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WATER AND WASTEWATER SERVICES - ENGINEERING
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MINIMUM INSTALLATION AND TESTING REQUIREMENTS

Date: October 1, 2012
Date Last Issued: June 23, 2010
Date First Issued: Prior to 1990

This document approved by the Broward County Water & Wastewater Services Technical Standards Committee.

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1 INSTALLATION OF NEW WATER MAINS

A. The installation of all new water mains shall be done in accordance with the requirements of AWWA Standard C600, “Recommended Standards for Water Works,” the Department of Health, Water and Wastewater Services (WWS) Services, and the manufacturer’s specifications and requirements.

B. See Installation Additional Requirements - Section 4.

C. Pipe Deflection - When it is necessary to deflect pipe from a straight line in either the vertical or horizontal plane or where long radius curves are permitted, the amount of deflection shall not exceed 75% maximum deflection recommended by manufacturer.

D. The minimum cover for ductile iron pipe is 30 inches.

2 INSTALLATION OF NEW WATER SERVICES

A. The installation of all new water services shall be done in accordance with the latest revision of AWWA Standard C600, C901 and C902 plus the additional requirements of the Department of Health, and WWS.

B. Laying

1. The bedding material used for service line installations shall consist of selected backfill material containing sand, no stone or rocks larger than 1" in diameter, and no drainfield lime rock larger than 3/4" in diameter.
2. When the service line is laid in the prepared trench, special care shall be taken to insure that minimum radius is maintained on plastic and copper service lines and that undue pressure is not exerted on the service line by rocks or other material protruding through the bedding material.
3. The interior of the service line shall be thoroughly cleaned of all foreign matter before being lowered into the trench. Compression joints and couplings shall be assembled in strict accordance with the manufacturer’s recommendations. Particular care should be taken to keep foreign materials from interfering with proper joint assembly. The mating surfaces of the compression joint should be wiped clean. The tubing should then be inserted into the compression fitting and made tight according to the manufacturer’s recommendations.
4. The maximum deflection of any service line shall not exceed 75% maximum deflection recommended by the tubing manufacturer. The service line shall terminate in an approved meter box or vault located within the public right-of-way or easement, adjacent to the property served.
5. See Installation Additional Requirements - Section 4.

3 INSTALLATION OF NEW GRAVITY SEWERS, FORCE MAINS AND PUMP/LIFT STATIONS

A. The installation of all new gravity sewers shall be done in accordance with the requirements of the "Recommended Standards for Waste Water Facilities (latest revision), DPEP, and WWS.

B. See Installation Additional Requirements - Section 4.

C. Pipe deflection is allowed for force mains only. See Section 1.

D. The minimum cover for ductile iron pipe is 30 inches. The minimum cover for PVC pipe is 36 inches.

4 INSTALLATION ADDITIONAL REQUIREMENTS

The installation of all new mains and services shall be in accordance with the requirements of WWS, and as stated herein.

A. Clearing

The Contractor shall perform all clearing necessary for the proper installation of all lines, and appurtenances in the locations shown on the drawings. Plantings, shrubbery, trees, utility poles or structures subject to damage resulting from the excavation shall be transplanted, relocated, braced, shored, or otherwise protected and preserved unless otherwise directed by the Engineer of Record.

B. Excavation

1. The Contractor shall perform all excavation of every description and of whatever substances encountered, to the dimensions and depth shown on the drawings or as directed. All excavations shall be made by open cut. All existing utilities such as pipes, poles, and structures shall be carefully supported and protected from injury, and in case of damage, they shall be restored at no cost to the County.
2. Work shall be properly sheeted and braced where necessary. Where wood sheeting or certain designs of steel sheeting are used, the sheeting shall be cut off at a level two feet above the top of the installed pipe and that portion below that level shall be left in place. If interlocking steel sheeting, of a design approved by the Engineer of Record is used, it may be removed providing removal can be accomplished without disturbing the bedding or alignment of the pipe. Any damage to the pipe bedding, pipe, or alignment of the constructed main caused by removal of sheeting shall be cause for rejection of the affected portion of the work.
3. Pipe trenches shall be excavated to a width, within the limits of the top of the

pipe and the trench bottom so as to provide a clearance on each side of the pipe barrel, measured to the face of the excavation, or sheeting if used, of not less than eight inches (8") nor more than twelve inches (12") except for pipe over eighteen (18") inches in nominal size, this maximum twelve (12") inches clearance may be increased to eighteen (18") inches. All pipe trenches shall be excavated to a level six inches (6") below the outside bottom of the proposed pipe barrel unless otherwise directed by the Engineer of Record. Properly sloped or shored per OSHA (Federal Register Part II, Department of Labor, OSHA 29CFR 1910; Permit required, confined spaces for General Industry, Final Rule) requirements and job site conditions, and Trench Safety Act **(**House Bill 3183 Law of Oct. 1, 1990**)**

4. Excavation for appurtenances shall be sufficient to provide a clearance between their outer surfaces and the face of the excavation, or sheeting if used, of not less than twelve inches (12"). Materials removed from the trenches shall be stored and disposed of in such a manner that they will not interfere unduly with traffic on public streets and sidewalks, and they shall not be placed on private property. In congested areas, such materials as cannot be stored adjacent to the trench or used immediately as backfill, if acceptable, shall be removed to convenient places of storage.

5. All excess material suitable for use as backfill shall be hauled to and used in areas where not enough suitable material is available from the excavation.

6. Suitable material in excess of backfill requirements and material unsuitable for backfill shall become the property of the Contractor and shall be removed from the work and disposed of by the Contractor at his expense.

7. All unsuitable material shall become the property of the Contractor and shall be removed from the work and disposed of by the Contractor at his expense.

8. Unsuitable material shall not be mixed with or allowed to contaminate suitable backfill material.

C. Dewatering

1. When practical, it is a requirement of these specifications that excavation shall be free from water before pipe or structures are installed. When not practical, work shall be done as specified by the Engineer of Record.

2. The Contractor shall provide all necessary pumps, under-drains, well point systems, and other means for removing water from trenches and other parts of the work. The Contractor shall continue dewatering operations until the backfill has progressed to a sufficient depth over the pipe to prevent flotation or movement of the pipe in the trench.

3. Water from the trenches and excavation shall be disposed of in such a manner as will not cause injury to public health, to public or private property, to the work completed or in progress, to the surface of the streets, or waterways or cause any interference with the use of the same by the public. When applicable, the Contractor shall use erosion control measures specified by permits.

D. Trench Stabilization

No claims for extras or additional payment will be considered for cost incurred in the

stabilization of trench bottoms which are rendered soft or unsuitable as a result of construction methods, such as improper or inadequate sheeting, dewatering or other causes. In no event shall pipe be installed when such conditions exist and the Contractor shall correct such conditions so as to provide proper bedding or foundations for the proposed installation.

E. Laying

1. A minimum two foot horizontal distance shall be maintained between new water main installations and any other utilities.
2. When the pipe is laid in the prepared trench, true to line and grade, the pipe barrel shall receive continuous, uniform support and no pressure will be exerted on the pipe joints from the trench bottom.
3. The interior of the pipes shall be thoroughly cleaned of all foreign matter before being lowered into the trench. During suspension of work for any reason at any time, a suitable stopper shall be placed in the end of the pipe last laid to prevent mud or other foreign material from entering the pipe. Lines shall be laid straight, and depth of cover shall be maintained uniform with respect to finish grade whether grading is completed or proposed at time of pipe installation. Where a grade or slope is shown on the drawings, batter boards with string line or a laser beam paralleling design grade shall be used by the Contractor to assure conformance to the required grade. No abrupt changes in direction or grade will be allowed. Any pipe found defective shall be immediately removed and replaced with sound pipe. Restrained joints shall be used for all bends, tees, plugs, and other fittings. The joints of all piping shall be made absolutely tight. The particular joint used shall be approved by the Engineer of Record and WWS prior to installation.
4. Mechanical joints shall be made up using annealed high strength cast iron bolts and rubber gaskets having either plain or duck tip as recommended by the manufacturer. All types of mechanical joint pipes shall be laid and jointed in full conformance with manufacturer's recommendations, which shall be submitted to the Engineer of Record for review and approval before work is begun. Torque wrenches set as specified in AWWA Standard C111 latest revision, shall be used; or spanner type wrenches may be used with the permission of WWS.
5. Push-on joints shall be made in strict, complete compliance with the manufacturer's recommendations. Lubricant, if required shall be an inert, nontoxic, water-soluble compound incapable of harboring, supporting, or culturing bacterial life. Manufacturer's recommendations shall be submitted to WWS for review and approval before work is begun.

F. Backfill

1. Backfilling of utility trenches will not be allowed until the work has been inspected by the Engineer of Record and he/she indicates that backfilling may proceed. Any work which is covered up or concealed without the knowledge and consent of the Engineer of Record may be required to be uncovered or exposed at no cost to the County.
2. Backfill material shall be non-cohesive and non-plastic, free of all debris,

lumps, clods, wood, broken paving or any organic or unstable material. Backfill material placed within one foot (1.0′) of the lines shall not contain any stones or rocks larger than two inches (2″) in diameter and no stones or rocks larger than six inches (6″) in diameter will be permitted in any backfill.

3. If a sufficient quantity of suitable backfill material is not available from the trench excavation, or other trench excavations within the site of the work, the Engineer of Record shall order the Contractor to provide additional material suitable for this purpose. The additional material shall be installed as specified herein.

4. Selected backfill material containing no stone or rocks larger than two inches (2″) shall be placed in six inch (6″) layers and thoroughly tamped to a depth of twelve inches over the top of the pipe. Particular attention and care shall be exercised in obtaining thorough support for the branch of all service connection fittings. Care shall be taken to preserve the alignment and gradient of the installed pipe.

5. After selected backfill has been placed to a depth of twelve inches (12″) over the pipe, backfilling shall proceed to a depth of thirty inches (30″) over the pipe by placing the backfill material in six inch (6″) layers and thoroughly compacting with mechanical vibrations. Backfill in this portion of the work shall be compacted to 100 percent of maximum density of the material as hereinafter defined.

6. After the backfill has been placed to a level thirty inches (30″) over the pipe, the remainder of the backfill shall be placed in layers, not to exceed nine inches (9″) and compacted with mechanical vibrators, or other suitable equipment, i.e., flooding to obtain a density of the backfilled material of not less than 100 percent of its maximum density as hereinafter defined.

7. An alternate method of backfilling shall be used when laying pipe underwater or when otherwise directed by the Engineer of Record. The alternate method of backfilling shall differ from the previously mentioned specification only in that the backfill material used around the pipe and to a level one foot (1.0) above the top of the pipe barrel shall be small diameter pea rock. Drain field lime rock not larger than 3/4″ in diameter is not acceptable.

8. Under certain circumstances flowable fill may be either desirable to use or is required by regulatory agencies. When used for backfilling purposes, the flowable fill shall meet the State of Florida, Department of Transportation specifications and requirements.

G. Restoring Surfaces

1. The top surfaces of the backfill shall be restored to the original or planned conditions or better. Trenches shall be carefully examined upon the completion of backfilling and surface irregularities that are dangerous or obstructive to traffic are to be removed. Paved sections shall conform in grade with adjacent areas and shall be of at least equal quality. Design mixes for flexible pavements shall be subject to approval by the local jurisdiction but shall adhere to Department of Transportation State of Florida rules and regulations and standards and/or other government agencies. All damaged or undermined areas of existing pavement, not previously removed, shall be removed and restored to original condition or in the

specified manner.

2. Equipment or traffic shall not travel over loose rock fragments, or other hard material, lying on sections of pavement which are not to be removed. For traffic control and safety barricades may be required. Removal, replacement and restoration of areas of pavement shall be as indicated on the drawings and the standard details.

3. Restoration shall conform to the requirements of the local jurisdiction.

5 PIPE BORING AND JACKING

A. The Contractor shall perform the pipe boring and jacking in accordance with the requirements specified herein.

B. Boring and Jacking materials and installation work shall be installed in accordance with standard practice and the requirements of the Florida Department of Transportation. The work shall be in accordance with and not limited to the following:

Contractor's Equipment: Shall be compatible with subsoil conditions encountered. The Engineer of Record may order the contractor to change his boring equipment if he considers it so non-compatible, and if, in his opinion, the change is necessary to safeguard the public and to protect public or private property.

Soil Stabilization: Unstable soil shall be stabilized ahead and around casing pipe by chemical grout injection and/or other acceptable methods.

Jacking: Installation of the casing pipe shall be a continuous operation until completed. It shall be done from one end of the crossing to the other without horizontal deflection or settlement of ground, surface facilities or structures.

Boring: Excavated materials shall be removed as jacking proceeds without causing voids behind casing pipe.

Grade Control: Casing lead pipe grade shall be checked at least every four feet or whenever directed. A jack shall be used at the head end to control grade as required.

Alignment Control: Alignment shall be controlled by guide rails set in the jacking pit.

Casing Pipe: Lengths shall be circumferentially welded in conformance with AWWA C206. After welding, the joint area inside and out shall be cleaned and the outside shall be given 2 coats of coal tar epoxy.

Carrier Pipe: The carrier pipe shall be jacked or cable-pulled with no tensile forces exerted on any pipeline joints.

6 TESTING WATER MAIN LINES

Water mains shall be tested in accordance with ANSI/AWWA Standard C600 latest

revision.

A. Hydrostatic Tests:

1. After a new water main has been laid and backfilled, it shall be pumped to a pressure of 150 PSI and all visible leaks stopped by approved methods. During the test, the pressure cannot drop more than 5 PSI below the starting pressure point.

2. A leakage test shall then be conducted at the above mentioned pressure and no installation will be acceptable by the Engineer of Record until the leakage is less than the number of gallons per hour as determined by the formula:

$$L = (S \times D \times P) \div 148000$$

in which L equals the allowable leakage in gallons per hour; S is the length of line in feet being tested; D is the nominal diameter of the pipe in inches; and P is the square root of the average test pressure during the leakage test in pounds per square inch. The test is usually maintained for two hours but it may be continued for one additional hour if it becomes apparent that the leakage is equal to or greater than the amount allowable. Water supplied to the main during the test to maintain the required pressure shall be measured by a 5/8-inch meter installed on the discharge side of the test pump, or by pumping from a calibrated container. A hose bib connection will be provided to accept the test gauge supplied by WWS.

3. The section of main being tested shall be limited to a maximum length of 2000′. When testing against closed metal-seated mainline valves, an additional leakage per closed valve of 0.0078 gal/hr/in. of nominal valve size shall be allowed. Any questions pertaining to procedures used during the test shall be decided WWS.

4. No allowable leakage shall be permitted for fire hydrants.

B. Bacteriological Tests:

1. After the water mains have satisfied the leakage requirements they shall be flushed through openings of the required size as detailed in ANSI/AWWA Standard C601 latest revision. The main shall then be sterilized in accordance with the provisions of the applicable sections of the above named specifications. On main breaks, cut-ins, etc., a liberal application of calcium hypochlorite shall be made; 50 PPM Chlorine during a 24 hour period.

2. Mains shall not be put into domestic service until the necessary bacteriological samples have been approved by the applicable regulatory agencies.

7 TESTING WATER SERVICE LINES

A. Hydrostatic Testing

Hydrostatic testing of water service lines shall be done in conjunction with the testing of the lateral or main line. No additional leakage allowance will be made for service lines or fire hydrants.

B. Sterilization

Sterilization of service lines shall be done in conjunction with the sterilization of the lateral or main line. Sufficient sampling points shall be taken from service line connections to assure uniform results throughout the system being tested.

8 TESTING FORCE MAIN LINES

Force mains shall be tested in accordance with AWWA Standard C600 latest revision.

A. Hydrostatic Tests:

1. After a new force main has been laid and backfilled, it shall be pumped to a pressure of 150 PSI and all visible leaks stopped by approved methods. During the test, the pressure cannot drop more than 5 PSI below the starting pressure point.
2. A leakage test shall then be conducted at the above mentioned pressure and no installation will be acceptable by the Engineer of Record until the leakage is less than the number of gallons per hour as determined by the formula:

$$L = (S \times D \times P) \div 148000$$

in which L equals the allowable leakage in gallons per hour; S is the length of line in feet being tested; D is the nominal diameter of the pipe in inches; and P is the square root of the average test pressure during the leakage test in pounds per square inch. The test is usually maintained for two hours but it may be continued for one additional hour if it becomes apparent that the leakage is equal to or greater than the amount allowable. Water supplied to the main during the test to maintain the required pressure shall be measured by a 5/8-inch meter installed on the discharge side of the test pump, or by pumping from a calibrated container. A hose bib connection will be provided to accept the test gauge supplied by WWS.

3. The section of main being tested shall be limited to a maximum length of 2000′. When testing against closed metal-seated valves, an additional leakage per closed valve of 0.0078 gal/hr/in. of nominal valve size shall be allowed. Any questions pertaining to procedures used during the test shall be decided by WWS.

B. Cleaning and Flushing

Upon completion of the hydrostatic testing, all force main piping shall be flushed with a sufficient amount of clear water to displace test water. If the discharged water shows evidence of excessive mud, sand or other deposits, the Engineer of Record may direct the Contractor to continue flushing, or to clean the entire force main system by other approved methods to insure the removal of such deposits.

9 TESTING GRAVITY SEWER MAIN LINES

A. Infiltration, Exfiltration Gravity Sewer Main Line

1. The allowable limits of infiltration or exfiltration for the entire system, or any portion thereof, shall not exceed a rate of 100 gallons per inch of inside pipe diameter per mile of pipe per 24 hours. No additional allowance will be made for house service lines. The allowable limits of infiltration or exfiltration of manholes shall not exceed a rate of four gallons per manhole per 24 hours.

2. Any part or all of the system may be tested for infiltration or exfiltration, as directed by the Engineer of Record. Prior to testing for infiltration, the system shall be pumped out so that normal infiltration conditions exist at the time of testing. The amounts of infiltration or exfiltration shall be determined by pumping into or out of calibrated drums or by other methods approved by the Engineer of Record.

3. The exfiltration test will be conducted by filling the portion of the system being tested with water to a level equal to the lowest part of the manhole frame.

4. Tests shall be conducted on portions of the system not exceeding three manhole runs or maximum of 1200′ (feet) whichever is greater unless otherwise directed by the Engineer of Record. Tests shall be run continuously for two hours.

5. Where infiltration or exfiltration exceed the allowable limits specified herein, the defective pipe, joints, or other fault construction shall be located and repaired by the Contractor. If the defective portions cannot be located, the Contractor shall remove and reconstruct as much of the work as is necessary in order to conform to the specified allowable limits.

6. The Contractor, at no expense to the County, shall provide all labor, equipment and materials and shall conduct all testing required, under the direction of the Engineer of Record.

B. Air Testing

1. Air testing is a method of testing the integrity of the pipeline and the structures that may be used in lieu of the method prescribed in paragraph A. (above). Also, WWS may direct the use of air testing under certain circumstances.

2. Testing procedures shall be in accordance with the following requirements. The results of the testing can be evaluated either by calculating the allowable times in accordance with charts or by using Pass/Fail charts that have been created by WWS.

3. At the start of the test, the pipelines are stabilized by pumping the lines with air to achieve a constant test pressure (for piping above the ground water table, it is necessary to achieve a constant 3.5 PSI; do not exceed 5 PSI). Maintain the test pressure for 5 minutes and do not permit the pressure to drop more than 0.5 PSI below the test pressure.

4. The test period begins when the pressure is adjusted to exactly 3.5 PSI (for piping above the water table) and the pressure supply is shut off. When the pressure bleeds to 3.0 PSI, start the test timing. Stop the time when the pressure bleeds to 2.5 PSI. Determine the time differential and compare it to the applicable charts (when calculating the allowable times).

5. If the bleed down time exceeds the allowable time per the chart, then the line passes. If the line reaches 2.5 PSI prior to reaching the allowable time, then it fails.

6. For piping that is below the water table, the above procedures are the same,

except that all pressures shall be adjusted (+) 0.433 psi/ft below the water table.

10 TESTING GRAVITY SEWER LATERAL

A. Infiltration/Exfiltration Gravity Sewer Laterals

1. Infiltration and exfiltration testing (Two feet of Head for exfiltration; zero head for infiltration) of service connection lines shall be done in conjunction with the testing of the lateral and/or main line sewer. No additional leakage allowance will be made for service lines.

2. Infiltration testing of service lines will not be permitted unless a minimum 2′ (feet) static head of ground water exists over the shallow end of the service line at cleanout.

11 VISUAL INSPECTION GRAVITY SEWER MAIN LINES

On completion of each block or section of sewer, or such other times as the Engineer of Record may direct, the block or section of sewer is to be cleaned, tested and inspected. Each section of the sewer is to show, in examination from either end, a full circle of light between manholes. Each manhole or other appurtenance to the system shall be of the specified size and form, be water tight, neatly and substantially constructed, with the top set permanently to exact position and grade. All repairs shown necessary by the inspection are to be made; broken or cracked pipe replaced; all deposits removed and the sewers left true to line and grade entirely clean and ready for use.

12 WWS T.V. INSPECTION GRAVITY SEWER MAIN LINES

A. After all other testing has been successfully completed by the contractor; a television inspection of any or all lines may be made at WWS' discretion and expense. Any defective work or necessary corrections brought out during this inspection must be corrected by the Contractor, at his expense, before the lines can be accepted for maintenance by WWS. All mud, sand, debris and other deposits shall be removed by approved methods prior to inspection.

B. The WWS detailed procedure must be followed when televising new gravity sewers. Review and approval of the tapes must be done by NASSCO certified personnel.

C. The percent of standing water at a sag in a sewer main will determine if the pipe is acceptable or not.

1. Sags that make up 5% or less of the pipe area are approved.
2. Sags that are between 5-10% of the pipe area are at the discretion of the WWS to accept or reject.
3. Sags that are more than 10% of the pipe area are unacceptable and should be rejected unless justified by the Engineer of Record to WWS. Acceptance is not final until agreed to by WWS. A letter of credit or a performance bond will be required for sags such as this; warranty extensions without this protection are not acceptable.

13 TESTING BACKFILL

A. Compaction and Densities Testing

Methods of control and testing of backfill construction to be employed in this work are:

1. Maximum density of all backfill material shall be determined by ASSHTO Method Designation T-180-C.
2. Laboratory and field density tests, which, in the opinion of WWS are necessary to establish compliance with the compaction requirements of these specifications, shall be be made at such depths and locations as selected by WWS.
3. Trench backfill which does not comply with the specified densities, as indicated by such tests, shall be reworked and recompacted until the required compaction is secured, at no additional cost to the County.
4. The first test shall be 12″ above the top of pipe or the water table, and in 6″ lifts thereafter.