper & Fittings
2. 4" Flg x Gate Valve with Handwheel	9. 2" Prefabricated Meter Setter w/ 2" Ball Valves (Per SFC Utilities Detail)
3. 4" Compound Meter (Furnished & Installed by SFC Utilities)	10. 4'x8' prefabricated vault w/concrete foundation (per SFC Utilities detail)
4. 4" Meter Strainer (Furnished & Installed by SFC Utilities)	11. Solid Sleeve Connection between Ductile Iron Pipe and Existing Pipe.
5. 4" Flg Coupling Adapter	12. Pipe Support
6. 4" Flg x PE Connection Piece	
7. 4" x 2" Service Saddle with 2" Corp. Stop Style Ball Valve	



**D. DESIGN STANDARDS:
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NOTE:

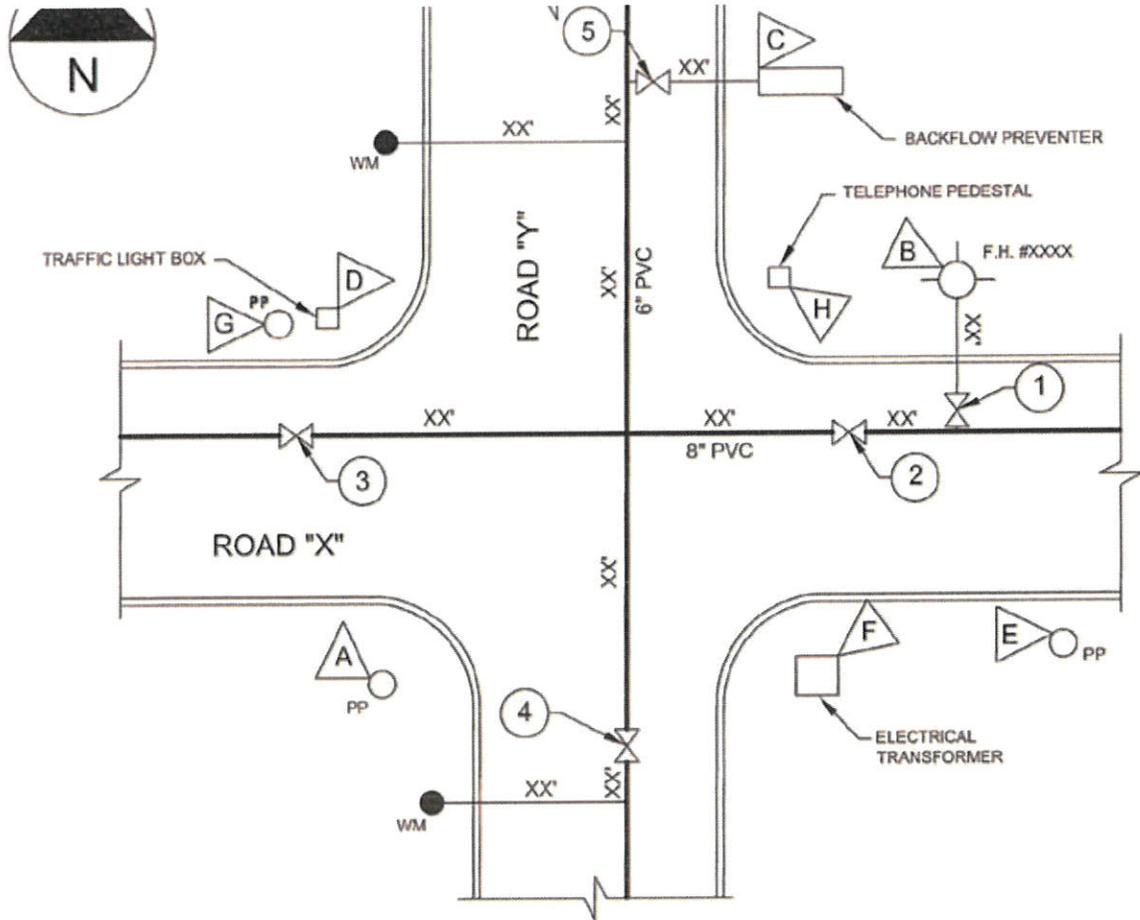
1. 3" (MODEL 363CAV332FT, CL125 FLANGE), 4" (MODEL MTP364/34.116.3, CL250 FLANGE/MODEL MTP364/34.332, CL125 FLANGE) & 6" (MODEL MTP366/34.116.3, CL250 FLANGE/MODEL MTP366/34.332, CL125 FLANGE) AIR & VACUUM VALVES SHALL BE MANUFACTURED BY CLA-VAL (OR APPROVED EQUAL).

3" and Larger Air-Vacuum Valve Vault Detail



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D. DESIGN STANDARDS: PUBLIC UTILITIES WATER AND WASTEWATER



FROM POINT	TO VALVE				
	①	②	③	④	⑤
▲			XXXX"	XXXX"	
▲	XXXX"	XXXX"			
▲			XXXX"		XXXX"
▲	XXXX"	XXXX"			
▲	XXXX"	XXXX"		XXXX"	
▲			XXXX"		
▲			XXXX"	XXXX"	XXXX"

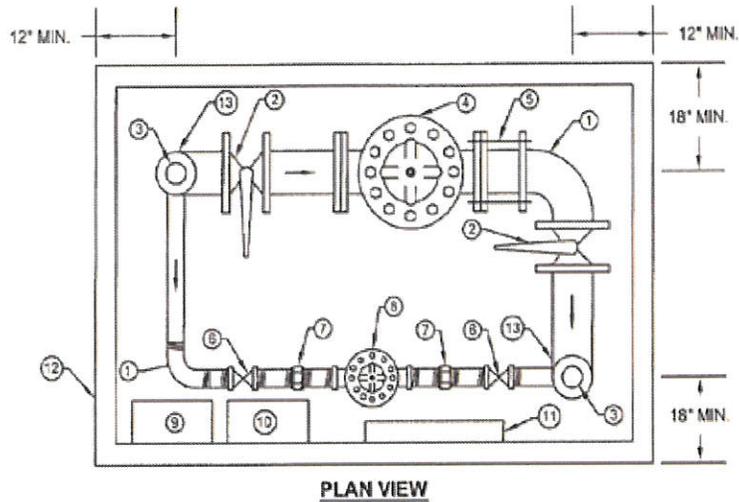
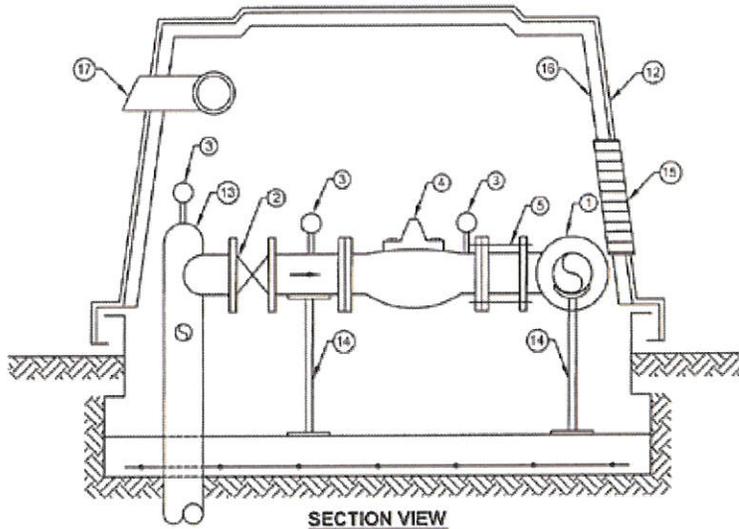
\downarrow 1/4"
 \downarrow 12"

Valve Referencing Notes:

1. All valves shall be referenced during construction with 3 swing ties from suitable reference points and the ties recorded on the construction drawing.
2. All reference points shall be easily field identified and shall consist of: Permanent Land marks (IE. Fire hydrants, power poles, electronic transformers, telephone pedestals, Etc.) that will box be relocated or removed during construction.
3. All fire hydrant valves shall be referenced with a dimension from the center of the hydrant to the valve box and shall have a minimum of one (1) swing tie from a separate reference point.



D. DESIGN STANDARDS: PUBLIC UTILITIES WATER AND WASTEWATER



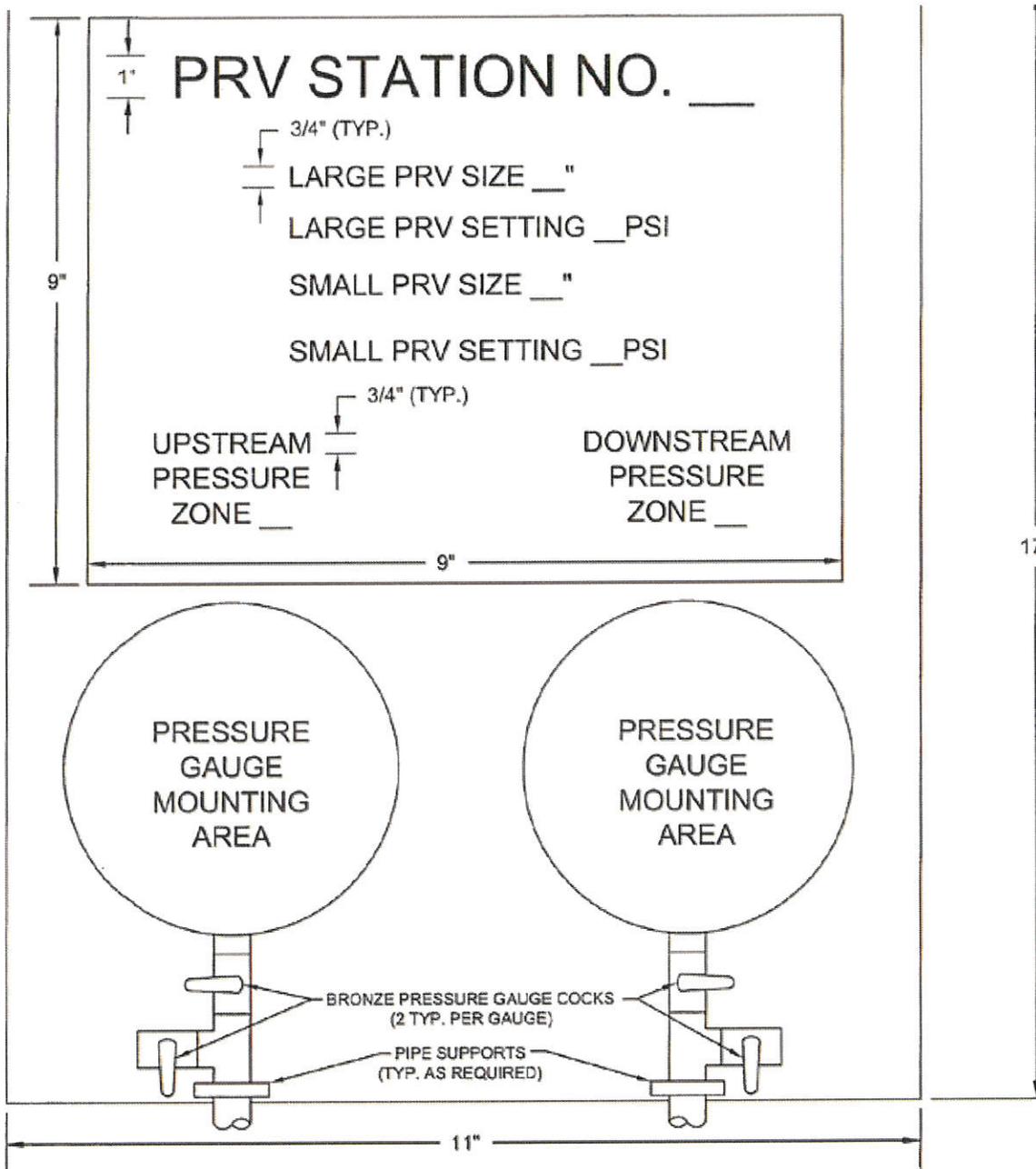
- Notes:**
1. Pressure gauges shall be 4" oil filled gauges & counted on pressure gauge mounting panel (see Detail)
 2. Pressure reducing valves shall be Clv-Val (model 90-01AN) or approved equal.
 3. Pressure reducing valve vaults shall be above grade vaults as manufactured by Engineer Fluid Inc. Canaris, or approved equal.
 4. Sacrificial anode is required for cathodic protection on prefabricated enclosure base.
 5. Enclosure shall be painted per manufacturer recommendation with color approved by SFC Utilities.
 6. Concrete slab shall be 6-inch thick with #5 rebar at 12" O.C. for reinforcement.

Private Pressure Reducing Valve Detail	
<p>Item</p> <ol style="list-style-type: none"> 1. 90" Elbow 2. Butterfly Valve 3. Pressure Gauge 4. Pressure Reducing Valve (Sized for high demand flow rates) 5. Flange coupling adapter 6. Ball valve 7. Union 8. Pressure reducing valve (sized for low demand flow rates) 	<p>Item</p> <ol style="list-style-type: none"> 9. Heater Unit 10. Power panel w/two (2) GFI Outlets 11. Pressure Gauge Mounting Panel 12. Prefabricated Enclosure 13. Welding Tee Riser 14. Pipe Support 15. Air Vent 16. Foam Insulation 17. Exhaust Fan 18. Concrete Slab



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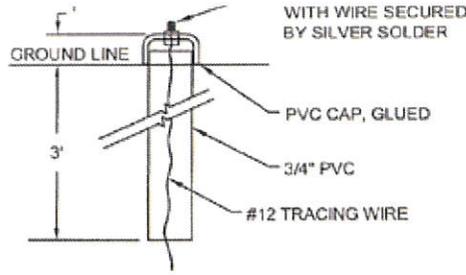
**D. DESIGN STANDARDS:
PUBLIC UTILITIES WATER AND WASTEWATER**



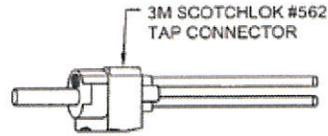
- Notes:**
1. Pressure gauge mounting plate shall be constructed of 3/8" aluminum
 2. Mounting plate shall be mounted to wall using 13/16" depth x 13/16" wide unistrut and four (4) 3/8" dia. X 2-1/2" long SS lag bolts with lag shield for concrete.
 3. Label plate shall be stainless steel acid etched and color filled.



D. DESIGN STANDARDS: PUBLIC UTILITIES WATER AND WASTEWATER

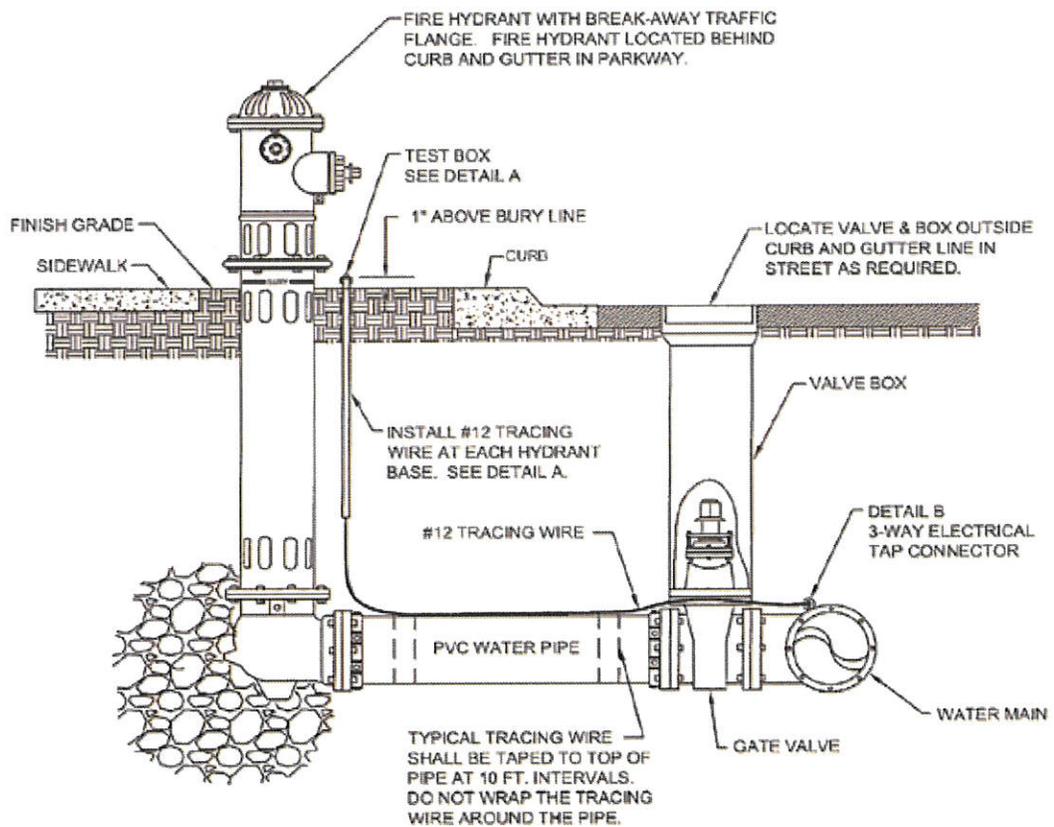


**DETAIL A
TEST BOX**



NOTE: WRAP CONNECTOR AND WIRE ENDS WITH GENERAL PURPOSE TAPE SEALANT TO MAKE THE CONNECTION MOISTURE PROOF (NOT SHOWN).

**DETAIL B
ELECTRICAL TAP CONNECTOR**



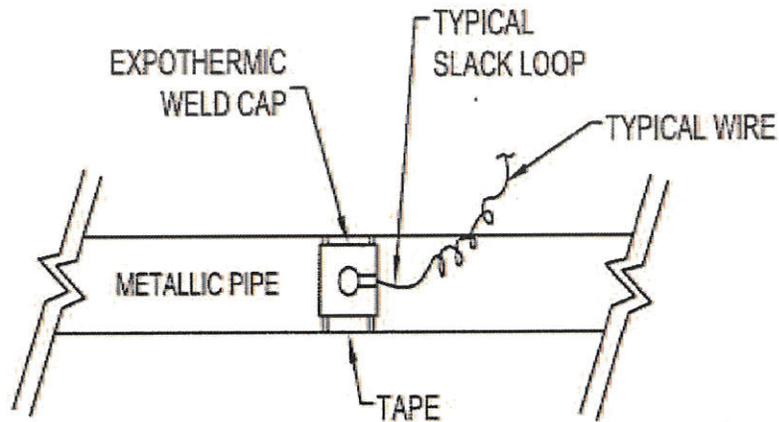
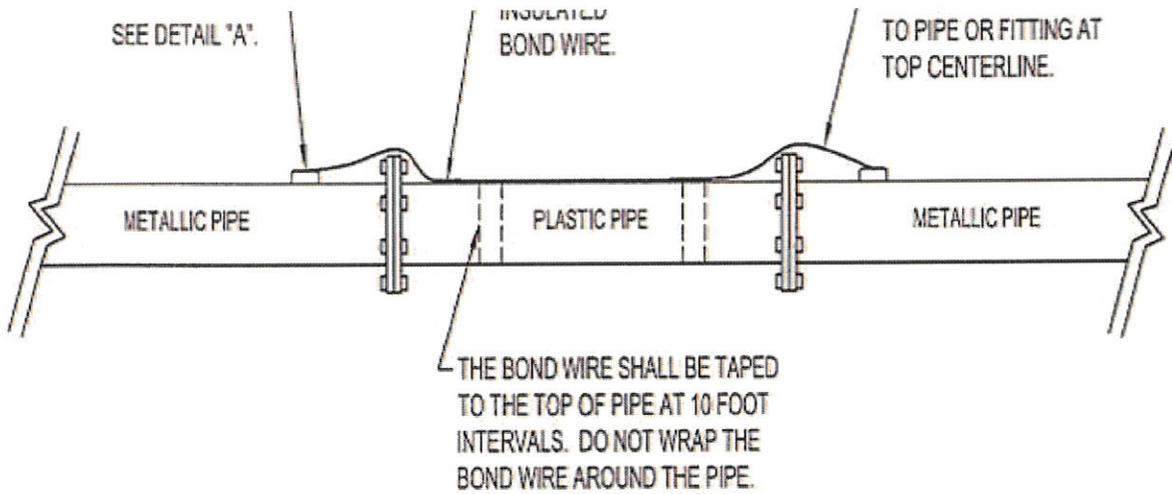
TRACING WIRE DESIGN AND DETAILS COURTESY
F. PEAK POWER ENGINEERING, INC.
109 AGUA FRIA, SANTA FE, NM 87501

Tracing Wire Detail



Santa Fe County Water Utilities
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**D. DESIGN STANDARDS:
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Bonding Jumper Detail



D. DESIGN STANDARDS: PUBLIC UTILITIES WATER AND WASTEWATER

SYMBOL		DATE	BY	REVISION	PROJECT NAME
					SANTA FE COUNTY WASTEWATER TREATMENT PLANT #224150, SAN JUAN, NM 87509
					PROJECT NO. 224150
					GENERAL CONTRACTOR
					DATE: 11/15/2011
					SCALE: AS SHOWN

REVISION	DATE	BY	REVISION
1	11/15/2011	WJ	ISSUED FOR PERMIT
2	11/15/2011	WJ	ISSUED FOR PERMIT
3	11/15/2011	WJ	ISSUED FOR PERMIT
4	11/15/2011	WJ	ISSUED FOR PERMIT
5	11/15/2011	WJ	ISSUED FOR PERMIT
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15	11/15/2011	WJ	ISSUED FOR PERMIT
16	11/15/2011	WJ	ISSUED FOR PERMIT
17	11/15/2011	WJ	ISSUED FOR PERMIT
18	11/15/2011	WJ	ISSUED FOR PERMIT
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100	11/15/2011	WJ	ISSUED FOR PERMIT

**D. DESIGN STANDARDS:
PUBLIC UTILITIES WATER AND WASTEWATER**

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EXHIBIT B

COUNTY OF SANTA FE

SANITARY SEWER DESIGN CRITERIA

EXHIBIT B

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INTRODUCTION

This document presents the criteria, standards and regulations related to the design of public sanitary sewer systems for general development service. It does not cover the criteria necessary for design of major interceptor sewers, or treatment facilities. The material is directed to the competent design professional and is not intended to be a detailed design handbook. Criteria and standards presented are those determined to be the minimum acceptable values necessary to result in system designs having satisfactory functional characteristics, durability and operational suitability. It is expected that the designer will strive for the best design to suit the circumstances involved, and that designs will reflect sound professional judgement at all times.

Section 1. GOVERNING REGULATIONS

Ordinances and policies related to the design and operation of sanitary sewer systems include the following:

A. **LAND DEVELOPMENT ORDINANCES**

These ordinances primarily require that sewer service be available to proposed developments before issuance of building permits. There are no specific design criteria included in these ordinances.

Section 2. ENGINEERING DESIGN CRITERIA FOR GRAVITY SEWER LINES

Unless otherwise authorized by the County's Utilities Department, for a specific project, specifications for pipe and other construction materials will be as required in the current edition of New Mexico Standard Specifications for Public Works Construction (NMSSPWC).

A. **DESIGN CAPACITY CRITERIA**

- (1) Off-site flows shall be determined by the County Utilities Department.
- (2) In areas with a mix of residential, commercial, industrial, etc., roughly representative of the county as a whole, the population of the contributing area shall be determined and the design flows calculated as follows:

$$Q^a - \text{Average Flow} = 80 * \text{Population} / 10^6, \text{ in MGD}$$

$$Q^p - \text{Peak Flow} = 2.5 * Q^a, \text{ in MGD}$$

$$Q^d - \text{Design Flow} = 1.2 * Q^p \text{ in MGD (for cfs multiply MGD by 1.547)}$$

- (3). Population loadings are assumed to be:

**D. DESIGN STANDARDS:
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2.5 persons for apartments, townhouses and mobile homes (DU)

3.3 persons for R-1 single-family homes (DU)

Where DU – Dwelling Unit

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(4). In primarily non-residential areas, design flows may be determined by other methods as may be appropriate, upon approval by the Department.

(5). Design shall be for full pipe flow at the design discharge.

(6). Manning's Formula shall be used for determination of pipe flow velocities and capacities using a value for Manning's $n = 0.013$, except for PVC & HDPE pipes for which designer shall use 0.009.

(a) Peak Velocity = Velocity at peak flow conditions

(b) Average Velocity = Velocity at average flow conditions

B. MANHOLE CRITERIA

(1) Manholes must generally be located on the centerline of the street right-of-way or the centerline of street width if the street is not concentric with the right-of-way. Manholes in curved streets may be located as much as 10' off from centerline of street or right-of-way; however, required clearances from other utilities must be maintained. The offset of such manholes is to be measured from center of manhole barrel to the centerline of the street or right-of-way.

(2) Standard minimum manhole depth is 6.0', measured from rim to invert.

(3) The required inside measurements or conditions for a manhole are as follows:

(a) Minimum inside diameter is 4 feet.

(b) A minimum 9" wide shelf must be provided on each side of each main line within the manhole.

(c) Where the main flow changes direction at a manhole, the manhole must be large enough so that the centerline radius of curvature of the flow invert will be larger than the pipe diameter.

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**MINIMUM MANHOLE DIAMETERS REQUIRED FOR DIRECTION
CHANGES**

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	<u>Degrees of Direction Change</u>							
Pipe ID	0°	5°	45°	50°	75°	80°	85°	90°
8" to 21"	4'	4'	4'	4'	4'	4'	4'	4'
24"	4'	4'	4'	4'	4'	4'	4'	6'
27"	4'	4'	4'	4'	4'	4'	6'	6'
30"	4'	4'	4'	4'	4'	6'	6'	6'
36"	6'	6'	6'	6'	{--NOT PERMITTED--}			
42"	6'	6'	6'	{--NOT PERMITTED--}				

(4) Changes in horizontal flow direction of more than 90° in a manhole shall not be permitted unless the following conditions are present:

(a) All lines are larger than 36".

(b) Continuous lines with a design flow greater than 3 MGD and a design velocity of 5fps or greater.

(c) Any junction of two flows, each with design flow greater than 3 MGD, where one line has a design pipe velocity of 5 fps or greater.

(5) Invert elevations will be called out for each inlet and outlet at a manhole.

(6) Drops across manholes will be provided as follows:

(a) Where the main flow does not change direction at the manhole, the design will provide:

(i) A slope across the manhole at least equal to the average of the slopes of the incoming and outgoing lines.

(ii) The minimum drop will be ≥ 0.05 feet for lines 42 inches in diameter and smaller.

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(b) Where the main flow changes direction at the manhole, the design will maintain the average of the slopes of the incoming and outgoing lines and compensate for the loss of velocity head caused by the turn.

(i) The slope component will be equal to the average of the slopes of the incoming and outgoing lines times the diameter of the manhole.

(ii) The velocity head component will be determined by the following formula:

$$h_v = K_b (v)^2 / 2g$$

where:

h_v = required drop to compensate for loss of velocity head (feet).

K_b = bend coefficient, use 0.4 for 90° turn, 0.32 for 45° turn and linear proportioning for other deflection angles (dimensions).

v = design velocity of incoming line based on design flow, ft/sec.

g = 32 ft/sec².

(iii) The total drop required through the manhole will be the sum of the slope component and velocity head component.

(c) Where flows converge at a manhole, the inverts should be designed to produce a smooth water surface at design flow with no backwater conditions in any of the incoming lines or in the manhole. Excessive drops which cause turbulence are to be avoided.

(d) The use of drop connections to manholes (drop manholes) will require CUD approval and shall conform to Sanitary Sewer Construction Details, Sheet 1. Drop manholes are required when inflows to outflows elevations will be greater than 1.5 feet.

7. The maximum distance between manholes allowed is:

- (a) 8"-21" mains – 450'
- (b) 24" & larger – 500' for average velocities 3 fps or less
- (c) 24" & larger – 800' maximum, for average velocities greater than 3 fps.

C. LINE CRITERIA

(1) Sanitary sewer materials must comply with the requirements set forth in the Specifications shown on the Sanitary Sewer Construction Details, Sheet 1.

**D. DESIGN STANDARDS:
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(2) Minimum line size allowed: 8" inside diameter.

(3) Following are minimum slopes considered necessary in noncurvilinear lines to provide minimum allowable velocities. **GREATER SLOPES THAN MINIMUM ARE DESIRABLE AND ARE TO BE PROVIDED WHERE POSSIBLE.** Maximum slopes should never result in super critical flow.

SEWER LD.	MINIMUM SLOPE (ft/ft)
8"	0.0060*
10"	0.0028
12"	0.0022
15"	0.0015
18"	0.0012
21"	0.0010
24"	0.0008
27"	0.00068
30"	0.00060
36"	0.00048

* A minimum slope of 0.0040 ft/ft is acceptable for an 8" line if the design loading is at least 200 R-1 DU's or 275 R-T, R-2 or mobile home dwelling units. This slope is also acceptable when the line material is PVC.

(4) Sections of line that are flat relative to the upstream line shall be avoided. As much as possible, continuous flow velocity and capacity will be provided. The energy gradient should slope generally parallel to the slope of the invert with no abrupt changes nor slopes opposite to the direction of flow.

(5) Line depth should be sufficient to provide gravity service to property contiguous to the line. Generally, house services shall be a minimum of 5' below the top of curb at the property line as measured from the top of curb to the invert of the service line.

(6) The main lines are to be located within public right-of-way except as noted in sub-section 7, which follows, and are to be aligned in accordance with the Primary

D. DESIGN STANDARDS: PUBLIC UTILITIES WATER AND WASTEWATER

Utility Locations. Where the Primary Utility Locations do not apply, the following criteria shall apply:

(a) The New Mexico Environmental Department policy on the proximity of water and sewer lines: 15 771 48

Whenever possible, it is desirable to lay parallel water and sewer lines at least 10 feet apart horizontally, and the water line should be at a higher elevation than the sewer. If this not possible, separate trenches will be required in all cases (this shall be effective even though one line has been installed prior to the other), and the water line shall be at least 2 feet above the sewer. When water and sewer lines cross each other, the water line shall be at least 2 feet above the sewer; otherwise the sewer shall be of ductile iron pipe." A preferred alternative is encasement in concrete as shown in the Sanitary Sewer Construction Details, Sheet 1 for ten (10) foot on each side of the water line. If ductile iron pipe is used it must be run from manhole to manhole.

(b) Main lines must be located so that they can be maintained without disturbing any sidewalk, curb, gutter or any other utility. The required trench must be totally within the paved roadway.

(c) Written approval of the Department must be obtained for any deviations from the primary utility locations.

(7) Sanitary sewer lines may be located outside public right-of-way only under the following conditions:

(a) Prior written approval is given by the SFCUD director or his/her designee.

(b) The main line must be located as follows:

(i) In a paved, permanent access utility easement, or

(ii) In a utility easement within a planned green/open space with access from a street suitable for sewer line maintenance equipment.

(iii) If (1) and/or (2) above are impossible due to prior plating, the situation will be handled as a special case to be approved by the SFCUD.

(c) In a permanent utility easement granted for exclusive use of water and sanitary sewer. It must be possible to excavate any buried sanitary sewer with 1:1 side slopes from the bottom of the pipe, without disturbing any sidewalk, curb and gutter, or any other utility. The required trench must be contained within the paved roadway and/or the exclusive easement. A minimum width easement of 20' is required for lines up to 10 feet deep. Lines

**D. DESIGN STANDARDS:
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deeper than 10 feet shall be provided with easements of a width in accordance to the following schedule:

DEPTH (H)	EASEMENT WIDTH (FT)	
10-15	25	
16-20	35	1577149
>20	100	

(d) Compliance with the New Mexico Environment Department policy on the proximity of water and sewer lines must be achieved.

(e) In private streets or rights-of-way, Primary Utility Locations shall apply.

D. CURVILINEAR SEWERS

Curvilinear sewers are permitted in accordance with the following criteria:

(1) The pipe length to be used, deflection angle, and radius of curvature must be stated on the plans.

(2) The maximum design deflection angle shall be 2/3 of pipe manufacturer's recommended maximum.

(3) The minimum radius of curvature is 300' based on 5.5 foot pipe lengths. If shorter lengths are available, small radii as appropriate shall be considered.

(4) The maximum distance between manholes shall be 400'.

(5) The slope of the curvilinear of the sewer must be at least 5% greater than the upstream slope straight line sewer. Additionally, the minimum slope criteria for curvilinear sewers is shown below.

SEWER I.D.	SLOPE
8"	0.0066
10"	0.0030
12"	0.0024
15"	0.0018

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(6) Generally, concrete encasement according to the Sanitary Sewer Construction Details, Sheet 1 is recommended where necessary due to proximity of water lines. If ductile iron pipe is utilized in lieu of concrete encasement, it shall run from manhole to manhole.

(7) Gravity Sewer – Minimum radius for Curvature for PVC SDR-35 pipe.

<u>Pipe Diameter</u>	<u>Laying Length</u>	<u>Min. Radius of Curvature</u>	<u>Max. Offset per Length</u>
8"	13'-0"	300 ft.	3"
8"	20'-0"	300 ft.	8"
10"	13'-0"	375 ft.	2 ½"
10"	20'-0"	375 ft.	6 ½"
12"	13'-0"	450 ft.	2"
12"	20'-0"	450 ft.	6"

Diameters greater than 12", shall be designed as approved by SFCUD.

E. SERVICE CONNECTIONS (Private collection systems and individual service connections).

(1) A minimum four inch (4") service connection must be made to the main line except at the end of cul-de-sacs where connection to a manhole shall be permitted in the manner shown in the Sanitary Sewer Construction Details, Sheet 1.

(2) Six inch (6") service connections shall be permitted only where a 6" tee in the main exists.

(3) Four inch (4") and six inch (6") mechanical taps are permitted to tappable 10" main lines. Mechanical or Manufacturer's taps are required where tees are not available in existing lines. Mechanical and Manufacturer's taps shall conform to the Sanitary Sewer Construction Details.

(4) Six inch (6") service connections to 8" mains and all service connections 8" and larger shall be made by means of a manhole when there are no existing tees of the required size in the main. Insertion of a factory made tee will be permitted, if practical, for purposes of connecting 4" and 6" services to an existing 8" main. Approved coupling devices

**D. DESIGN STANDARDS:
PUBLIC UTILITIES WATER AND WASTEWATER**

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shall be required. Service connections to a manhole are to be made with the invert of the service at the elevation of the top of the main line. No inside-manhole piping shall be permitted.

(5) Service connection shall not be made to sewer interceptors (lines 12 inches in diameter or larger) or lines with peak flows greater than 3 MGD, regardless of size.

(6) All service connections shall be made such that the service is perpendicular or radial to the sewer main.

(7) All service connections shall have a minimum slope of 1/4" per foot toward the main within the public right-of-way. Lesser slopes may be permitted with prior approval of SFCUD, provided engineered drawings are submitted.

F. Television Inspection of Constructed Sewers

All sewer lines constructed for the SFCUD shall be television inspected. The sewerline inspection shall be on a videocassette recorder (VCR) and the tape(s) furnished to the SFCUD prior to acceptance by the County.

Section 3 ENGINEERING DESIGN STANDARDS FOR PRESSURE SEWERS

A. GENERAL CONDITIONS

(1) Systems referred to in these design standards entail high and low pressure sewer installations to serve public or privately financed developments. All pipes, fittings, pumps, pump controls, and other appurtenant components of pressure sanitary sewers shall be designed by a professional engineer registered in New Mexico, with experience in the design of pressure sanitary sewer systems.

(2) Pipe design, installation and testing shall be made in accordance with AWWA Standards applicable to water lines, applicable provisions of the Santa Fe County Code, and the New Mexico Standard Specifications for Public Works Construction

(3) Pressure sewer systems may only be used when, in the opinion of the SFCUD staff, topographic or other conditions may not allow for the operation of conventional gravity flow sewers, or when installation of such sewers may disturb existing drainage ways and/or would increase the erosion potential in existing arroyos.

(4) Prior to its design, the concept of using a pressure system must be accepted in writing by the SFCUD engineer in the form of a sanitary sewer availability statement. For the SFCUD to make a determination, the proponent of a pressure sewer shall submit the relevant information regarding the site's topography.

(5) Design documents shall include all relevant system information as required the SFCUD for its review.

**D. DESIGN STANDARDS:
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B. HIGH PRESSURE SEWERS

(1) These systems generally include a lift stations(s), a pressurized discharge line (forcemain), an emergency power supply source, and all appurtenant controls and instrumentation, installed for sanitary sewage to be discharged into a gravity flow segment of the county's system.

(2) The design of lift stations, forcemains, and controls shall follow the guidelines presented in the manual of Practice (MOP) No. FD-4, Facilities Development, of the Water Environment Federation.

(3) Complete construction documents for this type of facility, shall include a design memorandum, specifications, and drawings for pumps, piping, instrumentation, alarms and telemetry. All parts shall be, in the opinion of the SFCUD, fully compatible with the county's existing system.

C. LOW PRESSURE SEWERS

(1) Low pressure sewers may constitute a very viable alternative to gravity flow collection lines. These systems will generally include individual on-site grinder pump stations discharging a finely ground slurry into small diameter, low pressure (60 psig or less) mains located within appropriate public utility easements or rights of way. Under certain conditions, it may also be desirable to use grinder pump stations which discharge into gravity flow sewer lines.

(2) Complete construction documents shall include the design memorandum, specifications and drawings for the entire system or network, from the grinder pump to the ultimate point of discharge into the gravity sewer. All parts shall be, in the opinion of the SFCUD, compatible with the county's existing system.

(3) Pump stations shall be designed as a package, complete with wet well, and appurtenant instrumentation and controls, fully compatible with the county's existing systems. Each station shall service no more than one individual legal lot.

(4) Individual grinder pump stations for residential service shall be designed to perform their grinding and pumping functions using no more than one (1) horsepower. The electric power for the installation shall be derived from the same source that serves the building and not a separate one. A grinding pump station shall serve no more than one residential lot.

(5) Placement of the grinder pump station shall be outdoors, in location of easy access for maintenance personnel. Wet well shall be provided with integral accessways.

(6) Low pressure collection system shall be designed as branched networks without loops, and as few as possible abrupt directional changes.

**D. DESIGN STANDARDS:
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(7) Pipes and appurtenant fittings shall be designed to be installed and tested in accordance with AWWA Standards applicable to water systems.

(8) Design shall protect the county system from potential odor problems associated with low pressure sewer discharge.

D. EQUIPMENT MANUFACTURER LIST

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(1) The county shall maintain an up-to-date list of pre-qualified manufacturers for lift and grinder pump stations, as well as electrical and instrumentation equipment.

(2) This list shall be updated not less often than once every two years. Proposed revisions to the list shall be submitted by a professional engineer for review by the SFCUD. Proposals shall include the rationale for the recommended revision(s).

D. DESIGN STANDARDS: PUBLIC UTILITIES WATER AND WASTEWATER

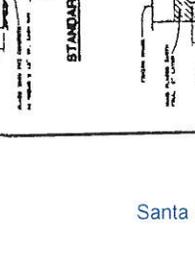
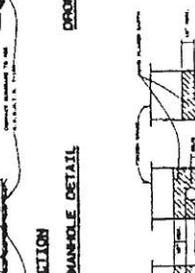
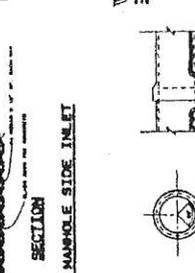
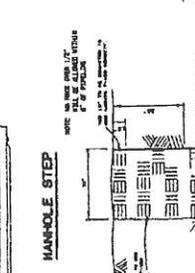
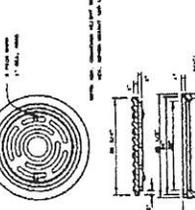
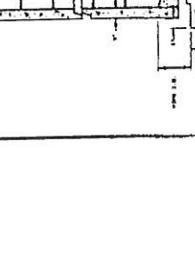
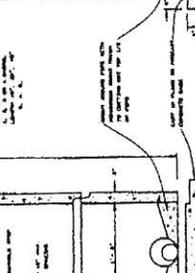
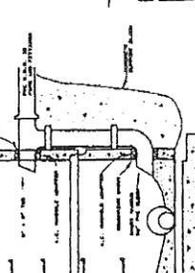
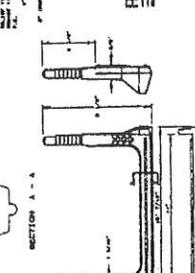
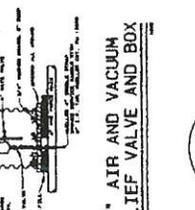
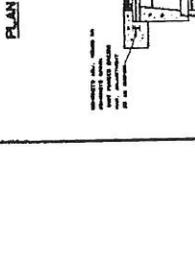
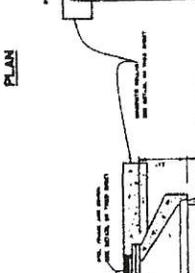
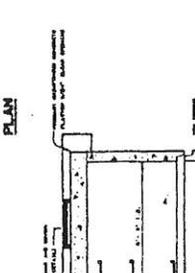
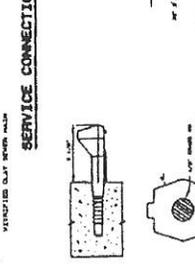
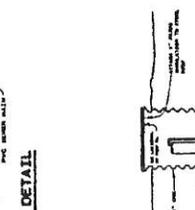
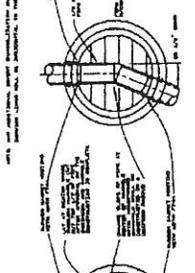
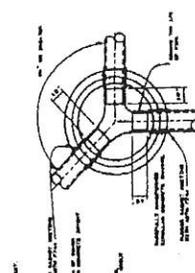
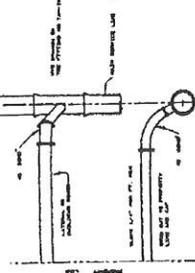
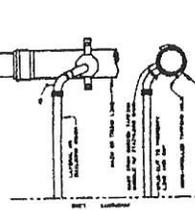
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- CONSTRUCTION NOTES**
1. ALL WORK SHALL BE IN ACCORDANCE WITH THE SANTA FE COUNTY SPECIFICATIONS FOR PUBLIC UTILITIES CONSTRUCTION EXCEPT TO THE EXTENT SHOWN OTHERWISE.
 2. ALL MATERIALS SHALL BE OF THE BEST QUALITY AVAILABLE AND SHALL BE SUBJECT TO INSPECTION AND TESTING BY THE COUNTY ENGINEER.
 3. ALL WORK SHALL BE COMPLETED WITHIN THE SPECIFIED TIME FRAME.
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- INSTALLATION**
1. THE MANHOLE SHALL BE INSTALLED IN ACCORDANCE WITH THE SANTA FE COUNTY SPECIFICATIONS FOR PUBLIC UTILITIES CONSTRUCTION.
 2. THE MANHOLE SHALL BE INSTALLED IN ACCORDANCE WITH THE SANTA FE COUNTY SPECIFICATIONS FOR PUBLIC UTILITIES CONSTRUCTION.
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 10. THE MANHOLE SHALL BE INSTALLED IN ACCORDANCE WITH THE SANTA FE COUNTY SPECIFICATIONS FOR PUBLIC UTILITIES CONSTRUCTION.

- MAINTENANCE**
1. THE MANHOLE SHALL BE MAINTAINED IN ACCORDANCE WITH THE SANTA FE COUNTY SPECIFICATIONS FOR PUBLIC UTILITIES CONSTRUCTION.
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- QUALITY CONTROL**
1. THE MANHOLE SHALL BE INSPECTED AND APPROVED BY THE COUNTY ENGINEER BEFORE CONSTRUCTION BEGINS.
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Santa Fe County Utilities Department		SANTA FE, NEW MEXICO	
SANITARY SEWER		CONSTRUCTION DETAILS	
DATE	SCALE	BY	CHECKED