Construction Inspection Manual

Lexington-Fayette Urban County Government
Lexington, Kentucky

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CHAPTER 7
APPURTENANCES

TABLE OF CONTENTS

7.1 Introduction

7.1.1 General

Appurtenances are auxiliary structures or devices that are added to sewers to enhance their operation and to facilitate inspection and maintenance. Appurtenances are integral parts of the sewer system, and must be constructed properly for the sewer system to function as it is designed.

Most appurtenances for public infrastructure are constructed in accordance with the *LFUCG Standard Drawings*. Accordingly, the construction of many types of appurtenances is very similar from one project to another. Some projects, however, may require special designs or construction techniques for appurtenances to function properly in association with the sewer system.

In this section, common types of appurtenances installed for infrastructure will be identified and their related construction procedures will be discussed.

7.1.2 Definitions

Appurtenances - Auxiliary structures such as manholes, catch basins, and service connections attached to the main sewer structure, but not considered as integral parts thereof, for the purpose of enabling the sewer system to function.

ASTM - An abbreviation for American Society for Testing and Materials.

Backfill - The refilling of an excavation after a structure has been placed therein or the material placed in an excavation in the process of backfilling. In sewer construction, backfill refers to the material placed in the trench from the top of the pipe encasement or cap up to the ground or subgrade level.

Branch Sewer - A sewer that receives sewage from collector sewers and discharges into a trunk sewer.

Castings - Metallic objects (normally cast iron) formed of molten metal in a mold. Examples are: manhole lids, manhole rims, catch basin grates, and frames, etc.

Cleanout - An upturned sewer pipe, generally placed at the end of the sewer, for providing means for inserting cleaning tools, for flushing, or for inserting an inspection light into the sewer.

Collector Sewer - A sewer located below a street, alley, or easement that receives flows directly from property service connections, sometimes referred to as the street sewer or sewer main.

Cradle - Refers to bedding and haunching materials (crushed stone or concrete) being laid upward from the trench bottom to the springline of the pipe.

Culvert - Pipe that drains open channels, swales, or ditches under a roadway or embankment.

Donut - A precast concrete ring placed at the top of a manhole to permit minor adjustments in elevation of the manhole frame and cover.

Drop Inlet - An assembly of pipe fittings at a manhole that is utilized when the incoming sewer is considerably higher in elevation than the ongoing sewer.

Encasement - Concrete or crushed stone used to enclose a sewer in a trench. Encasement shall extend all the way around the outside of the exterior wall of the pipe being encased as shown in the *LFUCG Standard Drawings.*

Grout - A fluid mixture of cement, sand, and water that can be poured or pumped easily.

Headwall - A wall at the end of a culvert or drain to protect the fill from scour or undermining, increase hydraulic efficiency, divert direction of flow, and serve as a retaining wall.

Inlet - A form of connection between surface of the ground and a drain or sewer for the admission of surface or stormwater into the sewer system.

Invert - The lower portion of a sewer or structure; the portion that is below the springline and is concave upward. Also, the lowest point on the inside surface of a sewer is referred to as the invert, particularly in reference to the elevation or slope of the sewer.

Junction Chamber - A monolithic concrete structure used to direct the flow from one or more branch sewers into the main sewer.

Lateral Risers - Vertical section of a property service connection specified when the depth of the sewer is excessive. Risers are encased in Class B concrete.

Main Sewer - The principal sewer to which branch sewers are tributary, also called a trunk sewer.

Manhole - A sewer appurtenance installed to provide: 1) access to sewers for inspection and maintenance, and 2) changes in sewer direction, elevation, and grade.

Precast - That which is formed in a mold or formed and distributed by the manufacturer as a complete unit.

Sanitary Sewer - A sewer that carries liquid and waterborne wastes from residences, commercial buildings, industrial plants, and institutions, together with minor quantities of ground, storm, and surface waters that are not admitted intentionally.

Service Laterals - A sanitary sewer line connection from the collection sewer to each adjacent property.

Sewage - Largely, the water supply of the common community after it has been fouled by various uses.

Sewer - A pipe or enclosed channel that carries wastewater or drainage water.

Storm Sewer - A sewer that carries stormwater and surface water, street wash, and other wash waters, or drainage, but excludes domestic wastewater and industrial wastes. Also called a storm drain.

Stormwater - Runoff from a storm event.

Stub - A short section of sewer installed into a manhole and plugged, to provide a future point of entry into the sewer system.

Subgrade - Soil exposed in a trench bottom or a road bed and upon which the pipe bedding material or pavement base material will be placed.

T (TEE) Branch - A pipe joined at a 90 degree angle with another pipe, molded together and manufactured as a whole unit.

Trench - Usually, a long, narrow, near vertical sided cut in rock or soil such as is made for utility lines.

Water Table - A surface of groundwater where the water pressure is equal to the atmospheric pressure. The static water level in a well defines the depth to the water table at that location.

7.2 Types of Appurtenances

Appurtenances that are commonly installed include branches and fittings, stubs, property service laterals, manholes, drop manholes, non-circular manholes, storm sewer inlets, and headwalls. In addition, other structures or devices of special design may be classified as appurtenances. The following paragraphs present brief descriptions of the types of appurtenances commonly utilized.

7.2.1 Branches and Fittings

Branches and fittings typically serve to connect property service laterals to collector sewers and to provide accesses for cleaning and inspection. The most common types of branches are tee and wye branches. Fittings commonly used include bends, spacers, reducers, and caps.

Wyes or tees are used to construct sanitary sewer lateral cleanouts along property service laterals. A cleanout is a vertical pipe with a capped end at the ground surface that provides an entrance for inserting cleaning tools or flushing the sewer lateral.

7.2.2 Stubs

A stub is a short section of sewer pipe installed into a manhole and directed toward an area for which LFUCG anticipates providing future service. The stub shall be a minimum of 12 inches in length and no longer than 6 feet. Following its construction, the upstream end of the stub is sealed with a watertight stopper or bulkhead.

7.2.3 Property Service Laterals and Risers

Lateral connections are often equipped with fittings and steep pipe sections or risers to aid in connecting property service laterals to the main sewer line when the main sewer is excessively deep or below the top of rock elevation. Riser sections provide steep grades within the right-of-way to prevent excessive excavation on private property. Lateral connections and allowable riser slopes are shown in the *LFUCG Standard Drawings*.

7.2.4 Manholes

The manhole is an appurtenance that permits the entry of personnel and equipment for inspection and maintenance of the sewer line. Generally, manholes are placed at all changes in vertical grade or horizontal alignment of the sewer. Sanitary and storm manhole details are illustrated in the *LFUCG Standard Drawings*.

Most manholes utilize precast concrete sections conforming to ASTM C 478. These precast sections typically include base sections, vertical risers, eccentric cones, concentric cones, bottom and top slabs, and grade rings. Figure 7.1 illustrates typical precast concrete manhole assemblies used for sewer construction.

The invert of the manhole is constructed with a channel of equal flow capacity to that of the incoming sewer, and with a bench, referred to as the wash section, which provides a work surface for maintenance.

Manholes are restricted to a minimum inside diameter of 4 feet. The top slab of the manhole is usually constructed of precast concrete eight inches thick, and provided with precast concrete grade rings (donuts) which permit close adjustments of the top elevation. In some manholes, eccentric or concentric cones are used above the top riser section in order to reduce the inside diameter of the manhole. The top is also equipped with a cast iron manhole frame and cover. In high water areas, the castings must be watertight. Manhole steps are made of cast iron or steel with a plastic coating and are embedded in the riser wall during the manufacturer's precasting process. Pipe openings 8 inches and smaller in diameter are generally fitted with watertight sewer pipe connections (elastomeric gaskets or couplings) which provide flexible joint connections between the pipes and the manhole.

7.2.5 Drop Manholes

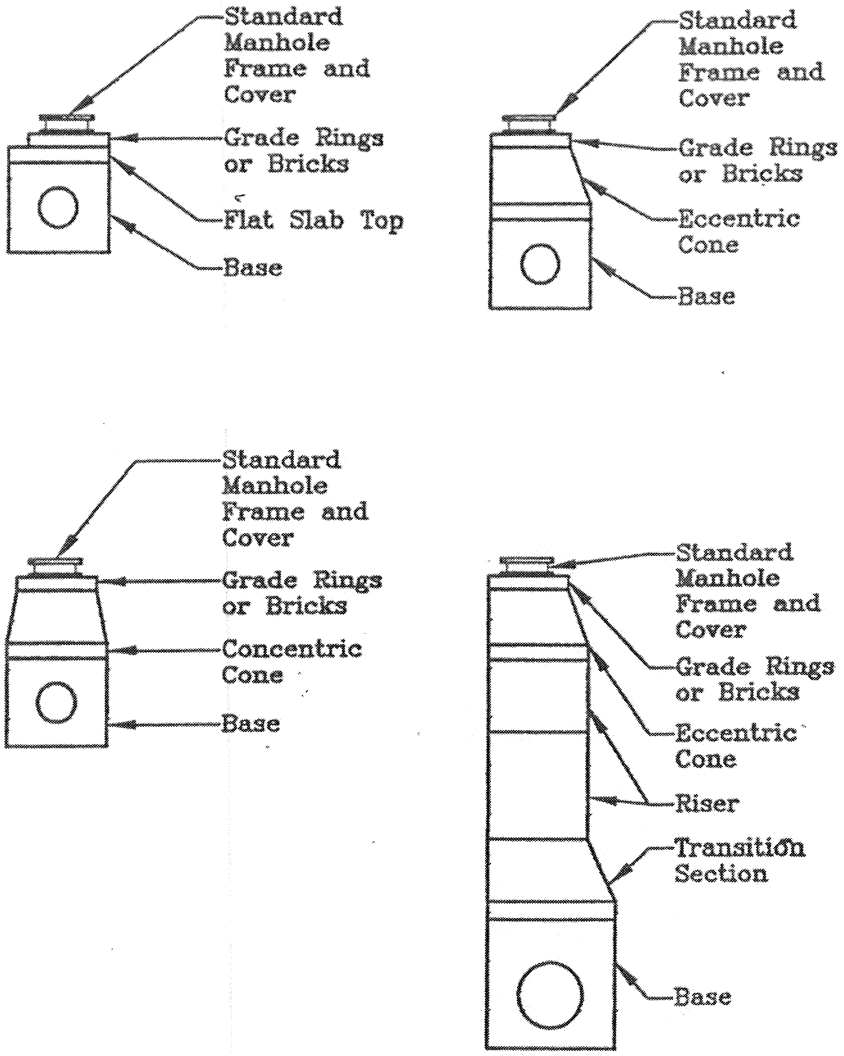
If a sanitary sewer enters a manhole at an elevation 2 feet or higher than the outgoing pipe, it is not satisfactory to permit the sewage stream to pour freely into the manhole because the structure would not provide an acceptable working space. Drop manholes are usually provided in these cases. Drop manholes are equipped with an exterior drop inlet encased in concrete that connects the higher invert to the manhole bottom. A typical drop manhole is shown in the *LFUCG Standard Drawings*.

7.2.6 Non-Circular Manholes

Non-Circular Manholes are square or rectangular junction structures installed at the intersections of two or more large sewers. Generally, junction chambers are constructed of precast or cast-in-place concrete, and precast manhole barrels are provided above the structure for inspection and maintenance access as shown in the *LFUCG Standard Drawings*.

CONSTRUCTION INSPECTION MANUAL

FIGURE 7.1
Precast Concrete
Manhole Assemblies



Adapted From: American Concrete Pipe Association

7.2.7 Surface Inlets and Curb Inlets

Storm sewer inlets are generally located at street intersections or at intermediate points along curbs for the purpose of intercepting gutter flows and conveying them into the storm sewer system. Storm sewer inlets are generally constructed of precast or cast-in-place concrete. Inlet castings include frames, grates, and curb irons. Typical surface and curb storm inlets are illustrated in the *LFUCG Standard Drawings*.

7.2.8 Headwalls

Headwalls are reinforced concrete structures normally constructed at both ends of a culvert. These structures provide stability for the pipe, prevent erosion around the ends of the pipe, and promote hydraulic efficiency of the pipe. Depending on the skews, locations and facility types, these structures are designed to accommodate single and multiple lines of circular and non-circular pipes. Typical headwalls are illustrated in the *LFUCG Standard Drawings*.

7.3 Inspection of Appurtenances

7.3.1 General

Careful inspection of the construction of appurtenances is necessary to ensure that the sewer facility functions properly. Like all structures, appurtenances must be accurately located according to Plans and must be constructed properly with respect to required sizes and dimensions.

The foundations for all appurtenances that require concrete construction, such as lateral risers, manholes, drop manholes, storm sewer inlets, non-circular junction structures and headwalls, must be prepared properly. If the appurtenance is to be constructed upon soil, the concrete may be placed, provided that the soil subgrade is judged to be adequate for support of the structure. The excavation shall be kept free of water during construction. Any soil beneath the appurtenance that does not appear to be adequate for support of the structure shall be stabilized as directed by the Engineer. If the appurtenance is to be constructed on or below the bedrock surface, additional rock must be removed and backfilled with crushed stone in accordance with the *LFUCG Standard Drawings*. The crushed stone is provided between the concrete and bedrock to prevent concentrated stresses caused by irregular rock surfaces. Under no circumstances shall the concrete be placed directly against bedrock.

Any branches, fittings, stubs, or sewer pipes that are to remain unconnected following the completion of the project shall be properly sealed. When the open ends of the pipes or fittings are smaller than 18 inches in diameter, the opening shall be sealed with stoppers cemented into place using a rubber gasket between the stopper and bell or socket. Openings 18 inches in diameter or larger shall be sealed with brick masonry or concrete bulkheads at least 4 inches thick.

For precast structures, the following criteria must be met:

1. Any use of precast structures must be so noted in the Contract Documents.

2. Structures that require specially designed footings shall not be precast.

3. Openings in precast structures for pipes shall be the outside diameter of the pipe plus a maximum of 6 inches. In order to use non-shrink grout, the opening shall be the outside diameter of pipe plus 3 inches. (Outside diameter of pipe plus 4½ inches is permissible when tapered hole forms are utilized.)

4. For precast structures (other than those with knockout panels) the opening around the pipe shall either be filled with non-shrink grout for the wall thickness of the structure or the pipe shall be encased with a minimum 6-inch collar of concrete from the inside face of the wall to 1 foot outside the outer face of the wall. The pipe shall be adequately supported to prevent settling while the grout or the concrete encasement is setting up. The inside face of the structure walls shall be finished with a trowel and wet brush finish.

5. For circular structures, the maximum inside diameter (or horizontal dimension) of pipe to be used with a given size of manhole shall meet the requirements shown in the *LFUCG Standard Drawings*.

6. For circular structures, the minimum distance allowed between precast holes for the pipes shall be 12 inches.

7. For circular structures and rectangular structures (other than those with knockout panels), the minimum vertical distance from the holes for the pipes to the top of the structure wall shall be 4 inches. If this vertical distance is less than 12 inches, then additional reinforcing steel shall be furnished for this section. The top slab must be designated for HS-20 loading.

8. For precast structures with knockout panels, holes for the pipes shall not be cut into the structural members, (i.e., top beams and corner columns) and non-shrink grout shall not be allowed to be placed around the pipes. The pipes shall be encased with concrete a minimum of 6 inches around the outside of pipe or a minimum of 3 inches beyond the hole knocked in the wall, whichever is greater. In addition, the concrete encasement shall extend from the inside face of the wall to 1 foot outside the outer face of the wall.

9. Precast structures with knockout panels shall not be used with more than 2 feet of earth cover unless load calculations are supplied.

10. For rectangular structures where pipe will be installed in adjacent walls (other than those with knockout panels), at least 6 inches of wall (measured from the interior corner) is required on each side of the pipe beyond the precast opening for the pipe. This rule is not applicable for structures that have pipe installed in opposite walls or where one outlet pipe is utilized.

7.3.2 Branches and Fittings

All branches and fittings must be inspected to confirm that they are of the proper types and sizes according to Plans. It is extremely important that all branches and fittings are connected properly.

Leakages at branches and fittings may be avoided by ensuring that the bell and rubber gaskets are clean. If gaskets must be placed on the pipe in the field, the direction of the bevel shall be checked.

Bells and gaskets shall be lubricated and connections shall be completed, taking care not to push the pipe too far past the home mark. Excessive insertion of the pipe past the mark may contribute to clogging or cause erroneous deflection readings.

Any branch or fitting which is to remain unconnected for a long period of time during construction shall be temporarily sealed with a cap, plug, or stopper. Backfill shall not be placed over a branch or fitting with an unsealed open end.

If the crushed stone encasements are not properly placed, stresses may develop at branches and fittings and cause cracking. The crushed stone must be placed uniformly around and beneath the branches or fittings to provide adequate support. Workers shall be advised not to stand on a branch or fitting if the stone encasement has not been placed to its final thickness above the pipe.

7.3.3 Stubs

Stubs must be installed as indicated on project Plans. The methods discussed in Section 7.3.2 shall be observed in inspecting the installation of stubs. All stubs must have a minimum length of 1 foot.

7.3.4 Property Service Laterals and Risers

Property service laterals shall be provided to each property adjacent to the collection sewer. Service laterals shall be extended 1 foot outside the easement or 1 foot inside the property line, whichever is greater. The laterals shall have a minimum slope of 1/8-inch per foot length, and a tee section shall be used to connect the lateral service line to the collection line. In general, lateral lines are installed to within 6 feet of final grades. If the collection sewer is deeper than 6 feet, a steeper lateral line is required within the right-of-way or easement so that property connection is less than 6 feet deep outside the easement. If the collection sewer is excessively deep or within a rock excavation, a vertical riser may be required from the sewer connection. A concrete cradle is required to support the vertical riser connection to the sewer collection pipe as shown in the *LFUCG Standard Drawings*.

When inspecting the construction of a riser, the Inspector shall pay particular attention to the dimensions of the riser, the concrete cradle, and the condition of the foundation material supporting the riser. In deep trench cuts on large sewers, it may be necessary to strengthen the riser by using steel reinforcing bars. When such reinforcing is shown on the Plans, the Inspector shall confirm that the proper sizes and grades of steel are used, and that the reinforcing steel is firmly positioned while concrete is placed.

7.3.5 Manholes

As noted earlier, manholes are constructed using precast and/or cast-in-place concrete. All precast units installed in manhole construction shall be inspected to ensure that they are of the types and dimensions as indicated on project Plans. All cast-in-place concrete shall be inspected observing the techniques discussed in Section 11.0.

The installation location and bottom elevation of the manhole are important. The bottom of the manhole excavation shall be checked to confirm that the excavation has been extended to the proper depth, allowing for the thickness of the manhole bottom and the crushed stone bed.

The foundation material shall be checked to confirm that the manhole will bear upon firm soil or rock. If ground or surface water inflow is a problem, the Contractor shall be required to pump the excavation and perform all concrete work in the dry. If high ground water is present, the potential for the manhole to be displaced upwardly because of buoyant forces may exist. This shall be brought to the attention of the Engineer.

An invert channel exhibiting good hydraulic properties is an important objective of manhole construction that frequently is not achieved. The channel shall be, as far as is possible, a smooth continuation of the pipe. According to design procedures, the sewer grades are calculated to the centers of the manholes, and these centers represent points where changes in slope shall occur. In addition, the bench adjacent to the channel shall be sloped downwardly toward the channel.

The concrete surfaces within the riser sections shall be free of voids or honeycombs. The corrosive atmosphere within the manhole makes it very important to determine that sufficient concrete cover is provided over the reinforcing steel. Before each section is placed, the Inspector shall make sure that flexible joint sealant has been placed properly in the groove end of the riser section, or, that a rubber O-ring gasket has been inserted into the recessed slot on the tongue end of the section.

The Inspector shall also verify the alignments and elevations of the openings for the influent and discharge pipes. All pipe openings 15 inches or smaller in diameter shall be provided with positive seal elastomeric gaskets. When inspecting the riser sections, the manhole steps shall be checked to make sure that they are securely embedded in the wall.

The Inspector shall verify that the manhole castings are as specified in the Plans or as shown in the *LFUCG Standard Drawings*. The manhole cover and frame shall have machined seating edges, and the cover shall set neatly in the frame with the top of the cover flush with the top of the frame ring. The covers shall have sufficient corrugations for tire traction and be marked in large letters, "SANITARY" or "STORM SEWER, LEXINGTON, KENTUCKY." The covers shall have two pick holes about 1-1/2 inches wide and 1/2 inch deep with 3/8 inch undercut all around.

All manholes 4 feet or greater in depth shall be equipped with manhole steps spaced as shown in the *LFUCG Standard Drawings* to form a continuous ladder. Manhole steps shall be aligned with the straight side of eccentric cone sections.

All sanitary sewer manholes must pass the application of a vacuum test according to ASTM C 1244. During the test, all pipes and lift holes are plugged and a vacuum of 10 inches of mercury shall be drawn on the manhole. The time is recorded for the vacuum to drop to 9 inches of mercury. Minimum allowable test times vary according to manhole depths and diameter and are tabulated in ASTM C 1244. If a manhole fails the initial test, necessary repairs shall be made and the manhole retested until a passing test is obtained. The manhole vacuum test is typically performed by LFUCG. Results of the test shall be documented in the Manhole Vacuum Test Report presented in Section 3.0.

7.3.6 Drop Manholes

Drop manholes are constructed as circular manholes with additional branches and fittings to direct flow from higher invert elevations to the base of the manhole. Accordingly, the inspection techniques discussed in Section 7.3.5 must be followed. During construction of drop manholes, particular attention shall be given to the dimensions of the vertical drop that occurs between the connecting sewer lines. The drop riser, tee, and stub must be encased in concrete as shown in the *LFUCG Standard Drawings*.

7.3.7 Non-Circular Manholes

Non-circular manholes or junction chambers are constructed of precast or cast-in-place concrete. When inspecting the concrete construction of junction chambers, the techniques described in Section 11.0 must be followed. The Inspector shall refer to the Contract Documents for the concrete type specified.

Items of particular concern when constructing junction chambers are the smoothness of the channels contained within the structure, the slope of the chamber floor, and the invert elevations of the adjoining pipes. Turbulence can be a problem in junction chambers, thus the channels constructed in the floor must be as smooth as possible and free of obstructions. The floor of the chamber must be sloped downwardly toward the channels to prevent the accumulation of sewage or sediment in the structure. The invert elevations of the adjoining sewer pipes must conform to those shown on the Plans. Generally, the inverts of branch lines are higher than the invert of the main sewer line to promote smooth flows.

To provide access to the junction chamber, an opening is provided in the top of the structure. Generally, the opening is constructed with standard precast manhole sections and the same manhole castings described in Section 7.3.5 are used and securely fastened. If required, vacuum testing shall be performed as described in Section 7.3.5.

7.3.8 Storm Sewer Inlets

The majority of storm sewer inlets are constructed using precast concrete. Similar to other appurtenances, storm sewer inlets must be constructed to the required sizes and dimensions as indicated on project Plans. An area of particular concern when constructing a storm sewer inlet is the location and diameter of the opening for the outgoing sewer pipe. All pipe connections shall be grouted and watertight. In addition, all castings used in association with the storm sewer inlet must be securely fastened. Only approved castings are permitted.

7.3.9 Headwalls

Headwalls may be of precast or cast-in-place construction. The techniques discussed in Section 11.0 shall be undertaken when inspecting cast-in-place headwalls. Following construction of the headwall, backfill must be carefully placed around the sewer pipe and the headwall to avoid cracking of the concrete.

7.4 References

7.4.1 Publications

Construction Inspection Guidance Manual, Louisville and Jefferson County Metropolitan Sewer District (MSD), Revised Edition, May 1993.

Lexington Fayette Urban County Government Standard Drawings, June 1997, Review Submittal.

7.4.2 Test Methods and Specifications

ASTM C 478, *Specification for Precast Reinforced Concrete Manhole Sections.*

ASTM C 1244, *Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test*.

7.5 Appurtenances Inspection Checklist

7.5.1 General

	Yes	No	N/A	
(1)	____	____	____	Are all appurtenance structures constructed to the proper dimensions and locations in accordance with the Plans?
(2)	____	____	____	Are the foundations for all appurtenances properly prepared?
(3)	____	____	____	If an appurtenance structure is to be constructed upon soil, is the soil subgrade adequate to support the structure?
(4)	____	____	____	If the appurtenance is to be constructed on rock, is a cushion of crushed stone provided between concrete faces and the rock?
(5)	____	____	____	Are any branches, fittings, stubs, or sewer pipes that are to remain unconnected following completion of the project properly sealed?
(6)	____	____	____	Do precast structures meet the appropriate criteria?
(7)	____	____	____	Have the precast structures been approved for use by the LFUCG Division of Engineering?
(8)	____	____	____	Are pipe openings of proper size and location?
(9)	____	____	____	Have shop drawings been submitted and approved?

7.5.2 Branches and Fittings

	Yes	No	N/A	
(1)	____	____	____	Are all branches and fittings properly connected?
(2)	____	____	____	Are spigot ends and gaskets being lubricated?
(3)	____	____	____	Are connections being made so that no twisting or folding of the rubber gasket used to seal the connection occurs?
(4)	____	____	____	Is proper care being exercised by the Contractor to ensure that the property service connection sewer is not pushed too far into the branch?

	Yes	No	N/A	
(5)	____	____	____	Prior to being covered with crushed stone, are branches or fittings that have been installed in the collector sewer, but which have not yet been connected to a property service connection, been temporarily sealed with a stopper?
(6)	____	____	____	Is crushed stone properly placed around and beneath all branches and fittings to prevent cracking at the fitting?
(7)	____	____	____	Are caps or plugs being placed at the upstream end of property service connections?

7.5.3 Stubs

	Yes	No	N/A	
(1)	____	____	____	Are stubs installed according to Plans?
(2)	____	____	____	Are the stubs properly sealed?
(3)	____	____	____	Are stubs a minimum of 1 foot in length?

7.5.4 Property Service Laterals and Risers

	Yes	No	N/A	
(1)	____	____	____	Has a service lateral been installed to each property?
(2)	____	____	____	All risers provided where needed?
(3)	____	____	____	When installed, are risers constructed to the proper elevations above the collector sewer?
(4)	____	____	____	Are the risers cradled in concrete in accordance with the *LFUCG Standard Drawings* or Contract Documents, as appropriate?
(5)	____	____	____	Are the riser slopes in accordance with the *LFUCG Standard Drawings* or Contract Documents, as appropriate?

7.5.5 Manholes

	Yes	No	N/A	
(1)	____	____	____	Are the openings constructed in the base section of the sewer pipes of the appropriate sizes and at the proper elevations?
(2)	____	____	____	If required by the Contract Documents, are the openings fitted with positive seal elastometric gaskets?
(3)	____	____	____	Are manholes constructed so that they are watertight and are the proper seals or O-ring gaskets used in all joints?
(4)	____	____	____	Is the channel in the base section constructed using the correct grades, diameters, and invert elevations?
(5)	____	____	____	Is the bench sloped downwardly toward the channel?
(6)	____	____	____	Do all castings conform to the *LFUCG Standard Drawings* or Contract Drawings, as appropriate?
(7)	____	____	____	Are the casings properly placed and securely fastened?
(8)	____	____	____	Have all sanitary sewer manholes passed a vacuum test?
(9)	____	____	____	Have the test results been documented in the Manhole Vacuum Test Report?

7.5.6 Drop Manholes

	Yes	No	N/A	
(1)	____	____	____	Does the extend of the vertical drop provided correspond to the Plans?
(2)	____	____	____	Is the drop inlet properly constructed with tightly sealed fittings that are firmly connected to the manhole before the concrete encasement is placed?
(3)	____	____	____	Is the drop inlet properly encased in concrete as shown in the *LFUCG Standard Drawings* or Contract Drawings, as appropriate?

7.5.7 Non-Circular Manholes and Junction Chambers

	Yes	No	N/A	
(1)	____	____	____	Are the cast-in-place concrete junction chambers constructed according to the techniques discussed in Section 11.0?
(2)	____	____	____	Are the channels in the junction chamber smooth and constructed on a uniform grade(s) through the chamber?
(3)	____	____	____	Is the bench sloped downwardly toward the channels?
(4)	____	____	____	Do the invert elevations of adjoining sewer pipes conform to the Plans?
(5)	____	____	____	Is the access opening of the junction chamber properly constructed?
(6)	____	____	____	Are all castings installed for the opening securely fastened?
(7)	____	____	____	Do the castings conform to the *LFUCG Standard Drawings?*

7.5.8 Storm Sewer Inlets

	Yes	No	N/A	
(1)	____	____	____	Are all connections between the inlet box and storm sewers grouted and watertight?
(2)	____	____	____	Are all castings used in association with the storm sewer inlet securely fastened?
(3)	____	____	____	Do the castings conform to the *LFUCG Standard Drawings*, where appropriate?
(4)	____	____	____	Were the proper types of grates and curb boxes provided?
(5)	____	____	____	Is the outlet pipe placed at the proper elevation and is it of the proper diameter?

7.5.9 Headwalls

	Yes	No	N/A	
(1)	____	____	____	Are cast-in-place concrete headwalls constructed using the techniques discussed in Section 11.0?
(2)	____	____	____	Is backfill carefully placed around the sewer pipe and headwalls in such a manner that no cracking of the concrete occurs?