

San Antonio Water System Standard Specifications for Construction

**ITEM NO. 804
EXCAVATION, TRENCHING AND BACKFILL**

804.1 DESCRIPTION: This section shall govern the excavation, trenching, and backfilling for water, sanitary sewer, and recycled water construction, unless otherwise noted in the contract documents. The work shall include all necessary drainage, dewatering, pumping, bailing, sheeting, shoring and incidental construction.

804.2 REFERENCE STANDARDS: Reference standards cited in this Specification Item No. 804 refer to the current reference standard published at the time of the latest revision date of this Specification Item No. 804, unless a date is specifically cited.

1. San Antonio Water System (SAWS):
 - a. Specifications for Water and Sanitary Sewer Construction
 - b. SAWS Materials Specifications
2. City Of San Antonio (COSA) Standard Specifications for Construction
3. Texas Commission of Environmental Quality (TCEQ)
 - a. Chapter 217 Design Criteria for Domestic Wastewater Systems
 - b. Chapter 290; Subchapter D – Rules and Regulations for Public Drinking Water
4. American Society for Testing and Materials (ASTM) International:
 - a. ASTM C 12 - Standard Practice for Installing Vitrified Clay Pipe Lines.
 - b. ASTM C76- Standard Specification for Reinforced Concrete Culverts, Storm Drain, and Sewer Pipe.
 - c. ASTM D 1556 - Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method.
 - d. ASTM D 2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications.
 - e. ASTM D 2487 - Standard Classification of Soils for Engineering Purposes.
 - f. ASTM D 6938 - Test Method for in place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
 - g. ASTM D 4318 - Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
 - h. ASTM D 558 - Standard Test Methods for Moisture-Density Relations of Soil Cement Mixtures.
 - i. ASTM D 698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600kN-m/m³)).
5. American Association of State Highway and Transportation Officials (AASHTO)
 - a. AASHTO M306: Standard Specification for Drainage, Sewer, Utility, and Related Castings.
6. Occupational Safety and Health Administration (OSHA).
 - a. Federal Regulations, 29 CFR, Part 1926, Standards – Safety and

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- 7. Health Regulations for Construction – Subpart P Excavation, International Organization of Standardization (ISO)
 - a. ISO9001 Standards
- 8. Texas Department of Transportation (TxDOT)
 - a. TxDOT Tex-101-E - Preparing Soil and Flexible Base Materials for Testing.
 - b. TxDOT Tex-110-E - Particle Size Analysis of Soils.
 - c. TxDOT Tex-112-E – Test Procedure for admixing Lime to Reduce Plasticity Index of Soils
 - d. TxDOT Tex-113-E - Laboratory Compaction Characteristics and Moisture-Density Relationship of Base Materials
 - e. TxDOT Tex-114 -E- Laboratory Compaction Characteristics and Moisture-Density Relationship of Subgrade, Embankment Soils, and Backfill Material
 - f. TxDOT Tex-142- E –Laboratory Classification of Soils for Engineering Purposes

804.3 SUBMITTALS: All submittals shall be in accordance with Owner’s requirements. All submittals shall be approved by the Owners’ Representative prior to delivery of materials and commencing any portion of the proposed scope of work.

- 1. Contractor to submit cut sheets when applicable.
 - a. No trenching will commence until cut sheets have been approved by SAWS’ Representative.
 - b. The depths of cuts indicated on the cut sheet, are from the center line hub elevation to the invert of the pipe.
- 2. Submit detailed trench plans, shoring system designs, special shoring designs, installation sequences, and flowable fill mix designs.
- 3. Submit planned typical method of excavation, backfill placement and compaction including:
 - a. Trench widths
 - b. Procedures for foundation and pipe zone bedding placement, and trench backfill compaction
 - c. Procedures for assuring compaction against undisturbed soil when pre-manufactured trench safety systems are proposed.
 - d. An excavation plan submittal signed and sealed by a Texas licensed professional engineer shall be submitted for review and acceptance by the SAWS’ Representative, if applicable, prior to the delivery of materials and commencing any portion of proposed construction activities where the planned excavation is 20 feet or greater.
- 4. Special Shoring Submittal shall include:
 - a. Submittal shall identify any atypical shoring requirements.
 - b. Submittal shall identify actual locations and requirements where special shoring will be used.
 - c. Submittal shall also identify special shoring requirements and locations based on design plans.
 - d. Trench widths

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- e. Procedures for foundation and pipe zone bedding placement, and trench backfill compaction
 - f. Procedures for assuring compaction against undisturbed soil.
 - g. An excavation plan submittal signed and sealed by a Texas licensed professional engineer shall be submitted for review and acceptance by SAWS' Representative prior to the delivery of materials and commencing any portion of proposed construction activities.
5. Submit trench excavation safety program in accordance with requirements of Specification Item No. 550 Trench Excavation Safety Protection
 6. Submit Temporary Special Shoring in accordance with requirements of COSA Standard Specification Items 551
 - a. Trench Safety System shall include designs for special shoring.
 7. Submit record of location of utilities as installed, referenced to survey control points. Include:
 - a. Locations of utilities encountered or rerouted.
 - b. Give stations, horizontal dimensions, elevations, inverts, and gradients.
 8. Submit detailed drawing with plotted utility or obstruction location to SAWS' Representative.
 9. Submit Emergency Action Plan (EAP) to address contingency plans in the event of damage to utilities. Include the following:
 - a. Contact personnel and agencies including primary and secondary telephone, numbers,
 - b. Contractor's hierarchy of responsible personnel,
 - c. Traffic control measures, and
 - d. Identification of resources to be available on or near project site in event of damage to utilities.
 10. Submit backfill material sources and product quality information in accordance with requirements of this specification.

804.4 MATERIALS: The Contractor shall procure, store, and place materials from either onsite or offsite sources which comply with the specified requirements.

1. The use of sand backfill is not allowed, unless sand is native soil to trenchline, is clean, and is approved by SAWS' Engineer. Filter fabric maybe required with sand.
2. Backfilling for pipelines is divided into three (3) separate zones:
 - a. Bedding: the material in the trench bottom in direct contact with the bottom of the pipe;
 - b. Initial backfill: is defined as backfill having a thickness in its compacted state from the surface of the bedding to a point 1 foot above the top of the pipe.
 - c. Secondary backfill: the backfill zone extending from the initial backfill surface to the top of the trench.
 - d. Materials and placement for each of the zones shall be as described herein
3. Trench Bottom Materials:
 - a. Stable Material: Existing stable material present during excavation includes:

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- (1) Trench bottom (free of water, muck, debris);
 - (2) Rock in boulder, ledge or coarse gravel (particle size not larger than 1- ¾ inch) formations;
 - (3) Coarse sand and gravels with maximum particle size of 1- ¾ inch, various graded sands and gravels containing small percentages of fines, generally granular and non-cohesive either wet or dry; and
 - (4) Fine sands and clayey gravels; fine sand, sand-clay mixtures, clay and gravel-clay mixtures.
- b. Unstable Material: Existing unstable materials are silt, muck, trash or debris in the trench bottom bearing level; rock on boulder ledge or coarse gravel (particle size larger than 1- ¾ inch) formations.
4. See Table 1 for an outline of the bedding and initial backfill requirements for various pipe materials.

**TABLE 1
BEDDING AND INITIAL BACKFILL REQUIREMENTS**

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

NOTE: The use of sand backfill is not allowed, unless sand is native soil to trenchline,

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is clean, and is approved by SAWS' Engineer. Filter fabric maybe required with sand.

- CSC = Concrete Steel Cylinder
- DI = Ductile Iron
- HDPE = High Density Polyethylene Pipe.
- PVC = Polyvinyl Chloride
- WSP = Tape Wrapped Steel Pipe.
- D = Outside Diameter of Pipe

- 5. Sanitary Sewer Backfill:
 - a. Bedding Material:
 - (1) The existing material at the bearing level shall be removed and replaced to a minimum depth of 6 inches or 1/8 of the outside diameter of the pipe, whichever is greater, with bedding material.
 - (2) The bedding material shall extend up the sides of the pipe sufficient to embed the lower quadrant of the pipe.
 - (3) The bedding material shall be composed of well-graded, crushed stone or gravel conforming to the requirements of Table 2 unless modified by the Engineer in writing.

Table 2	
Sanitary Sewer Backfill Materials	
Sewer Gravel	Percent
Passing 1- 1/2 inch sieve	100
Passing 1 inch sieve	95 to 100
Passing 1/2 inch sieve	25 to 60
Passing No. 4 sieve	0 to 10
Passing No. 8 sieve	0 to 5

- 6. Potable Water and Recycle Mains Backfill
 - a. Bedding Material:
 - (1) The existing material at the bearing level shall be removed and replaced to a minimum depth of 6 inches or 1/8 of the outside diameter of the pipe, whichever is greater, with bedding material.
 - (2) The bedding and initial backfill materials for concrete steel cylinder pipe (CSC), ductile iron pipe (DI), Wrapped Steel (WS) Pipe, High Density Polyethylene Pipe (HDPE) and Polyvinyl Chloride Pipe (PVC) in all nominal diameters shall be composed or well graded crushed stone or gravel conforming to the requirements of Table 3 unless modified by the Engineer in writing.

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Table 3	
Modified Grade 5 Backfill Materials	
Modified Grade 5	Percent
Passing ½ inch sieve	100
Passing 3/8 inch sieve	95 to 100
Passing No. 4 sieve	20 to 80
Passing No. 10 sieve	0 to 25
Passing No. 20 sieve	0 to 2

- b. Where copper or HDPE services (¾” – 2”) are installed, initial backfill shall be sand conforming to the following requirements:
- (1) Natural sand or sand produced from crushed gravel or crushed rock maximum ¼ inch free from clay and organic material conforming to the requirements of Table 4 unless modified by the Engineer.
 - (2) Larger services utilizing DI pipe or PVC (C-900) pipe shall be backfilled the same as mains and conform to the requirements of Table 3 unless modified by the Engineer in writing.

Table 4	
Sand Backfill- For Services	
Sand No.	Percent
Passing No. 4 Sieve	95
Passing No. 200 sieve	8

804.5 CONSTRUCTION: All existing utilities shall be protected from damage during the excavation and backfilling of trenches and, if damaged, shall be replaced by the Contractor at their own expense.

1. General:
 - a. Unless otherwise shown in the contract documents, **all excavation shall be unclassified and shall include all materials encountered regardless of their nature or the manner in which they are removed, to include but not limited to groundwater, water, rock, stone, sand, concrete, organic material, existing abandoned utility lines whether shown on the plans or not, or any kind of material that is encountered.**
 - b. Trenches shall not be backfilled until constructed structures or appurtenances, as installed, conform to all requirements specified.
 - (1) Failure to comply will require Contractor to re-excavate trench at no expense to SAWS.
 - c. Where pipe is specially coated or sleeve/tape wrapped for protection against corrosion, care shall be taken not to damage the coating or sleeve/tape wrap.
 - (1) Damage to be assessed by Manufacturer and repaired to

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manufacture's recommendation at no expense to SAWS.

- d. Where a trench has been improperly backfilled, or settlement occurs, the identified section shall be excavated to the trench depth and a length 50 feet in both directions of the failed area, then refilled and compacted to the grade and compaction level required.
 - e. Safety Devices: The Contractor shall provide and maintain barricades, flags, road flares, and other safety devices as required by local, state, and federal codes and ordinances and conduct work to create a minimum inconvenience to the public.
 - f. Temporary suspension of work does not relieve Contractors' responsibility of the above requirements.
 - g. Safety and Health Regulations: The Contractor shall at all times conform to all of the latest applicable regulations of 29 CFR Part 1926 Subpart "P" entitled Excavation, of OSHA Safety and Health Regulations for Construction," or most applicable approved equal provisions, and all other applicable state and local rules and regulations.
 - h. Archaeological (Unidentified Archaeological Sites): If the Contractor should encounter a section of an archeological feature, such as a acequia (early Spanish irrigation ditch) or any other archaeological deposits during construction operations, the Contractor must stop excavation immediately and contact the SAWS Engineer and SAWS Inspector, who will call the City Historic Preservation Officer at (210) 207-0035 for an archaeological investigation as per Section 35-432.3 of the City Code, "Unidentified Sites Archaeological."
 - (1) The Contractor cannot begin excavation again without written permission from SAWS.
 - (2) If more than three days are required for investigation (not including holidays and weekends) and the Contractor cannot work on other project scope items, the Contractor will be permitted to negotiate for additional construction time through a Request for Information (RFI).
 - i. The RFI shall be submitted within ten days after date of the first notice, additional standby time will not be considered.
 - (3) If the time required for investigation does not exceed three days for each event, contract duration will not be extended.
2. Excavation: The Contractor shall perform all excavation of every description and of all substances, including rock, encountered to the lines and grades shown in the contract documents or as determined by the Engineer.
- a. During excavation, material suitable for backfilling shall be stockpiled in orderly manner a safe distance from the banks of the trench to avoid overloading and to prevent slides or cave-ins as per 29 CFR Part 1926 Subpart "P" entitled Excavation, of OSHA Safety and Health Regulations for Construction,"
 - b. All excavated materials not required or suitable for backfill shall be

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- removed and properly disposed of by the Contractor or as directed by the Inspector at no additional cost to SAWS.
 - c. Grading shall be done as may be necessary to prevent surface water from flowing into trenches or other excavations, and any water accumulating therein shall be removed by pumping or by other approved methods.
 - d. Sheeting and shoring shall be installed in accordance with all applicable safety requirements for the protection of the work, adjoining property, and for the safety of all personnel.
 - e. Unless otherwise indicated, excavation shall be by open cut, hand, backhoe, hoe-ram, rock saw, or other approved method.
 - f. Short sections of a trench may be tunneled, if the pipe or structure can be safely and properly installed or constructed, and backfill can be properly compacted in such tunnel sections.
 - g. Tunneled section must be authorized by SAWS Engineer prior to start of Construction.
 - h. Where over-excavation occurs and when not as directed by the Engineer or Inspector, the under-cut trench shall be restored to grade at no cost to SAWS by replacement with a material conforming to the requirements of the bedding material or a material approved by the Engineer.
3. Trenching
- a. Trench walls shall be vertical
 - b. Open trenches are limited to 400 ft. open at one time.
 - c. Contractor must compact trench and install an all-weather surface prior to proceeding to next section. Sections are limited to 400 ft. of open trench.
 - d. Projects under 500 ft:
 - (1) Open trenches are limited to 200 ft. open at one time.
 - (2) Contractor must compact trench and install an all-weather surface prior to proceeding to next section. Sections are limited to 200 ft. of open trench
 - e. Where the trench bottom has been over excavated in excess both vertically and horizontally, beyond the limits as defined in contract documents, the pipe shall be concrete-encased or encased as directed by the engineer.
 - (1) Encasement shall extend from the trench wall to trench wall and be a minimum of 6 inches above the top of pipe. No separate pay item (See Specification Item No. 858, Concrete Encasement.
 - f. Where the trench bottom is not excavated in accordance with this specification due to rock or other hard under lying materials, then the pipe shall be concrete encased as defined in Specification Item No. 858, Concrete Encasement.
 - g. The practice of undercutting at the bottom or flaring at the top will not be permitted except where it is justified for safety or at the Engineer's and/or Inspector's direction.
 - h. In special cases, where trench flaring is required, the trench walls

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- shall remain vertical to a depth of at least 1 foot above the top of the pipe.
- i. The trench bottom shall be square or slightly curved to the shape of the trenching machine cutters.
 - j. The trench shall be accurately graded along its entire length to provide uniform bearing and support for each section of pipe installed upon the bedding material.
 - k. Bell holes and depressions for joints shall be dug after the trench bottom has been graded and bedding installed.
 - l. The pipe shall rest upon the new bedding material for its full length.
 - m. The minimum allowable base width of the trench shall be not less than 12 inches greater than the exterior diameter of the pipe, not less than 6 inches on each side. Trench supports are exclusive of the minimum trench width.
 - n. The maximum allowable base width of trench shall be not greater than 24 inches than the exterior diameter of the pipe, not more than 12 inches on each side. Trench supports are exclusive of the maximum trench width.
 - o. Whenever such maximum allowable width of trench is exceeded, except as provided for in the contract documents, or by written approval of the Engineer, the Contractor, at his sole expense, shall encase the pipe in concrete from trench wall to trench wall.
 - p. Any additional trench restoration required as a result of an excavation wider than this maximum width or subsequent surface or paving work, will be done at the Contractor's sole expense.
 - q. When unsuitable bearing materials such as water, silt, muck, trash, debris or rock in ledge, boulder or coarse gravel (particle size larger than 1- 3/4 inch) is encountered at the bearing level, the Contractor shall over- excavate and remove such materials to a depth no less than 6 inches below the bottom of the pipe and replace it with a material conforming to the requirements of this Specification or as approved by the Engineer and/or Inspector.
4. Dewatering: Prevent surface water and subsurface or groundwater from flowing into excavations and from flooding project site and surrounding area.
- a. The Contractor shall not allow water to accumulate in excavations or at subgrade level.
 - b. Remove water to prevent softening of foundation bottoms and soil changes detrimental to stability of subgrades and foundations.
 - c. Provide and maintain dewatering system components necessary to convey water from excavations.
 - d. Convey water removed from excavation and rainwater to collecting or runoff areas away from buildings and other structures.
 - e. Establish and maintain temporary drainage ditches and other diversions outside excavation limits.
 - f. Do not use trench excavations as temporary drainage ditches.
 - g. Dewatering devices shall be provided by the Contractor with filters to prevent the removal of fines from the soil.

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- h. Should the pumping system draw fines from the soil, the Inspector shall order immediate shutdown, and remedial measures will be the responsibility of the Contractor.
 - i. Upon completion of the dewatering work, the Contractor shall remove all equipment and leave the construction area in a neat, clean, condition that is acceptable to the Inspector.
 - j. The Contractor shall maintain a groundwater table at least 12 inches below the finished excavated trench depth.
 - k. Performances of the dewatering system for lowering groundwater shall be measured by observation wells on piezometers installed in conjunction with the dewatering system, and these shall be documented at least daily.
 - l. The Contractor shall maintain a daily log of these readings and submit them to the Inspector before payment.
 - m. No direct payment shall be made for costs associated with dewatering. All costs in connection therewith shall be included in the applicable contract price for the item to which the work pertains.
5. **Backfilling:** Trenches shall not be backfilled until the construction structures or appurtenances, as installed, conform to the requirements specified.
- a. Initial backfill is defined as backfill having a thickness in its compacted state from the surface of the bedding to a point 1 foot above the top of the pipe.
 - b. Initial Bedding material shall be consolidated to assure it is incorporated from the bottom of the trench up to the pipe centerline.
 - (1) A hand-held vibrator, commonly used for concrete work, can be used for this purpose. The vibrator shall be inserted every 3 feet on each side of the pipe.
 - c. For pipelines up to 24 inches in diameter initial backfill material shall be placed in two separate lifts above the bedding material the pipe is set on.
 - (1) The first lift shall be spread uniformly and simultaneously on each side and under the bottom quadrant of the pipe to the mid-point or spring line of the pipe.
 - d. For diameters larger than 24 inches, initial backfill material shall be evenly and simultaneously spread alongside, under the lower quadrant of the pipe and over the pipe in 18 (first lift) or 12 inch lifts to a point sufficient to a minimum of 1 foot above the top of the pipe (See Drawings).
 - e. Placement of the first lift of initial backfill shall be subject to inspection and approval prior to placement of second lift, which shall extend from the spring line of the pipe to a minimum of 1 foot above the top of the pipe.
 - f. Secondary backfill is defined as backfill from 1 foot above the top of the pipe to the top of the trench or bottom of pavement section.
 - g. Secondary backfill shall generally consist of materials removed

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from the trench and shall be free of brush, debris and trash.

- (1) Rock or stones having a dimension larger than 6 inches at the largest dimension shall be sifted out and removed before the material is used in the secondary backfilling zone.
 - (2) Secondary backfill material shall be primarily composed of compactible soil materials. The secondary backfill material shall be placed in maximum 12 inch loose lifts or as directed by the Engineer and/or Inspector.
- h. Secondary backfill shall be constructed in accordance with details shown in the construction documents.
 - i. All compaction within the secondary backfill zone shall be such that the relative dry density of each layer shall be not less than 98% compaction from the top of the initial backfill to the bottom of pavement section as outlined in TxDOT Testing Methods Tex-113 or Tex-114.
 - j. For native sand backfill and non-cohesive soils, Engineer will specify compaction requirements.
 - k. The second lift shall be evenly spread in a similar manner as the first lift.
 - l. Where specified, by Engineer, only the secondary backfilling may incorporate native excavated materials approved, By Engineer, for backfilling, consisting of earth, loam, sandy clay, sand and gravel, soft shale or other approved materials, free from large clods of earth or stones.
 - m. Where pipe is specially coated or sleeve/tape wrapped for protection against corrosion, care shall be taken not to damage the coating or sleeve/tape wrap.
 - n. Damaged wrap will be replaced at Contractor's expense.
 - o. Where a trench has been improperly backfilled, or where settlement occurs, the identified section shall be excavated to the trench depth and a length 50 feet in both directions of the failed area, then refilled and compacted to the grade and compaction level required at the Contractor's expense.
 - p. The use of sand, unless native soil is sand. Filter fabric maybe required with sand.
 - q. Compaction and moisture- density relationship to be determined by TxDOT Testing Methods Tex-113 or Tex-114.
 - r. Soil Characteristic determined by TxDOT-142e.
 - s. The pavement (asphalt) section shall have 95% compaction density with a maximum dry density at + or - 1% optimum moisture content as determined by tests on samples as outlined in the latest provisions of TX-DOT Testing Method Tex 113-E or Tex-114, unless otherwise shown on the contract documents.
 - t. At the time of compaction, the water content shall be at optimum moisture content, + or - 1% points as outlined in the latest provisions of TX-DOT Testing Method Tex 113-E or Tex-114.
6. Trench Surface Restoration: The surface of the backfilled trench shall be restored to match the previous existing conditions.
 - a. This shall include final grading, placement of topsoil and seeding,

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- placement of sod (such as at homes or businesses that had maintained grass), or other unprepared and prepared surfaces.
- b. Contractor must compact trench and install an all-weather surface prior to proceeding to next section. Sections limited to 400 ft. of open trench.
 - c. Trenches in alleys actively being used by vehicles (such as trash pickup, vehicle parking, etc.) shall be restored by grading and compacting to 98% (per TxDOT Tex-113 or Tex - 114) or higher with a minimum of 4 inches of flex- base materials for the entire width of the alley.
 - d. Asphaltic materials shall have a compaction density of 95%.
 - e. Alleys not actively used by vehicles shall be graded and compacted to 98% (per TxDOT Tex-113 or Tex - 114) or higher from the top of the initial backfill to the bottom of the pavement section, then spread grass seed for entire width of the alley.
 - f. Trenches in paved streets shall be covered with a temporary all-weather surface to allow for vehicular traffic and protect trench from weather, water infiltration and runoff until the final asphalt/concrete paving is complete.
 - (1) This surface shall be a minimum of 4 inches hot-mix cold lay compacted and rolled asphaltic black base, either hot-mix or cold-mix applied, or plates with cold mix asphalt installed around the edges.
 - (2) It is the Contractor's responsibility to maintain this surface until the final street restoration is complete.
 - (3) Sections limited to 400 ft. of open trench at a time.
 - (4) Projects under 500 ft open trenches are limited to 200 ft. open at one time
 - (5) Temporary street striping may also be required.
 - (6) This surface must be removed prior to final asphaltting.
 - g. All street work shall be done in accordance with the latest City of San Antonio Public Works' (or other city as applicable) construction specifications.
 - h. Included in this requirement is replacement of any curbs or sidewalks damaged or removed during the construction.
 - i. No separate payment for the surface restoration is permitted. The cost for this work must be included in the appropriate bid item.

804.7 DISPOSAL OF EXCAVATED MATERIALS: Any excess excavated material, not utilized after all fill requirements have been met, shall become the responsibility of the Contractor.

- 1. The Contractor shall dispose of it by hauling and wasting outside the limits of the rights-of-way or easements of this project and of public thoroughfares and water courses, in conformity with pertinent City, County, State and Federal codes and ordinances and in a manner meeting the approval of the Engineer or Inspector.

804.8 QUALITY CONTROL:

- 1. All testing to be coordinated 48 hours in advance with SAWS Inspector.
- 2. Samples to be taken in conjunction with SAWS samples at same time and

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- location.
3. Contractor to be prepared to test if coordinated with Inspector. Fines maybe assessed if Contractor cancel or delays owners geotechnical testing.
 4. Quality Assurance Testing: The Owner shall have such tests and inspections as he may desire performed by a nationally-accredited, independent testing laboratory for his guidance and control of the work.
 - a. The Owner will determine in-place density and moisture content by anyone or combination of the following methods:
 - (1) TxDOT Tex-113-E - Laboratory Compaction Characteristics and Moisture-Density Relationship of Base Materials
 - (2) TxDOT Tex-114 -E- Laboratory Compaction Characteristics and Moisture-Density Relationship of Subgrade, Embankment Soils, and Backfill Material
 - (3) ASTM D2922 (density of soil and soil aggregate in-place by nuclear methods – shallow depth),
 - (4) ASTM D1556 (density and unit weight of soil in-place by sand cone method),
 - (5) ASTM D2216 (lab density of water content of soil and rock),
 - (6) ASTM D3017 (water content of soil and rock – shallow depth in-place by nuclear methods) or most applicable approved equal provisions.
 - b. Payment for such tests shall be the responsibility of the Owner, including the material proctor tests and density tests.
 - c. The Contractor shall request testing work performed by the Owner by notifying the Owner of the areas available by Station Numbers or Dimensions and Lift Numbers.
 - d. The Contractor shall provide access to SAWS and for lab to the test area, associated trench excavation safety protection, and backfilling of the test areas at the Contractor’s expense for all depths and lifts.
 - e. The frequency and location of testing shall be determined solely by the SAWS. Or at a minimum tests will be done at location points randomly selected as indicated by the Inspector/Test Administrator, per each 18 (first lift from bottom) and 12 inch loose lift per 100 linear feet, at a probe depth of six (6) inches. One per lift 100 ft.
 - f. The Owner may test any lift of fill at any time, location, or elevation.
 5. Quality Control Testing: The Contractor shall be responsible for compaction in accordance with the appropriate Specification.
 - a. Compaction tests will be done at location points randomly selected or as indicated by the SAWS Inspector/Test Administrator, per each 18 (first lift from bottom) and 12 inch loose lift per 100 linear feet, at a probe depth of six (6) inches. One per lift 100 ft.
 - b. The inspector shall determine the depth at which the density test shall be taken.

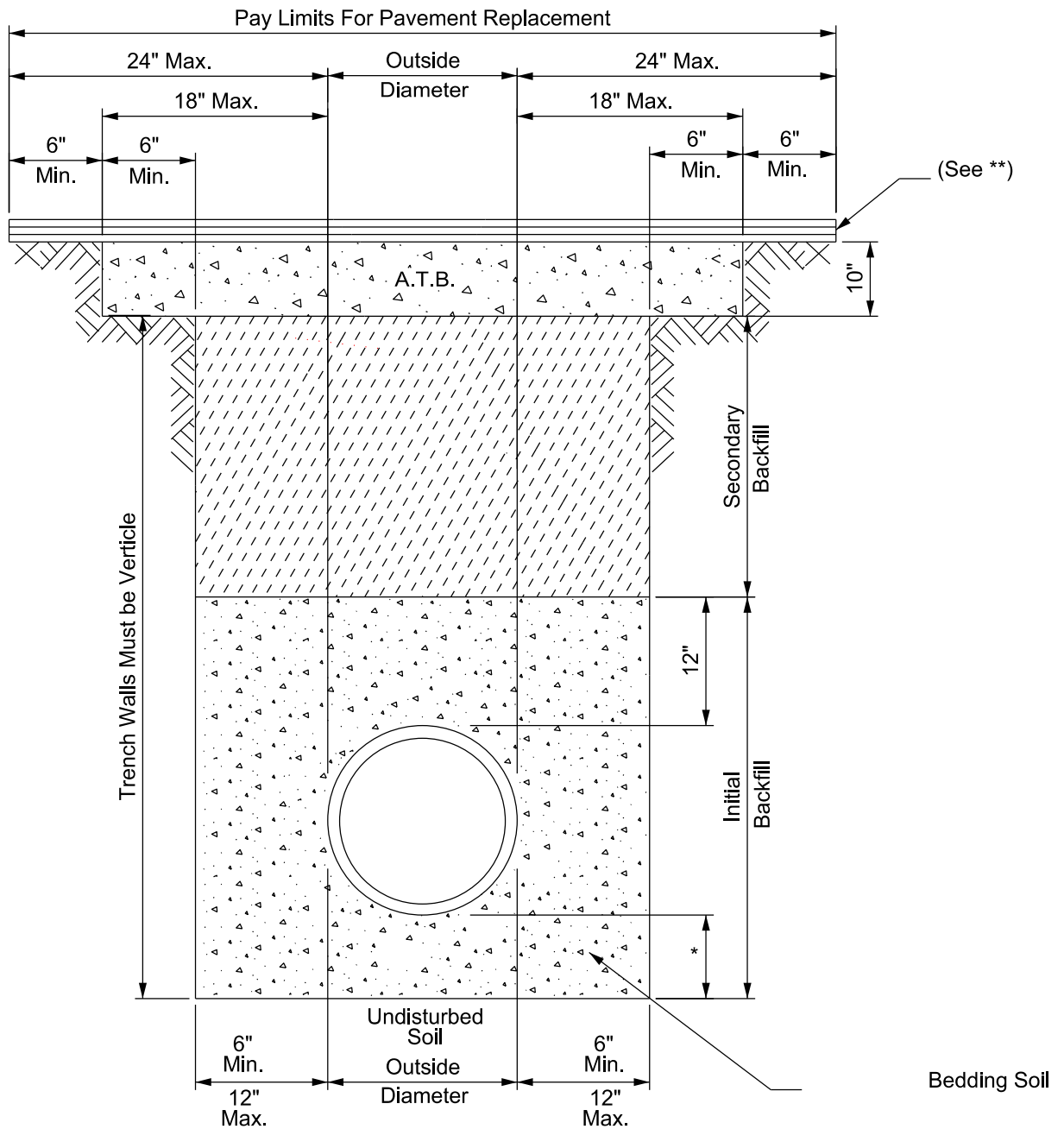
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- c. All depths shall be considered for testing without a predetermined maximum or minimum
- d. Test requirements above are indicated as a minimum requirement, but maybe subjected to follow more stringent requirements as established by other appropriate agencies (such as COSA Public Works Right of Way Management Plan, etc.)
- e. Any failed test shall require the Contractor to remove and replace that layer of backfill in the identified section of the failed test location to the trench depth and a length 50 feet in both directions, then refilled and compacted to the grade and compaction level required.
 - 1) The Contractor will also be required at no cost to SAWS to provide two additional tests at the replaced location where the initial test failed and at one location point, randomly selected or as indicated by the SAWS Inspector/Test Administrator.
- f. Sanitary Sewer Laterals will be subject to compaction tests at the discretion of the SAWS Inspector/Test Administrator within 100 linear foot segments.
 - 1) Any failed test shall require the Contractor to remove and replace that layer of backfill in the identified section of the failed test location to the trench depth and a length 50 feet in both directions, then refilled and compacted to the grade and compaction level required.
 - 1) The Contractor will also be required at no cost to SAWS to provide two additional tests at the replaced location where the initial test failed and at one location point, randomly selected or as indicated by the SAWS Inspector/Test Administrator.
- g. The Contractor shall be responsible for all costs associated with the proctor and density tests, and for providing to SAWS and Consultant, if applicable, verification that necessary compaction levels were achieved.
- h. These tests shall be performed by a nationally-accredited, independent testing laboratory.
- g. The Contractor shall provide access to SAWS and for lab to the test area, associated trench excavation safety protection, and backfilling of the test areas at the Contractor's expense for all depths and lifts.

804.9 MEASUREMENT: Excavation, Trenching and Backfill will not be measured for payment

804.10 PAYMENT: No direct payment shall be made for incidental costs associated with quality control testing, excavation, trenching backfilling for water mains and sanitary sewers, and placement of all-weather material and all costs in connection therewith shall be included in the applicable contract price for the item to which the work pertains.

End of Specification



The Existing Material at the Bearing Level shall be Removed and Replaced to a Minimum Depth of 6-Inches or $\frac{1}{8}$ of the Outside Diameter of the Pipe, whichever is Greater, with Bedding Material.

In Areas of over Excavation, Encasement shall extend from Trench Wall. Pay Limits shall not Exceed 12" Max. as shown on Detail. Additional Encasement shall be Incidental.

* Sewer Gravel 6" Min. or $\frac{1}{8}$ O.D. of the Pipe, whichever is Greater.

** Minimum 2" HMAC Type "D" for Trench Repair in Local / Residential Streets.

** Minimum 3" HMAC Type "C" for Trench Repair in Collector / Arterial Streets.

PROPERTY OF
SAN ANTONIO WATER SYSTEM
SAN ANTONIO, TEXAS

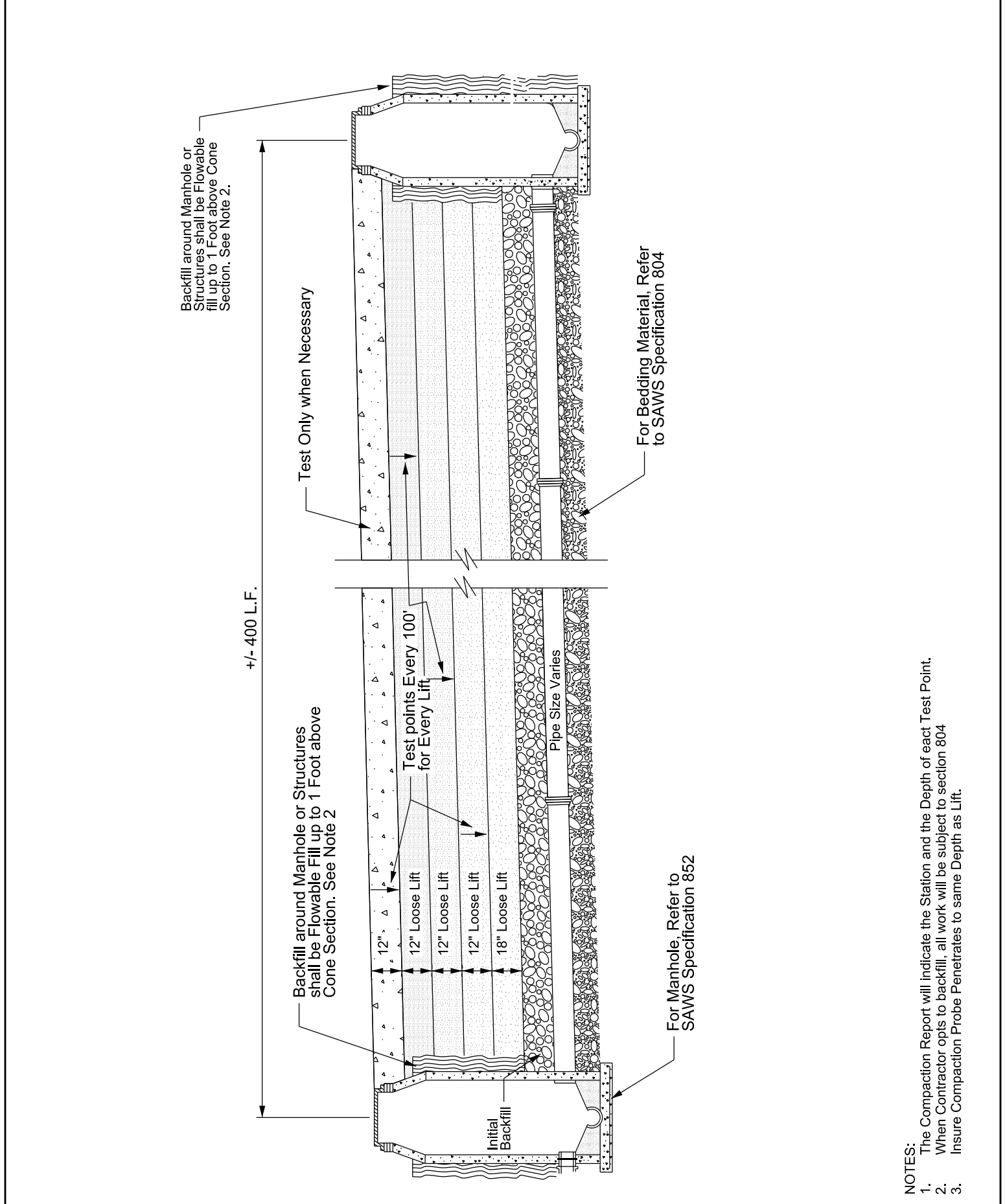
SANITARY SEWER PIPE
LAID IN TRENCH

APPROVED
MARCH 2008

REVISED
DEC 2018

DD-804-01

SHEET
1 OF 1



Backfill around Manhole or Structures shall be Flowable fill up to 1 Foot above Cone Section. See Note 2.

+/- 400 L.F.

Test Only when Necessary

For Bedding Material, Refer to SAWS Specification 804

Backfill around Manhole or Structures shall be Flowable Fill up to 1 Foot above Cone Section. See Note 2

Test points Every 100' for Every Lift

Pipe Size Varies

12" Loose Lift
12" Loose Lift
12" Loose Lift
12" Loose Lift
18" Loose Lift

For Manhole, Refer to SAWS Specification 852

Initial Backfill

- NOTES:
1. The Compaction Report will indicate the Station and the Depth of each Test Point.
 2. When Contractor opts to backfill, all work will be subject to section 804
 3. Insure Compaction Probe Penetrates to same Depth as Lift.

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SAN ANTONIO, TEXAS

TRENCH COMPACTION
DETAIL

APPROVED
MARCH 2018

REVISED
DEC 2018

DD 804-02

SHEET
1 OF 1