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PART 4

CITY OF LAKE WALES

WASTEWATER COLLECTION AND TRANSMISSION STANDARDS

4.1 General

Any new sewerage system to be connected to the public sewer shall not be constructed until final plans are approved by the Public Utilities Department. Contractor shall furnish all labor, equipment, and materials and shall perform all operations in connection with installation of a complete wastewater collection and pumping system ready for use in accordance with the specifications and the City's requirements, either specific or implied. This includes any and all restoration required to duplicate original site conditions prior to the commencement of construction.

4.2 Submittals

The Department shall be furnished three (3) sets of plans and specifications prepared by a registered engineer certified to do business in the State of Florida. Plans shall be in sufficient detail to accurately indicate all pertinent design and construction details for a comprehensive interpretation of the work to be performed. Two (2) copies of shop drawings shall be submitted to the Director of Public Utilities for review on any materials, which are requested as a substitute for previously approved materials. The City retains the right to refuse any proposed substitution.

4.3 Design Requirements

4.3.1 Minimum size

All new gravity sanitary sewer lines shall be a minimum of eight inches (8") in diameter. All new force mains shall be a minimum of six inches (6") in diameter, unless otherwise approved by the Public Utilities Department.

4.3.2 Alignment

All gravity sanitary sewers shall be laid with straight alignment and uniform grade between manholes. Where feasible, both gravity sanitary sewers and force mains shall be laid parallel to the right-of-way line.

4.3.3 Depth of cover

The depth of cover on all lines carrying wastewater shall not be less than thirty-six inches (36") unless otherwise approved by the City.

4.3.4 Slope

Minimum grades in gravity sewers shall not be less than those required to produce a velocity of approximately two feet (2') per second when the size pipe selected is flowing full and using an "n" value of 0.013 in the Manning Formula.

Sewers shall be designed with the following minimum grades:

8"	0.40%
10"	0.28%
12"	0.22%
14"	0.17%
15"	0.15%
18"	0.12%
21"	0.10%
24"	0.08%

4.3.5 Velocity

Force mains shall be designed to have a mean velocity of not less than two and a half feet (2.5') per second, with one pump operating at full speed. The maximum mean velocity, with all pumps operating, shall not exceed eight feet (8') per second.

4.3.6 Service Laterals

A separate and independent service lateral shall be constructed from the main to each building, lot, or two adjacent lots. Minimum size for services shall be four inches (4"), with a minimum slope of 2 %. Service lateral connections to the sewer main shall be made using wye fittings. Solvent-weld or strap-on saddles are not acceptable for new construction. Service laterals shall extend from the main to the edge of the road right-of-way and shall in no case be longer than fifty feet (50'). A cleanout shall be provided at the right-of-way line on each service lateral. All service lateral stub-outs shall be marked with a pressure treated 2x4 piece of lumber no less than four feet (4') in length. The 2x4 shall extend approximately one foot above grade and shall be painted green. The depth to the lateral shall be noted on the 2x4.The cleanout cap shall be within a twenty-four inch (24") circular concrete slab six inch (6") thick; the 2x4 shall be outside the slab.

4.3.7 Manholes

Manholes shall be installed on gravity sanitary sewer lines at all changes in grade, size, or alignment, at all intersections, and at the end of the line. The maximum distance between manholes shall be 400 feet. A manhole shall be constructed at the end of all lines, regardless of length. Minimum inside diameter of all manholes shall be sixty inches (60") for all sewer lines up to twenty-four inches (24") in diameter. Manholes for sewer lines larger than twenty-four inches (24") shall have an inside diameter of not less than seventy-two inches (72").

Where practical, manholes shall be placed on undisturbed soil. Where manholes must be installed in fill areas, fill shall be compacted to 95% of proctor rating in green area and 98% in the roadway at optimum density, as determined by AASHTO T-99 to an elevation not less than 36" above the proposed invert before excavation begins. Certification of compaction at the manhole location shall be provided before setting the manhole base.

Double ram neck and joint to be wrapped with six-inch (6") manhole wrap.

4.3.8 Air and Vacuum Venting

Where the force main profile is such that air pockets or entrapment could occur, provisions for air release valves shall be provided. Unless authorized by the Public Utilities Department, all air and vacuum valves shall be automatic. Air and vacuum valves shall be installed on all profile break points. Air release valves shall be installed as directed by the Utilities Department. All air valves shall be in accordance with the standard specifications and details.

4.3.9 Valve Locations

Where two force mains join, valves shall be installed on all force mains at the point of connection. Where force mains are to be extended for potential growth, the end of the force main shall have a gate valve with an MJ plug. Isolation valves shall be placed every 1000 feet for pipe size up to twelve inches (12"). For larger diameter force main every 750 feet.

4.4 Connections to Existing System

4.4.1 Connections to existing gravity sewer mains

Shall be made only after 48 hour notice to the Utilities Permit Coordinator. A watertight plug shall be installed to prevent any discharge to existing sewers until the City has accepted the completion of all tests and inspections and the new system.

4.4.2 Connections to existing force mains

Shall be made only after 48 hour notice to the Utilities Permit Coordinator. All tapping sleeves, valves, and fittings shall be provided by the contractor. Valves shall be locked shut until all tests and inspections are complete and the City has accepted the new system. All connections shall be made by the contractor using HOT TAP method with a stainless steel sleeve.

4.5 Products

4.5.1 Materials

All materials shall be new, of first quality, manufactured in the United States (or Public Utilities Department approved equivalent), and shall conform to the appropriate ASTM and/or AWWA standard, latest revision.

4.5.2 Fittings

All fittings and materials shall be inspected by the City Utilities Department after delivery and prior to being installed.

(1) All force main fittings shall be rated for not less than 150 psi working pressure.

4.5.3 Polyvinyl Chloride (PVC) Gravity Sewer Pipe

(1) Provide ring-tight gravity sewer pipe and fittings to meet or exceed the requirements of ASTM D 3034 SDR26. Pipe shall be dyed green. Bell shall consist of an integral wall section with a solid cross-section rubber ring.

(2) PVC gravity sewer pipe and fittings eighteen inches (18") and larger shall meet or exceed the requirements of ASTM F674. Pipe shall be dyed green.

4.5.4 Ductile Iron Gravity Sewer Pipe

(1) Ductile Iron is **not** acceptable for Gravity sewer lines within the City of Lake Wales, unless otherwise approved by the Public Utilities Director.

4.5.5 Sanitary Sewer Manholes

(1) Sewer manholes shall be constructed in accordance with the City's standard details. Excavation shall be made in accordance with applicable sections of these specifications.

(2) Concrete manholes shall be constructed of 4,000 pound, Type II Acid Resistant Concrete. Pre-cast manholes shall be in accordance with ASTM C478. For pre-cast manholes, all joints between manhole sections shall be sealed with two concentric rings of preformed plastic sealing compound, installed in accordance with manufacturer's recommendations. The sealing compound shall be "Ram-Nek" as manufactured by K.T. Snyder Co., or equal.

(3) Pre-cast concrete manholes shall have a minimum wall thickness of five inches (5"). Cast-in-place manholes shall have a minimum wall thickness of five inches (5").

(4) Manholes shall have channel inverts accurately and smoothly formed for each connecting pipe. The channel shall have a smooth "U" shape with the bottom conforming to the radius of the sewer pipe and a total depth equal to 90% of the pipe diameter. Channel inverts may be constructed of half pipe with finished surfaces shaped as shown on the detail. Use of brick or concrete block to form the invert is not acceptable.

(5) Only one exiting pipe shall be allowed per manhole.

(6) The bench should be sloped no less than ½ inch per foot (40 mm/m) (4 percent). No lateral sewer, service connection, or drop manhole pipe shall discharge onto the surface of the bench.

(7) When the manhole is completed, the frame and cover of dimensions shown shall be set in place in mortar. In paved areas, the top of the cover shall be flush with surrounding pavement. In unpaved areas, the top of the cover shall be two inches (2") above finish grade.

(8) Interior and exterior of all manholes shall receive ConSeal CS-55 coating at 4 mil thickness, unless otherwise determined by the Director of Public Utilities.

(9) Backfill shall be made in accordance with applicable sections of these specifications.

(10) All connections of pipes to manholes shall be made utilizing resilient pipe connectors.

(11) The Contractor shall install drop manhole connections when the difference in elevation of the incoming sewer invert and the manhole invert exceeds two feet (2'), or when directed by the Public Utilities Director. The difference in elevation shall be measured from the invert of the incoming pipe to the invert at the center of the manhole. Drop connections shall be PVC pipe, backfilled in six-inch (6") lifts and compacted by hand tampers.

(12) All castings for manhole covers and other purposes shall conform to specifications of the ASTM, Designation A48-74 for Class 30 gray iron. The castings shall be true pattern in form and dimensions, free from pouring faults, sponginess, cracks, blow-holes, and other defects in position affecting their strength and value for the service intended.

(13) Manhole frames and covers shall have the words "CITY OF LAKE WALES" and "SANITARY SEWER" cast thereon. Minimum clear opening of the cover shall be 36 inches. Cover shall weigh not less than 150 pounds. Circular covers must fit the frames in any position. Contact surfaces of both frames and covers shall be machined and any tendency to rattle, as determined by test before or after installation, will be sufficient cause for rejection of the frames and cover.

(14) Where required watertight frames and covers shall be Neenah Foundry Figure No. R-1916F, or equal, with rubber gasket.

(15) Manhole cover shall be equipped with inflow protection cover.

4.5.6 Ductile Iron Force Main

(1) Ductile iron is **not** acceptable for Force mains within the City of Lake Wales utility service area.

4.5.7 Polyvinyl Chloride (PVC) Force Main

(1) All PVC force mains four inch (4") diameter and greater shall be C900 (DR)18.

(2) Each length should be clearly labeled to allow identification and specification conformance. Force Main Pipe shall be green in color.

4.5.8 Valves

(1) Plug valves and butterfly valves are **not** authorized for use within the City of Lake Wales collection system.

(2) Additional information for valves can be found in the Sanitary Preferred Items list.

4.5.9 Air Relief Valves

Valves are to be A.R.I 2" NPT D25 NYLON3 150PSI USA. The Combination Air Valves shall be *fitted* with stainless steel hardware and tapping saddle.

4.5.10 Valve Operators

(1) Provide two inch (2") AWWA operating nut for all valves.

(2) All operators to open by turning counter clockwise.

4.5.11 Valve Boxes

Boxes shall be cast iron of standard design with adjustable drop section to fit disc or cover over valve. Interior diameter shall be not less than five inches (5), with cast iron cover marked "SEWER". Boxes shall be Glow F2454, or equal. Valve box shall be set in twenty-four inch (24") circular concrete, six inches (6") thick.

4.5.12 Steel Pipe Sleeves and Carrier Pipe

All construction projects requiring steel sleeves shall conform to the minimum Florida Department of Transportation (F.D.O.T) requirements for roadway crossings. Railroad crossings shall conform to railroad requirements. The following casing sizes shall be used for the corresponding carrier pipes:

CARRIER PIPE (Normal O.D.)	STEEL CASING (Required Dia.)
4"	8"
6"	12"
8"	16"
10"	18"
12"	24"
16"	30"
20"	36"

4.5.13 Tracer wire

(1) Shall be green-coated #10 gauge and installed on all force mains and gravity sewer lines. Tracer wire shall be taped to the top of pipe and stubbed up outside of valve box in a P200 NFG test box. Tracer wire is required on all non-metallic pipe.

(2) Caution tape is to be laid eighteen inches (18") above pipe and is to be marked as sewer. The tape should be three inches (3") in width.

(3) The trace wire testing is to be completed by a certified continuity technician.

4.6 General Installation

4.6.1 Preparation

Remove scale and dirt, on inside and outside, before assembly.

4.6.2 General

(1) Trenches shall be maintained in a dry condition at all times unless otherwise approved by the Public Utilities Director.

(2) Maintain six feet (6') minimum, ten feet (10') preferable, horizontal separation; vertical separation of water main from sewer piping in accordance with State requirements.

(3) NO trees are to be planted within twenty-five feet (25') of a sanitary sewer line or service main.

(4) The trench shall be dug so that the pipe can be laid to the alignment and depth required, and it shall be excavated only so far in advance of pipe laying as permitted by the Public Utilities Director. The trench shall be so braced and drained that the workmen may work therein safely and efficiently.

(5) All excavations deeper than three feet (3') shall be dewatered as required to maintain the water level at a minimum of two feet (2') below the excavation throughout excavation, bedding, and backfilling. Discharges of dewatering pumps shall be conveyed to natural drainage channels, drains, or storm sewers. Contractor shall treat discharge as required to prevent violations of state water quality standards.

(6) Pipe trench shall be prepared in accordance with pipe manufacturer recommendations.

(7) The following are minimum trench widths measured at the horizontal centerline of the pipe without undercutting:

Pipe Size	Minimum Trench Width
8"	24"
10"	26"
12"	30"

(8) Bell holes shall be provided at each joint to permit the jointing to be made properly.

4.6.3 Sheeting and Bracing

(1) During construction, the side slopes of all the excavations shall be maintained at an inclination no steeper than two horizontal to one vertical. Vehicles shall be at least five feet (5') away from the top of slope. If site conditions do not permit such side slopes, excavation shall be performed using trench boxes.

(2) Open-cut trenches shall be braced as required by any governing Federal and State Laws and municipal ordinances, and as may be necessary to protect life, property, or the work. Comply with the Florida Trench Safety Act and the related OSHA requirements of 29CFR.S.1926.650 Part P.

4.6.4 Handling Material

(1) All pipe and accessories shall be loaded and unloaded by lifting with hoists or skidding in a manner that will avoid shock or damage. Under no circumstances will such materials be dropped. Pipe handled on skidways shall not be skidded or rolled against pipe already on the ground.

4.7 Gravity Sewer Construction

4.7.1 Trenching and backfill shall be in accordance with the pipe manufacturer recommendations.

4.7.2 Gravity sewers shall be laid to exact line and grade by the use of a laser beam. Sewers will be inspected with a light at each manhole when the line is completed and backfill has been placed to a depth of one-foot (1') over the pipe. Backfill may be completed only after approval of each section is given for alignment and grade. Faulty sections of sewer lines rejected by the City shall be removed and re-laid by the Contractor at their own expense.

4.8 Gravity Sewer Testing

4.8.1 Televising Lines

Each gravity sanitary sewer, upon completion, or at such time as the Public Utilities Director may direct, is to be cleaned, tested, and inspected. All repairs or alterations shown necessary by these tests shall be made; all broken or cracked pipe removed; all excessive infiltration stopped; all deposits in pipe and manholes removed and the sewer left clean, true to line and grade, and ready for use.

Before final acceptance, gravity sewer lines shall be televised by a contractor with qualifications suitable to the City. Each line will be recorded using a DVD/CD recorder. Each run will be clearly labeled showing the manholes and with a counter indicating the lineal number of feet run from the reference point. DVD/CD shall be in color and shall include inspection of all newly installed laterals. The original DVD/CD shall be provided to the City.

Any pipe that holds water shall be cause for rejection of the installation. The following requirements for televising the gravity sewer must be met prior to acceptance by the City of Lake Wales.

A. All gravity sewer lines to be cleaned using high pressure flusher trucks prior to being televised with a closed circuit television camera. Flusher truck should vacuum any dirt and debris, along with cleaning water, out of manhole for disposal elsewhere.

B. Any debris remaining in the line shall be a cause for canceling the television inspection.

C. Within 24 hours of start of TV inspection, verify contractor adds enough water to upstream manhole to cause water to flow into downstream manhole. This is to ensure that all sags in sewer line are filled with water prior to start of construction.

D. Starting at uppermost reach, each line segment to be televised from downstream manhole to upstream manhole to allow better inspection of service connections.

E. At start of each line segment, inspection camera is turned on and panned around to show identifying landmarks to positively identify manhole being televised. Once camera starts recording, ensure that the camera is not turned off until the inspection is complete.

F. After showing identifying landmarks, camera to be lowered into the manhole and positioned into the downstream end of the segment being inspected.

G. The camera is to be towed behind a 1/2" target gauge and mandrel. The gauge is used to judge the depth of any sags or bellies in the line and mandrel is used to measure pipe deflection.

H. Verify the camera does not travel at a rate greater than thirty feet (30') per minute. All service wyes to be thoroughly inspected.

I. Ensure that there is **NO** leakage (infiltration) at any pipe joint or at connections to manholes. Any infiltration shall be grounds for failing the inspection.

J. Any line segments that require repairs to be re-televised prior to final acceptance.

K. Gravity sewers will also be tested or gauged to determine the amount of infiltration or exfiltration.

4.8.2 Gravity Pipe Leakage Testing (Method of testing to be determined by Utilities Inspector)

1. General

Tests shall be made by the low-pressure air test or the infiltration test. The infiltration test shall be used when the groundwater level is at least two feet (2') above the crown of the pipe measured at the upstream manhole. The exfiltration test shall be conducted from manhole to manhole. Trenches shall be completely backfilled and sewer line should be free of debris prior to testing. Plug all pipe outlets including laterals and secure plugs to prevent leakage blowout due to testing pressure.

2. Infiltration Test

(a) *Performance:*
The infiltration, as determined by a hydrostatic head test, shall have a minimum test head of two feet (2.0') above the crown of a pipe at an upstream manhole. For construction within the 100-year flood plain.

(b) *Execution:*
Stop at dewatering operations and allow the groundwater to return to its normal level and allow to remain so for at least 24 hours. Leakage shall be determined by any flow in the line.

3. Water Table Determination

The water table present at the time of testing shall determine the test method to be utilized. If the water table is above the bottom of the sanitary sewer, then infiltration testing shall be utilized. If the water table is below the bottom of the pipe, then exfiltration testing will be used.

4. Exfiltration Tests

The sewer section to be tested shall be filled to the top ring of the manhole with clear water or to a specified elevation (normally three feet (3') above the sewer crown) and then replace the manhole cover. The exfiltration is determined by any loss. Manholes or standpipes may be used to maintain the specified water level.

4.8.3 Manhole Leakage Test

Manholes shall be examined for visible leakage due to infiltration of ground water if the water table is greater than five feet (5') above the manhole invert or by filling with water to the base of the manhole frame. Infiltration or exfiltration shall not exceed the requirements specified above.

4.9 Force Main Construction

4.9.1 All pipe within the City R/O/W shall be laid to a minimum cover of thirty-six inches (36") from established grade if not otherwise indicated. Any variation shall be approved by the Public Utilities Director.

4.9.2 All force mains under roadways shall be HDPE piping for directional bore or PVC inside of a steel casing for Jack and Bore or open cut.

4.9.3 All force mains under roadways shall follow the established rules promulgated by the entity that owns the roadway; the City of Lake Wales requires force mains to be forty-eight inches (48") from the bottom of the asphalt to the crown of the pipe or casing.

4.9.4 Every precaution shall be taken to prevent foreign material from entering the pipe while it is being placed in the trench. During laying operations, no debris, tools, clothing, or other materials shall be placed into the pipe.

4.9.5 Pipe laying procedures will adhere to manufacturer's specifications or the PVC/HDPE handbook.

4.9.6 At times when pipe laying is not in progress, the open ends of pipe shall be closed by a watertight plug or cap. This provision shall apply during the noon hour as well as overnight. If water is in the trench, the seal shall remain in place until the trench is pumped completely dry.

4.9.7 The cutting of pipe for inserting fittings or closure shall be done in a neat and workmanlike manner without damage to the pipe so as to leave a smooth end at right angles to the axis of the pipe.

4.9.8 Install 10 gauge trace wire with all force main installations in accordance with City requirements.

4.9.9 All plugs, caps, tees, and bends shall be provided with restraining glands in accordance with City standards, manufacturer's specifications and the PVC handbook.

4.10 Force Main Testing

4.10.1 Before pressure testing force main, place a minimum cover of six inches (6") above the top of pipe, the contractor may leave all joints exposed. The backfill should be free of stones and hard earth. Pressure test the pipe in the presence of the City Inspector.

4.10.2 Pressure test shall be conducted at a minimum pressure of 150 psi. Leakage is defined as the

quantity of water to be supplied into the newly laid pipe, or in any valved section thereof, necessary to maintain the specified leakage test pressure after the pipe has been filled with water and the air expelled.

4.10.3 PVC Testing

No pipe installation will be accepted until the leakage is less than the number of gallons per hour as determined by the formula:

$$L = \frac{ND\sqrt{P}}{7{,}400}$$

L equals the allowable leakage in gallons per hour;
N is the number of joints in the length of the pipeline tested;
D is the nominal diameter of the pipe in inches;
P is the average test pressure during the leakage test, in pounds per square inch.

4.10.4 HDPE Testing

The test procedures consist of two steps; the initial expansion and the test phase.

After the pipe has been joined, fill it with water and carefully bleed off any trapped air. Subject the pipe to a pressure of 150 psi and check for any leaks. Fill the pipeline with water after it has been laid; bleed off any trapped air. Subject the lowest element in the system to a minimum test pressure of 150 psi, and check for any leakage. When test pressure is applied to a water-filled pipe, the pipe expands. During the initial expansion of the pipe under test, sufficient make-up water must be added to the system at hourly intervals for 3 hours to maintain the test pressure. After about 4 hours, initial expansion should be complete and the actual test can start.

When the test is to begin, the pipe is full of water and is subjected to a minimum test pressure of 150 psi. The test phase should not exceed 2 hours, after which time any water deficiency must be replaced and measured. Add and measure the amount of make-up water required to return to the test pressure and compare this to the maximum allowance.

NOTE: If specified by the engineer, pressure testing may be conducted prior to pipe installation. It shall be the responsibility of the contractor to ensure that appropriate safety precautions are observed during hydrostatic testing above ground.

4.10.5 Upon completion of all testing the force mains shall be cleaned by means of pigging to remove debris

4.11 Warranty

All portions of the installed sewer system and site restoration shall be fully guaranteed against material defects of improper workmanship for a period of one year from acceptance by the City. During this time, repairs will be made by the developer at no cost to the City. Any repairs made on the newly installed system by the City during this period will be charged to the developer.

4.12 AS-BUILTS

The engineer of record, or such Registered Engineer as may apply, shall submit to the City two sets of certified "As-Built/Record Drawing" (Hard copy), one set on mylar and one set in electronic media compatible with the City (AUTOCAD) system. The "As-Built" shall contain a certification from a registered Engineer in the state of Florida that indicates that the project has been substantially completed in accordance with the approved plans and specifications, or that the deviations noted on the "Record Drawings" will not prevent the project from complying with the design function of the project.

In order to effectively comply with this requirement, it would be necessary for the certifying Engineer to have provided periodic review and inspection of the installation of those facilities within the project. The Engineer may supplement his review and inspection of the project by utilizing information taken from a valid survey. **The "As-Built/Record Drawings" shall provide information on project facilities that indicates sufficient horizontal and vertical dimensional data in state plane coordinates so that the constructed improvements may be located and delineated.** All dimensions both horizontal and vertical shall be placed on the "As-Built/Record Drawings" and certified by a Professional Surveyor or Mapper and Professional Engineer before submitting to the City.

"As-Built/Record Drawings" that contain disclaimers that essentially render the Professional Engineer's certification meaningless will not be accepted.