

CHAPTER 5

MATERIALS TESTING, HANDLING AND
INSTALLATION

(GENERAL)

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All "SS" Drawings are located in the back of Chapter 10.

5.1 HANDLING AND INSTALLATION OF PIPE (GENERAL)

- A) Pipe shall be constructed to the lines, grades and elevations shown on the drawings. Unless otherwise specified by the Inspector or these Regulations, pipe handling and installation shall follow the Manufacturers recommended practice and applicable ASTM, AASHTO and AWWA Standards for each type of pipe used. Appropriate provisions of this section shall also apply to the handling and installation of culverts. Damages to pipes and appurtenances shall be repaired or replaced by the Developer, as required by the Public Works Inspector.
- B) Pipe, fittings and accessories shall be loaded and unloaded, so as to avoid shock or damage. Pipe handled on skid-ways should not be skidded or rolled against pipe already on the ground. Hooks or bare cables shall not be used to handle the pipe. Under no circumstances shall pipe materials be dropped.
- C) Refer to Chapter 5 for requirements concerning trenching and excavation. The minimum support for pipes shall be Class C bedding.

Pipe-laying shall commence at the lowest point and proceed up grade. Pipe shall be laid with the bell ends facing in the direction of laying. Corrugated metal pipe shall be laid with the external laps of the seams toward the inlet end.

Bedding shall be placed to provide a solid, unyielding, uniform-bearing surface for the full length of the barrel. Extra care shall be taken to create an unyielding bedding up to the spring line of the pipe. Blocking or wedging of the pipe will not be permitted, except as required for the proper construction of concrete cradles or encasements. Pipe-laying shall terminate at manholes, except for single length stub outs from manholes.

Equipment used in handling and joining pipe shall be adequate to handle the pipe smoothly and assure the proper closure of joints. All pipe shall be carefully centered, so that when joined together they will form a smooth, uniform invert. Deflection at field joints

shall not exceed the maximum deflection recommended by the Pipe Manufacturer.

Concrete used for encasements shall have a 3,750 psi minimum compressive strength in 28 days and be Type II. Prior to placing the concrete for cradles or encasements, temporary supports consisting of concrete blocks or bricks shall be used to support the pipe in place. Not more than two supports shall be used for each pipe length, one adjacent to the shoulder of the bell and the other near the spigot end; no encasements shall be poured, until the Public Works Inspector has inspected and approved the pipe to be incased and its supports.

Storm sewer pipe shall be cleaned and free of obstructions before acceptance by the Inspector. If visual inspection is not possible, the Developer shall "ball" or televise pipelines under the observation of the Public Works Inspector to ensure that the lines are clear.

Pipe deflections shall not exceed $\frac{1}{8}$ of the Pipe Manufacturer's recommendations.

The Public Works Inspector shall approve the repair of broken, damaged or misaligned storm sewer pipe. No encasements shall be placed on storm sewer pipes until the Public Works Inspector has inspected the unearthed joints to be repaired.

When called for on the plans, grates shall meet the following requirements:

- A) Grating shall be constructed of steel bars with a minimum diameter of $\frac{5}{8}$ ". Reinforcing bars shall not be used.
- B) Welded connections shall be $\frac{1}{4}$ " minimum.
- C) Spacing between bars shall normally be 6", unless site conditions are prohibitive.
- D) All exposed steel shall be galvanized, in accordance with AASHTO Mil.
- E) Welded joints shall be galvanized with a rust-

preventive paint.

Grates shall be secured to the headwall or end section by removable devices, such as bolts or hinges, to allow maintenance access, prevent vandalism and prohibit entrance.

5.2 WATER: ACCEPTANCE/TESTING AND INSTALLATION OF PIPE

5.2.1 Acceptance and Testing of Pipe:

No Hydrostatic Tests shall be made on any portion of the pipeline until all field placed concrete has had adequate curing time. All pipe shall be field pressure-tested to not less than the pressure class of the pipe. The distribution lines shall be segmented for testing so that the test pressure at the high point shall be not less than 125 psi. The Public Works Inspector shall approve the method of supplying water for hydrostatic testing as well as the source of the water. Use of barrels to supply water for hydrostatic testing is strictly prohibited. The Developer shall be responsible for supplying the equipment, etc., necessary to accomplish the prescribed testing.

The pipeline shall be in a state of readiness for testing; all bulkheads, pumps, taps and appurtenances necessary to fill the pipeline and maintain the required pressure shall be in place. The pipeline shall be filled with water and the test pressure of not less than the pressure class of the pipe applied to the pipeline by means of a pump, equipped with a suitable pressure regulator. When filling the pipeline, it shall be filled at a rate which will not cause any surges, nor will it exceed the rate at which the air can be released. All air in the line shall be properly purged.

Where blow-offs or hydrants are not available or are not effective in purging air from the line, a tap to purge the line is required. While the test pressure is maintained an examination shall be made of the pipeline in general, and any leaks shall be repaired. Any pipe or fitting found to be cracked shall be removed and replaced. Cutting and replacing

pavement, excavating and back-filling, are a necessary part of locating and repairing leaks discovered by pressure-testing of pipe. After all visible leaks have been stopped, the full test pressure shall be maintained for two continuous hours. The following are tabulated allowable leakage rates between line valves:

<u>Pipe Size</u>	<u>Allowable Feet of Pipe-Gallons per Hour Leakage per 1000 Inside Dia.</u>
6	.54
8	1.74
12	1.10

(See Table 6 in AWWA C600 for additional details).

Allowable leakage for each section between line valves shall not exceed the leakage rate set forth. No leakage is allowed through the bonnet of the line valve. Any valve leakage through the bonnet shall be repaired in place, or removed and replaced. Should testing show a leakage rate in excess of the rates shown, the pipeline shall not be accepted. The pipeline shall be repaired and re-tested as described in this Section until it meets the test requirements.

5.2.2 Disinfection Testing: All water lines shall be disinfected, prior to being put into service or being live-tapped. Disinfection shall be as outlined in Chapter 7 of this Manual, followed by the Chlorine Concentration Test, followed by the Bacteria Test, as specified by the Colorado Department of Health Regulations. Testing shall be, performed by the Town's Public Works Department.

5.2.3 Acceptance of Pipe: The pipeline system may be placed in operation after all required cleaning, testing and inspections have been completed, and written permission has been granted by the Town.

5.2.4 Water Pipe Installation: Pipe shall be constructed to the lines, grades, and elevation shown on the drawings. Unless otherwise specified by the Public Works Inspector or these Standards, pipe handling and installation shall follow the recommended practice in AWWA C600. Damages to pipes and appurtenances shall be repaired or replaced by the Developer, as required by the Public Works Inspector.

5.2.4.1 Site Conditions: Proper implements, tools and facilities shall be provided by the Developer for the safe and convenient execution of work. Water shall be removed from trenches while pipe is being laid and shall not be allowed to rise around the pipe before back-filling. When pipe-laying is not in progress, access to the open ends of the pipe shall be restricted. At all times, precaution shall be taken to prevent foreign materials from entering the pipe.

5.2.4.2 Bedding Requirement: The minimum support for pipes shall be Class D bedding, unless otherwise specified. Refer to Chapter 6 of this Manual, for class descriptions.

5.2.4.3 Direction: Pipe-laying shall commence at the lowest point and proceed up grade. Pipe shall be laid with the bell ends facing in the direction of the laying.

5.2.4.4 Placement: Bedding shall be placed to provide a solid, unyielding uniform-bearing surface for the full length of the barrel. Extra care shall be taken to create unyielding bedding up to the spring line of the pipe.

- 5.2.4.5 Joints: All "push-on" bell and spigot joints shall be pushed home according to the Manufacturer's instructions. If a certain section of pipe can not be pushed home, then the section will be rejected. All mechanical joints shall be tightened to Manufacturer's recommendations. Maximum joint deflection shall not exceed 3 degrees.
- 5.2.4.6 Protective Coatings: Metallic pipe and all fittings shall be wrapped in acceptable corrosion protection materials; e.g., polyethylene tubing. This wrapping, if required on the approved plans or by the Public Works Inspector, is required to be installed according to AWWA Standard C105.
- 5.2.4.7 Anchorage of Bends: Concrete thrust blocks shall be placed where shown on the approved plans. They shall conform to the requirements and dimensions shown on the approved plans. If thrust blocks are not detailed on the plans, they shall be installed, at a minimum, on all tees, plugs, caps, valves, hydrants and bends of 11¼ degrees or more. Concrete used shall be 3,750 psi compressive strength in 28 days. All thrust blocks shall be separated from the pipe by a 6 mil layer of polyethylene to act as a bond breaker. Normally, restrained joints will not be permitted, except when undisturbed soils are not available for a thrust block, for vertical bends, or to reduce the thrust block size for pipes larger than 12". For more details see Chapter 7 of this Manual.
- 5.2.4.8 Deflections: Pipe deflections shall not exceed the Pipe Manufacturer's recommendations.

For deflections which are designed, the designer shall not use a higher allowance than half the Manufacturer's allowable deflection.

- 5.2.4.9 Repair of Broken Pipe: The Public Works Inspector shall approve the repair of broken or damaged water pipe. The broken pipe must be observed by the Inspector prior to repair, and after repair approved for back-fill.
- 5.2.4.10 Valves and Boxes: The type of valves acceptable to the Town are specified in Chapter 7 of this Manual. Valves shall open left, be Class 150 and normally be mechanical joint.
- 5.2.4.11 Installation: All valves shall be installed at the grade and locations shown on the approved plans. Valve boxes are required to be of the screw type. All valves shall be protected by 5' of cover. If the valve is deeper than 7½' from finished grade to the bonnet top, then an extension shall be installed. Lids for boxes shall have the word "water" on them.
- 5.2.4.12 Service Lines, Taps, Curb Stops: The corporation stop on the main shall be at a 45° degree angle above the center line of the main. All taps shall be done using bronze or brass tapping saddles and shall be installed according to the Manufacturer's recommendations. The Public Works Inspector shall inspect the main and top prior to back-filling. In the event the tap is covered before it is inspected, it shall be uncovered by the Developer to allow for inspection. If the tap or water main is damaged during the process of locating, it

shall be repaired immediately by the Developer in a manner acceptable to the Inspector. In addition, the location of the service line shall be marked on the curb by a "W" symbol, and a 2"x4" piece of lumber shall be extended from the end of the pipe to above ground level. If the line is not to be connected initially to a meter yoke, the end of the service line shall then be sealed shut to keep rocks and dirt out of the line. Every precaution shall be taken to prevent foreign material, including trench water, from entering the pipe.

5.2.4.13 Meter Pits: Air relief valves, vaults and vent pipes shall be installed at the locations shown on the approved plans. See Chapter 7 of this Manual, for details of a typical combination air relief valve and vault. The valve shall be separable from the main by a gate valve. The cast iron lid for the vault shall have the word, "Water", on it.

5.2.4.14 Pressure-Reducing Valves: Pressure-reducing valves, vaults and vent pipes shall be installed at the locations shown on the approved plans. See Chapter 7 of this Manual, for details of a typical pressure-reducing valve and vault. All pressure-reducing valves shall have an outside bypass piping arrangement, to permit removal of the valve while continuing water flow in the main. The cast iron lid for the vault shall have the word, "Water", on it.

5.2.4.15 Fire Hydrants: All hydrants shall be installed to conform to grade and alignment shown on plans. Hydrants are required to be thrust-blocked behind the hydrant and at the tee on the main line and be rodded, (two all thread

rods), from the tee on the main to the hydrant. All rodding shall be protected by bituminous coating or wrapped in 6 mil polyethylene. The gate valve required as a shut-off for the hydrant shall be located no farther than 18" from the main line, (end of tee to center of hydrant valve).

Approximately a third of a yard of pea gravel shall be placed under the fire hydrant to assist in positive drainage from the hydrant drain hole. Care should be taken to keep the concrete thrust block from covering the hydrant drain hole. The steamer connection shall face the direction as shown on the approved plans or as required by the Fire Department. Additionally, the steamer connection shall be no closer than 18" to finished grade. See Chapter 7 of this Manual.

5.3 SEWER: ACCEPTANCE/TESTING AND INSTALLATION OF PIPE

5.3.1 General: Tests for water-tightness shall be conducted by the Developer at his/her own expense. The testing will be under the direction of the Public Works Inspector on all new sewer construction, after back-filling and compaction and prior to final acceptance. The testing procedure shall be as per the pertaining section of Chapter 10 in this Manual.

If, in the opinion of the Inspector, excessive ground water is encountered in the construction of a section of the sewer, the exfiltration test for leakage will be replaced with an infiltration test in accordance with Pipe Manufacturers Specifications or relevant ASTM Specifications. When leakage or infiltration exceeds the amount allowed by the relevant specification, the Developer, at its expense, shall locate the leaks and make the necessary repairs or replacements to reduce the leakage or infiltration to the specified limits. Any

individually-detectable leaks shall be repaired, regardless of the test results.

5.3.2 Mandrel Test of PVC Pipe: The Public Works Department Inspector may require a mandrel test of all, or any portions of, installed PVC sewer line. Following backfill and compaction, but prior to pavement surfacing, the main line shall be cleaned and then mandreled to measure for obstruction, (deflections, joint offsets and lateral pipe intrusions). A rigid mandrel, with a circular cross-section having a diameter of at least 98 percent of the specified average inside diameter, shall be pulled through the pipe by hand. Obstructions encountered by the mandrel shall be corrected by the Developer. All material, equipment, and labor to perform the test, shall be provided by the Developer, at no cost to the Town.

5.3.3 Acceptance of Pipe: The sewer collection system may be placed in operation after all required cleaning, testing and inspection have been completed and written permission has been granted by the Director of Public Works. Television camera inspection of sewer pipe may be required, if unresolved problems are not corrected. If this is necessary, such television camera inspection costs shall be borne by the Developer.

5.3.4 Handling and Installation: Pipe shall be constructed to the lines, grades and elevations shown on the approved plans. The handling and installation of PVC pipe, unless otherwise specified by the Director of Public Works, shall conform to the pertaining sections of this Manual.

5.3.4.1 Conditions for Sewer.

A) Protection of Existing Underground Utilities: The Developer shall proceed with caution in the excavation and preparation of the trench, so that the exact location of underground structures, both known and unknown, may be

determined. If required, the Developer shall excavate and locate existing underground utilities ahead of trench excavation to anticipate grade changes. The Developer shall notify local utilities whenever working near gas mains or services, or near electrical or telephone cable, or when the presence of these utilities is suspected in the area of construction. In the event of damage, the Town's Public Works Department and the affected utility company shall be notified immediately.

B) Wet Trench: During construction, the Developer shall provide and maintain adequate equipment to proper removal and dispose of all excess water entering the trench or any other part of the work. Use of an active sewer under construction for disposal of the water will not be permitted. Before any pipe is laid, the trench shall be dry and shall be kept dry while joints are completed. In areas where unstable soil is encountered below the bottom of the pipe, the Developer shall excavate such material to the limits determined by the Public Works Inspector and backfill with acceptable, compacted bedding material.

C) Underdrains: Underdrains shall be installed where shown on the approved plans. Where excessive groundwater is encountered, the Public Works Inspector may also require construction of gravel or piped underdrains, (even if not required by the plans), to reduce infiltration. The trench shall be excavated to the required depth and width and back-filled with the underdrain bedding material. Additional underdrain bedding material shall then be placed

to a level 4" over the top of the underdrain pipe and the sewer pipe installed. Bedding for underdrain pipe or for gravel under drain without pipe shall be composed of washed gravel or crushed rock, well-graded in the size range from $\frac{3}{4}$ " minimum to 1" maximum. Filter cloth is required.

5.3.4.2 Subdrains: All subdrain systems installed, (with or without soils analysis), shall include provisions for access to the subdrain pipe to permit inspection and cleaning. Access points, as a minimum, shall be in the form of two-way clean-outs placed through the bottom bench of sanitary sewer manhole inverts. All clean-outs in manholes shall be capped with a water-tight, non-corrodible plug. The plug shall be flush with the top of the bench or countersunk to prevent hindrance to the safe footing of maintenance crews.

5.3.4.3 Clean-outs: At manholes, where multiple subdrain branches meet, a clean-out for each branch shall be provided. Branch connection points under manholes shall be via a 45 wye. No tee connections will be permitted. Special consideration and clean-out detail modifications may be needed in these cases due to bench space available within the manhole. Clean-outs shall not be within the sewer flow channel at any time. Details shall be subject to review and approval of the Town. Oversized manhole diameters may be required in these instances.

5.3.4.4 Bedding Requirements: The minimum support for PVC pipe shall be Class B bedding, if not specified on the approved plans. Refer to Chapter 6 of this Manual, for class descriptions and other installation details related to

bedding.

5.3.4.5 Direction: Pipe-laying shall commence at the lowest point and proceed upgrade. Pipe shall be laid with the bell ends facing in the direction of the laying.

Bedding shall be placed to provide a solid, unyielding uniform-bearing surface for the full length of the barrel. Extra care shall be taken to create unyielding bedding up to the spring line of the pipe.

5.3.4.6 Joints: All "push-on" bell and spigot joints shall be pushed completely home. If a certain section of pipe cannot be shoved home, then the section will be rejected.

5.3.4.7 Tapping the Main:

A) See the pertaining drawings within Chapter 10 of this Manual. Where tees have not been installed in the main sewer, the main shall be tapped by machine drilling. The drilling machine and method of drilling shall be, approved by the Public Works Inspector. The Inspector shall inspect the main and saddle at every tap prior to back-filling. In the event the tap is covered before it is inspected, it shall be uncovered by the Developer to allow visual inspection of the tap and the main. If the main sewer line is cracked or broken during the process of locating and tapping, the Town shall be immediately notified. It shall be repaired immediately to the satisfaction of the Inspector.

B) Use of PVC Tapping Saddles: PVC tapping saddles shall be as manufactured and furnished by the pipe supplier, or approved equal, and

have bell and spigot configurations compatible with the pipe. All PVC tapping saddles shall be of the type which use stainless steel bands to attach to the pipe and a bell gasket on the service side. Use of solvent weld saddles is prohibited.

5.3.5 Encasements or Structural Sewer. When the sewer pipe is required to be encased in concrete as shown on the approved plans or by the Public Works Inspector, the concrete used shall have a 3,750 psi minimum compressive strength in 28 days and be Type II. Details of such encasement are shown on Drawing No. T-4; within Chapter 6 of this Manual. When the sewer pipe is required to be a structural or pressure pipe, as shown on the approved plans or required by the Inspector, the pipe shall be ductile iron, Class 52, meeting AWWA C151 and may be required to be lined with bonded polyethylene.

5.3.6 Repair of Broken Pipe. The Public Works Inspector shall approve the repair of broken or damaged sewer pipe. The broken pipe must be observed by the Inspector prior to repair and after repair approved for backfill.

5.3.7 Manholes.

5.3.7.1 Minimum Acceptable: Manholes shall be pre-cast with or without pre-formed inlets and outlets. Manholes shall meet ASTM C-478. Manhole bases may be pre-cast or field-poured. Details are shown on Drawing No. SS-1; within Chapter 10 of this Manual.

5.3.7.2 Installation:

A) Manhole Bases: Manhole bases shall extend at least 8" below the bottom of the pipe and shall be benched up to at least 2" above the top of the highest crown. All concrete used in manhole bases shall be Type II 3,750 psi compressive strength minimum in 28 days. Reinforcing, as detailed in Drawing No. SS-1 through SS-5, shall

be placed in bases. Pipe shall be terminated flush with the interior manhole wall. All PVC pipe shall have suitable water stop protection where the pipe is laid in the concrete. Transitions from inlet to outlet shall be smooth and of the proper radius for uninterrupted flow. Inverts shall be plastered with cement mortar and left smooth and clean.

B) Manhole Sections: Pre-cast manhole sections shall not be placed on the base for 48 hours after the base pour, unless authorized by the Public Works Inspector. The top of the bench shall be thoroughly cleaned and moistened with water. While the bench is still moist, a full mortar bed, at least 1" in thickness, shall be applied to the pre-cast section bearing seat. The first pre-cast section shall be carefully lowered on the bench so that the mortar bed will be forced out from under the section evenly on all sides. Each succeeding pre-cast section shall be jointed in a similar manner and smoothly finished inside and out. All lifting holes and other imperfections in the interior manhole wall shall be filled with cement mortar. The Developer has the option of using plastic gaskets in conjunction with mortar.

C) Manhole Cover Rings: Manhole cover rings shall be installed, at a minimum of 2 and a maximum of 6, 2" pre-cast concrete adjusting rings above the lid or cone of the manhole. Manhole rings shall be set in a full bed of mortar to the grade called for on the plans. In new streets, manhole covers shall be left below grade until pavement is completed, then raised to grade and a concrete apron

poured around it. See Drawing No.'s SS-8 and SS-9.

- D) Reference Markers: Whenever a manhole is located outside of a traveled street or walkway, a reference marker is required. This marker shall be a plastic marker as specified by the Director of Public Works.
- E) Connections to Existing Manholes: Where there is no existing pipe stubbed out, sewer pipe connections to existing manholes shall be made in such a manner that the finished work will conform as nearly as practicable to the essential requirements specified for new manholes. The Developer shall break out as small an opening in the existing manhole as necessary to insert the new sewer pipe. The existing concrete foundation bench shall be chipped to the cross-section of the new pipe to form a smooth continuous invert similar to what would be formed in a new concrete base. Cement grout shall be used as necessary to smoothly finish the new invert and to seal the new line so the junction is water-tight.
- F) Drop Manholes: All drop manholes are to be installed as detailed on the approved plans and in conformance with Drawing No. SS-2, 3 and 4.

5.4 STORM DRAINAGE: ACCEPTANCE/TESTING AND INSTALLATION OF PIPE

- 5.4.1 For Storm Drainage Design and Details reference the Town's Storm Drainage Criteria Manual.
- 5.4.2 Testing for Water-Tightness: Tests for water-tightness of storm sewer shall be conducted by the Developer, at his/her own expense with the assistance and under the direction of the

Public Works Inspector prior to final acceptance.

A) Exfiltration Test: Unless otherwise shown on the plans, each section of storm sewer line shall be tested between successive manholes by closing the lower end of the storm sewer to be tested and the upper manhole shall be filled with water to street level or to a maximum elevation of 6' above the upper flow line of said upper manhole. In any section of pipeline, should the head at the lowest point in the section exceed 12', then the Public Works Inspector will set forth the special method of testing to meet field conditions. The Developer, at his expense, shall furnish all water, materials and labor for making the required tests. All tests shall be made in the presence of the Inspector and shall last at least 24 hours.

B) Infiltration Test: Infiltration tests shall be performed on each lateral by itself. The main line shall be tested by itself when the flows from all laterals are blocked off, but it shall be tested in segments not to exceed 1,000'.

C) The maximum exfiltration and infiltration per inch of diameter per mile per 24 hours shall be as follows:

Joint Type.

Tongue & Groove-Rubber or Mastic	300 gal.
Bell and spigot	200 gal.

D) If the rate of infiltration or exfiltration is found to exceed the prescribed amount, the Developer shall provide at his own expense, and at the direction of the Public Works Inspector, electronic or photographic visual inspection of the interior of the conduit. The Developer shall make the appropriate repairs as approved by the Inspector and shall continue to test the conduit until it is considered satisfactory.

Systems: Underground storm sewer lines shall be constructed of reinforced concrete pipe conforming to the requirements of this Article. Culvert pipes, where specifically approved by the Public Works Inspector, may be constructed of corrugated metal pipe conforming to the requirements of this Article.

Where the nature of storm drainage facilities requires a variance from the data shown in this Article, the Developer shall provide detailed specifications for materials and workmanship for review and approval by the Public Works Inspector at the time the Inspector reviews and approves the project.

- 5.4.3 Reinforced Concrete Pipe: The Developer shall furnish all labor, materials, tools and equipment necessary to complete all storm sewer line installation, as required by the plans, with completion of all work under the development agreement as specified herein. The excavation shall be made to the lines and grades shown on the approved plans.

Pipe-laying shall be in accordance with Pipe Manufacturer's specifications relevant ASTM Standards or the pertaining criteria within this Manual.

The annular space for joints shall be clean and dry when joints are made, except that in hot, dry weather, concrete pipe joints shall be moistened with water, as required, immediately before application on mortar joints.

- A) Bell and Spigot Joints: The rubber gasket shall be installed as indicated by the controlling Specification and the Manufacturer of the rubber gasket.
- B) Tongue and Groove Joints: These shall be of rubber gasket or Mastic and will be installed as directed by Gasket Manufacturer with due care that all parts of the joints are properly sealed.

5.4.4 Corrugated Metal Pipe: The Developer shall furnish all labor, materials, tools and equipment necessary to complete all storm sewer line installations, as required by the approved plans, with completion of all work under the development agreement, and as specified herein. The excavation shall be made to the lines and grades shown on the plans.

5.4.4.1 Jointing: The usual method of jointing corrugated steel pipe is by means of steel connecting bands. The bands overlap the ends of each pipe section an equal amount. All connections must be water-tight.

A) Standard Bands shall be used for most installations on all sizes of pipe.

B) Two-Piece Bands shall be used on larger diameter pipes under difficult installation conditions.

C) Rod and Lug Bands shall be used on levees, aerial sewers and similar installation where water-tightness is essential.

D) Gasketed Type Bands with neoprene gaskets shall be used for restricted leakage applications.

These bands and their method of installation are shown in the C.S.P.A. Installation Manual, latest edition.

5.4.5 High Density Polyethylene (HDPE)
As per paragraph 5.6.4 and the Manufacturers recommendations.