

TECHNICAL PROVISIONS
SEWER SYSTEM SPECIFICATIONS and STANDARD DRAWINGS

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1.0 GENERAL

1.1 Time for Completion

The Time for completion shall be **60** Working Days commencing from receipt of the Notice To Proceed.

Contractor agrees that the Work shall be prosecuted regularly, diligently, and uninterruptedly and at such rate of progress as will insure full completion thereof within the Time for completion stated above. It is expressly understood and agreed, by and between Contractor and Owner, that the Time for completion is reasonable for the completion of the Work, taking into consideration the average climatic range, usual industrial conditions prevailing in this locality, and lead time required to procure equipment.

1.2 Hours of Work

Overtime and shift work may be established as short-term procedure by Contractor with written notice to and written permission from Owner. No work other than overtime and shift work approved by Owner shall be done between the hours of 4:30 P.M. and 7:00 A.M., nor on Saturdays, Sundays, or legal holidays, except such work as is necessary for the proper care and protection of the Work already performed, except in case of emergency, and as specified herein.

Any costs associated with performing overtime work which is initiated by the Contractor shall be borne solely by the Contractor.

1.3 Permits

The Contractor shall obtain and pay for any other permits or license fees that are required for the work.

It should be noted that a Traffic Control Plan may be required by the Contractor.

1.4 Protection of Existing Utilities

The Contractor shall notify any utility owner whose utility may be threatened by the Contractor's operation. The Contractor shall coordinate their efforts with the utility owner and shall take every precaution to protect the utility. The Contractor shall submit a plan as to the method the Contractor will use to protect and support any utilities which will become exposed during excavations or that which are vulnerable to failure due to unsupported trenches or other construction activity.

1.5 Scope of Work

Contractor shall furnish all labor, materials, equipment and incidentals required to install complete and in place, the gravity and pressure sewer/brine line in entirety to the satisfaction of SAWPA as specified herein, in applicable sections of the Standard Specifications for Public Works Construction, and as shown on the Drawings. References in the Standard Specifications to measurement and payment shall not apply.

The Contractor shall be responsible for installing all improvements as indicated on the drawings and specified herein. The Contractor shall coordinate with SAWPA for time and duration of shutdown

of the existing sewer/brine line. Contractor shall notify SAWPA two weeks prior to shut down. Actual duration of the shut down shall not exceed 48 hours.

1.6 Measurement and Payment

The Contractor shall provide all labor, materials and equipment for the installation of all sewer mains and appurtenances described within these specifications and the construction drawings.

Payment for each bid item shall be included in the contract unit price or lump sum price shown on the Bidder's Proposal. Payment for each bid item shall include full compensation for all labor, materials, tools, equipment necessary to complete the work as shown on the plans and in the Specifications and no additional compensation will be allowed.

2.0 EXCAVATION

2.1 General

Excavation shall be in accordance with Section 306-1.1 of the Standard Specifications, as specified herein and as shown on the Drawings.

The Contractor shall furnish all labor, materials, equipment and incidentals necessary to perform all trenching for pipelines and appurtenances, including drainage, filling, backfilling, dewatering, disposal of surplus material and restoration of trench surfaces and easements.

The Contractor shall furnish and place all sheeting, bracing, and supports and shall remove from the excavation all materials which the Owner may deem unsuitable for backfilling. The bottom of the excavation shall be firm, dry, and in all respects, acceptable. If conditions warrant, the Contractor may be ordered to deposit gravel for pipe bedding, or gravel refill for excavation below grade, directly on the bottom of the trench immediately after excavation has reached the proper depth and before the bottom of the trench has become softened or disturbed by any cause whatever. The length of open trench shall be the length of pipe which can be installed in one day. All excavation shall be made in open trenches.

All excavation, trenching, and related sheeting, bracing, etc. shall comply with the requirements of OSHA excavation safety standards (29 CFR Part 1926.650 and 1926.3651 and 1926.652 and appertained appendixes) and State requirements. Where conflict between OSHA and State regulations exists, the more stringent requirements shall apply.

Wherever the requirement for a percent compaction is referred to herein it shall mean "at least that percent of maximum density as determined by ASTM D1557, Method D".

Prior to the start of work the Contractor is required to submit the proposed method of backfilling and compaction to the Owner for review.

2.2 Trenches

- A. Trench excavation shall include material of every description and of whatever substance encountered, including rock and boulders. Pavement, where encountered, shall be cut with a saw, wheel or pneumatic chisel along straight lines before excavating.

- B. The Contractor shall strip and stockpile topsoil from grassed areas crossed by trenches. At the Contractor's option, topsoil may be otherwise disposed of and replaced, when required, with approved topsoil of equal quality.
- C. While excavating and backfilling is in progress, traffic shall be maintained, and all utilities and other property protected as provided in the General Conditions.
- D. Trenches shall be excavated to the depth indicated on the Drawings, and in widths sufficient for laying the pipe, bracing, and for pumping and drainage facilities as required. The bottom of the excavations shall be firm and dry and in all respects acceptable to the Owner. Trench width shall be practical minimum.
- E. Excavation and dewatering shall be accomplished by methods which preserve the undisturbed state of subgrade soils. The trench may be excavated by machinery to, or just below the designated subgrade, provided that material remaining in the bottom of the trench is no more than slightly disturbed. Subgrade soils which become soft, loose, "quick", or otherwise unsatisfactory as a result of inadequate excavation, dewatering or other construction methods shall be removed and replaced by screened gravel fill as required by the Owner at the Contractor's expense.
- F. Clay and organic silt soils are particularly susceptible to disturbance due to construction operations. When excavation is to end in such soils, the Contractor shall use a smooth-edge bucket to excavate the last one foot of depth.
- G. Where pipe is to be laid in screened gravel bedding, the trench may be excavated by machinery to the normal depth of the pipe provided that the material remaining in the bottom of the trench is no more than slightly disturbed.
- H. Where pipe is to be laid directly on the trench bottom, final excavation at the bottom of the trench shall be performed manually, providing a flatbottom true to grade upon undisturbed material. Bell holes shall be made as required.
- I. Unless otherwise required by any Encroachment Permit, the existing pavement shall be scored to approximately one-fourth its thickness by saw-cut along a straight line and shall be broken out to provide clean, solid, vertical faces, free of loose material.

2.3 Limit of Excavation

Unless specified otherwise, trenches shall be excavated not more than 500 feet in advance of pipe laying. Trenches shall be adequately shored and braced so that the earth will not slide or settle, and so that all existing improvements of any kind will be fully protected from damage. Any damage resulting from lack of adequate shoring and bracing shall be the responsibility of Contractor. Contractor shall effect all necessary repairs or reconstruction at his own expense, as directed by Owner, and shall bear all other expense resulting from such damage.

2.4 Width of Trench

Excavation shall extend to the width and depth shown on the Drawings or as specified, and shall provide suitable room for installing pipe, structures and appurtenances.

Unless otherwise shown, all pipeline trenches shall, wherever possible, have vertical sides and a maximum trench width at the top of the pipe equal to the outside diameter of the sewer plus two (2) feet. Sloping of trench walls will be permitted under certain conditions.

Whenever the maximum allowable width of trench is exceeded for any reason except as permitted by written direction of Owner, Owner may require at its discretion, that Contractor, at his expense, provide construction in accordance with higher class bedding condition or cradle pipe in Class B concrete. The maximum allowable width of trench is shown on the Drawings.

2.5 Excavated Materials

All material excavated from the trench shall be so placed as to offer a minimum of obstruction to traffic. Gutters shall be kept clear or other provisions shall be made for handling street or road drainage. Excavated material shall be stacked without excessive surcharge on the trench bank or obstructing free access to hydrants and gate valves. Inconvenience to traffic and abutters shall be avoided as much as possible. Excavated material shall be segregated for use in backfilling as specified below.

Should conditions make it impracticable or unsafe to stack material adjacent to the trench, the material shall be hauled and stored at a location provided by the Contractor. When required, it shall be rehandled and used in backfilling the trench at Contractor's expense.

Excess material and material that is not approved by Owner for use as backfill shall be disposed of elsewhere by Contractor entirely at his own expense unless otherwise permitted by Owner.

If pipe or other material belonging to Owner is uncovered or removed from the excavation, all pipe or other material which is salvable in the opinion of the Owner shall be disposed of as directed by Owner. Material not considered to be salvable shall be disposed of with other excess excavated material.

2.6 Blasting

Blasting for excavation will be permitted only after securing approval of Owner and only when proper precautions are taken for the protection of persons and property. The hours of blasting will be fixed by Owner. Any damage caused by blasting shall be repaired by Contractor at his expense. Contractor's methods of blasting and procedure shall conform to State and local laws and municipal ordinances. Precautions shall be taken to post signs warning operators of radio equipment to stop transmitting in any area in which blasting operations are in progress.

3.0 BEDDING

3.1 General

Bedding shall be in accordance with Sections 306-1.2.1 of the Standard Specifications, as specified herein and as shown on the Drawings. Bedding shall be suitable for the load factor condition specified.

3.2 *Good Soil*

Trench shall have a flat or semi-circular bottom conforming to the grade to which the pipe is to be laid. Bottom of trench shall be graded and prepared to provide firm and uniform bearing throughout the entire length of each joint of pipe. Sewer shall not be laid on earth mounds and bell holes shall be excavated in the sides and bottom of the trench at pipe joints, of such size that the process of making joints and inspection can be carried on satisfactorily, and so that the pipe barrel will bear evenly on the bottom of the trench.

3.3 *Bedding in Poor Soil*

All soft, spongy, or unstable material shall be removed from the bottom of the trench to a depth as determined in the field by Owner and shall be refilled to proper grade, at Contractor's expense, with crushed rock or other special bedding material, as approved by Owner. Bedding material shall be tamped to 90 percent compaction, graded, and prepared to provide a firm and uniform trench bottom.

3.4 *Bedding in Rock*

Where rock is encountered, it shall be removed below grade and the trench backfilled with crushed rock or other suitable material as approved by Owner to provide a compacted earth cushion with a thickness under the pipe of not less than six (6) inches. Bedding material shall be tamped to 90% compaction, graded, and prepared to provide a firm and uniform trench bottom.

3.5 *Excess Excavation*

Should the excavation for the sewer be carried below grade without instruction from Owner, it shall be refilled to proper grade, at Contractor's expense for all labor and material, with crushed rock tamped in place to 90 percent minimum compaction.

4.0 *SHEETING AND BRACING*

- A. The Contractor shall furnish, put in place, and maintain sheeting and bracing required by Federal, State or local safety requirements to support the sides of the excavation and prevent loss of ground which could endanger personnel, damage or delay the work or endanger adjacent structures. If the Owner is of the opinion that at any point sufficient or proper supports have not been provided, the Owner may order additional supports placed at the expense of the Contractor. Compliance with such order shall not relieve the Contractor from responsibility for the sufficiency of such supports. Care shall be taken to prevent voids outside of the sheeting, but if voids are formed, they shall be immediately filled and rammed.
- B. Where sheeting and bracing is required to support the sides of trenches, the Contractor shall engage a Professional Engineer, registered in the State of California, to design the sheeting and bracing. The sheeting and bracing installed shall be in conformity with the design, and certification of this shall be provided by the Professional Engineer. Contractor shall submit P.E. Certification Form to show compliance with this requirement.

- C. When moveable trench bracing such as trench boxes, moveable sheeting, shoring or plates are used to support the sides of the trench, care shall be taken in placing and moving the boxes or supporting bracing to prevent movement of the pipe, or disturbance of the pipe bedding and the screened gravel backfill.
- D. When installing rigid pipe (R.C., V.C., A.C., etc.), any portion of the box extending below mid diameter shall be raised above this point prior to moving the box ahead to install the next pipe. This is to prevent the separation of installed pipe joints due to movement of the box.
- E. When installing flexible pipe (PVC, DIP, Steel, etc.) trench boxes, moveable sheeting, shoring or plates shall not be allowed to extend below mid-diameter of the pipe. As trench boxes, moveable sheeting, shoring or plates are moved, screened gravel shall be placed to fill any voids created and the screened gravel and backfill shall be recompacted to provide uniform side support for the pipe.
- F. The Contractor will be permitted to use steel sheeting in lieu of wood sheeting for the entire job wherever the use of sheeting is necessary. The cost for use of sheeting will be included in the bid items for pipe, and shall include full compensation for driving, bracing and later removal of sheeting.
- G. All sheeting and bracing shall be carefully removed in such manner as not to endanger the construction of other structures, utilities, or property, whether public or private. All voids left after withdrawal of sheeting shall be immediately refilled with sand by ramming with tools especially adapted to that purpose, by watering or otherwise as directed.
- H. The Contractor shall receive no payment, for sheeting, bracing, etc., during the progress of the work. The Contractor shall receive no payment for sheeting which has actually been left in the trench for the convenience of the Contractor.
- I. Sheetting driven below mid-diameter of any pipe shall remain in place from the driven elevation to at least 1-ft above the top of the pipe.

5.0 TEST PITS/UTILITY POTHOLING

- A. The Contractor is required to excavate test pits of all existing, connection points, utilities and services located within 5-feet horizontally and vertically of the proposed pipeline prior to the approval of shop drawings. Existing utilities to be Potholed will be determined from those identified on the plans and those which are marked out in the field.
- B. Test pits shall be backfilled as soon as the desired information has been obtained. The backfilled surface shall be maintained in a satisfactory condition for travel until resurfaced as specified.
- C. The Contractor shall set an offset nail for each utility potholed with a horizontal and vertical distance to the top and bottom of the utility. The Contractor shall also determine the outside dimension of the utility.
- D. The Contractor shall notify the Owner immediately of any utility conflicts with the proposed pipeline.

6.0 EXCAVATION BELOW GRADE AND REFILL

- A. Whatever the nature of unstable material encountered or the groundwater conditions, trench drainage shall be complete and effective.
- B. If the Contractor excavates below grade through error or for convenience, or through failure to properly dewater the trench, or disturbs the subgrade before dewatering is sufficiently complete, the Contractor may be directed by the Owner to excavate below grade as set forth in the following paragraph, in which case the work of excavating below grade and furnishing and placing the refill shall be performed at the Contractor's own expense.
- C. If the material at the level of trench bottom consists of fine sand, sand and silt or soft earth which may work into the screened gravel notwithstanding effective drainage, the subgrade material shall be removed to the extent directed and the excavation refilled with a 6-in layer of coarse sand, or a mixture graded from coarse sand to the fine peastone, as approved by the Owner, to form a filter layer preserving the voids in the gravel bed of the pipe. The composition and gradation of gravel shall be approved by the Owner prior to placement. Screened gravel shall then be placed in 6-in. layers thoroughly compacted up to the normal grade of the pipe.
- D. If the trench bottom is determined to be unsuitable and overexcavation, and furnishing and placing of refill material is directed by the Owner, the cost for the required work shall be negotiated with the Owner. No work shall be performed until a cost for said work is agreed to and a Change Order is issued.

7.0 BEDDING AND BACKFILL

7.1 General

Bedding and backfill shall be in accordance with Sections 306-1.2.1 and 306-1.3 of the Standard Specifications, as specified herein and as shown on the Drawings, and in accordance with permits issued by agency having jurisdiction (State, County, City) over rights-of-way in which construction is taking place. Bedding and backfill shall not commence without prior approval of Owner or of other aforementioned agency.

- A. As soon as practicable after the pipe has been fused and laid, backfilling shall begin and thereafter be prosecuted expeditiously. Bedding gravel, as specified for the type of pipe installed, shall be placed up to 1-ft over the pipe.
- B. Where the pipes are laid outside of the street pavement, the ground shall be restored to its original level and condition.
- C. Where the pipes are laid in streets, the remainder of the trench up to a depth of 1-ft below the bottom of the specified permanent paving shall be backfilled with specified fill material in layers not to exceed 1-ft, and compacted in accordance with these specifications. **All in accordance with City of Lake Elsinore ordinances and permits.**
- D. To prevent longitudinal movement of the pipe, dumping backfill material into the trench and then spreading will not be permitted until selected material or screened gravel in the pipe zone has been placed and compacted to a level 1-ft over the pipe.
- E. Backfill shall be brought up evenly on all sides. Each layer of backfill material shall be thoroughly compacted by rolling, tamping, or vibrating with mechanical compacting equipment or hand tamping, to required compaction. If rolling is employed, it shall be by use

of a suitable roller or tractor, being careful to compact the fill throughout the full width of the trench.

- F. If water restrictions are in force, the Contractor shall obtain water elsewhere, or compact the backfill by other approved methods at no additional cost to this Contract.
- G. Where other methods are not practicable, compaction shall be by use of hand or pneumatic ramming with tools weighing at least 20 lbs. The material being spread and compacted in layers not over 6-in thick. If necessary, sprinkling shall be employed in conjunction with rolling or ramming.
- H. Install pipe in accordance with manufacturer's instructions.
- I. Subject to the approval of the Owner, fragments of ledge and boulders smaller than 6-in may be used in trench backfill providing that the quantity in the opinion of the Owner, is not excessive. Rock fragments shall not be placed until the pipe has at least 2-ft of earth cover. Small stones and rocks shall be placed in thin layers alternating with earth to insure that all voids are completely filled. Fill shall not be dropped into the trench in a manner to endanger the pipe.
- J. Bituminous paving shall not be placed in backfill. Frozen material shall not be used under any circumstances.
- K. All road surfaces shall be watered down and mechanically broomed immediately after backfilling and at least on a daily basis at the completion of the work day. Dust control measures shall be employed at all times.

7.2 Backfill (Bedding) Adjacent to Pipe

Selected backfill material shall be used and it shall be as specified in Section 306-1.2.1 of the Standard Specifications and shall be one (1) inch maximum in size. Crushed rock or concrete shall be used as required, in accordance with the Bedding Class and Load Factor shown on the Drawings.

7.3 Backfill Above the Pipe

Backfill shall be in accordance with Section 306-1.3 of the Standard Specifications. Unless specified otherwise, all backfill material shall be compacted to a minimum relative compaction of 90% as determined by field compaction tests, unless specified otherwise or permitted. Relative compaction shall be determined in accordance with ASTM D-1557 (modified to three-layer curve in lieu of five-layer curve), latest.

Sandy, granular soils may be compacted by means of water densification by jetting per Section 306-1.3.3 of the Standard Specifications (flooding is not allowed for water-densified backfill). Soils not having a sandy or granular nature shall be backfilled and compacted mechanically per Section 306-1.3.2 of the Standard Specifications. On steep slopes and other locations where compaction by water densification is not practicable, backfill material shall be compacted mechanically.

7.4 Relative Compaction Testing

Owner shall perform compaction tests at various levels above the pipe and within the bedding at locations selected by the Owner. Relative compaction shall be determined in accordance with ASTM D-1557 (latest), modified to five-layer curve in lieu of three-layer curve.

Contractor shall provide excavation, shoring, and access adequate to permit said compaction tests by the Owner. If compaction is being performed mechanically, the Owner will perform compaction tests during the backfilling operation.

Where water densification is performed, Contractor shall excavate after compaction is completed to permit Owner to perform compaction tests.

If compaction tests fail, Contractor shall recompact failed areas and shall pay for all subsequent tests necessary to determine compliance with compaction requirements.

8.0 VITRIFIED CLAY PIPE (V.C.P.) SEWER PIPE

8.1 General

Pipe materials to be furnished hereunder shall be extra-strength vitrified clay pipe (V.C.P.) in accordance with Section 207-8 and 208-2 of the Standard Specifications. VCP shall be manufactured by Pacific Clay Products, Incorporated, Interpace Corporation, or approved equal.

8.2 Data to be Submitted by Contractor

Contractor shall furnish six (6) copies of each of the following:

- a. Affidavit of compliance stating that all materials furnished comply with all applicable requirements of latest ASTM Specifications specified;
- b. Certified test reports containing results of all physical and chemical tests on pipe and fittings to be furnished, showing compliance with latest ASTM Specifications.

Each length of pipe and each fitting furnished under this specification shall be clearly marked with the following information:

- a. Manufacturer's name or initials and plant location
- b. Nominal pipe size
- c. The words "Extra Strength" or the symbol "ES"

8.3 Factory Inspection

Owner shall at all times have the right to inspect all work and materials in the course of manufacture as well as witness testing. Manufacturer shall furnish Owner reasonable notice for obtaining such information as he may desire regarding the progress and manner of the work and the character and quality of materials used. Manufacturer shall furnish, upon request, certified test reports on the manufacture of the pipe.

8.4 Loading and Transporting

Pipe shall be loaded on rubber-tired vehicles, adequately supported, and chocked to prevent any damage during transportation and delivered job site. During the unloading and stringing operations, the pipe shall be moved in such a manner, as to prevent injury to the pipe. Unloading shall be

accomplished in a workmanlike manner as directed by the manufacturer. Under no circumstances are pipe sections to be dropped or bumped in handling.

8.5 Defective or Damaged Material

All pipe and fittings shall be carefully inspected for defects. Any pipe, fitting, or joint found to be defective in workmanship or material or so damaged as to make repair and use impossible, at the Owner's discretion, shall be rejected and removed from the job site.

9.0 POLYVINYL CHLORIDE (PVC) SEWER PIPE

9.1 Scope

Contractor shall furnish and install all pipe and fittings together with all material, equipment, and labor and perform all operations necessary to construct sewer mains and appurtenances, as specified, unless otherwise indicated.

9.2 Materials - Polyvinyl Chloride (PVC) Sewer Pipe

9.2.1 General

Polyvinyl chloride (PVC) sewer pipe for sizes up to and including 15-inch diameter pipe. Color of PVC pipe shall be green.

9.2.2 Material

Pipe and fittings shall be made from PVC compound, as defined in ASTM D 1784. Pipe and fittings shall conform to Section 207-17, of the Standard Specifications for Public Works Construction, Latest Edition. Pipe and fittings shall meet the requirements of ASTM D 3034-81, with the following exceptions:

9.2.2.1 Pipe and Fittings

All pipe shall be suitable for use as a gravity sewer conduit with provisions for expansion and contraction at each joint with a rubber ring or elastomeric gasket. The joint material shall be in accordance with the manufacturer's standard dimensions and tolerances, unless otherwise specified herein. The pipe shall be uniform in color, opacity, density, and other physical properties. Pipe shall be marked in accordance with ASTM D 3034-81 for gravity sewer. Only newly manufactured pipe and fittings will be allowed. Pipe and fittings must be installed within two years from the date of manufacture, which shall be stamped on each section of pipe or the material will be rejected.

A factory applied reference mark shall be provided on the spigot end to insure proper position at the adjoining bell.

Standard pipe lengths shall be twenty (20) feet maximum and twelve and one-half (12.5) feet minimum, At manufacturer's and/or the Contractor's option, random lengths of not more than fifteen percent (15%) of total footage may be shipped in lieu of standard lengths and as approved by the Engineer.

All fittings shall be as manufactured and supplied by the pipe manufacturer and have bell and/or spigot configurations compatible with that of the pipe. All joints shall be made with flexible elastomeric seals (gaskets) in accordance with ASTM D 3212-76 and shall be capable of passing all tests specified in said Standard and within these Specifications. Solvent weld joints are not allowed.

9.2.2.2 *Sizes, Dimensions, and Tolerances*

Polyvinyl chloride and sewer pipe shall be supplied in the sizes and with the dimensions and tolerances shown in ASTM D 3034-81, SDR 35, or latest revision.

9.2.2.3 *Pipe Stiffness*

Minimum "pipe stiffness" at five percent (5%) deflection shall be 46 for all sizes when tested in accordance with ASTM D 2412, External Loading Properties of Plastic Pipe by Parallel-Plate Loading.

9.2.3 *Handling and Storage*

Polyvinyl chloride pipe shall be delivered to the job site from the factory and stored at the job site in palletized units or bundles to prevent unnecessary deflection prior to installation.

Care shall be taken during the transporting of the pipe to ensure that the binding and tie-down methods do not damage or deflect the pipe in any manner. Pipe bent, deflected, or otherwise damaged during shipping shall be rejected.

Pipe stored on the job site shall be covered with canvas or other opaque material to protect it from the sun's rays and be well ventilated to prevent the build-up of heat.

Pipe that is discolored due to ultra-violet (UV) radiation will be rejected.

9.3 *Excavation and Backfill*

Pipe Bedding and Trench Width - The following provisions shall supplement Sections 3.2 and 3.3 ("Excavation" and "Backfill") of these Technical Provisions.

9.3.1 *Backfill Adjacent to Pipe*

All PVC sewer pipe shall be installed in accordance with ASTM D 2321 except that all bedding material will be Class I material with angular 1/4-inch to 3/4-inch maximum graded stone as listed in ASTM D 448, Size #67, and shall be placed a maximum of six (6) inches and a minimum of four (4) inches below the pipe to a minimum of 75% of the pipe diameter above the invert of the pipe, or one (1) foot minimum, whichever is greater.

Contractor shall place the bedding material under the haunches of the pipe and to the spring line by spading and rodding, taking care not to disturb the horizontal or vertical alignment of the pipe. After the Contractor has placed the bedding material to the top of the pipe, he shall carefully "walk-in" the haunching material around the pipe after which the remaining bedding shall be placed to four (4) inches above the top of pipe.

9.3.1.1 *Unstable Trench Backfill*

Where conditions such as unstable or flowing soil conditions (including regulations) require a supported trench, the minimum trench width shall be in accordance with Table 63 of the Uni-Bell Handbook of PVC Pipe, Second Edition, dated March 1982, as follows:

<u>Nominal Pipe Size (Inches)</u>	<u>Trench Width, Minimum Inches</u>
8	36
10	42
12	42
15	48

Timber sheeting, where used below the top of the pipe, should be driven approximately two (2) feet below the bottom of the pipe and be left in place approximately 1.5 feet above the top of pipe. In supported trenches, compaction of the foundation and embedment materials should extend to the trench wall or to the sheeting left in place.

If movable sheeting or boxes are used, these should be used in a manner not to disturb the embedment material within 2½-inch pipe diameters on each side of the installed pipe.

9.3.2 *Backfill Above the Pipe*

The remainder of the pipe zone, as shown on Page S-08 of the Sewer System Standard Drawings, shall be backfilled in accordance with Section 3.3.3 b. of the Technical Provisions of the Sewer Specifications. The Contractor shall take due precautionary measures in order to prevent the "floating" of the pipe when applying water. Additional depth of backfill over the pipe may be necessary in larger size PVC pipe to prevent "floating."

9.4 *Testing*

9.4.1 *Air Test*

The Contractor shall perform an air pressure test in conformance with Section 306-1.4.4 of the Standard Specifications for Public Works Construction, latest edition.

9.4.2 *Deflection Test (Mandrell Testing)*

The Contractor will be required to test all PVC sewer pipes for deflection, as described in Section 306.1.2.12 of the Standard Specifications for Public Works Construction, latest edition, and the following specifications.

9.4.2.1

Not less than thirty (30) days after installation but after backfill has been placed and compacted and before air testing and cap paving, the Contractor shall pass a rigid mandrel through all sections of PVC pipe. The mandrel shall have diameters in accordance with Table "A" (shown below) for the various diameters of sewer pipe to be tested.

TABLE "A"
MANDREL SIZES FOR DEFLECTION TEST

Nominal Pipe Size	Base Inside Diameter (In Inches)	5% Deflection Mandrel Diameter (In Inches)
8-inch	7.900	7.524
10-inch	9.875	9.405
12-inch	11.751	11.191

Nominal Pipe Size	Base Inside Diameter (In Inches)	4% Deflection Mandrel Diameter (In Inches)
15-inch	14.403	13.849

The mandrel shall be a rigid, round device with circular cross sections, in accordance with the diameters shown in Table "A." The length of the circular portion of the mandrel (maximum diameter) shall be equal to the nominal diameter of the pipe and all mandrels shall be submitted to the Engineer for approval prior to testing and shall remain in engineer's care, custody, and control.

The testing device shall be pulled through the completed pipelines by hand. For acceptance, the device must pass through the entire section of line between structures in one pass without use of excessive force. If the device sticks in the pipe at any point, the pipe shall be replaced and retested by the Contractor.

9.4.2.2

The cost for all mandrel testing, including cleaning sewer main prior to tests, repairs, and retesting, shall be included in the unit price bid for sewer pipe and no additional compensation will made, therefore.

10.0 HIGH-DENSITY POLYETHYLENE (HDPE) SEWER PIPE

10.1 General

10.1.1 Description

This specification governs the material, pipe, fittings, joining methods and general construction practice for High Density Polyethylene (HDPE) piping systems.

10.1.2 *Quality Assurance*

References, American National Standards Institute (ANSI), American Society for Testing and Materials (ASTM), Federal Specifications (FS), International Standards Organization (ISO), and manufacturer's printed recommendations.

10.2 *Materials*

10.2.1 *Pipes*

Pipe shall be manufactured from a PE 3408 resin listed with the Plastic Pipe Institute (PPI) as TR-4. The resin material shall meet the specifications of ASTM D3350-02 with a minimum cell classification of PE345464C. Pipe shall be ductile iron pipe sizes (DIPS). Pipe shall be DR21. Pipe shall have a manufacturing standard of ASTM D3035 and be manufactured by an ISO 9001 certified manufacturer. The pipe shall contain no recycled compounds except that generated in the manufacturer's own plant from resin of the same specification from the same raw material. The pipe shall be homogeneous throughout and free of visible cracks, holes, foreign inclusions, voids, or other injurious defects.

10.2.2 *Fitting*

- A. Electrofusion Fittings - Electrofusion Fittings shall be PE3408 HDPE, Cell Classification of 345464C as determined by ASTM D3350-02 and be the same base resin as the pipe. Electrofusion Fittings shall have a manufacturing standard of ASTM F1055.
 - I. Provide a 30" DIPS x 24" DIPS Eccentric reducer with flanged end on 30-inch side, plain end on 24-inch side for field fusion to HDPE pipe. Verify need for reducer and size of existing 30-inch PVC, IPS or DIPS prior to fabrication of reducer in order to fabricate to match pipe size.
- B. Flanged and Mechanical Joint Adapters - Flanged and Mechanical Joint Adapters shall be PE 3408 HDPE, Cell Classification of 345464C as determined by ASTM D3350-02 and be the same base resin as the pipe. Flanged and mechanical joint adapters shall have a manufacturing standard of ASTM D3216. All adapters shall be pressure rated to provide a working pressure rating no less than that of the pipe.
- C. Restrained Flange Adapter for use in transition from PVC to HDPE shall be made from ductile iron with a 10 – 12 mil fusion bonded epoxy lining and coating conforming to ASTM A536 and have standard ANSI/AWWA C110/A21.10 (125#/Class 150) bolt pattern.

Restraint for flange adapter shall consist of a plurality of individual actuated gripping wedges to maximize restraint capability. Torque limiting actuating screws shall be used to insure proper initial set of gripping wedges.

The flange adapters shall be capable of deflection during assembly or permit lengths of pipe to be field cut to allow a minimum 0.6 inch gap between the end of the pipe and the mating flange without affection the integrity of the seal.

The flange adapter shall be the Series 2100 MEGAFLANGE Restrained Flange Adapter as produced by EBAA Iron, Inc or approved equal.

10.3 Execution

10.3.1 General

- A. Pipe and Fittings - Size as indicated on the plans. Install as shown in accordance with manufacturer's recommendations.
- B. Connections – If a transition from PVC to HDPE is competent and a connection can be made to the existing HDPE and the Owner agrees that it is acceptable, then a new reducer, coupling, restrained adapter connection may not be required. This determination must be made prior to the purchase of materials for the connection.

Connection of new DIPS HDPE DR 21 to existing PVC shall be made with a restrained flange adapter, such as EBAAIRONS Series 2100 MEGAFLANGE, flange connected to the HDPE flange adapter with ductile iron back up ring. The flanged 30" side of the eccentric 24 x 30 reducer will be connected to the restrained flange adapter. The 24-inch side will be fused to the new HDPE pipe.

10.3.2 Joining

- A. Butt Fusions - Sections of polyethylene pipe should be joined into continuous lengths on the jobsite above ground. The joining method shall be the butt fusion method and shall be performed in strict accordance with the pipe manufacturer's recommendations. The butt fusion equipment used in the joining procedures should be capable of meeting all conditions recommended by the pipe manufacturer, including, but not limited to, temperature requirements of 430 degrees Fahrenheit, alignment, and an interfacial fusion pressure of 75 PSI. The butt fusion joining will produce a joint weld strength equal to or greater than the tensile strength of the pipe itself. All field welds shall be made with fusion equipment equipped with a Data Logger. Temperature, fusion pressure and a graphic representation of the fusion cycle shall be part of the quality control records.
- B. Sidewall Fusions - fusions for connections to outlet piping shall be performed in accordance with HDPE pipe and fitting manufacturer's specifications. The heating irons used for sidewall fusion shall have an inside diameter equal to the outside diameter of the HDPE pipe being fused. The size of the heating iron shall be ¼ inch larger than the size of the outlet branch being fused.
- C. Mechanical - Bolted joining may be used where the butt fusion method cannot be used. Flange joining will be accomplished by using a HDPE flange adapter with a ductile iron back-up ring. Mechanical joint joining will be accomplished using either a molded mechanical joint adapter or the combination of a Sur-Grip Restrainer and Pipe Stiffener as manufactured by JCM Industries, Inc. Either mechanical joint joining method will have a ductile iron mechanical joint gland.

Flange bolt tightening shall be done in the order and recommended torque as recommended by the manufacturer or as outlined in Performance Pipes Technical Note PP 811-TN PE Flange Connections.

- D. Other - Socket fusion, hot gas fusion, threading, solvents, and epoxies may not be used to join HDPE pipe.

10.3.3 Quality and Workmanship

The pipe and/or fitting manufacturer's production facility shall be open for inspection by the owner or designated agents with a reasonable advance notice. During inspection, the manufacturer shall demonstrate that it has facilities capable of manufacturing and testing the pipe and/or fittings to the standards required by this specification.

10.3.4 Pipe Packaging, Handling and Storage

The manufacturer shall package the pipe in a manner designed to deliver the pipe to the project neatly, intact and without physical damage. The transportation carriers shall use appropriate methods and intermittent checks to insure the pipe is properly supported, stacked and restrained during transportation such that the pipe is not nicked, gouged, or physically damaged.

During loading, transportation and unloading, every precaution shall be taken to prevent injury to the pipe. No pipe shall be dropped from cars or trucks, or allowed to roll down slides without proper retaining ropes. During Transportation each pipe shall rest on suitable pads, strips, skids or blocks securely wedged or tied in place. Any pipe damaged shall be replaced.

Pipe shall be stored on clean, level ground to prevent undue scratching or gouging. If the pipe must be stacked for storage, such stacking shall be done in accordance with the pipe manufacturer's recommendations. The pipe shall be handled in such a manner that it is not pulled over sharp objects or cut by chokers or lifting equipment.

Sections of pipe having been discovered with cuts or gouges in excess of 10% of the pipe wall thickness shall be cut out and removed. The undamaged portions of the pipe shall be rejoined using the heat fusion joining method.

Fused segments of the pipe shall be handled so as to avoid damage to the pipe. Chains or cable type chokers must be avoided when lifting fused sections of pipe. Nylon slings are preferred. Spreader bars are recommended when lifting long fused sections.

10.3.5 Inspection

Inspect the pipe for defects before installation and fusion. Defective, damaged or unsound pipe will be rejected.

10.4 Construction Practice

10.4.1 Trench Construction

Trenching shall be done in accordance with ASTM D 2321, Section 6 and/or ASTM D2774.

10.4.2 Embedment Material

Embedment materials shall be Class I, Class II, or Class III materials as defined by ASTM D 2321, Section 5. The use of Class IV and Class V materials for embedment is not recommended and should be done only with the approval of the engineer. Class I crushed stone and Class II well-graded gravels are preferred. The embedment material shall have an installed density of at least 85% Standard Proctor Density through compaction or consolidation.

10.4.3 Bedding

The pipe bedding shall be constructed in accordance with ASTM D2321, Section 5, Table 2.

10.4.4 Haunching and Initial Backfill

Haunching and initial backfill shall be as specified in ASTM D2774 and/or ASTM D2321, Section 5, Table 2 using Class I, Class II or Class III materials. Materials and compaction shall be as shown on the drawings.

10.5 Testing

10.5.1 Gravity Pipelines

Gravity flow pipelines shall be tested to the requirements and specifications of ASTM F 1473.

10.5.2 Pressure Pipelines

A. Pressure pipelines shall be tested in accordance with the specifications and requirements of the engineer and pipe manufacturer's recommendations. The hydro-test shall be conducted in accordance with the "Inspections, Tests and Safety Considerations" document as available through PPI. If a system component such a fabricated or mechanical fitting has a pressure rating less than that of the pipe, the piping system shall be pressure tested to the manufacturer's guideline on that component.

11.0 INSTALLATION

11.1 General

All sewers shall be laid true to line and grade and at the locations as shown by Construction Drawings or as specified. Pipe shall be installed in accordance with the manufacturer's directions, applicable provisions of "Clay Pipe Engineering Manual," as published by the National Clay Pipe Institute, and in accordance with Section 306-1.2.2 of the Standard Specifications.

Before lowering and while suspended at trench side, the pipe shall be inspected for defects. Vitrified clay pipe (V.C.P.) shall be rung with a light hammer to detect cracks. Any defective material shall be rejected and removed from the site. Trench bottom shall be inspected and adjustments made in line and grade. All pipe shall be laid without break, upgrade from structure to structure, with the bell end of the pipe upgrade.

As the work progresses, the interior of the sewer pipe shall be cleaned of all dirt and superfluous materials with a procedure approved by Owner.

At the end of each day's work, all openings in the sewer pipe shall be plugged with water-tight expandable plugs or approved equal.

11.2 Field Jointing

After the pipe has been lowered into the trench it shall be jointed in accordance with Section 306-1.2.3 of the Standard Specifications.

11.3 Manufacturer's Observation

The pipe and fitting manufacturer shall have free access to the work during laying operations and testing. Any improper act on the part of Contractor which the manufacturer may observe shall be reported to Owner. Manufacturer shall be free to observe and check all tests.

11.4 Tolerances

Maximum departure from specified grade at invert of pipe shall be 0.02 feet. The return from said departure to grade shall not create high spots or low spots in the sewer invert. The fall through manholes shall be at the pipe grade specified unless shown otherwise on the Drawings.

12.0 MANHOLES AND APPURTENANCES

12.1 Scope

Manholes shall be constructed of precast reinforced concrete in accordance with the requirements of ASTM C478, latest. Dimensions and details of manholes and appurtenances shall be as shown on Construction Drawings, Standard Drawings, or as specified.

12.2 Manhole Covers

Manhole covers and frames shall be furnished in accordance with the Construction Drawings, Section 206-3.3 of the Standard Specifications, and the Standard Drawings. Castings shall conform to ASTM, Class 35. The bearing surfaces of the frames and covers shall be machined and the cover shall seat firmly into the frame without rocking. The frame and cover shall be thoroughly cleaned and coated with commercial quality asphalt paint. The cover shall have a raised letter identification of "SAWPA SEWER."

12.3 Manhole Steps

Manhole steps shall not be installed on new manhole installations or manhole extensions.

12.4 Concrete and Mortar for Manholes

Concrete shall be of the class specified on the Construction Drawings or Standard Drawings and shall be in accordance with the Basic Concrete Specifications herein.

Cement mortar shall consist of one (1) part portland cement and two and one half (2½) parts clean, well-graded sand of such size that all will pass a No. 8 sieve. Cement and sand shall first be combined in the proper proportions, and then thoroughly mixed with the quantity of water necessary to produce a mixture sufficiently workable for the purpose intended.

Mortar shall be used as soon as possible after mixing and shall show no visible signs of setting prior to use. Retempering of mortar will not be permitted.

12.5 Waterstop

All PVC sewer pipe manhole bases shall have a waterstop installed to prevent the infiltration of ground water into the manhole at the inlet and outlet piping.

12.6 Excavation and Backfill

Manhole bedding and excavation width – The following provisions shall supplement Sections 3.2 and 3.3 (“Excavation” and “Backfill”) of these Technical Provisions.

12.6.1 Backfill Under Manhole Base

Contractor shall excavate to a minimum 6 inches below bottom of manhole base. Bedding material below manhole base will be angular $\frac{3}{4}$ inch to 1-inch maximum graded stone.

12.6.2 Backfill Adjacent to Manhole

Contractor shall place selected backfill adjacent to manhole in accordance with Section 3.3.3.b of the Technical Provisions of the Specifications.

12.6.3 Compaction Testing Adjacent to Manhole

In addition to compaction testing along the length of the sewer pipe, a minimum of one (1) compaction test shall be taken within 2’ of each manhole to assure of adequate soil compaction adjacent to each manhole.

13.0 LATERALS

13.1 Location and Size

Laterals shall be furnished in accordance with the Construction Drawings and the Standard Drawings. Laterals will not be permitted in driveway areas and shall be located a minimum of 10 feet from any potable water service.

14.0 FORCE MAINS

Unless specified otherwise, force mains shall be constructed of polyvinyl chloride pipe, in accordance with the pipeline specifications. Air and vacuum valves and plug valves shall be in accordance with the Valve Specifications.

15.0 TESTING SEWER FOR LEAKAGE AND VISUAL INSPECTION

15.1 General

Contractor shall, upon completion of the sewer main and appurtenances including backfill (prior to paving), perform tests for leakage on the sewer main and laterals. Contractor shall furnish all labor and equipment to perform testing, including providing calibrated meters for measurement of the leakage, necessary bulkheads, piping, gages, pumps and power, and shall furnish to Owner copies of all tests performed.

Contractor, at his own expense, shall do all excavation necessary to locate and eliminate leaks or other defects which may develop under test, including removal of backfill and sewer line necessary to achieve the required water tightness. After repair the required test shall be repeated until the sewer main and appurtenances meet the requirements set forth herein. Refer to Section 12.0 herein for repair.

15.2 Leakage Test

The leakage test to be performed by the Contractor shall be either the water exfiltration test or the air pressure test in accordance with Section 306-1.4.1, 306-1.4.2, and 306-1.4.4 of the Standard Specifications. The water infiltration test, per Section 306-1.4.3 of the Standard Specifications, will be required only when specified in the Special Requirements, on the Drawings, or where groundwater is encountered.

15.3 Water Exfiltration Test

Test shall be in accordance with Section 306-1.4.2 of the Standard Specifications, as modified herein. The total leakage shall be the decrease in volume of water in the upper structure. The leakage shall not exceed 0.05 gallon per minute per inch of nominal diameter of pipe per 1,000 feet of sewer pipe being tested. The length of house connections shall not be used in computing the length of sewer main being tested. The minimum test duration period shall be two hours.

If groundwater is encountered and the Owner requires the infiltration test, the Contractor will be required to also perform the air pressure test, and the exfiltration test will not be required.

15.4 Air Pressure Test

The air pressure test shall be in accordance with Section 306-1.4.4 of the Standard Specifications.

16.0 INSPECTION OF PIPELINE INTERIOR

Contractor shall provide closed circuit television inspection (CCTV) as a post-construction method to determine if the sewer line has been installed as required and all interior pipe joints are seated properly, no cracks in the pipe are evident and no construction debris is left in the sewer line.

Television inspection shall be performed after the air test has been accepted, all repairs made, cleaning of line and completion of base paving. CCTV system shall have a rotating lens camera with articulating head. Each joint will be scanned 360 degrees. The television camera shall be specifically

designed and constructed for sewer and water pipe inspection. The camera shall be operative in 100% humidity conditions. Lighting for the camera shall minimize relative glare. Lighting and camera quality shall be suitable to provide a clear, in focus picture of the entire periphery of the pipe for all conditions encountered during the work. Focal distance shall be adjustable through a range from 6" to infinity. The remote reading footage counter shall be accurate to one percent (1%) over the length of the particular section being inspected. The camera, television monitor and other components of the color video system shall be capable of producing a minimum of 350 line resolution. Documentation consisting of a color video tape and a written report detailing the condition of the pipe and joints shall be submitted to SAWPA for approval prior to testing.

Any defects in the pipe lining or joints shall be repaired and another video taken of the repaired section and submitted for approval by SAWPA prior to testing. **For domestic water systems including the pump-to-waste pipeline, all video equipment must be certified for DOMESTIC WATER LINE INSPECTION ONLY, and NEVER to have been utilized in a non-potable system.**

17.0 PIPE REPAIR AND REPLACEMENT

Where it is determined that the pipe must be replaced due to excessive leakage or damaged pipe, said replacement may be performed by installing new pipe and connecting to existing utilizing rubber Calder-type couplings with stainless steel bands. For pipe larger than 12-inch, said couplings shall be encased in concrete, as directed by the Owner.

The use of pressure-applied sealants may be permitted where approved by the Owner to repair joints where the structural integrity of the pipe remains. A multiple number of leaking joints evidencing material or installation defects shall require removal and replacement of pipe and repair with sealant will not be permitted.

18.0 CONDUCTOR CASINGS AND CARRIER PIPES

Wherever required, conductor casings shall be installed. Said casings shall be comprised of reinforced concrete pipe, as shown on the Standard Drawings. Conductor casing shall be bored or jacked or bored and jacked into place unless open trench installation is permitted; it shall not be sluiced or jetted into place. Conductor casing shall be bored or jacked into place from one direction only. Boring and jacking shall be in accordance with Section 306-2 of the Standard Specifications.

Conductor casing shall be installed to permit installation of the carrier pipe to the lines, grades, and depths specified. Contractor will be permitted a tolerance from exact grade and alignment of 0.10 feet unless specified otherwise. Unless specified otherwise, the methods and equipment used shall be as selected by Contractor and as approved by Owner. Said approval shall not relieve the Contractor of any responsibility with regard to conductor casing construction. Conductor casing shall have an inside diameter at least six (6) inches larger than the greatest outside diameter of carrier pipe. Prior to any boring or jacking or boring and jacking operations, Contractor shall submit to Owner a construction plan consisting of a schedule of operations, details of methods of construction, types of equipment to be used, details of boring or jacking pit including lengths, widths, and depths, and shoring and bracing required. Said construction plan shall be approved by Owner before any construction is commenced.

Contractor shall take all necessary precautions to prevent subsidence of or lifting of existing roadbeds, roadways, and pavements thereon. Material excavated during boring or jacking or boring and jacking operations shall be removed carefully so as to prevent caving. Voids created during construction shall be backpacked promptly to the extent practicable with soil cement or grout which shall consist of a slightly moistened mixture of one part cement to five parts granular material unless specified otherwise.

After conductor casing has been constructed, casing spacers shall be placed around the carrier pipe according to manufacturer's specifications and then installed in conductor casing in accordance with aforementioned construction plan, as approved by Owner. The annulus between conductor casing and carrier pipe shall not be filled with sand unless otherwise specified. Contractor shall install rubber end seals at each end of the conductor casing to prevent intrusion of water into the casing.

Contractor shall backfill boring or jacking pit with material specified for pipeline backfill. Said backfill material shall be compacted to the relative compaction specified which shall not be less than 90%. Contractor shall remove conductor casing and carrier pipe remnants, shoring materials, asphalt, concrete, and all other work-related debris. Contractor shall restore paved surfaces, unless directed otherwise.

19.0 SPECIAL RULES AND REGULATIONS APPLICABLE FOR CERTAIN SEWER SERVICE CONNECTIONS

19.1 Traps

As a condition to SAWPA approval for a requested sewer service connection and/or sewer service, where applicable as determined by SAWPA, grease, oil, and sand interceptor facilities, hereinafter referred to as "traps," shall be provided by the Applicant/Discharger at his expense (in addition to all other required sewer service connection and private sewer system [Building Sewer] facilities) for the proper handling of wastewater containing floatable grease, flammable wastes, sand, or other harmful ingredients, except that such traps shall not be required for private residential dwelling units. All traps shall be of a type and capacity approved by SAWPA, and shall be installed in a location which is readily and easily accessible for cleaning and inspection purposes. In maintaining such traps, the Applicant (Discharger) shall be responsible for the proper removal and disposal, by appropriate lawful means, of the trapped or collected material and shall maintain records of the dates and means of disposal, which records shall be available for and subject to review by SAWPA. Any removal or hauling of the trapped or collected materials not performed by the Applicant/Discharger must be performed by a currently licensed waste disposal firm. The minimum size for such traps shall be 750 gallons. All expenses, including construction, operation, and maintenance costs associated with such traps shall be borne solely by the Applicant/Discharger.