

SECTION 1207

PIPE AND STRUCTURES

Pipe and structures for storm drainage and sanitary sewers shall conform to Sections 202, 206, and 207 of the APWA Standard Specifications and these City Standard Specifications.

1207-1 NONREINFORCED CONCRETE PIPE

1207-1.2 Materials. - Delete Section 207-1.2, "Materials" of the APWA Standard Specifications and substitute the following:

Materials used in manufacturing the pipe shall be as specified in ASTM C 14, with the following exceptions:

- 1) The portland cement for sanitary sewer pipe shall be Type II modified in conformance with ASTM C 150 or Type IP (MS) in conformance with ASTM C 595.
- 2) Portland cement for drainage pipe shall be Type II in conformance with ASTM C 150 or Type IP in conformance with ASTM C 595.
- 3) All aggregates shall conform to Section 90, "Portland Cement Concrete" of these City Standard Specifications.

1207-1.7 Perforated Pipe. - Delete Section 207-1.7 "Perforated Pipe" of the APWA.

1207-2 REINFORCED CONCRETE PIPE (RCP)

1207-2.1 General. - Delete Section 207-2.1, "General" of the APWA Standard Specifications and substitute the following:

It shall be the Contractor's responsibility to insure the timely delivery and proper storage of all pipe materials.

All pipe sizes refer to the nominal inside diameter of pipe (including any pipe linings) and no pipe, except where specified herein, shall deviate from the nominal size designated by more than plus or minus one percent. All pipe, pipe joints incorporated into the pipe, and manufactured fittings connecting pipe between structures shall be of one and only one manufacturer's brand and of the same type, quality, class, and size unless otherwise specified or detailed on the plans. All field cut pipe shall be accomplished by methods and equipment recommended by the pipe manufacturer. No hammer and chisel cuts will be permitted.

The Contractor shall submit at his own expense, working drawings and material details of all special pipe for approval before the pipe shall be manufactured or used on the work. All pipe and fittings delivered to the job site shall be marked by the manufacturer with such inventory and identification as to be

properly identified in the field as meeting the requirements for the work.

1207-2.1.1 Quality Assurance/Control. - The pipe manufacturer shall designate one person for Quality Assurance. It shall be that individual's responsibility to assure pipe manufacturing Quality Control. This individual shall be responsible for all pipe testing, keeping quality control records, insuring that quality assurance procedures are followed during the manufacture of the pipe, and inspecting each pipe length before leaving the plant.

Pipe shall be separated in lots of no more than 400 feet in order of manufacture. Each pipe shall be dated according to date of manufacture and numbered sequentially for each date of manufacture, pipe class indicated for each pipe, and D-load.

- (a) **D-Load Test:** All pipe shall be subject to a D-load test at the manufacturer's plant. The Engineer may select at random and test as specified one length of each class of pipe for the D-load test as specified in ASTM C 497. Three-edge bearing test loads shall be applied to produce a 0.01-inch crack except that applied test loading may be terminated without producing a 0.01-inch maximum crack if or when such loading has reached one hundred ten percent (110%) of that required for and relative to the specified D-load for the subject pipe.

The cost of the pipe and the tests shall be borne by the Contractor. Pipe will be acceptable under the test requirements specified herein when all the test specimens conform to the test requirements. Should any of the test specimens fail to meet the test requirements, the manufacturer will be allowed to retest 2 additional specimens for each specimen that failed, and the pipe shall be acceptable only when all of the retest specimens meet the strength requirements.

Test results shall be submitted to the City prior to shipment to the project jobsite. Results shall indicate the specified D-load applied.

- (b) **Reinforcing Steel Placement:** The pipe manufacturer shall cut a minimum of four cores, at least 2-1/2 inch diameter, as indicated in the Table of Frequency of Sampling and Testing. Two cores taken near the bell end, 180 degrees apart, and two cores taken near the spigot end, 180 degrees apart, and 90 degrees from the opposite to determine the reinforcing steel location. If the steel is misplaced more than plus or minus 1/2-inch in any one core the manufacturer shall core two other sections of pipe selected by the Engineer from the lot from which the original pipe was selected. If the four cores of each pipe retested indicates the steel is in the proper location, the remainder of the pipe in that period run will be accepted. If the steel is not in the proper place that period's run will not be accepted.

All of these cores shall be checked to determine that the reinforcing steel is completely embedded in concrete and that the concrete adheres to the steel surface. The exposed surfaces of the cores shall be inspected for concrete to reinforcing steel contact. Contact between the circumferential reinforcement and the concrete shall be considered noncontinuous if a void is found in which a 1/16-inch diameter pin can be inserted 1/4-inch deep, without undue force, between the reinforcement and concrete. The lot will be acceptable if the total number of noncontinuous contact surfaces is 10% or less of the total number of steel bars exposed by the cut. If more than 10 percent noncontinuous contact surfaces are found in the first series of cores, the manufacturer may cut an additional series of cores, and if the additional cores bring the total to 10% or less, the lot will be acceptable.

If the steel location meets the specification requirements, the pipe core holes shall be filled with approved Epoxy mortar. If all other specifications requirements are met, the pipe will be accepted.

- c) Pipe Joint Shear Test: The shear load for the pipe joint shear test shall be 150 lb/in. of nominal diameter and shall be uniformly applied over an arc of not less than 120 degrees along a longitudinal distance of 12 inches. The assembled pipe shall rest on three supports. A support shall be located at each extreme end of the assembly. The third support shall be placed within 14 inches of the joint for flush bell pipe. The shear load shall be placed on a loading block (cradle) immediately adjacent to the joint. During these tests, the ends of the tested pipe shall be restrained only in the amount necessary to prevent longitudinal movement, and there shall be no joint leakage when tested either with water or air as described under "Acceptance Tests for Sanitary and Storm Drainage Systems."

Upon removal of the test load and the disassembly of the joint, neither the bell nor the spigot shall show permanent deformation or damage. If any joint tested should fail, two additional joints shall be tested. Failure of any of the additional joints so tested shall be cause for the rejection of that 400 feet of manufactured pipe.

1207-2.1.2 Contractor Submittals. - The Contractor shall submit the following to the Engineer:

- 1) Test Certificates or Certificate of Compliance guaranteeing that the pipe furnished hereunder is in compliance with the requirements of these City Standard Specifications.

- 2) Quality Control records of test as required by the attached "Table of Frequency of Sampling and Testing," and as specified herein.

TABLE OF FREQUENCY OF SAMPLING AND TESTING

Item Test	Frequency	Remarks
<u>At Manufacturing Plant</u>		
1. RCP Core	*	1207-2.1.1(b)
2. PVC lining ** Pull Test	1 per 50 pipe	Without regard to type of pipe or lot
3. RCP D-Load	*	ASTM C 497
4. RCP Hydrotesting, 12 PS: for 1 hr.	*	ASTM C 361
5. Absorption	1 core from item #1	ASTM C 497 Sec. 7 Method A, Max 7%
6. Concrete Strength	5 cyl 6"x 12"	ASTM C 361, Sec 10 daily Mfg cast/ independent lab test
7. Aggregate	weekly	ASTM C 33 except gradation shall not apply
8. Cert. of Type II modified cement, mix design, and gasket ASTM C-361 Sec. 9.1.2	As required	
9. PVC lining spark Flaw Test**	Each section of pipe	15,000 VAC
10. PVC lining Chemical Resistance	certification by manufacturer permitted	
11. Carbonate Equiv. Test	*	Section 12.07-2.5(5)
12. Pipe joint shear test	2 joints on first lot	
<u>In Field</u>		
13. Joint Leakage, Air hydrostatic test	each joint and each completed section	ASTM C 1103
14. PVC lining** spark Flaw Test	Each section of pipe	15,000 VAC

- * For the purpose of these specifications, a lot is defined as 400 feet but no more than 50 sections of pipe, or fraction thereof, of one size and class manufactured on consecutive working days. If the 400 feet, but no more than 50 sections, of pipe are not made on consecutive working days, then only those made on consecutive working days shall be considered a lot. If an interruption in the manufacture of a lot occurs, the Engineer may permit the pipe made after the interruption to be included in the lot,

provided the interruption does not last more than 7 calendar days. A new lot number will be assigned if any change occurs in the size or spacing of reinforcing steel, in the concrete mix, or in the curing method.

** Lined RCP pipe only.

3) Detailed fabrication and laying working drawings.

1207-2.1.3 Quality Control Records. - The Contractor shall, prior to pipe delivery, submit to the Engineer with two copy sets of the manufacturer's quality control records for pipe manufactured in accordance with this section. Records shall indicate thereon: (1) the agency and technician performing the test, (2) frequency of sampling and testing, (3) the test date, (4) the City's Job Number assigned to the project, (5) the pipe size, (6) lot number and date manufactured, and (7) required test results and additional information as required herein. Each test record sheet shall be endorsed by the manufacturer, (and the agency performing the test if other than the manufacturer), as certifying compliance with this Section.

1207-2.2 Materials. - Delete Section 207-2.2, "Pipe Materials " of the APWA Standard Specifications and substitute the following:

Materials shall comply with Section 6 of the appropriate ASTM Designation under which the subject pipe is to be manufactured, modified as specified hereunder.

- 1) Portland cement used in the manufacture of sanitary sewer pipe shall be Type II modified in conformance with ASTM C 150 or Type IP (MS) in conformance with ASTM C 595.
- 2) Portland cement used in the manufacture of all other pipes shall be Type II in conformance with ASTM C 150 or Type IP in conformance with ASTM C 595.
- 3) No admixtures shall be introduced to concrete mixes without specific approval by the Engineer. Approval for admixture or blend usage for pipe for a specific project shall not be considered a general use approval for subsequent projects unless stated.
- 4) Rubber for gaskets shall be neoprene and shall comply with the requirements of ASTM C 361.

1207-2.5 Pipe Design. Delete Section 207-2.5 "Joints" of the APWA Standards and substitute the following: Design shall comply with Section 7 of the appropriate ASTM Designation under which the subject pipe is to be manufactured, modified as specified hereunder:

- 1) In no case shall pipe be less than that specified under ASTM C 76 provisions for Class III RCP, Wall B, unless otherwise specified.
- 2) Joint assembly design shall be reinforced concrete bell and spigot type incorporating a fully retained, single or

- double rubber gasket in accordance with ASTM C 361. Steel joint rings will not be allowed. The joint shall meet the thickness requirements of the United States Bureau of Reclamation (USBR) Type R-4 joint whether flared or flush bell pipe is supplied. Reinforcement steel shall be in each end of the pipe bell and spigot.
- 3) Manufacturer's design working drawings shall be submitted to the Engineer for approval prior to fabrication. Drawings shall indicate, at relative scale, concrete covers, reinforcement placements and joint assembly design. Submittals shall also include the design pipe size, D-load, Cement type, concrete strength and areas, and types and placements of reinforcement.
 - 4) Pipe minimum and maximum lengths, except where required otherwise, shall be in accordance with Section 3.1.2 of ASTM C 361.
 - 5) Carbonate Equivalence Test for Non PVC-Lined RCP: The method and procedure for determining the alkalinity content for the inner wall of RCP shall be as follows:
 - a) A minimum of two carbonate equivalence tests shall be run on sample pipe manufactured from concrete ingredients batched each week of manufacture for each pipe size manufactured. Additional testing on different pipe sections shall be required if the carbonate equivalence results of individual tests per pipe sample vary more than 10%.
 - b) Test samples of concrete shall be obtained from randomly selected pipe sections by drilling, using carbide concrete bits as will procure at least 5 grams of material per drilling. Sample material shall be taken at two locations on the pipe interior at least 12 inches apart longitudinally and to the depth of the steel reinforcements, surface. (For elliptically placed reinforcements, sample material shall be taken at the minor axis as marked on the pipe.)
 - c) All drilled holes shall be repaired with cement and fine aggregate as specified and used in the manufacture of the subject pipe.
 - d) Each material sample shall be tested separately as obtained from the subject pipe. Test material shall be ground or pulverized sample material, oven dried for at least four hours at a temperature of 100 degrees plus 5 degrees Celsius prior to testing.
 - e) Testing shall involve the following equipment and procedures:

- 1) Equipment - Sample weighing shall be performed with a precision balance accurate to at least the nearest 10 milligrams. Liquid measures shall be performed with precision burettes accurate to at least 2/10 of a milliliter. Meters for measuring pH shall read to at least the nearest tenth of a unit. Weighing and pH meter equipment shall have been properly calibrated for correctness.
 - 2) Test procedure - Weigh at least one gram of the test material of each sample into an appropriately sized Erlenmeyer flask and add about 100 ml of distilled water. (Place glass funnel in neck of flask to minimize spray losses). Slowly add 50 ml of Standardized I-Normal Hydrochloric Acid per gram of test material. When effervescence has subsided, heat to boiling and boil about 1/2 minute period. Cool and add 50-100 ml distilled water. Titrate with standardized, carbonate-free, 1-normal Sodium Hydroxide solution to an end point of pH 6.8 minimum to 7.8 maximum. End point reading must be stabilized for not less than two minutes.
- f) Calculation of Carbonate Equivalence - Calculation shall be based upon the chemical reaction of equivalent weights of Calcium Carbonate, CaCO_3 , and the liquid measures of specifically standardized acid and base titrating solutions, to the nearest tenth of one gram at the stabilized end point. The equivalence of the tested sample shall be expressed in a percentage as CaCO_3 to the nearest tenth of one percent.
- g) Test results shall be submitted to the City prior to shipment to the project jobsite. Results shall indicate the: (1) weight of the test material, (2) actual standardized normality of the acid and titrate solutions and the test amounts used, and (3) individual sample and pipe section average equivalent CaCO_3 percentage.

1207-2.7.2 Curing Procedures. - Delete Section 207-2.7.2 of the APWA and add the following:

Cast and spun pipe shall be cured by steam or water, or a combination of both in conformance with ASTM C 76 Section 10.2.1, 10.2.2, or 10.2.3.

1207-2.8 Causes for Rejection. - Rejection of pipes shall be in accordance with APWA Section 207-2.8 and these City Standard Specifications. The quality of materials, the process of manufacture and the finished pipe shall be subject to inspection and approval by the Engineer. Pipe shall be substantially free of fractures and surface roughness. The ends of the pipe shall be normal to the walls and center line of the pipe, within the limits of variation given in Sections 12.3 and 12.4 of ASTM C 76. Pipe shall be subject to rejection as described in Section 15 of ASTM C 76, and in addition to the following:

- 1) Any shattering or flaking of concrete or other conditions indicating an improper concrete mix or molding.
- 2) PVC liner with bubbles, T-lock not properly embedded in the concrete or voids behind the PVC liner.
- 3) Any exposed reinforcing steel.
- 4) Voids around the reinforcing steel.

The Engineer's decision regarding rejection of the pipe shall be final and the rejected pipe shall be immediately removed from the jobsite at no cost to the City. Rejected pipe shall be clearly and indelibly marked accordingly so as to prevent confusion with pipe delivered under subsequent shipments.

Bell and spigot repairs shall be done with epoxy mortar only and shall be limited to normal pipe dressing operation. Any other repair in this area of the pipe shall require the prior approval of the Engineer before the repair is done. Other repairs outside of the bell and spigot shall be limited to a 12-inch square in any direction at the surface of the pipe and 3/4-inch deep.

Painting with cementitious slurry without the prior approval of the Engineer is strictly prohibited and shall be cause for rejection of the pipe.

The City reserves to right to accept damaged pipe after being suitably repaired by the Contractor, at no cost to the City. Repair procedures shall be submitted by the Contractor for the Engineer's review and approval prior to performing any repair work. The Engineer's approval of any repaired pipe shall not waive the right to reject repair of any subsequent damaged pipe regardless of whether or not it is similarly damaged.

1207-9 DUCTILE IRON PIPE (DIP). - Delete Section 207-9 of the APWA Standard Specifications and substitute the following:

Ductile Iron Pipe shall be class 150, with compression (TYCON or equal) type joints, unless otherwise specified. Pipe shall be wrapped with an 8 mils thick polyethylene in conformance with AWWA C105 (Polywrap) for corrosion resistance.

1207-20 PIPELINE STRUCTURES. - Pipeline structures shall conform to the requirements of these City Standard Specifications. All manhole structures shall be watertight. Eccentric manholes will not be allowed unless permitted by the Engineer.

Concrete for sewer structures shall be Class A with Type II modified cement in conformance with ASTM C 150 or Type IP (MS) in conformance with ASTM C 595. Concrete for drainage structures shall be Class A with Type II cement in conformance with ASTM C 150 or type IP in conformance with ASTM C-595.

Manholes shall be provided with covers to prevent the intrusion of debris into the sewer pipe as soon as the manhole is constructed or as directed by the Engineer. This measure does not relieve the Contractor from his duties as to alert the public from hazardous conditions as specified in these Standard Specifications.

Manholes shall have non-rocking manhole frame and covers, as shown on Standard Detail D-10, unless otherwise noted on the plans.

Manhole brick shall conform to Section 202-1.2 of the APWA Standard Specifications.

All manholes shall be provided with concrete collars to hold the frame firmly in place.

1207-21 MEASUREMENT AND PAYMENT. The work of this section will not be separately measured for payment. Full compensation for the materials specified in this section shall be considered as included in the various contract unit prices paid for pipe and structures and no additional compensation will be allowed therefor.

SECTION 1301

TRENCH EXCAVATION, BEDDING AND BACKFILL

1301-1 GENERAL

1301-1.1 Description. - This work shall consist of the excavating and backfilling of trenches, including the restoration of surfaces, for the installation or repair of storm and sanitary sewers, and other such drainage facilities and their appurtenant structures as shown on the plans, as specified in specifications and the special provisions, and as directed by the Engineer.

1301-1.2 Utilities Excavation Permit. - Before any excavation within an existing City street will be allowed, a Utility Excavation Permit or written approval by the Director shall be obtained and a copy of said permit or approval shall be available at the site of the work. Signed and executed contracts for public improvements or sewer lateral permits issued by the City shall constitute compliance with this Section. The Utilities Excavation Permit shall be maintained on the job at all times.

1301-1.3 Permit to Perform Excavation or Trench Work. - Attention is directed to Section 5-1.02A "Trench Excavation Safety Plans," of the General Conditions. Inasmuch as the City of San Jose does not issue "Permit to Perform Excavation or Trench Work," the Contractor shall secure such a permit from the State of California, Division of Industrial Safety, as required by Section 6500 of the State of California Labor Code.

The permit together with a copy of approved plan for trench excavation safety plan shall be maintained on the job site at all times.

1301-1.4 Survey Monuments and Points. - Whenever monuments, property corners, or other survey points are so located that they may be damaged or destroyed by the proposed excavation, the Contractor shall notify the Engineer, 48 hours prior to start of construction, so that such monuments, property corners, or survey points may be tied out.

1301-1.5 Existing Utilities. - In accordance with the provisions of Section 7-1.11 "Preservation of Property" and in Section 8-1.10 "Utility and Non-Highway Facilities" of the General Conditions, existing facilities shall be protected from damage. Any damage done to utility facilities shall be reported to the respective utility owner by the Contractor, and any repair work required shall be done by such company's repair crew. Prior to backfilling, all repair work shall be approved by the Engineer.

All sewer and utility lines that cross or lie along the trench shall be adequately supported during construction and such supports left in place. Care should be exercised when backfilling around such lines to avoid any damage to them. Any pipeline or lateral, storm or sanitary, cut or damaged in any way shall be replaced in kind. The damaged pipe shall be replaced between adjacent joints. No patching of damaged pipe will be permitted. When it is impossible to avoid damaging signal facilities installed in the pavement, coordination with the City Streets and Traffic Department is required. Damage to traffic signal loops, pads,

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interconnect cables, conduits or fire alarm conduits shall be repaired or replaced as directed by the Engineer.

All traffic markers and markings damaged or destroyed shall be replaced unless otherwise directed by the Engineer.

1301-1.6 Backfill and Surface Restoration Methods. - Backfill and restoration of surface for trenches are classified by method in accordance with the type of backfill and surfacing materials required, depending on the location of the trench. The methods are as specified in Section 1301-4.2 "Backfill and Surface Restoration," and as shown below:

**Table 1301-1
Backfill & Surface Restoration Methods**

<u>Method</u>	<u>Backfill</u>	<u>Restoration of Surface Material</u>	<u>Location</u>
A	Structural Backfill	1" Surface over 8" Deeplift AC or as shown on plans	(1) Transverse Crossing All Streets (2) Longitudinal Trench Openings - Select Major Streets (3) Inspection Cuts or Pot Holes
B	Native	12" Agg. Base w/ 3" AC Type 'B' 1" Surface AC	(1) Longitudinal Trench Openings - All Streets except as above
C	Native	In Kind	(1) Outside of AC Traveled Way

1301-1.7 Dewatering. - Trenches shall be dewatered as specified on Section 1302-3 "Trench Dewatering" of these City Standard Specification.

1301-2 MATERIALS

1301-2.1 Bedding. - Bedding material shall conform to the following criteria:

1301-2.1.1 Class I. - Class I Bedding shall have a Durability Index (Calif. Test No. 29) of not less than 30. Where percent passing the #1 sieve is equal or greater than 8%, the Sand equivalent (Calif. Test No. 217) shall not be less than 40. Gradation requirements are shown in Table I.

1301-2.1.2 Class II. - Class II Bedding shall have a Durability Index (Calif. Test No. 229) of not less than 40 and a Sand Equivalent (Calif. Test No. 217) of not less than 60. Gradation requirements are shown in Table I.

1301-2.1.3 Class III. - Class III Bedding shall meet the gradation and Sand Equivalent (Calif. Test No. 217) requirements of Structure Backfill described in Section 19-3.06 of the Standard Specifications.

1301-2.1.4 Class IV. - Class IV Bedding shall be native soils and not be bedrock, cobbles, etc. Gradation requirements are shown in Table I.

1301-2.1.5 Class V. - Class V Bedding shall be plain or reinforced Class A Portland cement concrete, constructed as specified in the special provisions and shown on the plans.

Table 1
Bedding Gradation

Sieve Size	Bedding Class (Gradation - Percent Passing)			
	I	II	III	IV
1"	100	100	see Sec.	100
3/4"	90-100	90-100	19-3.06	90-100
1/2"	---	---		
3/8"	20-55	40-100		
#4	0-10	25-40		
#8	0-5	18-33		
#30		5-15		
#50		0-7		
#200		0-4		

1301-2.2 Backfill. - Backfill material shall conform to the following:

1301-2.2.1 Native Material. - Native material shall be free of vegetation and debris and shall be free of all rocks larger than 3 inches in maximum dimension.

1301-2.2.2 Structural Backfill. - Structural Backfill shall be a mixture of clay, sands, and gravel; shall have a sand equivalent of not less than 20; and shall conform to the following grading:

<u>Sieve Size</u>	<u>Percent Passing</u>
3 Inch	100
No. 4	35-100
No. 30	20-100

In addition, if the material is to be densified by jetting, its grading shall be such that it will permit proper densification and draining of the material.

1301-2.3 Controlled Density Fill. - Controlled density fill shall consist of a mixture of aggregate, portland cement, mineral admixtures, water, and at the option of the Engineer, chemical accelerating admixtures.

1301-2.3.1 Portland Cement. - Portland cement shall be Type II Modified conforming to the provisions in Section 90-2.01, "Portland Cement," of

these City Standard Specifications. Mineral admixtures shall not be substituted for portland cement.

1301-2.3.2 Water. - Water shall conform to the provisions in Caltrans Section 90-2.03, "Water" of these City Standard Specifications. Chemical admixtures for accelerating shall be Type C or Type E conforming to the requirements in ASTM C 494.

1301-2.3.3 Aggregates. - Aggregate shall conform to the quality requirements of Caltrans Section 90-2.02, "Aggregates" of these City Standard Specifications. Aggregate shall be well graded from coarse to fine. Aggregate shall have a Sand Equivalent, as tested by California Test 217, of not less than 40.

Aggregate shall be of such size and gradation that, when mixed with Type II modified portland cement and mineral admixtures, and tested in accordance with ASTM C 39, the compressive strength of a sample will not be less than 100 or greater than 200 pounds per square inch at 28 days.

The Contractor shall notify the Engineer, in writing, of the source and grading of the aggregate to be used in the CDF. If material supplier is not approved by the City for CDF, Contractor shall make such material available to the Engineer for sampling and testing at least 45 days prior to scheduled placing of the fill. Should the Contractor change his source of supply, he shall notify the Engineer in writing of the new source and grading, and make that material available for sampling and testing at least 45 days prior to intended use.

1301-2.3.4 Proportioning, Mixing, and Transporting. - The Portland cement content of the controlled density fill shall be not less than 47 pounds per cubic yard except that, after testing samples of the Contractor's proposed supply, the Engineer may order an increase in cement content, if necessary to meet the compressive strength requirement specified above.

Proportioning for controlled density fill shall conform to the requirements for proportioning concrete mixes in Section 90-5, "Proportioning," of these City Standard Specifications except that dividing of aggregate into sizes will not be required.

Mixing and transporting controlled density fill shall conform to the requirements for mixing and transporting concrete in Section 90-6, "Mixing and Transporting," of these City Standard Specifications. Controlled density fill shall have a slump, as tested by ASTM C 43, of not more than 10 inches.

1301-2.4 Surface Restoration Materials. - Surface restoration materials shall conform to the applicable provisions for bases and surfacing specified elsewhere in these City Standard Specifications.

1301-3 EXCAVATION

1301-3.1 General. - Excavation for installation of underground facilities shall conform to the provisions as specified herein.

When excavation is within existing asphalt concrete or Portland cement concrete pavements, the edges of the trench outline shall be cut, before the trenching operation is begun, to a neat line with a cutting device approved by the Engineer.

The removal of asphalt concrete or Portland cement concrete pavements, curbs, gutters, sidewalks, or driveways shall be in accordance with the applicable provisions of Section 16 "Clearing and Grubbing," of these City Standard Specifications.

Excavations shall be performed in such a manner as to avoid any unnecessary damage to streets, sidewalks, landscaping and other existing improvements or facilities.

All underground facilities, such as sewer laterals, water services, gas services and underground electrical or telephone conduit crossing the trench line shall be located and exposed if necessary ahead of any trenching operations. All underground facilities within the limits of work shall be protected from damage due to construction related activities. Excavations in the street shall be performed in such a manner that not more than one traffic lane is restricted in either direction at any time, unless otherwise provided for in these City Standard Specifications, the special provisions, or the permit.

Excavation shall not commence until immediately before installation of the underground facilities. The material from the excavation shall be placed in a position that will not cause damage to or cause obstruction to vehicular and pedestrian traffic nor interfere with surface drainage. All public utility trenches shall be color coded according to Underground Services Alert (USA).

Rubble from the removal of asphalt or portland cement concrete pavements, curbs, gutters, sidewalks, or driveway shall be immediately removed from the site of the work so as to preclude the possibility of contaminating the backfill material.

Unless otherwise permitted in writing by the Engineer, all surplus excavated material shall be immediately removed and disposed of outside of the project limits.

The Contractor shall not sweep construction and other debris into the storm drainage system and shall prevent such materials from entering the storm drains.

The Contractor is advised that disposal of dirt and other debris into the public storm drain system is prohibited under the San Jose Municipal Code and under California State Fish and Game Code. Any fines and penalties levied against the Contractor for violation of the above and related regulations are the sole responsibility of the Contractor.

1301-3.2 Width and Depth of Trench. - All trenches in existing paved areas shall be excavated vertically and shall be of sufficient width to provide free working space on either side of the applicable installation. For installation of pipe conduits (water, storm, sanitary) the width of the trench, clear of shoring, shall allow a minimum clearance of 4 inches on each side of the pipe or bell, for pipe of 4 inches to 24 inches in diameter, and 6 inches on each side of the pipe or bell, the pipe of 27 inches and greater diameter. The maximum width of the trench on each side of the pipe shall not exceed the above minimum plus 25 percent of the outside diameter of the pipe. The walls of the trench shall rise vertically to a height of at least 12 inches above the pipe.

1301-3.3 Bottom of Trench. - The bottom of the trench, with or without bedding material, shall be graded and prepared to provide a firm unyielding and uniform bearing throughout the entire length of pipe conduit. The trench bottom shall be smooth and free from irregularities greater than 1/2-inch diameter, large dirt clods, and any frozen material. If the native material in the trench bottom is not

conductive to fine grading, or as otherwise specified, bedding material shall be used. Bedding shall conform to the requirements of Section 1301-4.1 "Bedding."

1301-3.4 Bracing and Excavations. - Attention is directed to the provisions in Section 7-1.01E, "Trench Safety" of the General Conditions.

The Contractor shall furnish and install all sheet piling, shoring, bracing, lagging or other precautions against caving in or sloughing in of the sides of the trench.

1301-4 BEDDING AND BACKFILL

1301-4.1 Bedding. - Bedding material of the class and type designated on the plans or in the special provisions shall be placed under and about the pipe to the depths shown on the plans, except that Type D does not require bedding material.

Where it becomes necessary to remove boulders or other interfering objects at subgrade for bedding, any void below such subgrade shall be filled with the class and type of bedding material designated in the contract documents. Where concrete is specified to cover the pipe, the top of the concrete shall be considered as the top of the bedding.

If soft spongy, unstable, or other similar material is encountered upon which the bedding material or pipe is to be placed, this unsuitable material shall be removed to a depth ordered by the Engineer and replaced with bedding material suitably densified. Additional bedding so ordered, over the amount required by the contract documents, will be paid for as extra work as provided in Section 4-1.03D, "Extra Work" of the General Conditions. If the necessity for such additional bedding material has been caused by an act or failure to act on the part of the Contractor, or is required for the control of groundwater, the Contractor shall bear the expense of the additional excavation and bedding.

Bedding material shall first be placed so that the pipe is supported for the full length of the barrel. If the pipe is laid in a rock cut, there shall be at least 4 inches of bedding below the pipe, even if Type D bedding has been indicated in the contract documents. Then the remainder of the bedding shall be placed.

1301-4.1.1 Type of Bedding. - Pipe shall be embedded entirely, partially or not at all, in accordance to the following types:

- Type A Bedding material shall have a minimum thickness beneath the pipe of 4 inches, or one-eighth of the outside diameter of the pipe, whichever is greater, and shall be placed around the pipe and extend up the sides of the trench to a height of 12 inches above the pipe.
- Type B Bedding material shall have a minimum thickness beneath the pipe of 4 inches, or one-eighth of the outside diameter of the pipe, whichever is greater, and shall extend up the sides of the trench to the springline of the pipe (mid or quarter point of pipe).
- Type C Bedding material shall have a minimum thickness beneath the pipe of 4 inches, or one-eighth of the outside diameter of the pipe, whichever is greater, and shall

extend up the sides of the trench to the pipe haunchline (eighth point of pipe).

Type D No bedding material required. Pipe shall be laid on trench bottom and backfilled.

**Table 1301-2
Bedding Type**

<u>Category of Pipe</u>	<u>Type of Bedding</u>
ABS Composite Pipe	A
ABS Solid Wall Pipe	A
Ductile Iron Pipe	C
Concrete Pipe Plain and Reinforced	
24" Diameter and Less	B
25" Diameter and Greater	A
Corrugated Aluminum Pipe	A
Corrugated Steel Pipe	A
Poly-Vinyl Chloride Pipe	A
Reinforced Plastic Mortar Pipe	A
Vitrified Clay Pipe	A

1301-4.1.2 Placing Bedding or Initial Backfill. - According to the Class and Type of bedding, the bedding material may be required to be placed and compacted in more than one lift. Class I material requires no compacting. Class II and III material requires hand or mechanical compaction. If no material is required for bedding the pipe, the initial backfill shall be carefully shaded around the pipe and carefully compacted to the haunchline of the pipe. Precautions shall be taken to prevent movement of the pipe during placement of bedding or initial backfill.

1301-4.2 Backfill and Surface Restoration. - Surface restoration of pavements in the traveled way shall be replaced in kind or as designated for Method A or B, whichever is greater. Restoration of surfaces outside of traveled way shall be as designated for Method C or as required by the Engineer.

When deemed necessary, the Engineer will make the final determination of backfill and surface restoration methods and materials to be used.

The type of backfill and surface restoration methods shall be as shown on the plans, or as designated on the permit, or special provisions and shall be in accordance with these specifications.

The material supporting, surrounding and/or extending to one foot above the top of the pipe shall be considered as bedding and shall conform to the provisions of Section 1301-4.1 "Bedding." Material from the bedding to the finished or subgrade shall be considered as backfill and shall conform to the provisions for the appropriate method of backfill as herein provided.

No broken pavement, regardless of size, shall be permitted in any back-fill. Not more than one 30 foot segment of trench shall be left open at the end of the day at each independent operation, unless otherwise permitted by the Engineer. Where Method A backfill is required, none of the trench shall be left open at the end of the day except as specifically authorized by the Engineer.

1301-4.2.1. Method A Backfill and Surface Restoration. - Method A backfill and surface restoration shall be used on all sewer and other utility line trenches which are excavated: (1) across existing streets, (2) in the general longitudinal direction of traffic of major city streets, except that when the trench opening is in the parking lane Method B may be allowed, and (3) all inspection or repair cuts in existing streets.

The trench shall be backfilled with either imported backfill material compacted to at least 95 percent compaction or with Controlled Density Fill. Any compaction method is acceptable except jetting. Jetting will only be allowed if approved by the Engineer. The trench backfill may be capped with 8 inches of deep lift asphalt base placed in 2 lifts and one inch surface, finished to the surrounding grade. The asphalt base material shall be Type B Gradation: 3/4-inch maximum, Class medium, Asphalt Concrete, and shall be compacted to a relative density of 98 percent.

All Asphalt Concrete surfaces shall be sealed with type SS-1 Asphalt Emulsion, applied at the rate as designated by the Engineer.

1301-4.2.2 Method B Backfill and Surface Restoration. - Method B backfill and surface restoration shall be used on all sewer and utility line trenches which are excavated in the general longitudinal direction of traffic in improved street sections. In unimproved areas scheduled for development Method B backfill shall be used without the surfacing requirement.

Backfill material shall be either approved native material or imported material and shall be placed in horizontal, uniform layers not exceeding 0.75 foot in thickness before compaction, except as specified for jetting below. Each layer of backfill from the bottom of the trench to 2.5 feet below finished grade shall be compacted to a relative compaction equal to the surrounding soil, but not less than 85 percent. Backfill within 2.5 feet of finished grade in existing improved areas or the basement grade in areas to be developed shall be compacted to a relative compaction of not less than 95 percent.

Compaction of backfill by jetting will be permitted only when, as determined by the Engineer, the backfill material is of such character that it will be self-draining when compacted and that foundation materials will not soften or be otherwise damaged by the applied water.

A wetting agent, approved by the Engineer, shall be added to the jetting water at a rate recommended by the manufacturer.

The length of the jetting tube shall be such that the end of the tube extends to the springline of the pipe and shall be alternately placed on both sides of the pipe during the jetting of the backfill. The backfill shall be jetted in separate layers, not to exceed 4 feet in thickness.

During jetting, the length of the jetting tube shall be adjusted so the end of the tube extends to within one foot of the bottom of the layer being saturated.

Water jetting of the backfill shall take place as soon after placing the backfill as construction will allow. No equipment capable of compacting the top layer of the unjetted backfill shall be allowed in the trench area until after the jetting operation is complete. Any area prematurely surface compacted shall be excavated to a depth of 2 feet prior to jetting.

The pavement section shall be replaced as specified herein. Immediately after completion of the backfill and compaction operation, a minimum of 12 inches of Class III aggregate base (compacted thickness) shall be placed on the compacted

backfill and surfaced with a temporary lift of 3 inches of cutback (cold mix) asphalt mixture.

The trench shall then be maintained for 30 calendar days to allow settlement to take place. The entire trench section shall then be tamped with a tamper of sufficient size to displace the trench section down to the depth of the existing pavement structure, exclusive of base rock, or a minimum of 4 inches, whichever is greater. After tamping, 4 inches or more of AC shall be placed in 2 lifts. The AC shall be Type: B, Gradation: 3/4" or 1/2" maximum, Class: medium. Where tamping is impossible because of existing facilities or other valid reasons, the temporary cold mix and sufficient aggregate base shall be removed to a depth to insure placing of 6 inches of Asphalt Concrete 4-1/2" of Type: B, Gradation: 3/4" maximum, Class: medium and 1-1/2" Type: B, Gradation: 1/2" maximum, Class: medium.

All AC surfaces shall be sealed with SS-1 Asphalt Emulsion, applied at the rate as designated by the Engineer.

1301-4.2.3 Method C Backfill and Surface Restoration. - Method C backfill and surfacing shall be used on all sewer and utility line trenches which are excavated in areas outside of existing traveled ways.

The trench shall be backfilled with either approved native or structural backfill material and compacted by jetting with water. Mechanical compaction will only be allowed with approval from the Engineer. The last 2-1/2 feet shall be compacted to not less than 90 percent relative compaction, and the surface area replaced or restored in kind. The replacement or restoration of surface improvements, such as; curbs, curbs and gutters, sidewalks, driveway aprons or other such facilities shall be comparable to or exceed the minimum city standards for such facilities.

In unimproved areas, after compaction, backfill material may be heaped 12-inches above the trench and allowed to settle naturally.

When any portion of a trench is within 4 feet of the edge of pavement or within an improved shoulder area without a curb, the surface of the trench shall be restored either in kind, or with 4-inches of Class III aggregate base, whichever is greater, and any surface improvement restored.

1301-4.2.4 Temporary Resurfacing. - Unless permanent pavement is replaced immediately, a temporary surface, consisting of Asphalt Concrete, 3 inches thick, shall be placed and maintained at locations determined by the Engineer, wherever an excavation is made through the pavement. In sidewalk or driveway areas the temporary asphalt concrete surface shall be at least one inch thick. At major intersections and other critical locations, a greater thickness of Asphalt Concrete may be required. The temporary pavement shall be constructed as soon as conditions permit, and shall remain in place and maintained until the permanent restoration of pavement is constructed.

1301-4.2.5 Mechanically Compacted Backfill. - Backfill shall be mechanically compacted by means of tamping rollers, sheepfoot rollers, pneumatic tire roller, vibrating rollers, or other mechanical tampers. All such equipment shall be of a size and type approved by the Engineer. Impact-type pavement breaker (stompers) may be permitted only over reinforced concrete pipe or ductile iron pipe.

Permission to use specific compaction equipment shall not be construed as guaranteeing or implying that the use of such equipment will not result in damage

to adjacent ground, existing improvements, or improvements installed under the Contract. The Contractor shall make its own determination in this regard.

Material for mechanically compacted backfill shall be placed in lifts which, prior to compaction, shall not exceed the thickness specified below for the various types of equipment:

- 1) Impact, free-fall, or "stomping" equipment - maximum lift thickness of 2 feet.
- 2) Vibratory equipment, including vibratory plates, vibratory smooth-wheel rollers, and vibratory pneumatic-tired rollers-maximum lift thickness of 2 feet.
- 3) Rolling equipment, including sheepsfoot (except for roadway base), grid, smooth wheel (nonvibratory), pneumatic-tired (nonvibratory), and segmented wheels - maximum lift thickness of one foot.
- 4) Hand-directed mechanical tampers - maximum lift thickness of 2 feet.

Mechanically compacted backfill shall be placed in horizontal layers of thickness, not exceeding those specified above, compatible to the material being placed and the type of equipment being used. Each layer shall be evenly spread, moistened, or dried, if necessary, and then tamped or rolled until the specified relative compaction has been attained.

1301-4.2.6 Water Densified Backfill. - Jetting shall be accomplished by the use of a jet pipe to which a hose is attached, carrying a continuous supply of water under pressure.

Unless flooding is specified or otherwise authorized by the Engineer, all backfill to be densified by water shall be jetted.

The backfill shall be jetted in accordance with the following requirements:

- 1) The jet pipe shall consist of a minimum of 1-1/2 inch diameter pipe to which a minimum 2 inch diameter hose is attached at the upper end. The jet pipe shall be of sufficient length to project to within 2 feet of the bottom of the lift being densified.
- 2) The Contractor shall jet to within 2 feet of the bottom of the lift and apply water in a manner, quantity and at a rate sufficient to thoroughly saturate the thickness of the lift being densified. The jet pipe shall not be moved until the backfill has collapsed and the water has been forced to the surface.
- 3) The lift of backfill shall not exceed that which can be readily densified by jetting, but in no case shall the undensified lift exceed 15 feet.
- 4) Where the nature of the material excavated from the trench is generally unsuitable for densification with water, the Contractor may, at no cost to the City, import suitable material for jetting or densify the excavated material by other methods. The backfill shall be allowed to thoroughly drain until the surface of the

backfill is in a firm and unyielding condition prior to commencement of any subsequent improvements. The Engineer may require the Contractor, at no cost to the City, to provide a sump and pump to remove any accumulated water.

- 5) The Contractor shall make its own determination that jetting will not result in damage and any resulting damage shall be repaired at no cost to the City.

1301-4.2.7 Controlled Density Fill. - Controlled density fill shall be placed in a manner as will assure complete filling of the trench without segregation of the fill and without pockets of entrapped air.

1301-5 MEASUREMENT AND PAYMENT. - The work of this section will not be separately measured for payment. Full compensation for the excavation, bedding, and backfill specified in this section shall be included in the various contract unit prices paid for pipe and structures and no additional compensation will be allowed therefor.

SECTION 1302

PIPE INSTALLATION

1302-1 GENERAL

1302-1.1 Description. - This work shall consist of laying pipe in trenches or jacking pipe, and making joints as required to complete the pipe installation, as shown on the plans, as specified in these specifications and the special provisions, and as directed by the Engineer.

Trenches shall be excavated, trench bottom prepared, and bedding placed and compacted as specified in Section 1301, "Trench Excavation, Bedding, and Backfill" of these City Standard Specifications.

Bell holes shall be excavated at each joint, if necessary, to provide full length barrel support of the pipe and to prevent point loading at the bells or couplings.

Fill material or trench subgrade beneath the pipe shall be graded and shaped to provide a uniform and continuous support beneath the pipe at all points between the bell holes or pipe joints.

Unless otherwise specified or directed by the Engineer, all pipe shall be laid straight between the changes in alignment and at uniform grade between changes in grade. For concrete pipes with elliptical reinforcement, the pipe shall be placed with the minor axis of the reinforcement in a vertical position.

Attention is directed to Section 1301-1.5, "Existing Utilities" of these City Standard Specifications for requirements relating to protection of existing facilities.

1302-2 MATERIALS. - Materials shall conform to the requirements of Section 1207, "Pipe and Structures" of these City Standard Specifications and the requirements of this Section.

1302-3 TRENCH DEWATERING. - At all times groundwater and surface runoff shall be controlled to maintain the trench in a stable condition during construction.

At the time of laying pipe, the prepared trench shall be in a firm and dry condition. If trench is not in such condition, the Contractor shall furnish and operate such pumps or other devices as may be necessary for removing ground water from trenches during the construction of pipeline system.

When shown on the plans, or ordered by the Engineer, a filter blanket of pervious material or permeable material conforming to the provisions of Section 19-3.065, "Pervious Backfill Material" of the City Standard Specifications shall be placed in accordance to the dimensions shown on the plans or to a depth ordered by the Engineer. If the filter blanket is ordered by the Engineer, it will be paid for as extra work as provided in Section 4-1.03D, "Extra Work," of the General Conditions.

1302-4 PIPE LAYING

1302-4.1 General. - Regardless of the type of pipe shown on the plans or as specified in the special provisions the standard procedures for pipe laying specified herein shall apply.

Pipe will be inspected in the field before and after laying. If any cause for rejection is discovered in a pipe after it has been laid, it shall be subject to rejection. All corrective work shall be approved by the Engineer and shall be at no cost to the City.

When connections are to be made to any existing pipe, conduit, or other appurtenances, the actual elevation or position of which cannot be determined without excavation, the Contractor shall excavate for, and expose, the existing improvement before laying any pipe or conduit. The Engineer shall be given the opportunity to inspect the existing pipe or conduit before connection is made. Any adjustments in line or grade which may be necessary to accomplish the intent of the plans shall be made, and the Contractor will be paid for any additional work resulting from such change in line or grade as extra work as provided in Section 4-1.03D, "Extra Work" of the General Conditions.

Pipe shall be laid to upgrade with the socket or collar ends of the pipe upgrade unless otherwise approved by the Engineer.

Corrugated metal pipes shall be laid with external laps of the circumferential seams toward the inlet end. Corrugated pipes shall be shipped and handled in such a manner as to prevent damage to protective coatings.

Pipe shall be laid to plan line and grade, within uniform bearing under the full length of the barrel of the pipe. Suitable excavation shall be made to receive the socket or collar which shall not bear upon the subgrade or bedding. Any pipe which is not in true alignment or shows any undue settlement after laying shall be taken up and relaid at no cost to the City.

At the close of work each day, or whenever the work ceases for any reason, the end of the pipe shall be securely closed unless otherwise permitted by the Engineer.

1302-4.1.1 Laterals. - The term "sewer lateral connection" or "house lateral" as used in these specifications, on the plans or other drawings, is used to designate the branch sewers laid from the main sewer to points on the property lines from which sewer service can be obtained by proper connection therefrom. When so indicated by the plans, house lateral connections shall be laid either from the upper end of a "y" branch or from a manhole to the property lines. All laterals shall be laid to a grade of 1/4-inch vertical rise to one foot run of pipe, (2%) slope, unless otherwise specified by the Engineer. When the top of the lateral is less than 3 feet below the subgrade at any point, ductile iron pipe shall be used for the lateral unless specified otherwise on plans.

A 2 inch by 2 inch by 3 foot redwood marker shall be placed at the end of the sewer lateral, or, if the curb is already in, a letter "S" shall be stamped on the face of the curb at a point opposite the end of the sewer lateral.

Storm sewer laterals shall be laid on a minimum grade of two percent (1/4" per foot).

1302-4.2 Field Joining of Pipe. -

1302-4.2.1. General. - Materials for pipe joints shall conform to the applicable requirements of Section 1207, "Pipe and Structures."

Pipe joints shall be handled and assembled in accordance with the following general requirements:

- 1) Care shall be taken to avoid dragging the spigot on the ground or allowing it to be damaged by contact with gravel, crushed stone or other hard objects.
- 2) Joint mating surfaces shall be cleaned immediately prior to jointing.

Joining of pipe sections shall be in accordance with the manufacturer's or industry recommendations for the type of joints used and as specified herein. All joints shall be so formed that when the pipe sections are drawn together the system shall be continuous, uniform, and watertight.

1302-4.2.2. Vitrified Clay Pipe. - Unless otherwise indicated on the plans or specified in the special provisions, vitrified clay pipe shall be joined as herein specified with either premolded resilient compression joints or compression couplings.

- (1) **Resilient Compression Joints.** - The mating components of premolded resilient compression joints shall be wiped clean of dirt and other foreign matter, and the surfaces coated with an approved lubricant. The spigot end of the pipe to be installed shall be positioned in the bell end of the pipe previously laid and shoved home. For large diameter pipe, a lever attachment or bar cushioned by a wooden block shall be used to mate the pipes. In no case shall a bar be used on the unprotected bell end of pipe.

The mating surfaces of the pipes shall be in tight contact with each other upon completion of the joining installation.

- (2) **Compression Couplings.** - Unless otherwise specified, pipe shall be delivered to the job site with the sleeve attached to one end of each pipe section. The spigot end of the pipe to be joined shall be inserted in the sleeve and the steel compression band shall be tightened immediately.

1302-4.2.3 Concrete Pipe Joints. - The ends of concrete pipe (reinforced or nonreinforced) sections shall be so formed that when properly laid together they will make a continuous and uniform line of pipe. The joints shall be such design as will permit placement without appreciable irregularities in the flowline, and capable of being sealed to prevent leakage or infiltration.

Unless otherwise indicated on the plans or specified in the special provisions, concrete pipe shall be joined, as herein specified, with rubber gasketed joints.

- (1) **Rubber Gasketed Joints.** - Gasket type joints shall be watertight and flexible. Each joint shall contain a solid gasket of neoprene or other material approved by the Engineer, which shall be the sole element responsible for

watertightness of the joint. When laying the pipe, the bell end of the pipe shall be laid with the bell upstream. The gasket and bell shall be thoroughly cleaned and then lubricated with a soft vegetable soap compound. The gasket shall be stretched evenly when it is installed on the pipe. The spigot end of the pipe to be laid shall be inserted into the bell end of the previously laid pipe. For pipe in which the inside joints are to be pointed, suitable spacers shall be placed against the inside shoulder of the bell to provide the proper space between the abutting ends of the pipe. After the joint is assembled, a feeler gage shall be inserted between the bell and the spigot and the position of the gasket checked around the complete circumference of the pipe. If the gasket has been improperly placed the pipe shall be withdrawn and the joint remade. The gasket shall not be reused if damaged.

1302-4.2.4 Cast and Ductile Iron Pipe Joints. - The type of joint to be used will be indicated on the plans or in the special provisions, and shall be installed as specified by the manufacturer.

1302-4.2.5 Corrugated Metal Pipe Joints. - Corrugated metal pipe shall be joined with coupling bands. The separate sections of pipe shall be laid in the trench with outside laps of circumferential joints upgrade, with longitudinal laps positioned other than in the invert, and with a maximum spacing between sections of 1-1/2 inches. The sections shall then be joined with coupling bands. Corrugations or projections on the coupler shall properly engage the pipe corrugations of each section before bolts are tightened.

Paved inverts shall be placed and centered on the bottom of the trench. Any damage to the protective lining and coating shall be repaired prior to the backfilling around the pipe.

If waterproof joints are called for on the plans, or specified, the caulking compound or other waterproofing material used shall be subject to the approval of the Engineer.

Where hydraulic structures such as manholes are constructed in conjunction with corrugated metal pipe, the ends of pipes shall penetrate through structure walls and be placed flush or cut off flush with the structure face, unless otherwise directed by the Engineer.

1302-4.2.6 Poly-Vinyl Chloride Pipe Joints. - Poly-Vinyl Chloride pipe shall be sealed with rubber sealing ring premolded in the bell of the pipe for sewer pipe or with insertable rubber sealing rings for pressure pipe. Lubricant shall be applied to spigot end of pipe. The pipe shall be assembled to coupling by using a bar and wood block or level or friction pullers. The spigot end shall be pushed in until the reference mark on the spigot end is flush with the end of the bell. The pipe lengths in the trench shall be continuously supported between bell holes.

1302-4.2.7 Reinforced Plastic Mortar Pipe Joints. - Reinforced Plastic Mortar pipe shall be sealed with a rubber sealing ring installed in a factory-formed groove in the spigot end of the pipe section. The mating areas of the pipe shall be

wiped clean, including the groove for the rubber sealing ring. The rubber ring shall be installed in groove. Assemble pipe sections by stabbing, bar and wood block or level or friction pullers making sure spigot end is firmly seated to the shoulder of the bell end of a joining pipe.

1302-4.2.8 Acrylonitrile-Butadiene-Styrene (ABS) Composite Pipe Joint. - ABS composite pipe shall be joined and sealed by solvent cement joint coupling and installed as herein specified. Apply a coat of primer to the inside of the socket and to the outside of the spigot end of pipe. Without delay, apply a coating of cement to the same surfaces in sufficient quantity that when the spigot is fully inserted into the socket, a bead of excess cement will form around the complete circumference of the outside juncture of the spigot and socket. Remove excess cement. The pipe lengths in the trench shall be continuously supported between joints.

1302-5 JACKING

1302-5.1 General. - Before starting excavation, the Contractor shall submit working drawings of jacking pit bracing, casing or conduit, and jacking head proposed to be used.

Unless otherwise specified, the methods and equipment used in jacking casing or pipe shall be optional with the Contractor, provided that the proposed method is approved by the Engineer. Such approval, however, shall in no way relieve the Contractor of the responsibility for making a satisfactory installation meeting the criteria set forth herein. Only workers experienced in jacking operations shall be used in performing the work.

The leading section of casing or pipe shall be equipped with a jacking head securely anchored thereto to prevent any wobble or variation in alignment during the jacking operation.

The driving ends of the casing or pipe shall be properly protected against spalling and other damage, and intermediate joints shall be similarly protected by the installation of sufficient bearing shims to properly distribute the jacking stresses. Any sections of casing or pipe conduit showing signs of failure shall be removed and replaced with a new precast section or with a cast-in-place section, which is adequate to carry the loads imposed upon it.

Excavation shall not be made in excess of the outer dimensions of the casing or pipe being jacked unless approved by the Engineer. Every effort shall be made to avoid any loss of earth outside of the jacking head. Excavated material shall be removed from the casing or pipe as excavation progresses, and no accumulation of such material within the conduit will be permitted.

Once the jacking operation has commenced, it shall be continued uninterrupted around the clock until the casing or pipe has been jacked between the specified limits. This requirement may be modified if the Contractor submits to the Engineer for prior approval methods and details that shall prevent the "freezing" of the casing or pipe and ensure that the heading is stable at all times.

Upon completion of the jacking operations, all voids around the outside face of the casing or conduit shall be filled by grouting.

Grouting equipment and material shall be on the work site before jacking operations and drilling of grout holes are completed in order that grouting around the jacked casing or conduit may be started immediately after the jacking operations have finished.

Should appreciable loss of ground occur during the jacking operation, the voids shall be backpacked promptly to the extent practicable with soil cement consisting of a slightly moistened mixture of one part cement to 5 parts granular material. Where the soil is not suitable for this purpose, the Contractor shall import suitable material at no cost to the City. The soil cement shall be thoroughly mixed and rammed into place as soon as possible after the loss of ground.

1302-5.2 Jacking Reinforced Concrete Pipe. - When pipe is specified to be jacked into place, the design of such pipe is based upon the superimposed loads and not upon the loads which may be placed upon the pipe as a result of the jacking operations. Any increase in pipe strength in order to withstand jacking loads shall be the responsibility of the Contractor.

Where pipe 60 inches or greater in inside diameter is to be jacked for a distance greater than 32 feet, a pilot tunnel shall be constructed first to ensure accuracy of grade and alignment. The dimensions and support of the pilot tunnel will be optional with the Contractor subject to the approval of the Engineer. Such approval shall in no way relieve the Contractor of the responsibility for damage of any nature which may occur as a result of the method.

Supports for pilot tunnels shall be removed as jacking progresses.

Unless the Contractor submits an alternate proposal to the Engineer for approval and the method is approved by the Engineer, the following method shall be used for supporting and guiding the pipe:

After the pilot tunnel has been constructed, a concrete cradle shall be placed true to line and grade and conforming to the outside radius of the pipe. The cradle shall be of such dimensions as to adequately and uniformly support the pipe under the lower 60 degree sector measured on the outside of the pipe. The curved surface shall be formed or accurately screeded to the proper dimensions. It shall be reinforced with not less than 0.3 percent of longitudinal steel and not less than 0.5 percent of transverse steel with respect to the cross-sectional area of the cradle. The transverse steel shall be bent on a radius equal to the radius of the outside of the pipe plus 2 inches and shall extend to within one inch of the edge of the cradle.

In lieu of the concrete cradle specified above, the Contractor may, subject to the approval of details by the Engineer, set steel rails in the concrete base slab to true line and grade.

Grout holes, pipe, and fittings shall be placed in the pipe invert on centers no greater than 5 feet and shall perform such pressure grouting as is necessary to fill voids and to secure uniform bearing between the cradle and the pipe. The grout shall be neat cement grout. Grouting pressures shall be as determined in the field by the Contractor and approved by the Engineer.

All costs involved in the performance of the work of constructing pilot tunnels and cradles shall be included in the price bid for jacking pipe.

1302-5.3 Jacking Steel Casing and Installing Pipe Inside Casing. - Unless otherwise specified on the plans, the size and wall thickness of the casing to be jacked to accommodate the contract pipeline shall be at the Contractor's

option except that the casing thickness shall be not less than 3/8-inch, and the Contractor shall be fully responsible for the sufficiency of the casing provided.

The joints of sections of casing to be jacked shall be welded with a continuous circumferential weld. It shall be the Contractor's responsibility to provide stress transfer across the joints which is capable of resisting the jacking forces involved.

All clay pipe installed in a jacked casing shall have mechanical compression joints. The pipe shall be braced or filled to prevent shifting or flotation during backfilling operations.

Backfill shall be gunite sand, gunite concrete, or pressure concrete, except where specified otherwise in the plans or in the special provisions. Pressure concrete shall not be placed until the mix design, placement method, and equipment have been approved by the Engineer.

If the pressure concrete mix cannot be readily pumped or placed by the placing equipment, additional water may be added, provided the water-cement ratio of the approved mix design is not exceeded.

Where gunite sand backfill is used, the pipe shall be laid on a concrete subbase or on gravel bedding where shown on the plans or approved by the Engineer.

The pipe barrels shall rest upon concrete support blocks with the pipe sockets clearing the concrete subbase by at least 1/2 inch.

In addition to submitting details of the jacking pit bracing, casing, and jacking head required, the Contractor shall submit to the Engineer for approval details of the following in advance of the proposed jacking operation: concrete support blocks, bracing to prevent pipe shifting or flotation, and pressure concrete mix design, placement method, and equipment.

1302-5.4 Jacking Corrugated Steel Pipe. - Corrugated steel pipe to be jacked in place between the limits shown on the plans shall conform to the provisions of these specifications and the following: The thickness of the pipe designated in the contract item will be the minimum thickness permitted. Any heavier thickness of pipe or other facilities required to withstand jacking pressure shall be determined and furnished by the Contractor at no cost to the City.

Corrugated pipe lengths may be joined by field riveting. Variation from theoretical alignment and grade at the time of completion of placing shall not exceed 1-inch per 100 feet.

The diameter of the excavated hole shall not be more than 0.1 foot greater than the outside diameter of the pipe. Sluicing or jetting with water will not be permitted. When material tends to cave in from outside of these limits, a shield shall be used ahead of the first section of pipe or the face of excavation shall not extend beyond the end of the pipe greater than 1-1/2 feet, unless permitted by the Engineer.

1302-5.5 Tolerances. - Pipe and casing shall be jacked true to line and grade. When a pilot tunnel is required to be constructed in connection with jacking reinforced concrete pipe, variations of the pilot tunnel from theoretical alignment and grade shall not exceed 0.25 percent of the distance from the jacking point to terminus of pilot tunnel, unless otherwise shown on the plans or specified in the special provisions.

1302-6 MEASUREMENT. - The work performed under this section will be listed in the contract item by pipe size, type, thickness, or whatever information is necessary for identification.

The length of the various pipes to be paid for will be the horizontal length in linear feet measured from centerline of structure to centerline of structure or terminus. Laterals to be paid for will be the horizontal length in linear feet from inside face of structure or terminus. Stub outs will be measured per linear foot and paid for by length designated on the plans or the length actually installed if ordered by the Engineer.

Pipe bends, wyes, tees and other branches will be measured and paid for per each of the actual number installed.

If the contract item is provided for, jacked casing will be measured per linear foot and paid for by the actual length of casing installed.

1302-7 PAYMENT. - The length of pipes and casing measured as specified in Section 1302-6 "Measurement," will be paid for at the contract unit price, per linear foot for the various types, sizes, and classes of pipe or casing installed.

Except when a contract item is provided for jacked casing the cost of furnishing and jacking casing in place shall be included in the contract price per linear foot for that portion of the pipeline to be installed within the casing.

The above prices and payments shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in installing various sizes and classes of pipe including excavating, furnishing, and placing backfill, jacking pipe or casing, connecting new pipe to existing facilities, restoration of pavement, testing, flushing and cleaning, complete in place as shown on the plans, as specified in these specifications and the special provisions, and as directed by the Engineer.

Structures installed in connection with the pipe main or where otherwise shown separately on the plans will be measured and paid for in accordance with the provisions of Section 1305 "Pipeline Structures."

SECTION 1305

PIPELINE STRUCTURES

1305-1 GENERAL

1305-1.1 Description. - This work shall consist of furnishing all necessary material, equipment, and labor for the construction of manholes, drainage inlets, flushing inlets and other sewer drainage appurtenances, as shown on the plans, as specified in these specifications and the special provisions, and as directed by the Engineer. The type of structures will be as designated on the plans.

1305-1.2 Existing Facilities. - Existing sewer drainage facilities shall be adjusted to grade, remodeled or abandoned as shown on the plans and in accordance with the provisions of Section 15, "Existing Facilities" of these City Standard Specifications.

New frames, grates and covers shall be set on new structures.

1305-2 MATERIALS. - Materials shall conform to the requirements of Section 1207, "Pipe and Structures."

1305-3 INSTALLATION

1305-3.1 Manholes. - Manholes shall be sound, watertight structures constructed at the locations shown on the plans, in accordance to the standard plan details and these specifications.

All manholes shall be waterproofed by applying a coat of sodium silicate, or other approved waterproofing agent, to the interior surfaces. The waterproofing agent shall contain a dark green pigment, and shall be not soluble in water and shall be easily recognizable.

1305-3.1.1 Foundation. - After excavation is completed and approved, a cast-in-place foundation or base block shall be constructed. The excavation for the foundation shall be level and of sufficient width and depth to accommodate the foundation dimensions herein specified.

The foundation specified shall be of such width that the outside edges shall be a minimum of 3 inches beyond the outside wall of the manhole wall at all points and be of such depth that it is a minimum of four inches under the outside bottom of the lowest pipe in the foundation and a minimum of three inches over the outside top of the highest pipe in the foundation.

The concrete for the foundation shall be placed continuous and deposited in such a manner that segregation of material does not occur. Once deposited, the concrete shall be consolidated mechanically so as to secure a dense watertight mass.

Before final set of the concrete, a keyway shall be made in the top of the foundation block by use of a metal form ring. The keyway in the foundation block will only be required for precast manholes.

Whenever possible, the foundation shall be formed around the pipe running continuously through the manhole.

When the pipe cannot be run continuously through the manhole base foundation invert channels shall be shaped and troweled smooth, with transitions,

of line and grade, from one pipe to another. The channels shall conform to and be of such width equal to the inside diameter of the pipes.

The top of the foundation, from inside face of manhole, shall be shaped to slope toward the channels at the rate of one inch per foot minimum.

1305-3.1.2 Precast Concrete. - Precast concrete manholes shall consist of cylindrical barrel sections, concentric tapered cones, and grade ring sections.

The various shaft sections shall fit together readily and all jointing and connections shall be cemented with mortar or joined with rubber gaskets or mastic joint fillers. All mortar joints shall be troweled smooth on the inside face and shall be watertight.

The rubber ring gaskets shall be installed so as to form a flexible watertight seal. The mastic joint filler shall be applied in accordance with the manufacturer's recommendations so as to form a watertight seal.

The shaft sections and cone shall be combined in such a manner that a maximum height of the throat or neck is no more than 18 inches to finished grade. The measurement shall include the manhole frame casting.

1305-3.1.3 Brick Construction. - All brick masonry shall be double thickness. The brick shall be clean and thoroughly dampened immediately before laying. All brick shall be laid in freshly made mortar and each brick shall be laid with a "push joint." In no case will sluicing or grouting of a joint be allowed nor will a joint be made by working in the mortar after the brick has been laid. Every fifth course of brick shall be a header course.

The joints between the courses, horizontal and vertical shall not be less than 1/4-inch nor more than 1/2-inch wide and shall be uniform throughout the work. The inside and outside surfaces shall be smoothly plastered with cement mortar at least 1/2-inch in thickness.

Upon completion of the brick work all surfaces shall be thoroughly cleaned and all excess mortar removed from foundation and interior of manhole.

1305-3.1.4 Drop Connections. - Drop connections to manholes shall be constructed, at the locations shown on the plans, in accordance to the standard details and these specifications.

The lower pipe shall be constructed into the foundation in accordance with the provisions of Section 1305-3.1.1 "Foundation." The upper pipe shall be installed after the manhole shaft is in place. The pipe shall be flush with the inner wall of the manhole and the opening between pipe and wall shall be mortared watertight.

The lower pipe, including the long radius bend shall be encased in concrete. The remaining void including 10 foot reach of the upper pipe shall be backfilled with imported backfill material and compacted to 95 percent relative compaction.

1305-3.1.5 Setting Manhole Frames Casting.- The manhole frame castings shall be permanently set when so authorized by the Engineer. The frame casting shall be centered on the manhole neck and set on a layer of mortar. The mortar shall be neatly struck. In flexible pavement areas a concrete collar shall be formed and poured around the manhole neck from the top of the casting to the top of the cone section so as to securely anchor the frame to the manhole neck. The collar shall be of uniform width at least 4 inches wider than the flange of the casting. The concrete mixture for the collar, shall contain lamp black coloring.

The amount of lamp black to be added to the mixture will be specified by the Engineer.

In areas to be paved with asphalt concrete the manhole frame casting and collar shall not be installed until the final paving lift is placed. A steel protection plate of adequate strength, close filled and well secured, shall be kept over the manhole opening until frame casting and collar is installed. Pipeline protection plates shall be installed on top of the foundation channel ledges, to protect the pipeline channels from falling debris and shall not be removed until the frame and cover is installed.

1305-3.2 Flushing Inlets. - Flushing inlets shall be constructed at the locations shown on the plans in accordance to the standard plan details and these specifications.

The riser shaft and fittings of the flushing inlet shall be 8 inches in diameter and shall be of the same material as, and joined in the same manner as, the sewer main to which it connects.

The riser shaft shall be a straight piece of pipe joined to the main by means of a 90 degree long radius bend attached directly to the main for terminus of the sewer main.

The 90 degree bend shall be encased in concrete.

In areas to be paved, the riser shaft shall not extend into the structural section of the pavement until after such pavement section is completed. The top and opening of the riser section, below the structural section, shall be protected and temporarily sealed until such time as the riser can be completed and the frame and cover permanently installed.

The finished riser shaft shall be cut smoothly and at right angle and shall extend to within 2 inches of the casting cover.

1305-3.2.1 Frame and Cover. - The riser frame and cover shall be permanently set when so authorized by the Engineer. The frame shall be centered on the riser pipe shaft so that the pipe does not touch the frame. When the frame has been set to final grade, a circular concrete collar shall be formed and poured around the frame, not touching the pipe, and bearing on firm ground. The collar shall be at least 12 inches in depth, measured from top of frame, and shall be 8 inches in circular width.

1305-3.3 Drainage Inlets. - Drainage inlets or catch basins shall be of the type specified and constructed or installed at the locations shown on the plans in accordance to the standard plan details and these specifications.

1305-3.3.1 Cast-In-Place. - Cast-in-place drainage inlets shall be constructed on a compacted subgrade with the natural earth bank serving as the outside form. All other forming and placing of concrete shall conform to the provisions of Section 51 "Concrete Structures." The interior bottom shall be shaped accurately so as to be smooth, uniform, and cause minimum resistance to flowing water. The bottom, from inside walls, shall be sloped toward the outlet.

Hooded curb inlets shall be constructed in 2 phases, The sides and bottom of the inlet shall be poured monolithically with the height of the sides below the grade of the bottom of the curb and gutter. The castings shall be set along with the forming of the curb and gutter, and poured along with or after installation of the curb and gutter.

Flat grate inlets shall be constructed in a single phase.

1305-3.3.2 Precast. - Precast inlet structures shall be set on a previously placed or constructed concrete slab foundation. The foundation shall be 6 inches thick and 3 inches wider than outside dimensions of the precast structure.

Provisions shall be made for connections for pipe laterals to be installed in the structure. All joints between vertical sections and openings around pipes shall be grouted with cement mortar.

The top of the inlet shall be accurately set to line and grade as shown on the plans.

1305-4 MEASUREMENT. - Quantities of the various type of manholes, flushing inlets and drainage inlets will be determined as units from actual count of the item complete and in place, including castings.

1305-5 PAYMENT. - Items of work, measured as specified in Section 1305-4 "Measurement" will be paid for at the contract unit price each by type for manholes, drop manholes, flushing inlets and drainage inlets.

The above prices and payments shall be full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in constructing the manholes and inlets, complete in place, including connections to pipes and other structures, as shown on the plans, as specified in these specifications and the special provisions, and as directed by the Engineer.

SECTION 1307

ACCEPTANCE TESTS FOR SEWERS

1307-1 GENERAL

1307-1.1 Description. - This work shall consist of testing sewers and force mains for leakage and deflection, and the furnishing of all necessary materials and equipment required. Deflection tests will be required for flexible pipe sewers only.

The air pressure test shall be the referee method used to determine watertight integrity of all sewers. The hydrostatic leakage test method will only be used when specifically ordered by the Engineer in writing.

This work shall be accomplished as specified in these specifications and the special provisions, and as directed by the Engineer.

Leakage test shall be performed on the entire sewer main installed, with the length of each test section limited to the pipe segment between manholes.

Deflection test for flexible pipe shall be run on the entire sewer system.

1302-1.2 Preparation of Sewer System. - Prior to performing leakage or deflection tests for acceptance, the sewer system installation shall be completed (laid, backfilled and compacted), and cleaned. Cleaning of the sewer system shall be in accordance to the provisions of Section 1308, "Cleaning Pipe Lines" of these City Standard Specifications.

1307-2 METHODS OF TESTING

1307-2.1 Air Pressure Test. - Air pressure test shall be in accordance with APWA Section 306-1.4.4, "Air Pressure Test."

1307-2.2 Hydrostatic Leakage Test. - When the hydrostatic leakage test, in lieu of air test, is ordered by the Engineer, the Contractor shall furnish all water, material and labor necessary to make the test. All testing shall be done in the presence of the Engineer and in accordance with the procedures as specified herein.

Each section of the sewer main to be tested shall be sealed by inserting stoppers in the lower end of the sewer segment, the inlet pipe of the upper manhole, and any side sewers at intervening manholes. The pipe and upstream manhole shall be filled with water to a point not less than 5 feet above the invert of the pipe or prevailing ground water elevation, whichever is higher. The line segment shall be filled approximately 4 hours prior to testing. The line shall be tested for at least 2 hours, maintaining the head specified above by measured additions of water. The sum of the additions of water added shall be the amount of leakage for the test period. When the amount of leakage, in a section tested, exceeds the maximum allowable, the Contractor shall locate the source of the leak or leaks and correct such leaks to the satisfaction of the Engineer. After the leak or leaks has been corrected, and the trench rebackfilled and compacted, the section of line shall then be retested to compliance.

The maximum allowable leakage tolerance for sewers is 500 gallons per inch diameter per mile of pipe per day, (0.066 gallons per minute per inch diameter per 1000 feet of pipe). The maximum allowable leakage tolerance for force mains

is 5 gallons per inch of diameter per mile of pipe per day, (0.0039 gallons per inch of diameter per 100 feet of pipe).

1307-2.3 Deflection Test. - The deflection test for flexible pipe sewer systems shall be performed by pulling a mandrel through the pipe line. The mandrel shall have a diameter equal to 95 percent of the inside diameter of the pipe system being tested. When the mandrel cannot be pulled through the pipe line the Contractor shall locate and correct the defect to the satisfaction of the Engineer. After the defect is corrected and trench backfilled, the section of line shall then be retested to compliance.

Deflection tests shall be performed not sooner than 30 days after completion of placement and densification of backfill. The pipe shall be cleaned and inspected for offsets and obstructions prior to testing.

The mandrel shall: (1) be a rigid, nonadjustable, odd number of legs (9 legs minimum), mandrel having an effective length not less than its nominal diameter; and (2) be fabricated of steel, fitted with pulling rings at each end, stamped or engraved on some segment other than a runner indicating the pipe material specification, nominal size and be furnished in a suitable carrying case labeled with the same data as stamped or engraved on the mandrel.

The mandrel shall be pulled through the pipe by hand to ensure that maximum allowable deflections have not been exceeded. Prior to use, the mandrel shall be certified by the Engineer. Use of an uncertified mandrel or a mandrel altered or modified after certification will invalidate the test. If the mandrel fails to pass, the pipe will be deemed overdeflected.

Overdeflected pipe shall be uncovered and, if not damaged, reinstalled within 45 calendar days of its removal. Damaged pipe shall not be reinstalled, but shall be removed from the work site. Any pipe subjected to any method or process other than removal, which attempts, even successfully, to reduce or cure overdeflection, shall be uncovered, removed from the work site and replaced with new pipe. The replaced pipe shall be tested for deflection not sooner than 30 days after installation.

1307-3 TELEVISION INSPECTION. - After all testing specified in this section has been satisfactorily completed, the entire tested sewer shall be given a television inspection. The Contractor shall inspect internal sanitary sewer mains by color television camera and the inspection shall be recorded in magnetic medium, as specified hereinafter. Television inspection shall be performed before and after installation of the liner. Cleaning of the existing sanitary sewer shall be performed prior to the television inspection by a separate operation.

The inspection shall be recorded in true color in Beta Max II or VHS ("SP") Cassette format with on-screen footage readout on the lower part of the screen.

A written log in City of San Jose Standard Television Inspection format (available from the Engineer) shall accompany the recorded cassette. Including the following information shall accompany the recorded cassette:

- 1) Date
- 2) Tape Number
- 3) Location
- 4) Pipe Material and Size
- 5) Name of Equipment Operator

- 6) Name of Firm Performing the Inspection
- 7) All deficiencies in the sewer installation shall be noted and their location referenced to their on-screen footage readout

The recorded cassette and accompanying report shall be delivered to the Engineer not later than 24 hours after completion of the inspection. The cassette and report shall become the property of the City. The Engineer will review the recorded television inspection and will notify the Contractor whether:

- 1) The review revealed a satisfactory installation, or
- 2) The review revealed deficiencies

The Contractor may review the recorded television inspection by requesting and arranging the review with the Engineer.

The following deficiencies in sanitary sewer liner installation shall be corrected by the Contractor at no cost to the City:

- 1) Joint separation (if applicable)
- 2) Offset joints (if applicable)
- 3) Cracked or damaged liner pipe
- 4) Infiltration points
- 5) Debris in the line

The City will not accept a credit, maintenance bond, or any other form of compensation in lieu of corrective measures that may be required to correct any sections of sewer that are improperly installed or do not meet the requirements of these specifications. In addition, all corrective measures proposed by the Contractor shall be approved by the Engineer. In addition, should repairs of the sewers be accomplished by the use of any unauthorized materials or procedure, the Engineer will require replacement of those substandard portions or repairs made to conform to the requirements of these specifications.

Upon completion of repairs the sewer main shall be TV inspected and the recorded TV inspection will be reviewed by the Engineer. This process shall be repeated until the review of the recorded television inspection reveals a satisfactory installation.

1307-4 MEASUREMENT AND PAYMENT. - The work specified in this section will not be separately measured for payment. Full compensation for the acceptance tests specified in this section shall be considered as included in the various contract unit prices paid for sewer pipe and no additional compensation will be allowed therefor.

SECTION 1308

CLEANING PIPE LINES

1308-1 GENERAL

1308-1.1 Description. - This work shall consist of flushing and cleaning of installed pipe lines, and the furnishing of all necessary materials and equipment required, in accordance with these specifications, the special provisions and as may be directed by the Engineer.

1308-2 FLUSHING AND CLEANING. - After the pipe line has been installed and the trench backfill has been completed, the Contractor shall flush and clean all sewer mains to be free of all debris.

1308-3 MEASUREMENT AND PAYMENT. - The work specified in this section will not be separately measured for payment. Full compensation for the work specified in this section for sanitary sewer lines shall be considered as included in the various contract unit prices paid for sewer pipe and no additional compensation will be allowed therefor.

SECTION 1501

SEWER REHABILITATION

1501-1 GENERAL

1501-1.1 Description. - This work shall consist of rehabilitation of sewers by a lining process as shown the plans, as specified in those specifications and the special provisions, and as directed by the Engineer.

Rehabilitation of sewers shall conform to the requirements of Section 500-1, "Pipeline Rehabilitation" of the APWA Standard Specifications and these City Standard Specifications.

The type or types of materials and methods for the project shall be as designated on the plans.

1501-2 MATERIALS. - The City will require testing of the materials for compliance with these specifications prior to delivery to the project. Materials shall not be more than six months old from the date of manufacture to the time of installation.

1501-3 MISCELLANEOUS REQUIREMENTS. - If the Contractor uses any material or method other than that approved by the Engineer, the Contractor shall, at no cost to the City, remove the rehabilitated pipe, and replace it with a new pipe. The material of the new pipe shall be as approved by the Engineer.

1501-3.1 Odor and Noise Mitigation. - When working inside manholes and sewer lines, the Contractor shall exercise caution and comply with OSHA requirements when working in the presence of hydrogen sulfide.

To minimize the dispersal of sewer odors above ground the Contractor shall:

- 1) Seal all open sanitary manholes or access openings in the lines when his operations have been suspended for a period of two hours or more.
- 2) During construction operations when open manholes or access openings can not be sealed, the Contractor shall vent and filter hydrogen sulfide gases upstream of the openings in the line.

The hydrogen sulfide gas level shall not exceed 5 ppm (by volume) at the outside wall of any habitable structure or at any point within 25 feet of the sewer opening.

The noise level from the Contractor's operation shall not exceed 86 dbA at the outside wall of any habitable structure or at any point within 50 feet of the noise source.

Within 30 days after execution of the contract the Contractor shall submit odor and noise mitigation plans for the approval by the Engineer.

1501-3.2 Plugging and Diversion of Sewage Flow. - The work may require the temporary plugging of the sewer upstream of the construction area and diversion of sewage flows. The Contractor shall submit a diversion plan, at least

one week in advance, to the Engineer and provide all material, labor, and equipment to plug lines, and divert and pump sewage flows. The Contractor shall be responsible for any damages that may result from the blockage of sewage.

Flow charts are available for viewing at the Public Works Department in the San Jose City Hall. The charts are only meant to represent flow at the time that the measurements were taken.

If the Engineer determines that the Contractor's diversion plan is inadequate, the Contractor shall provide equipment, materials, and labor, to develop a viable diversion and pumping plan.

Prior to plugging any lines, the contractor shall notify the Sewer Engineering Section of the Streets and Traffic Department, at least 24 hours in advance at (408) 277-4373.

Included in this item of work is pumping of local depressions in the pipe that may or may not be shown on the plans.

1501-3.3 Sewer Lateral Verification. - The Contractor shall dye test all laterals to verify active laterals, if required by the Engineer or the plans, and shall be responsible for connecting only those laterals that are actively in service.

1501-3.4 Existing Sewer Service Lateral Connections. - The Contractor shall be responsible for the reconnection of existing laterals to the new liner according to the recommendations of the liner manufacturer and these City Standard Specifications.

1501-4 CLEANING OF PIPELINES. - All sewer lines to be relined shall be cleaned prior to video inspection or rehabilitation of the existing line.

Video tapes provided by the City are only intended for the observation of the structural condition of the pipe at the time of the taping. The tapes do not indicate to what extent cleaning is required. It is the responsibility of the Contractor to investigate, before bidding, the amount of cleaning required to perform the insertion of the liner.

Cleaning shall be accomplished using standard mechanically-powered or hydraulically-propelled cleaning tools. Selection of the equipment to be used shall be based on the condition of the lines at the time the work commences and shall be as approved by the Engineer.

The pipelines shall be cleaned by removing all sludge, dirt, sand, grease, rocks, roots, and other material and obstructions from the sewer lines and manholes that would prevent proper installation of the pipe liner. All necessary precautions shall be taken to protect the sewer lines from damage due to the use of cleaning equipment. Whenever hydraulically-propelled cleaning tools (those dependent upon water pressure to provide cleaning force, or any tools which require the flow of water in the sewer line) are used, precautions shall be taken to ensure that the water pressure created does not cause any damage or flooding to public or private property being serviced by the manhole sections involved.

All sludge and other solid or semi-solid materials resulting from the cleaning operation shall be removed at the upstream or downstream manhole of the section being cleaned. Material shall not be allowed to pass from one section to another. When hydraulic cleaning equipment is used, a suitable weir or dam shall be constructed in the downstream manhole to trap all solid material.

All materials resulting from pipeline cleaning operations shall be removed and conveyed by the Contractor to a waste disposal site. The Contractor shall

locate and select a suitable waste disposal site and pay all disposal fees involved. Under no circumstances shall materials removed from sewer lines be dumped or spilled onto the streets or into ditches, catch basins or storm drains or downstream sanitary sewer lines.

Vehicles used to convey the waste materials to the disposal sites shall be tightly covered.

1501-5 TELEVISION INSPECTION. - Refer to Section 1307-3, "Television Inspection" of these Specifications.

1501-6 POINT REPAIRS

1501-6.1 General. - The point repair contract item covers work required to prepare defective sections of existing sewer lines for rehabilitation that requires excavation. Generally, the work will include repair of joints or replacement of pipe. Flow control of affected reaches of sewer shall be performed as specified herein.

Point repair locations indicated on video tapes, provided by the City or Contractor, or indicated on the plans can not always exactly be determined before the pipe is exposed. The location shown on the plans shall be considered accurate if within five feet of the actual location. All work to expose and correct the defect, materials, and equipment shall conform to applicable provisions of this Section.

All point repairs shall be visually inspected by the Engineer prior to backfilling.

The repair method for severe offset joints, sags, obstructions, and broken pipe is as described below:

- 1) For offset joints and sags, the Contractor may realign the existing pipe. Voids created by realignment shall be backfilled to prevent further movement of the pipe.
- 2) For obstructions, broken pipe, and sags and obstructions that can not be realigned the Contractor shall remove the necessary length of pipe by cutting perpendicular to the pipe axis to leave a plain end. The section shall be replaced with the same pipe material and diameter as the existing pipe. The new section shall be banded to the existing section and concrete poured around the band.

1501-6.2 Materials. - Unless otherwise indicated by the plans or the Engineer, the pipe and materials shall be the same as that of the existing line and shall conform to the requirements of Section 1207, "Pipe and Structures" of these City Standard Specifications for type and class.

1501-6.3 Earthwork. - All trenching and backfill shall be performed as specified in Section 1301, "Trench Excavation, Bedding and Backfill" of these City Standard Specifications."

1501-6.4 Sewage Diversion and Dewatering. - When required by the plans, the Contractor shall divert sewage flows around the work and dewater the excavation. This work shall be performed as specified in this section and Section 1302, "Pipe Installation" of these City Standard Specifications.

1501-6.5 Notification. - The Contractor shall notify the Engineer at least 24 hours prior to performing the work and obtain approval of the work to be performed.

1501-7 MEASUREMENT. - The work performed under this section will be listed in the contract item by pipe size and type, and type of liner or whatever information is necessary for identification.

The length of pipe rehabilitation to be paid for will be the horizontal length measured in feet from terminus to terminus as shown on the plans with the length in feet of intervening structures deleted.

Verification of sewer lateral and reconnection of sewer lateral will be measured as units determined from actual count in place.

1501-8 PAYMENT. - The lengths of rehabilitated pipe, measured as specified in Section 1501-7, "Measurement" will be paid for at the contract price per linear foot for the sizes of pipes and types of liner installed.

The pay quantity for verification of sewer lateral and reconnection of sewer lateral, measured as specified in Section 1501-7, "Measurement," will be paid for at the appropriate contract unit price for the number of laterals verified and reconnected.

Pumping and diversion of sewage, and odor and noise mitigation each will be paid for at the appropriate contract lump sum price.

The above prices and payments shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and for doing all work involved in pumping and diversion of sewage, cleaning, TV inspection before and after lining, furnishing and installing liner, point repairs, verification and reconnection of laterals, odor and noise mitigation, all complete in place, as shown on the plans, as specified in these specifications and the special provisions, and as directed by the Engineer.