



Orange County Utilities

Orlando, FL

Park Manor Estates Water and Wastewater System Improvements
100% Submittal

Technical Specifications

December 14, 2012

HDR Project No. 194-152266



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(SIGNATURE)

CHANDLER R. WILSON, P.E.

FL. P.E. LICENSE NO.: 73910

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B	<u>Geotechnical Report for SR 46 Reclaimed Water and Force Main Project</u> . Report prepared by Nodarse & Associates, Inc. (Terracon Consultants, Inc.), September 4, 2012.
C	Orange County Utilities 2011 <u>Standards and Construction Specifications Manual</u> Appendix D "List of Approved Products and Approval Process"
D	Florida Department of Environmental Protection (FDEP) Permit for Constructing a Domestic Wastewater Collection/Transmission System. Issued 10/08/2012.
E	Florida Department of Environmental Protection (FDEP) Notice of Intent to Use the General Permit for Construction of Water Main Extensions for PWSs. Issued 10/02/2012

- 1 D. Intent:
- 2 1. All Work called for in the Specifications applicable to this Contract, but not shown on the
- 3 Drawings in their present form, or vice versa, shall be of like effect as if shown or
- 4 mentioned in both. Work not specified either in the Drawings or in the Specifications, but
- 5 involved in carrying out their intent or in the complete and proper execution of the Work, is
- 6 required and shall be performed by the Contractor as though it were specifically delineated
- 7 or described.
- 8 2. Items of material, equipment, machinery, and the like may be specified on the Drawings and
- 9 not in the Specifications. Such items shall be provided by the Contractor in accordance with
- 10 the specification on the Drawings.
- 11 3. The apparent silence of the Specifications as to any detail, or the apparent omission from
- 12 them of a detailed description concerning any Work to be done and materials to be
- 13 furnished, shall be regarded as meaning that only the best general practice is to prevail and
- 14 that only material and workmanship of the best quality is to be used, and interpretation of
- 15 these Specifications shall be made upon that basis.
- 16 E. When obtaining data and information from the Drawings, conflicts, errors, and discrepancies
- 17 shall be resolved from the documents given the following order of precedence:
- 18 1. Agreement
- 19 2. Change Orders
- 20 3. Addenda
- 21 4. Supplementary Conditions
- 22 5. Instructions to Bidders
- 23 6. General Conditions
- 24 7. Specifications (Div. 1 through 16)
- 25 8. Drawings
- 26 9. Dimensions
- 27 When measurements are affected by conditions already established or where items are to be
- 28 fitted into constructed conditions, it shall be the Contractor's responsibility to verify all such
- 29 dimensions at the site and the actual job dimensions shall take precedence over scale and
- 30 figure dimensions on the Drawings.
- 31 10. Full-size Drawing
- 32 11. Large-scale Drawing
- 33 12. Small-scale Drawing
- 34 13. Advertisement for Bids
- 35 14. Bid
- 36 15. Bonds
- 37 16. Insurance Certificates
- 38 17. Insurance Endorsements
- 39 18. Affidavits

40 1.4 PROTECTION AND RESTORATION

- 41 A. The Contractor shall be responsible for the preservation of all public and private property, and
- 42 shall use every means of protection necessary to prevent damage thereto. If any direct or
- 43 indirect damage is done to public or private property by or on account of any act, omission,
- 44 neglect, or misconduct in the execution of the Work on the part of the Contractor, such property
- 45 shall be restored by the Contractor, at his expense, to a condition similar or equal to that existing
- 46 before the damage was done, or he shall make good the damage in other manner acceptable to
- 47 the County/Professional.
- 48 B. Protection of Trees and Shrubs
- 49 1. Protect with boxes or other barricades.
- 50 2. Do not place excavated material so as to injure trees or shrubs.
- 51 3. Install pipelines in short tunnels between and under root systems.
- 52 4. Support trees to prevent root disturbance during nearby excavation.

1 C. Tree and Limb Removal

- 2 1. Tree limbs, which interfere with equipment operation and are approved for pruning, shall be
3 neatly trimmed and the tree cut coated with tree paint.
4 2. The County may order the Contractor, for the convenience of the County, to remove trees
5 along the line or trench excavation. The Contractor shall obtain any permits required for
6 removal of trees. Ordered tree removal shall be paid for under the appropriate Contract
7 Items.

8 D. Trees or shrubs destroyed by negligence of the Contractor or his employees shall be replaced by
9 him with new stock of similar size and age, at the proper season and at the sole expense of the
10 Contractor.

11 E. Lawn Areas: All lawn areas disturbed by construction shall be replaced with like kind to a
12 condition similar or equal to that existing before construction. Where sod is to be removed, it
13 shall be carefully removed, and the same re-sodded, or the area where sod has been removed
14 shall be restored with new sod in the manner described in the applicable section.

15 F. Fences: Any fence, or part thereof, that is damaged or removed during the course of the Work
16 shall be replaced or repaired by the Contractor, and shall be left in as good a condition as before
17 the starting of the Work.

18 G. Where fencing, walls, shrubbery, grass strips or area must be removed or destroyed incident to
19 the construction operation, the Contractor shall, after completion of the Work, replace or restore
20 to the original condition all such destroyed or damaged landscaping and improvements.

21 H. The cost of all labor, materials, equipment, and work for restoration shall be deemed included in
22 the appropriate Contract Item or items, or if no specific item is provided therefore, as part of the
23 overhead cost of the Work, and no additional payment will be made therefore.

24 **1.5 PUBLIC NUISANCE**

25 A. The Contractor shall not create a public nuisance including, but not limited to, encroachment on
26 adjacent lands, flooding of adjacent lands, or excessive noise.

27 B. Sound levels measured by the County/Professional shall not exceed 45 dBA from 8 p.m. to 8
28 a.m. or 55 dBA 8 a.m. to 8 p.m. This sound level shall be measured at the exterior of the nearest
29 exterior wall of the nearest residence. Levels at the equipment shall not exceed 85 dBA at any
30 time. Sound levels in excess of these values are sufficient cause to have the Work halted until
31 equipment can be quieted to these levels. Work stoppage by the County/Professional for
32 excessive noise shall not relieve the Contractor of the other portions of this specification
33 including, but not limited to, completion dates and bid amounts.

34 C. No extra charge may be made for time lost due to work stoppage resulting from the creation of a
35 public nuisance.

36 **1.6 CONTRACTOR'S PAYMENTS TO COUNTY FOR OVERTIME WORK**

37 A. County Inspector Work Hours: Normal work hours for the County's inspector(s) are defined as
38 any eight (8) hour period between the hours of 7:00 a.m. and 7:00 p.m. on the weekdays of
39 Monday through Friday. Any County Inspector(s) work beyond the aforementioned normal
40 work hours shall be requested in writing 48 hours in advance. All overtime and weekend work
41 compensation to the County's Inspector(s) for working beyond the normal working hours are
42 considered overtime compensation and shall be paid for by the Contractor at the overtime pay
43 rate of \$47.50 per hour. This overtime pay rate is subject to adjustment by the County. The
44 Contractor agrees that the County shall deduct charges for work outside normal work hours and
45 for overtime pay from payments due the Contractor.

1 **1.7 MAINTENANCE OF SERVICE**

- 2 A. If this project includes the demolition, rehabilitation and replacement of facilities that transmit
3 wastewater within a wastewater collection system; the collection and transmission of wastewater
4 is a continuous operation and must remain in service at all times. Unless noted otherwise on the
5 plans, the operation of the existing wastewater pumping facility on each of the respective
6 locations shall remain in service until the transfer of service has been completed. See "Transfer
7 of Service" for additional description of these requirements. In lieu of maintaining the existing
8 pumping station, the Contractor may provide bypass pumping. Bypass pumping provided by the
9 Contractor either as alternate to maintaining the existing pumping facility or as required when
10 noted on the specific facility plan shall meet the requirements as noted in Section 01 50 16
11 "Collection System Bypass".
- 12 B. The Contractor shall, prior to interrupting any utility service (water, sewer, etc.) for the purpose
13 of making cut-ins to the existing lines or for any other purposes, contact the County and make
14 arrangements for the interruption which will be satisfactory to the County.
- 15 C. Utility lines that are damaged during construction shall be repaired by the Contractor and service
16 restored within 4 hours of the breakage. The County retains the option of repairing any damage
17 to utility pipes in order to expedite service to the customers. The Contractor will remain
18 responsible for all costs associated with the repair.

19 **1.8 TRANSFER OF SERVICE**

- 20 A. The Contractor shall use temporary plugs in the existing and proposed sewer lines to control the
21 routing of gravity flow to the active pumping facility during the transfer period. The proposed
22 pumping facility shall be constructed while the existing or bypass facility is in operation. When
23 the County has accepted the proposed facilities and placed the facility into operation, the transfer
24 of service is complete. The Contractor may begin the work of removing the existing facility or
25 bypass pumping equipment. The Contractor shall also install permanent plugs in the sewer pipes
26 to allow abandonment or removal of the existing sewer system and pumping facilities as noted
27 on the plans.

28 **1.9 LABOR**

- 29 A. Supervision: The Contractor shall keep the Contract under his own control and it shall be his
30 responsibility to see that the Work is properly supervised and carried on faithfully and
31 efficiently. The Contractor shall supervise the Work personally or shall have a competent,
32 English speaking superintendent or representative, who shall be on the site of the Project at all
33 working hours, and who shall have full authority by the Contractor to direct the performance of
34 the Work and make arrangements for all necessary materials, equipment, and labor without
35 delay.
- 36 B. Jurisdictional Disputes: It shall be the responsibility of the Contractor to pay all costs that may be
37 required to perform any of the Work shown on the Drawings or specified herein to avoid any
38 work stoppages due to jurisdictional disputes. The basis for subletting work in question, if any,
39 shall conform to precedent agreements and decisions on record with the Building and
40 Construction Trades Department, AFL-CIO, dated June, 1973, including any amendments
41 thereto.
- 42 C. Apprenticeship: The Contractor shall comply with all of the requirements of Section 446, Florida
43 Statutes, for all contracts in excess of \$25,000 excluding roadway, highway or bridge contracts
44 and the Contractor agrees to insert in any subcontract under this Contract the requirements of
45 this Article.

1 **1.10 MATERIALS AND EQUIPMENT**

2 A. Manufacturer

- 3 1. All transactions with the manufacturers or Subcontractors shall be through the Contractor,
4 unless the Contractor shall request and at the County/Professional's option, that the
5 manufacturer or Subcontractor communicate directly with the County/Professional. Any
6 such transactions shall not in any way release the Contractor from his full responsibility
7 under this Contract.
- 8 2. All workmanship and materials shall be of the highest quality. The equipment shall be the
9 product of manufacturers who are experienced and skilled in the field with an established
10 record of research and development. No equipment will be considered unless the
11 manufacturer has designed and manufactured equipment of comparable type and size and
12 have demonstrated sufficient experience in such design and manufacture.
- 13 3. All materials and equipment furnished by the Contractor shall be subject to the inspection,
14 review and acceptance of the County and meet the requirements as outlined in the Orange
15 County Utilities Standards and Construction Specifications Manual. No material shall be
16 delivered to the work without prior approval of the County/Professional.
- 17 4. All apparatus, mechanisms, equipment, machinery, and manufactured articles for
18 incorporation into the Project shall be the new (most current production at time of bid) and
19 unused standard products of recognized reputable manufacturers.
- 20 5. Manufactured and fabricated products:
- 21 a. Design, fabricate and assemble in accord with the best engineering and shop practices.
22 b. Manufacture like parts of duplicate units to standard sizes and gauges, to be
23 interchangeable.
- 24 c. Any two or more pieces of material or equipment of the same kind, type or
25 classification, and being used for identical types of service, shall be made by the same
26 manufacturer.
- 27 d. Products shall be suitable for service conditions as specified and as stated by
28 manufacturer.
- 29 e. Equipment capacities, sizes and dimensions shown or specified shall be adhered to
30 unless variations are specifically approved in writing.
- 31 f. Do not use material or equipment for any purpose other than that for which it is
32 designed or is specified.

33 **1.11 MANUFACTURER'S SERVICE**

- 34 A. Where service by the manufacturer is specified to be furnished as part of the cost of the item of
35 equipment, the Work shall be at the Contractor's expense.
- 36 B. The services provided shall be by a qualified manufacturer's service representative to check and
37 verify the completed installation, place the equipment in operation, and instruct the County's
38 operators in the operation and maintenance procedures. Such services are to be for period of
39 time and for the number of trips specified. A working day is defined as a normal 8-hour
40 working day on the job and does not include travel time.
- 41 C. The services shall further demonstrate to the County/Professional's complete satisfaction that the
42 equipment will satisfactorily perform the functions for which it has been installed.

43 **1.12 INSPECTION AND TESTING**

44 A. General

- 45 1. If, in the testing of any material or equipment, it is ascertained by the County/Professional
46 that the material or equipment does not comply with the Contract, the Contractor shall be
47 notified thereof, and he will be directed to refrain from delivering said material of
48 equipment, or to remove it promptly from the site or from the Work and replace it with
49 acceptable material, without cost to the County.

- 1 G. Inspection by existing utility owners: The Contractor shall pay for all inspections during the
2 progress of the Work required and provided by the owner of all existing public utilities
3 paralleling or crossing the Work, as shown on the Drawings. All such inspection fees shall be
4 deemed included in the appropriate Contract Item or items, or if no specific item is provided
5 therefore, as part of the overhead cost of the Work, and no additional payment will be made
6 therefore.
- 7 H. Inspection by Other Agencies: The Florida Department of Transportation, the Florida
8 Department of Environmental Protection, and other authorized governmental agencies shall have
9 free access to the site for inspecting materials and Work, and the Contractor shall afford them all
10 necessary facilities and assistance for doing so. Any instructions to the Contractor resulting
11 from these inspections shall be given through the County. These rights of inspections shall not
12 be construed to create any contractual relationship between the Contractor and these agencies.

13 1.13 PROJECT SITE AND ACCESS

14 A. Right-of-Way and Easements

- 15 1. The use of public streets and alleys shall be such as to provide a minimum of inconvenience
16 to the public and to other traffic. Any earth or other excavated material spilled from trucks
17 shall be removed by the Contractor and the streets cleaned to the satisfaction of the County.
- 18 2. The Contractor shall not enter or occupy private land outside of easements, except by
19 written permission of the property owner.
- 20 a. Contractor to execute License Agreement to Enter Upon Lands to Connect Residential
21 and Commercial Buildings to Public Utility Systems found in *Appendix A* of these
22 Contract Specifications prior to entering upon private lands.
- 23 3. At the time of the Pre-Construction meetings, the Contractor shall fully acquaint himself
24 with the status of all easements required for the Work and the possibility of parcels
25 remaining to be acquired, if any. Should easements not be acquired by the County in
26 specific areas of the Work, the Contractor shall sequence and reschedule his work therein so
27 as not to interfere with the progress of work in other areas of the Project. Such rescheduling
28 of Work shall be performed by the Contractor at no additional cost to the County. The
29 County agrees that it will make every effort to acquire all remaining easements with all
30 speed and diligence possible so as to allow the completion of the Work within the Contract
31 time.

32 B. Access

- 33 1. Neither the material excavated nor the materials or equipment used in the construction of
34 the Work shall be so placed as to prevent free access to all fire hydrants, valves or
35 manholes.
- 36 2. Access to businesses located adjacent to the project site must be maintained at all times.
37 Contractor may prearrange the closing of business access with the business Owner. Such
38 prearranged access closing shall not exceed two (2) hours. Property drainage and grading
39 shall be restored and all construction debris removed within 48 hours of backfilling trench.
- 40 3. Contractor agrees that representatives of the County and any governmental agents will have
41 access to the Work wherever it is in preparation or progress and that the Contractor shall
42 provide facilities for such access and inspection.

43 1.14 UTILITIES

44 A. Utility Construction

- 45 1. Public utility installations and structures shall be understood to include all poles, tracks,
46 pipes, wires, conduits, house service connections, vaults, manholes and all other
47 appurtenances and facilities pertaining thereto, whether owned or controlled by
48 governmental bodies or privately owned by individuals, firms or corporations, used to serve
49 the public with transportation, traffic control, gas, electricity, telephone, sewerage, drainage
50 or water. Other public or private property, which may be affected by the Work, shall be
51 deemed included hereunder.

2. All open excavations shall be adequately safeguarded by providing temporary barricades, caution signs, lights and other means to prevent accidents to persons, and damage to property. The Contractor shall, at his own expense, provide suitable and safe bridges and other crossings for accommodating travel by pedestrians and workmen. Bridges provided for access to private property during construction shall be removed when no longer required.
3. The length of open trench will be controlled by the particular surrounding conditions, but shall always be confined to the limits described by the County. If any excavation becomes a hazard, or if it excessively restricts traffic at any point, the County may require special construction procedures. As a minimum, the Contractor shall conform to the following restoration procedures:
 - a. Interim Restoration: All excavations shall be backfilled and compacted as specified by the end of each working day. For excavations within existing paved areas; limerock base or soil cement base (match existing) shall be spread and compacted to provide a relatively smooth surface free of loose aggregate material. At the end of each workweek, the S-I asphaltic surface course shall be completed and opened to traffic. Contractor shall coordinate his construction activity including density tests and inspections to allow sufficient time to achieve this requirement. All driveway cuts shall be backfilled, compacted, and limerock base spread and compacted immediately after installation. Contractor shall coordinate with the individual property owners prior to removing the driveway section. Any utility crossing an existing roadway, parking lot or other paved area shall be patched by the end of the working day.
 - b. All pipe and fittings shall be neatly stored in a location, which will cause the least disturbance to the public. All debris shall be removed and properly disposed of by the end of each working day.
 - c. Final Restoration Overlay: After completing all installations, and after testing of the pipe (but no sooner than 30 days after applying the S-I asphaltic surface), final restoration shall be performed. In no event shall final restoration begin after substantial completion. Final restoration shall provide an S-III asphaltic overlay as specified in an uninterrupted continuous operation until completion. Any additional restoration required after testing shall be repaired in a timely manner at no additional cost to the County.
 - d. Maintenance of all restored facilities shall be the Contractor's responsibility. This maintenance shall be performed on an on-going basis during the course of construction. The Contractor's Progress Schedule shall reflect the above restoration requirements.
 - e. Additional Restoration for Work in Business or Commercial Districts: The Contractor shall restore all private property, damaged by construction, to its original condition. Access to businesses located adjacent to the project site must be maintained at all times. Contractor may prearrange the closing of business accesses with the business owner. Such prearranged access closing shall not exceed two (2) hours. Property drainage and grading shall be restored within 24 hours of backfilling trench.

B. Existing Utilities

1. The locations of all existing underground piping, structures and utilities have been taken from information received from the respective owner. The locations are shown without express or implied representation, assurance, or guarantee that they are complete or correct or that they represent a true picture of underground piping, conduit and cables to be encountered. It is the Contractor's responsibility to verify all depths of marked locates as well as underground structures.
2. The Contractor shall, at all times in performance of the Work, employ acceptable methods and exercise reasonable care and skill so as to avoid unnecessary delay, injury, damage or destruction of existing public utility installations and structures; and shall, at all times in the performance of the Work, avoid unnecessary interference with, or interruption of, public utility services; and shall cooperate fully with the owners thereof to that end.

- 1 3. Pipelines shall be located substantially as indicated on the Drawings, but the County
2 reserves the right to make such modifications in locations as may be found desirable to
3 avoid interference with existing structures or for other reasons. When the location of piping
4 is dimensioned on the Drawings, it shall be installed in that location; when the location of
5 piping is shown on a scaled drawing, without dimensions, the piping shall be installed in the
6 scaled location unless the County approves an alternate location for the piping. Where
7 fittings are noted on the Drawings, such notation is for the Contractor's convenience and
8 does not relieve him from laying and jointing different or additional items where required.
9 The County/Professional may require detailed pipe laying drawings and schedules for
10 project control.
- 11 4. The Contractor shall exercise care in any excavation to locate all existing piping and
12 utilities. All utilities, which do not interfere with the completed Work, shall be carefully
13 protected against damage. Any existing utilities damaged in any way by the Contractor shall
14 be restored or replaced by the Contractor at his expense as directed by the County. Any
15 existing facilities, which require operation to facilitate repairs, shall be operated only by the
16 owner of the respective utility.
- 17 5. It is the responsibility of the Contractor to ensure that all utility or other poles, the stability
18 of which may be endangered by the proximity of excavation, be temporarily stayed and/or
19 shored in position while Work proceeds in the vicinity of the pole and that the utility or
20 other companies concerned be given reasonable advance notice of any such excavation by
21 the Contractor.

22 C. Notices

- 23 1. All governmental utility departments and other owners of public utilities, which may be
24 affected by the Work, will be informed in writing by the Contractor two (2) weeks after the
25 execution of the Contract or Contracts covering the Work. Such notice will be sent out in
26 general, and directed to the attention of the governmental utility departments and other
27 owners of public utilities for such installations and structures as may be affected by the
28 Work.
- 29 2. The Contractor shall also comply with Florida Statute 553.851 regarding notification of
30 existing gas and oil pipeline company owners. Evidence of such notice shall be furnished to
31 the County within two weeks after the execution of the Contract.
- 32 3. It shall be the Contractor's responsibility to contact utility companies at least 72 hours in
33 advance of breaking ground in any area or on any unit of the Work so maintenance
34 personnel can locate and protect facilities, if required by the utility company.
- 35 4. The Contractor shall give a minimum 5 working day notice prior to utility personnel
36 interrupting a utility service (water, sewer, etc.) for the purpose of making cut-ins to the
37 existing lines or for any other purposes, contact the utility owner and make arrangements for
38 the utility personnel to isolate the existing lines thus providing interruption which will be
39 satisfactory to the utility owner.

40 D. Exploratory Excavations

- 41 1. Exploratory excavations shall be conducted by the Contractor for the purpose of locating
42 underground pipelines or structures in advance of the construction. Test pits shall be
43 excavated in areas of potential conflicts between existing and proposed facilities and at
44 piping connections to existing facilities a minimum of 48 hours or 1000 feet in advance of
45 Work. If there is a potential conflict, the Contractor is to notify the County/Professional
46 immediately. Information on the obstruction to be furnished by the Contractor shall
47 include: Location, Elevation, Utility Type, Material and Size. Test pits shall be backfilled
48 immediately after their purpose has been satisfied and the surface restored and maintained in
49 a manner satisfactory to the County.

1 E. Utility Crossings

- 2 1. It is intended that wherever existing utilities must be crossed, deflection of the pipe within
3 specified limits and cover shall be used to satisfactorily clear the obstruction unless
4 otherwise indicated on the Drawings. However, when in the opinion of the County this
5 procedure is not feasible, he may direct the use of fittings for a utility crossing or conflict
6 transition as detailed on the Drawings.

7 F. Relocations

- 8 1. Relocations shown on the Drawings: Public utility installations or structures, including but
9 not limited to light poles, signs, fences, piping, conduits and drains that interfere with the
10 positioning of the Work which are shown on the Drawings to be removed, relocated,
11 replaced or rebuilt by the Contractor shall be considered as part of the general cost of doing
12 the Work and shall be included in the prices bid for the various contract items. No separate
13 payment shall be made therefore.
- 14 2. Relocations not shown on the Drawings
- 15 a. Where public utility installations or structures are encountered during the course of the
16 Work, and are not indicated on the Drawings or in the Specifications, and when, in the
17 opinion of the County, removal, relocation, replacement or rebuilding is necessary to
18 complete the Work under this contract, such Work shall be accomplished by the utility
19 having jurisdiction, or such Work may be ordered, in writing by the County, for the
20 Contractor to accomplish.
- 21 b. If such Work is accomplished by the utility having jurisdiction, it will be carried out
22 expeditiously and the Contractor shall give full cooperation to permit the utility to
23 complete the removal, relocation, replacement or rebuilding as required. If such Work
24 is accomplished by the Contractor, it will be paid for as a Change Order.
- 25 3. All existing castings, including valve boxes, junction boxes, manholes, hand holes, pull
26 boxes, inlets and similar structures in the areas of construction that are to remain in service
27 and in areas of trench restoration and pavement replacement, shall be adjusted by the
28 Contractor to bring them flush with the surface of the finished Work.
- 29 4. All existing utility systems which conflict with the construction of the Work herein, which
30 can be temporarily removed and replaced, shall be accomplished at the expense of the
31 Contractor. Work shall be done by the utility unless the utility approves in writing that the
32 Work may be done by the Contractor.

33 **1.15 RELATED CONSTRUCTION REQUIREMENTS**

34 A. Traffic Maintenance

- 35 1. Maintain public highway traffic within the limits of the Project for the duration of the
36 construction period, including any temporary suspensions of Work. Work shall also include
37 construction and maintenance of any necessary detour facilities; furnishing, installing and
38 maintaining of traffic control and safety devices during construction, control of dust, or any
39 other special requirements for safe and expeditious movement of vehicular and pedestrian
40 traffic.
- 41 2. Traffic Control shall be provided at the Contractor's expense by the Contractor's personnel
42 or off-duty uniformed police officer, depending on and as required by the applicable traffic
43 control requirements jurisdictional to the construction or road.
- 44 3. The Contractor shall prepare and submit a Maintenance of Traffic plan (MOT) to the
45 County/Professional and to the County Public Works Department for review and acceptance
46 prior to commencing any Work on the site. The Traffic Control Plan shall detail procedures
47 and protective measures proposed by the Contractor to provide for protection and control of
48 traffic affected by the Work consistent with the following applicable standards:
- 49 a. Standard Specifications for Road and Bridge Construction, Latest Edition including all
50 subsequent supplements issued by the Florida Department of Transportation, (FDOT
51 Spec.).
- 52 b. Manual of Traffic Control and Safe Practices for Street and Highway Construction,
53 Maintenance and Utility Operations, FDOT.

- 1 c. Right-of-Way Utilization Regulations, Orange County, Florida, latest edition. All
2 references to the respective agency in the above referenced standards shall be construed
3 to also include the County for this Work.
4 d. The cost of any required road permits shall be borne by the Contractor.
5 e. The Contractor will notify the public one week in advance of any scheduled work via
6 the use of portable message boards. The message boards shall be located at each
7 approach to the construction area.
8 4. Before closing any thoroughfare, the Contractor shall give written notice to, and if
9 necessary, obtain a permit or permits from the duly constituted public authority having
10 jurisdiction over the thoroughfare. Notice shall be given no less than 72 hours in advance of
11 the time when it may be necessary in the process of construction to close such thoroughfare,
12 or as may be otherwise provided in the acceptable Maintenance of Traffic plan (MOT).
13 5. The Contractor shall sequence and plan construction operations and shall generally conduct
14 his Work in such a manner as not to unduly or unnecessarily restrict or impede existing
15 normal traffic through the streets of the local community.
16 6. Insofar as it is practicable, excavated material and spoil banks shall not be located in such a
17 manner as to obstruct traffic. The traveled way of all streets, roads and alleys shall be kept
18 clear and unobstructed insofar as is possible and shall not be used for the storage of
19 construction materials, equipment, supplies, or excavated earth, except when and where
20 necessary.
21 7. If required by duly constituted public authority, the Contractor shall, at his own expense,
22 construct bridges or other temporary crossing structures over trenches so as not to unduly
23 restrict traffic. Such structures shall be of adequate strength and proper construction and
24 shall be maintained by the Contractor in such a manner as not to constitute an undue traffic
25 hazard. Private driveways shall not be closed except when and where necessary, and then
26 only upon due advance notice to the County and for the shortest practicable period of time
27 consistent with efficient and expeditious construction. The Contractor shall be liable for
28 any damages to persons or property resulting from his work.
29 8. The Contractor shall make provisions at all "open cut" street crossings to allow a minimum
30 of one lane to be open for vehicular traffic at all times. Lane closing shall be as permitted
31 by the local governing authority and shall be repaired to a smooth, safe driving surface
32 immediately following the installation of pipe or conduit. Flagmen shall be required, in
33 addition to barricades, signs and other protective devices at all lane closings.
34 9. The Contractor shall make provisions at cross streets for the free passage of vehicles and
35 pedestrians, either by bridging or otherwise, and shall not obstruct the sidewalks, gutters, or
36 streets, nor prevent in any manner the flow of water in the latter, but shall use all proper and
37 necessary means to permit the free passage of surface water along the gutters.
38 10. The Contractor shall immediately cart away all offensive matter; exercising such precaution
39 as may be directed by the County. All material excavated shall be so disposed of as to
40 inconvenience the public and adjacent tenants as little as possible and to prevent injury to
41 trees, sidewalks, fences and adjacent property of all kinds.

42 B. Barrier and Lights

- 43 1. The Contractor shall exercise extreme care in the conduct of the Work to protect health and
44 safety of the workmen and the public. The Contractor shall provide all protective measures
45 and devices necessary, in conformance with applicable local, state and federal regulations
46 regarding their need and use. Protective measures shall include but are not limited to
47 barricades, warning lights/flashers and safety ropes.
48 2. All equipment and vehicles operating within ten (10) feet of the roadway shall have flashing
49 strobe lights attached.

1 C. Dewatering and Flotation

- 2 1. The Contractor, with his own equipment, shall do all pumping necessary to dewater any part
3 of the Work area during construction operations to insure dry working conditions. The
4 Contractor shall be completely responsible for any tanks, wet wells or similar structures that
5 may become buoyant during the construction and modification operations due to the ground
6 water or floods and before the structure is put into operation. The proposed final structures
7 have been designed against buoyancy; however the Contractor may employ methods, means
8 and techniques during the various stages of construction (or other conditions), which may
9 affect the buoyancy of structures. Should there be any possibility of buoyancy of a
10 structure; the Contractor shall take the necessary steps to prevent its buoyancy either by
11 increasing the structure's weight, by filling it with approved material or other acceptable
12 methods. Damage to any structures due to floating or flooding shall be repaired or the
13 structures replaced at the Contractor's expense.
14 2. Contractor shall be responsible for any required permits for the discharge of ground water.

15 D. Dust and Erosion Control

- 16 1. The Contractor shall prevent dust nuisance from his operations or from traffic by the use of
17 water and deliquescent salts.
18 2. Erosion and Sedimentation Control
19 a. Temporary erosion controls include, but are not limited to, grassing, mulching, netting,
20 watering and reseeded on-site surfaces and soil and borrow area surfaces and providing
21 interceptor ditches at ends of berms and at those locations which will ensure that
22 erosion during construction will be either eliminated or maintained within acceptable
23 limits as established by the County, FDEP and any other agency having jurisdiction.
24 b. Temporary sedimentation controls include, but are not limited to; silt dams, traps,
25 barriers, and appurtenances at the foot of sloped surfaces which will ensure that
26 sedimentation pollution will be either eliminated or maintained within acceptable limits
27 as established by the County, FDEP and any other agency having jurisdiction.
28 c. The construction of temporary erosion and sedimentation control facilities shall be in
29 accordance with the technical provision of section 104-6.4 of the 1991 Edition, FDOT
30 Standard Specifications for Road and Bridge Construction.
31 d. Contractor is responsible for providing effective temporary erosion and sediment
32 control measures during construction or until final controls become effective.

33 E. Lines and Grades

- 34 1. All Work under this Contract shall be constructed in accordance with the lines and grades
35 shown on the Drawings, or as given by the County/Professional. The full responsibility for
36 keeping alignment and grade shall rest upon the Contractor.
37 2. The Contractor shall, at his own expense, establish all working or construction lines and
38 grades as required from the project control points set by the County, and shall be solely
39 responsible for the accuracy thereof.
40 3. Water main and forcemain shall have a minimum of 36-inches of cover over the top of the
41 pipe. Cover shall vary to provide long uniform gradient or slope to pipe to minimize air
42 pockets and air release valves. The stationing shown on the Drawings for air and vacuum
43 release valve assemblies are approximate and the Contractor shall field adjust these
44 locations to locate these valves at the highest point in the pipeline installed. All locations
45 must be acceptable by the County.
46 4. To insure a uniform gradient for gravity pipe and pressure pipe, all lines shall be installed
47 using the following control techniques as a minimum:
48 a. Gravity lines; continuous control, using laser beam technology.
49 b. Pressure lines; control stakes set at 50 ft intervals using surveyors' level instrument.

50 F. Cutting and Patching

- 51 1. The Contractor shall do all cutting, fitting or patching of his portion of the Work that may
52 be required to make the several parts thereof join and coordinate in a manner satisfactory to
53 the County and in accordance with the Drawings and Specifications.
54 2. Preparation:

- 1 a. Inspect the existing conditions of the Project, including elements subject to damage
- 2 and/or movement during cutting and patching.
- 3 b. Provide adequate temporary support to assure the structural integrity of all facilities
- 4 during completion of the Work.
- 5 3. Performance:
- 6 a. Execute cutting and demolition by methods, which will prevent damage to other
- 7 existing facilities and will provide proper surfaces to receive installation of equipment
- 8 and repair.
- 9 b. Excavation and backfilling shall be performed in a manner, which will prevent
- 10 settlement and/or damage to existing facilities.
- 11 c. All pipes, sleeves, ducts, conduits and other penetration through surfaces shall be made
- 12 airtight.
- 13 d. Refinish entire surfaces as necessary to provide an even finish to match adjacent
- 14 finishes.

15 G. Temporary Construction

- 16 1. Temporary fences: If, during the course of the Work, it is necessary to remove or disturb
- 17 any fencing, the Contractor shall at his own expense, provide a suitable temporary fence
- 18 which shall be maintained until the permanent fence is replaced. The County/Professional
- 19 will be solely responsible for the determination of the necessity for providing a temporary
- 20 fence and the type of temporary fence to be used.
- 21 2. Responsibility for Temporary Structures: In accepting the Contract, the Contractor assumes
- 22 full responsibility for the sufficiency and safety of all temporary structures or work and for
- 23 any damage which may result from their failure or their improper construction, maintenance
- 24 or operation and will indemnify and save harmless the County from all claims, suits or
- 25 actions and damages or costs of every description arising by reason of failure to comply
- 26 with the above provisions.

27 H. Daily Reports

- 28 1. The Contractor shall submit to the County's Representative daily reports of construction
- 29 activities including non-work days. The reports shall be complete in detail and shall include
- 30 the following information:
- 31 a. Days from Notice to Proceed; Days remaining to substantial and final completion.
- 32 b. Weather information
- 33 c. Work activities with reference to the Critical Path Method (CPM) schedule activity
- 34 numbers (including manpower, equipment and daily production quantities for each
- 35 individual activity).
- 36 d. Major deliveries
- 37 e. Visitors to site
- 38 f. Test records
- 39 g. New problems, and
- 40 h. Other pertinent information
- 41 2. A similar report shall be submitted for/by each Subcontractor.
- 42 3. The report(s) shall be submitted to the County Representative's Field Office within two (2)
- 43 days of the respective report date. Each report shall be signed by the Contractor's
- 44 Superintendent or Project Manager. Pay request will not be processed unless daily reports
- 45 are current.
- 46 4. If a report is incomplete, in error, or contains misinformation, a copy of the report shall be
- 47 returned by the County Representative to the Contractor's Superintendent or Project
- 48 Manager with corrections noted. When chronic errors or omissions occur, the Contractor
- 49 shall correct the procedures by which the reports are produced.

1 I. Cleaning

2 1. During Construction

- 3 a. During construction of the Work, the Contractor shall, at all times, keep the site of the
4 Work and adjacent premises as free from material, debris and rubbish as is practicable
5 and shall remove the same from any portion of the site if, in the opinion of the County,
6 such material, debris, or rubbish constitutes a nuisance or is objectionable.
7 b. Provide on-site containers for the collection of waste materials, debris and rubbish and
8 remove such from the site periodically by disposal at a legal disposal area away from
9 the site.
10 c. Clean interior spaces prior to the start of finish painting and continue cleaning on an as-
11 needed basis until painting is finished. Use only those cleaning materials which will
12 not create hazards to health or property and which will not damage surfaces. Use only
13 those cleaning materials and methods recommended by the manufacturer of the surface
14 material to be cleaned. Schedule operations so that dust and other contaminants
15 resulting from cleaning process will not fall on wet or newly coated surfaces.
16 d. The Contractor shall remove from the site all surplus materials and temporary structures
17 when no longer necessary to the Work at the direction of the County.

18 2. Final Cleaning

- 19 a. At the conclusion of the Work, all equipment, tools, temporary structures and materials
20 belonging to the Contractor shall be promptly taken away, and he shall remove and
21 promptly dispose of all water, dirt, rubbish or any other foreign substances. Employ
22 skilled workmen for final cleaning. Thoroughly clean all installed equipment and
23 materials to a bright, clean, polished and new appearing condition. Remove grease,
24 mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials
25 from sight-exposed interior and exterior surfaces. Broom clean exterior paved surfaces;
26 rake clean other surfaces of the grounds.
27 b. The Work shall be left in a condition as shown on the Drawings and the remainder of
28 the site shall be restored to a condition equal or better than what existed before the
29 Work.
30 c. Prior to final completion, or County occupancy, Contractor shall conduct an inspection
31 of interior and exterior surfaces, and all work areas to verify that the entire Work is
32 clean. The County will determine if the final cleaning is acceptable.

33 **1.16 CONSTRUCTION NOT PERMITTED**

34 A. Use of Explosives

- 35 1. No blasting shall be done except upon approval by the County and the governmental agency
36 or political subdivision having jurisdiction. When the use of explosives is approved by the
37 County as necessary for the execution of the Work, the Contractor shall use the utmost care
38 so as not to endanger life or property, and assume responsibility for any such damage
39 resulting from his blasting operations, and whenever directed, the number and size of the
40 charges shall be reduced. All explosives shall be stored in a secure manner and all such
41 storage places shall be marked clearly, "DANGEROUS EXPLOSIVES" and shall be in care
42 of competent watchmen. All permits required for the use of explosives shall be obtained by
43 the Contractor at his expense. All requirements of the governmental agency issuing permit
44 shall be observed.

45 **PART 2 - PRODUCTS (NOT USED)**

46 **PART 3 - EXECUTION (NOT USED)**

END OF SECTION

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1 2. It also includes applying and obtaining all licenses and permits required for the execution of
2 the Work.

3 C. Within this Specification, the Construction of the water mains, gravity sewer, and manholes with
4 laterals, services, valves, fire hydrants, CIPP lining, and appurtenances as well as the
5 Rehabilitation of the gravity sewer system within the limits described in 1.1.A shall be referred
6 to as the Project or Work and Orange County Utilities shall be referred to as the Owner or
7 County.

8 **1.2 WORK NOT COVERED BY CONTRACT DOCUMENTS**

9 A. Work not shown in the Drawings or not included in the Specifications will not be covered by the
10 Contract Documents.

11 **1.3 PROVISIONS FOR FUTURE WORK**

12 A. Provisions for future work will be shown on the Drawings.

13 **PART 2 - PRODUCTS (NOT USED)**

14 **PART 3 - EXECUTION**

15 **3.1 CONSTRUCTION SEQUENCE**

16 A. The Contractor will construct the Work in a sequence such that one area of the Project is
17 completed prior to moving to the next area except for final pavement.

18 B. The Sequence of Construction shall be as follows:

19 1. Phase 1 – The work on the following streets are included:

- 20 a. Genevieve Street
- 21 b. Dominico Street
- 22 c. Exuma Street
- 23 d. Roberta Avenue
- 24 e. Abigail Street
- 25 f. Barbados Street
- 26 g. Tangora Street
- 27 h. Sonata Lane
- 28 i. Scandia Lane
- 29 j. Fernando Street from Barbados Lane to Park Manor Drive
- 30 k. Park Manor Drive to Tangora Street

31 2. Phase 2 – The work on the following streets are included:

- 32 a. Buttercup Lane
- 33 b. Grayson Drive
- 34 c. Delphinium Drive
- 35 d. Narcissus Lane
- 36 e. Murdock Boulevard
- 37 f. Jonathon Drive
- 38 g. Bresslyn Boulevard
- 39 h. Tomes Court
- 40 i. Kain Court
- 41 j. Eastview Drive
- 42 k. Fernando Street from Park Manor Drive to Murdock Boulevard
- 43 l. Park Manor Drive from Tangora Street to Eastview Drive

44 3. Phase 3 – The work on the following streets are included:

- 45 a. Woodvalley Way
- 46 b. Dunehill Drive

- 1 c. Maloney Lane
- 2 d. Regency Court
- 3 e. Regency Street
- 4 f. Inverson Street
- 5 g. Dawson Avenue
- 6 h. Hendrix Avenue
- 7 i. Jane Eyre Drive from Woodvalley Way to Dawson Avenue
- 8 j. Jepson Street from Woodvalley Way to Park Manor Drive
- 9 k. Park Manor Drive from Jane Eyre Drive to Hendrix Avenue
- 10 4. Phase 4 – The work on the following streets are included:
- 11 a. Twiggs Court
- 12 b. Crestridge Court
- 13 c. Bridlewood Avenue
- 14 d. Tobie Court
- 15 e. Bernice Court
- 16 f. Hardwick Court
- 17 g. Jepson Street from Mozart Drive to Woodvalley Way
- 18 C. A proposed sequence of work is as follows:
- 19 1. Contractor would first install the main(s), water and/or sewer including valves.
- 20 2. Contractor would then install the laterals and services, but not connect to homeowners
- 21 lateral or service and any other appurtenances, such as fire hydrants and flush stations.
- 22 3. Contractor would clean, pressure test and disinfect the installed main(s).
- 23 4. Contractor would provide as-built drawings for installed mains and appurtenances.
- 24 5. Owner/Engineer would submit partial clearance request to FDEP for installed mains.
- 25 6. Once approval is obtained from FDEP, then Contractor will connect laterals and service to
- 26 existing homeowner’s service and lateral.
- 27 7. Finish grade all disturbed areas.
- 28 8. Temporarily pave all work in the road way.
- 29 9. Sod all disturbed areas.
- 30 10. Contractor can proceed to the next street once the main(s), both water and sewer are
- 31 installed complete. However, another crew can begin installing laterals, services, manholes,
- 32 and other appurtenances to the main(s) before the pipe laying crew moves.
- 33 D. The Contractor may propose another sequence of construction for review, but it must meet the
- 34 intent that the Work is done including providing water and sewer service to all affected
- 35 residences as quickly as possible in an area before moving on to another.

36

END OF SECTION

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1 **SECTION 01 11 20**
2 **JOB CONDITIONS**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

- 5 A. Section Includes:
6 1. Job conditions.

7 **1.2 PROJECT CONDITIONS**

- 8 A. Prior to installation of pipe, valves, valve ID tags, fittings, manholes, fire hydrants, pavement,
9 concrete, or other material or equipment, verify with subcontractors, material or equipment
10 manufacturers, and installers that the surface to which those materials attach to or installed, is
11 acceptable for installation of those materials or equipment.

- 12 B. Correct unacceptable surface until acceptable for installation of equipment or materials.

- 13 C. General description of project area:

14 1. Park Manor Estates:

- 15 a. The Park Manor Estates Subdivision is located in east-central Orange County and is
16 bounded by State Road 50 (Colonial Drive), Rouse Road, SR 408, and Dean Road.
17 Within the Subdivision, the County owns and operates water distribution and
18 wastewater collection systems providing service to approximately 1,400 residential
19 units. The service area within the Subdivision comprises approximately 683 acres and
20 is completely residential. The neighborhood in which the rehabilitation project will take
21 place is "built-out" or an established community. The infrastructure and homes vary in
22 age depending on their location in the Park Manor Estates Subdivision. In the northeast,
23 the areas adjoining Park Manor Drive, the homes and infrastructure were built in the
24 early 1960s. In the southeast, the areas along and south of Jepson Street, the homes and
25 infrastructure date back to the early 1970s. In the southwest area, primarily between
26 Innsbruck and Meadowvale Drives, construction occurred primarily in the late 1970s.
27 Finally, the western portion of the Park Manor Estates includes facilities and homes
28 constructed as recently as the early 1990s. The community consists of two-lane,
29 suburban roadways with "Miami Curb" and closed drainage systems. Much like other
30 planned developments, the roadways tend to be curvy in nature, with a number of
31 looped streets and multiple cul-de-sac side streets (Courts). Many of the neighborhoods
32 have sidewalks on both sides of the roadways, while the older sections, like those in the
33 northeast, may have sidewalk on only one side of the street or none at all. In general,
34 the homes are modest in nature. Many homeowners have landscaped the parkway areas
35 between the curb and sidewalk. As one might expect, there are a number of large trees
36 abutting the roadways in the established neighborhoods, while the newer sections lack
37 this feature. Several of the neighborhoods include roadside mailboxes, most of which
38 are "pole mounted," while others are constructed of brick or concrete block with stucco.
39 The newer sections have community mail stations.

40 1) Water System:

- 41 a) The existing water distribution system within the Park Manor Estates
42 Subdivision consists of approximately 64,524 linear feet of piping. Most of
43 the pipes comprising the network vary in age from an estimated forty five
44 years old to several years old. Pipe diameters range in size from 2 inches to 10
45 inches. Piping materials within the water distribution system include asbestos
46 cement, ductile iron, galvanized steel, and PVC.

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- 2) Wastewater System:
 - a) The existing wastewater collection system within the boundaries of the Park Manor Estates Subdivision consists of approximately 57,000 linear feet of piping, around 215 manholes, and approximately 1,400 service laterals. Most of the pipes and structures within the network vary in age from an estimated forty years old. Pipe diameters range in size from 4-inch to 10-inch collection piping. Piping materials within the wastewater collection system include vitrified clay pipe, HDPE and PVC. Approximately 60% of the systems manholes are constructed of brick with cast iron ring and covers.
- 2. This general description of the project area is not a substitute to information shown in the Drawings or in the Specifications.

END OF SECTION

1 **SECTION 01 25 13**
2 **PRODUCT SUBSTITUTIONS**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

5 A. Section Includes:

- 6 1. The procedure for requesting the approval of substitution of a product that is not listed as
7 equivalent to a product which is specified by descriptive or performance criteria or defined
8 by reference to one or more of the following:
9 a. Name of manufacturer.
10 b. Name of vendor.
11 c. Trade name.
12 d. Catalog number.
13 2. Substitutions may be "or-equals".

14 B. Request for Substitution - General:

- 15 1. Base all bids on materials, equipment, and procedures specified.
16 2. Certain types of equipment and kinds of material are described in specifications by means of
17 references to names of manufacturers and vendors, trade names, or catalog numbers.
18 a. When this method of specifying is used, it is not intended to exclude from consideration
19 other products bearing other manufacturer's or vendor's names, trade names, or catalog
20 numbers, provided said products are "or-equals," as determined by Engineer.
21 3. Other types of equipment and kinds of material may be acceptable substitutions under the
22 following conditions:
23 a. Or-equals are unavailable due to strike, discontinued production of products meeting
24 specified requirements, or other factors beyond control of Contractor; or,
25 b. Contractor proposes a cost and/or time reduction incentive to the Owner.

26 **1.2 QUALITY ASSURANCE**

27 A. In making request for substitution or in using an approved product, Contractor:

- 28 1. Has investigated proposed product, and has determined that it is adequate or superior in all
29 respects to that specified, and that it will perform the function for which it is intended.
30 2. Will provide same guarantee for substitute item as for product specified.
31 3. Waives all claims for additional costs related to substitution which subsequently arise.

32 **1.3 DEFINITIONS**

33 A. Product: Manufactured material or equipment.

34 **1.4 PROCEDURE FOR REQUESTING SUBSTITUTION**

35 A. Substitution shall be considered only:

- 36 1. After award of Contract.
37 2. Under the conditions stated herein.

38 B. Written request through Contractor only.

39 C. Transmittal Mechanics:

- 40 1. Follow the transmittal mechanics prescribed for Shop Drawings in Specification Section 01
41 33 00.
42 a. Product substitution will be treated in a manner similar to "deviations," as described in
43 Specification Section 01 33 00.
44 b. List the deviation and justifications on the transmittal form in the space provided under
45 the column with the heading DESCRIPTION.

1 1) Include in the transmittal letter, either directly or as a clearly marked attachment,
2 the items listed in Paragraph D below.

3 D. Transmittal Contents:

- 4 1. Product identification:
- 5 a. Manufacturer's name.
 - 6 b. Telephone number and representative contact name.
 - 7 c. Specification Section or Drawing reference of originally specified product, including
 - 8 discrete name or tag number assigned to original product in the Contract Documents.
- 9 2. Manufacturer's literature clearly marked to show compliance of proposed product with
- 10 Contract Documents.
- 11 3. Itemized comparison of original and proposed product addressing product characteristics
- 12 including but not necessarily limited to:
- 13 a. Size.
 - 14 b. Composition or materials of construction.
 - 15 c. Weight.
 - 16 d. Electrical or mechanical requirements.
- 17 4. Product experience:
- 18 a. Location of past projects utilizing product.
 - 19 b. Name and telephone number of persons associated with referenced projects
 - 20 knowledgeable concerning proposed product.
 - 21 c. Available field data and reports associated with proposed product.
- 22 5. Data relating to changes in construction schedule.
- 23 6. Data relating to changes in cost.
- 24 7. Samples:
- 25 a. At request of Engineer.
 - 26 b. Full size if requested by Engineer.
 - 27 c. Held until substantial completion.
 - 28 d. Engineer not responsible for loss or damage to samples.

29 **1.5 APPROVAL OR REJECTION**

- 30 A. Written approval or rejection of substitution to be given by the Engineer.
- 31 B. Engineer reserves the right to require proposed product to comply with color and pattern of
- 32 specified product if necessary to secure design intent.
- 33 C. In the event the substitution is approved, the resulting cost and/or time reduction will be
- 34 documented by Change Order in accordance with the General Conditions.
- 35 D. Substitution will be rejected if:
- 36 1. Submittal is not through the Contractor with his stamp of approval.
 - 37 2. Request is not made in accordance with this Specification Section.
 - 38 3. In the Engineer's opinion, acceptance will require substantial revision of the original design.
 - 39 4. In the Engineer's opinion, substitution will not perform adequately the function consistent
 - 40 with the design intent.
- 41 E. Contractor shall reimburse Owner for the cost of Engineer's evaluation whether or not
- 42 substitution is approved.

43 **PART 2 - PRODUCTS - (NOT APPLICABLE TO THIS SECTION)**

44 **PART 3 - EXECUTION - (NOT APPLICABLE TO THIS SECTION)**

45 **END OF SECTION**

- 1 C. Submit a stored material log with each application for payment which identifies the type,
2 quantity and value of all stored material, and that tracks when the stored materials are installed
3 and deducts them from stored quantity at that time. Include original invoices for all stored
4 materials that payment is requested.
- 5 D. Waivers of Claims and Mechanics Lien: With each Application for Payment submit waivers of
6 claims and mechanics liens from Subcontractors or Sub-subcontractors and suppliers for the
7 construction period covered by the previous applications.
- 8 1. Submit partial waivers on each item for the amount requested, prior to deduction for
9 retainage, on each item.
 - 10 2. The Contractor shall include a certification with each application stating that all previous
11 payments received from the County under the Contract have been applied by the Contractor
12 to discharge in full all obligations of the Contractor in connection with the Work by prior
13 applications for payment, and all materials and equipment incorporated into the Work are
14 free and clear of all liens, claims, security interest and encumbrances.
- 15 E. Transmittal: Submit 4 executed copies of each Application for Payment to the County by means
16 ensuring receipt within 24 hours. One copy shall be complete, including waivers of lien and
17 similar attachments when required.
- 18 1. Transmit each copy with a transmittal form listing attachments, and recording appropriate
19 information related to the application in a manner acceptable to the County.
 - 20 2. The Contractor shall include a certification with each application stating that all previous
21 payments received from the County under the Contract have been applied by the Contractor
22 to discharge in full all obligations of the Contractor in connection with the Work by prior
23 applications for payment, and all materials and equipment incorporated into the Work are
24 free and clear of all liens, claims, security interest and encumbrances.
- 25 F. Initial Application for Payment: Administrative actions and submittals that must precede or
26 coincide with submittal of the first Application for Payment include the following:
- 27 1. List of Subcontractors
 - 28 2. List of principal suppliers and fabricators
 - 29 3. Schedule of Values
 - 30 4. Contractor's Construction Progress Schedule (accepted)
 - 31 5. List of Contractor's staff assignments
 - 32 6. Copies of building permits
 - 33 7. Copies of authorizations and licenses from governing authorities for performance of the
34 Work.
 - 35 8. Certificates of insurance and insurance policies
 - 36 9. Performance and Payment bonds (if required)
 - 37 10. Data needed to acquire County's insurance
- 38 G. Monthly Application for Partial Payment: Administrative actions and submittals that must
39 precede or coincide with submittal of Monthly Partial Payments include the following:
- 40 1. Relevant tests
 - 41 2. Progressive As-builts
 - 42 3. Table 01 71 23-2 Asset Attribute Data Form Examples
 - 43 4. Table 01 71 23-3 Pipe Deflection Table Example
 - 44 5. Table 01 71 23-4 Gravity Main Table
 - 45 6. Partial Release of lien
 - 46 7. Partial consent of surety
 - 47 8. Site photographs
 - 48 9. Updated Progress Schedule: submit one electronic copy and five (5) copies
 - 49 10. Summary of Values
 - 50 11. Pay Request
 - 51 12. On-Site Storage
 - 52 13. Executed Private Property License Agreement(s)

- 1 H. Substantial Completion Application for Payment: Following issuance of the Certificate of
2 Substantial Completion, submit an Application for Payment. This application shall reflect any
3 Certificates of Partial Substantial Completion issued previously for County occupancy of
4 designated portions of the Work.
- 5 1. Administrative actions and submittals that shall precede or coincide with this application
6 include:
- 7 a. Occupancy permits and similar approvals
8 b. Warranties (guarantees) and maintenance agreements
9 c. Test/adjust/balance records
10 d. All Shop Drawings shall have been submitted and approved
11 e. All Final Operation and Maintenance instructions/manuals shall have be submitted and
12 approved
13 f. Meter readings
14 g. Start-up performance reports
15 h. Change-over information related to the County's occupancy, use, operation and
16 maintenance.
17 i. Final Cleaning
18 j. Application for reduction of retainage and consent of surety.
19 k. Advice on shifting insurance coverage
20 l. List of incomplete work, recognized as exceptions to County's Certificate of
21 Substantial Completion.
- 22 I. Final Completion Application for Payment: Administrative actions and submittals which must
23 precede or coincide with submittal of the final payment Application for Payment include the
24 following:
- 25 1. Prior to submitting a request for final payment or the County issuing a Certificate of
26 Completion for the Work, the Contractor shall submit the final Record Documents to the
27 County for approval. Retainage funds will be withheld at the County's discretion based on
28 the quality and accuracy of the final Record Documents.
29 2. Completion of project close-out requirements.
30 3. Completion of items specified for completion after Substantial Completion.
31 4. Assurance that unsettled claims are settled.
32 5. Assurance that work not complete and accepted is now completed.
33 6. Transmittal of required project construction records to the County.
34 7. Proof that taxes, fees and similar obligations have been paid.
35 8. Removal of temporary facilities and services has been completed.
36 9. Removal of surplus materials, rubbish and similar elements.
37 10. Change of door locks to County's access.
38 11. Execute certification by signature of authorized officer.
39 12. Prepare Application for Final Payment as required in General Conditions

40 **1.4 SUBMITTAL PROCEDURES**

- 41 A. Submit four (4) copies of each Application for Payment at time stipulated in Agreement.
42 B. Provide one copy of data with cover letter for each copy of submittal. Show Application number
43 and date, and line item by number and description .

44 **PART 2 - PRODUCTS - (NOT APPLICABLE TO THIS SECTION)**

45 **PART 3 - EXECUTION - (NOT APPLICABLE TO THIS SECTION)**

46 **END OF SECTION**

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1 **SECTION 01 29 00**
2 **MEASUREMENT AND PAYMENT PROCEDURES**

3 **PART 1 GENERAL**

4 **1.1. GENERAL**

- 5 A. Measurement and payment will be based upon Work completed and accepted in accordance with
6 the Contract documents. Materials, equipment, skills, tools, and labor which is reasonably and
7 properly inferable and necessary for the proper completion of the Work in a substantial manner
8 and in compliance with the requirements stated or implied by the Drawings and Specifications
9 shall be furnished and installed by Contractor without additional compensation, whether
10 specifically indicated in the Contract Documents or not. These items are considered incidental to
11 the unit price bid items shown in the Bid Form. The described items apply for all applicable
12 parts in the Bid Form.
- 13 B. All measurement for payment will be based on the actual quantities of completed and accepted
14 work performed in strict accordance with the Drawings and Specifications. All work completed
15 under this Contract shall be measured by Resident Project Representative or Contractor in the
16 presence of the Owner or Engineer according to the methods outlined below.
- 17 C. The County reserves the right to alter the Drawings, modify incidental work as may be
18 necessary, and increase or decrease quantities of Work to be performed to accord with such
19 changes, including deduction or cancellation of any one or more of the unit price bid items.
20 Changes in the Work shall not be considered as a waiver of any condition of the Contract nor
21 invalidate any.

22 **1.2. ESTIMATED QUANTITIES**

- 23 A. All estimated quantities stipulated in the Bid Form or other Contract Documents are approximate
24 and are to be used only (a) as a basis for estimating the probable cost of the Work, and (b) for the
25 purpose of comparing the bids submitted for the Work. The actual amounts of work done and
26 materials furnished under unit price items may differ from the estimated quantities. The basis of
27 payment for work and materials will be the actual amount of work done and materials furnished.
28 Contractor agrees that he will make no claim for damages, anticipated profits, or otherwise, on
29 account of any difference between the amounts of work actually performed and materials
30 actually furnished and the estimated amounts therefore.
- 31 B. Contractor shall not plead misunderstanding or deception because of this estimate of quantities.
32 Contractor is responsible for making its own estimate of the size, kind, and quantity of material
33 and equipment included in the Work to be done under this Contract. All work shown on the
34 Drawings, herein specified, or implied in any way in the Drawings or Specifications shall be
35 done regardless of whether or not the Work is specifically defined in a Bid item.
- 36 C. Except where otherwise specified, the unit or lump sum bid price bid for each item of work
37 which involves excavation or trenching shall include all costs for such work. No direct payment
38 shall be made for excavation or trenching of rock or other unclassified material unless shown
39 elsewhere.
- 40 D. Except for mobilization/demobilization, payment for Work will be based on the percent of
41 completed work of each item of in the Schedule of Values, including stored materials, as
42 determined by the County. Progress of work in each item of the Schedule of Values will be
43 determined separately by the County. However, the County will issue a single payment
44 certificate for progress on the Contract.

1 E. Where payment by scale weight is specified under certain items, the Contractor shall provide
2 suitable weighing equipment which shall be kept in accurate adjustment at all times and
3 certified. The weighing of all material shall be performed by the Contractor in the presence and
4 under the supervision of the County.

5 F. Where pipe fittings are noted on the Drawings, such notation is for the Contractor's convenience
6 and does not relieve the Contractor from laying and jointing different or additional items where
7 required.

8 **1.3. SUBMITTALS**

- 9 A. Informational Submittals: Submit on form approved by Owner.
10 1. Schedule of Values.
11 2. Application for Payment.
12 3. Final Application for Payment.
13

14 **1.4. SCHEDULE OF VALUES**

- 15 A. Prepare a separate Schedule of Values for the Water System Improvements and the Wastewater
16 Collection System Improvements separately of the Work under the Agreement.
17 B. Submit a Schedule of Values to Engineer within twenty (20) days after Notice to Proceed.
18 C. Upon request of Engineer, provide documentation to support the accuracy of the Schedule of
19 Values.
20 D. Unit Price Work: Reflect unit price quantity and price breakdown from conformed Bid Form.
21 E. Lump Sum Work:
22 1. List bonds and insurance premiums, mobilization, demobilization, preliminary and detailed
23 progress schedule preparation, equipment testing, and contract closeout separately.
24 2. Break down by Division 2 through 49 with appropriate subdivision of each Specification.
25 F. An unbalanced or front-end loaded schedule will not be acceptable.
26 G. Summation of the complete Schedule of Values representing all the Work shall equal the
27 Contract Price.
28 H. Submit Schedule of Values on a Compact Disc (CD), in a spreadsheet format compatible with
29 latest version of Excel.

30 **1.5. APPLICATION FOR PAYMENT**

- 31 A. Application for payment shall be submitted by the Contractor to the Resident Project
32 Representative (RPR) in accordance with the schedule established by the General Conditions
33 and Agreement between the County and the Contractor.
34 B. Contractor shall use the County Application for Payment form including required attachments.

35 **1.6. MEASUREMENT FOR PAYMENT**

- 36 A. Methods of Measurement – Generally
37 1. Units of measurement shall be defined in general terms as follows:
38 a. Linear Feet (LF)
39 b. Square Feet (SF)
40 c. Vertical Feet (VF)
41 d. Square Yards (SY)
42 e. Cubic Yards (CY)
43 f. Each (EA)
44 g. Sacks (SK)
45 h. Lump Sum (LS)

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- 2. Unit Price Contracts/Items:
 - a. Linear Feet (LF) shall be measured along the horizontal length of the centerline of the installed/removed material, unless otherwise specified. Pipe shall be measured along the length of the completed pipeline, regardless of the type of joint required, without deduction for the length of valves or fittings. Pipe included within the limits of lump sum items will not be measured.
 - b. Vertical Feet (VF) shall be measured along the vertical length of the centerline of the installed/removed material, unless otherwise specified. Manholes and other below ground structures shall be measured along the length of completed work regardless of diameter/perimeter.
 - c. Square Feet (SF), Square Yards (SY), Cubic Yards (CY), Each (EA) and Sacks (SK) shall be measured as the amount of the unit of measure installed and compacted within the limits specified and shown in the Specifications and Drawings. Slope angles and elevations shall be measured using land-surveying equipment. Contractor shall provide supporting documentation (i.e. drawings, delivery tickets, invoices, survey calculations, etc.) to verify actual installed quantities.
- B. Lump Sum Contract/Items:
 - 1. Quantities provided in the Schedule of Values are for the purpose of estimating the completion status for progress payments. Payment will be made for each individual item on a percentage of completion basis as estimated by the Contractor and approved by the County.
 - 2. Adjustments to costs provided in the accepted Schedule of Values may be made only by Change Order
 - 3. The County reserves the right to delete any item included in the Schedule of Values and decrease the Contract Price by the scheduled amount for the item deleted.

1.7. MEASUREMENT FOR PAYMENT

- A. ***Only those bid items specifically included in the Bid Schedule are applicable for this Contract.*** The measurement and payment items have been standardized. The sections are separated into subsections and these subsections have bid items designated with “xxx” after the first 5 digits of the bid item number. All of the bid items in the Bid Schedule have all 8 digits for a specific bid item. The first 5 digits designate which bid item description (see TABLE A: “Measure and Payment Items”) that corresponds with the bid item listed in the Bid Schedule. The sections and subsections are listed below.
 - 10. General Requirements
 - 10.1 General
 - 11. Site Work
 - 11.1 Miscellaneous
 - 11.2 Road Work
 - 11.3 Install/Replace Fence or Wall
 - 11.4 Bypass Pumping
 - 11.5 Abandon or Remove Pipe/Structure
 - 12. Pressure Pipes
 - 12.1 Pressure Pipe and Fittings and Restrained Joints
 - 12.2 Valves
 - 12.3 Tapping Sleeve and Valve Assembly
 - 12.4 Cut-in Connections to Existing Main
 - 12.5 Piping Appurtenances
 - 12.6 Directional Drill
 - 12.7 Pipe Bursting
 - 13. Wastewater Collection System
 - 13.1 Cleaning Sanitary Sewers
 - 13.2 CCTV Sanitary Sewers

- 1 13.3 Install/Replace Sanitary Sewer
- 2 13.4 Install/Replace Sanitary Manholes
- 3 13.5 Sanitary Manhole Rehabilitation
- 4 13.6 Sanitary Service Laterals and Cleanouts
- 5 13.7 Cured-in-Place Pipe (CIPP) Liner
- 6 13.8 Sanitary Sewer Pipe Bursting
- 7 14. Pump Stations
- 8 14.1 Wastewater Duplex Pump Station
- 9 14.2 Wastewater Triplex Pump Station
- 10

11 **1.8. LISTING AND DEFINITION OF PAY ITEMS**

12
13 **10. General Requirements**

14 **Pay Item No. 10.110.110: Mobilization, Demobilization, Bonds, and Permits (not exceed**
15 **5% of Total Bid Price):**

16 Item shall be measured as lump sum.

- 17 1. Measurement: Measurement of various items for Mobilization and Demobilization
- 18 shall not be made for payment and all items shall be included in the lump sum price.
- 19 This lump sum price shall not exceed 5% of the total bid price.
- 20 2. Payment:
- 21 a. Payment of 75 percent of the applicable lump sum price for the item shall be full
- 22 compensation for the Work consisting of the preparatory Work and operations
- 23 in mobilizing for beginning Work on the Contract, including, but not limited to,
- 24 movement of those personnel, equipment, supplies and incidentals to the
- 25 project site, preparation of submittals, and for the establishment of temporary
- 26 offices and buildings, safety equipment and first aid supplies, project signs,
- 27 field surveys, sanitary and other facilities required by these specifications, and
- 28 State and local laws and regulations. The costs of bonds, permits, and any
- 29 required insurance, project signs, and any other preconstruction expense
- 30 necessary for the start of the work, excluding the cost of construction materials,
- 31 shall also be included. This Work also consist of the general project
- 32 management of the Work including, but not limited to, field supervision and
- 33 office management, as well as other incidental cost for management of the
- 34 Work during the duration of the Contract. This Work also includes maintenance
- 35 of the field offices for the duration of the Contract.
- 36 b. Payment of the remaining 25 percent of the applicable lump sum price for this
- 37 item also consists of demobilization or the operations normally involved in
- 38 ending Work on the project including, but not limited to, termination and
- 39 removal of temporary utility service and field offices; demolition and removal
- 40 of temporary structures and facilities; restoration of Contractor storage areas;
- 41 disposal of trash and rubbish, and any other post-construction work necessary
- 42 for the proper conclusion of the Work.
- 43 3. Pay item to be apportioned to the water and wastewater system improvements of the
- 44 Project.
- 45

46 **Pay Item No. 10.120.110: Preconstruction Audio/Video Documentation:**

- 47 1. Measurement: Item shall be measured as lump sum and be based on the satisfactory
- 48 submittal of a comprehensive pre-construction video in accordance with the County
- 49 requirements and specifications (Section 01 30 00).
- 50 2. Payment: Payment of the applicable Contract lump sum price as stated in the
- 51 proposal will be full compensation for furnishing all labor, materials, and equipment
- 52 necessary to create a comprehensive pre-construction video in accordance with the
- 53 County requirements and the Contract Documents.

- 1 3. Pay item to be apportioned to the total of the water and wastewater system
2 improvements of the Project and paid monthly based on the Work completed as part
3 of the pay application.
4

5 **Pay Item No. 10.130.110: Indemnification (minimum \$100.00):**

- 6 1. Payment: In consideration of the Contractor's Indemnity Agreement as set out in the
7 Contract Documents, the County specifically agrees to give the Contractor a
8 minimum of \$1,000.00 and other good and valuable consideration, receipt of which
9 is acknowledged upon signing of the Agreement
10 2. Pay item to be apportioned to the water and wastewater system improvements of the
11 Project.
12

13 **Pay Item No. 10.140.110: Project Record Documents (a minimum 1% of Total Bid Price):**

- 14 1. Measurement: Item Measurement for this item shall be based on satisfactory
15 progress of the Contractor to provide Project Record Documents in accordance with
16 the County requirements and specifications (Section 01 78 39). Various items for
17 Project Record Documents shall not be made for individual payment and all items
18 shall be included in the lump sum price. This lump sum price shall be a minimum of
19 1% of the total bid price.
20 2. Payment: Payment of the applicable Contract lump sum price as stated in the
21 proposal will be full compensation for furnishing all labor, materials, and equipment
22 necessary to create the Project Record Drawings, including the certified as-built
23 survey, in accordance with the County requirements and specifications. Payment will
24 be made at the lump sum price divided into equal monthly payments based on the
25 Contract Time and acceptance by County of the progressive as-builts drawings and
26 tables.
27 3. Pay item to be apportioned to the total of the water and wastewater system
28 improvements of the Project and paid monthly based on the Work completed as part
29 of the pay application.
30

31 **Pay Item No. 10.150.110: Maintenance of Traffic:**

- 32 1. Measurement: Measurement shall be based on satisfactory Maintenance of Traffic
33 (MOT) in accordance with County requirements and Florida Department of
34 Transportation (FDOT) standards.
35 2. Payment: Payment of the applicable Contract lump sum price as stated in the
36 proposal will be full compensation for furnishing all labor, materials, and equipment
37 necessary to maintain public roadway and pedestrian traffic including flag men,
38 uniformed police officers, barricades, warning lights/flashers, and safety ropes. Also
39 included is furnishing, installing and maintaining a Traffic Control Plan, control and
40 safety devices, control of dust, temporary crossing structures over trenches, any
41 necessary detour facilities, and other special requirements for the safe and
42 expeditious movements of traffic.
43 3. Pay item to be apportioned to the total of the water and wastewater system
44 improvements of the Project and paid monthly based on the Work completed as part
45 of the pay application.
46

47 **Pay Item No. 10.160.110: Public Information Officer:**

- 48 1. Measurement: Measurement shall be based on satisfactory Public
49 Information/Relations in accordance with County requirements.
50 2. Payment: Payment of the applicable Contract lump sum price as stated in the
51 proposal will be full compensation for furnishing all labor, materials, and equipment
52 necessary to provide and maintain communication with those individuals having a
53 residence, business, or property adjacent to or within 1000 feet of the construction
54 area. Payment shall include the rental of venues, preparation of and conducting all
55 meetings, and preparation of and disbursement of printed materials.

3. Pay item to be apportioned to the water and wastewater system improvements of the Project.
4. Payment will be made by equal monthly disbursement.

Pay Item No. 10.170.110: License Agreement/Notification to Homeowner:

1. Item shall be measured as lump sum to obtain notarized License Agreement from affected property owners and all items shall be included in the lump sum price.
2. This item shall include furnishing all labor, materials, equipment and services necessary to obtain notarized License Agreement from affected property owners prior to beginning any work on private property.
3. Pay item to be apportioned to the total of the water and wastewater system improvements of the Project requiring the execution of License Agreement(s) and paid monthly based on the Work in the areas completed as part of the pay application that require the execution of License Agreement(s).

11 Site Work

Pay Item No. 11.110.110: Erosion and Sediment Control:

1. Measurement: Measurement shall be based on satisfactory Erosion and Sediment Control in accordance with the County requirements and specifications (Section 31 25 00).
2. Payment: Payment of the applicable Contract lump sum price as stated in the proposal will be full compensation for furnishing all labor, materials, and equipment to control and prevent sediment transportation from the Work area to adjacent properties, including installation, maintenance, and removal of temporary erosion and sediment controls.
3. Pay item to be apportioned to the total of the water and wastewater system improvements of the Project and paid monthly based on the Work completed as part of the pay application.

Pay Item No. 11.120.110: Unsuitable Materials:

1. Measurement: Unsuitable Material shall be measured in actual cubic yards removed and disposed of in accordance with the County requirements and specifications. The Contractor shall provide survey calculations to verify actual removed quantities beyond that required per the Contract Documents.
2. Payment: Payment will be made at the contract unit price bid per cubic yard as stated in the proposal and shall include all labor, materials and equipment to remove and dispose of unsuitable material including the removal of overburden as well as supplying, installing and compacting acceptable material to return to Project grade.
3. All quantities will be backed up by a haul ticket designating the quantity of each load removed. Quantity will be tabulated for each cubic yard of unsuitable material removed beyond that required per the Contract Documents based on the survey of actual conditions. Material used to return subgrade to Project grade will be assumed to be equal to that removed.

11.2 – Road Work

Pay Item No. 11.210.111: 8” Thick Soil Cement Base:

1. Measurement: Soil Cement Base shall be measured in actual square yards of concrete base with prime and tack coats installed to the limits of asphalt removal/replacement as shown in the Contract Documents in accordance with the County requirements and specifications (Section 32 11 34).
2. Payment: Payment will be made at the contract unit price bid per square yard as stated in the proposal for Soil Cement Base and shall include all labor, materials and

1 equipment to install, pour, and spread concrete base. No separate payment will be
2 made for prime and tack coats.
3

4 **Pay Item No. 11.220.110 through 11.220.112: Temporary Paving (Cold Mix Overlay)**
5 **(various thickness):**

- 6 1. Measurement: Temporary Paving shall be measured in actual square yards for the
7 limits shown on the drawings of temporary paving regardless of installed thickness
8 furnished and installed in accordance with the Plans and Specifications. Any
9 quantities in excess of the limits shown on the drawings will come at the expense of
10 the Contractor unless otherwise approved by the County.
11 2. Payment: Payment will be made at the contract unit price bid per square yard and
12 thickness range required as stated in the proposal for Temporary Paving and shall include
13 all labor, materials, and equipment to apply the cold mix overlay at pre-removal
14 thicknesses to the limits shown on the drawings in accordance with County requirements
15 and specifications. The unit price bid shall also include traffic signalization repair, and
16 temporary striping and markings.
17

18 **Pay Item No. 11.250.110: Concrete Sidewalk Replacement 4" Thickness:**

- 19 1. Measurement: Concrete Sidewalk Replacement shall be measured in actual square
20 yards for the limits shown on the drawings of concrete sidewalk removed and
21 replaced. Width of replaced sidewalk shall match that of existing sidewalk.
22 Thickness shall match that of existing concrete sidewalk or 4"; whichever is greater;
23 and be compliant with the Americans with Disabilities Act (ADA) Design Standards.
24 Any quantities in excess of the limits shown on the drawings will come at the
25 expense of the Contractor unless otherwise approved by the County.
26 2. Payment: Payment will be made at the contract unit price bid per square yard as stated
27 in the proposal for Concrete Pavement Replacement and shall include all labor,
28 materials, and equipment for saw-cutting, removal and proper disposal of existing
29 concrete, compaction, form work, concrete and reinforcement replacement, restoration,
30 and clean-up for a complete installation.
31

32 **Pay Item No. 11.250.111: Concrete Driveway Replacement 6" Thickness:**

- 33 1. Measurement: Concrete Driveway Replacement shall be measured in actual square
34 yards for the limits shown on the drawings of concrete driveway removed and
35 replaced. Replaced portions of driveways shall conform to the lines and grades of
36 removed portions of driveways. Thickness shall match that of existing concrete
37 driveway or 6"; whichever is greater. Any quantities in excess of the limits shown
38 on the drawings will come at the expense of the Contractor unless otherwise
39 approved by the County.
40 2. Payment: Payment will be made at the contract unit price bid per square yard as stated
41 in the proposal for Concrete Pavement Replacement and shall include all labor,
42 materials, and equipment for saw-cutting, removal and proper disposal of existing
43 concrete, compaction, form work, concrete and reinforcement replacement, restoration,
44 and clean-up for a complete installation.
45 3. Pay item will also include the removal and replacement of any brick paver driveways
46 encountered in this project. Measurement shall be in actual square yards for the
47 limits shown in the drawings and include all work necessary to replace the brick
48 paver driveway to its previous condition or better. Any quantities in excess of the
49 limits shown on the drawings will come at the expense of the Contractor unless
50 otherwise approved by the County.
51

52 **Pay Item No. 11.280.110: Concrete Curb and/or Curb & Gutter Replacement:**

- 53 1. Measurement: Concrete Curb and/or Curb and Gutter Replacement shall be measured in
54 actual linear feet for the limits shown on the drawings that is removed and replaced
55 measured along the centerline of the curb within the excavation of the trench to a

1 maximum width equal to the width of the pavement cut as shown on the drawings. All
2 additional curb and gutter damaged shall be replaced by the Contractor at his own
3 expense. Any quantities in excess of the limits shown on the drawings will come at
4 the expense of the Contractor unless otherwise approved by the County.

- 5 2. Payment: Payment will be made at the contract unit price bid per linear feet as stated in
6 the proposal for Concrete Curb and Gutter Replacement and shall include all labor,
7 materials, and equipment for saw-cutting, removal and proper disposal of existing
8 concrete curb and gutter, subgrade and compaction, restoration with sod, and concrete
9 curb and gutter replacement for a complete installation.

10 11 **11.4 – Bypass Pumping**

12 13 **Pay Item No. 11.410.110: Bypass Pumping 6” to 12” Sanitary Sewer Mains:**

- 14 1. Measurement: Measurement for this item shall be based on the complete by-pass
15 operation and contingency plan in accordance with the County requirements and
16 specifications.
- 17 2. Payment: Payment of the applicable Contract lump sum price shall be full
18 compensation for furnishing all labor, materials, equipment as necessary for by-pass
19 operations and contingency plan as required, including pumps, piping, and hoses;
20 tankers; temporary suction, by-pass and service piping; hauling and proper disposal
21 of wastewater; plugging; gasoline/diesel fuel for pump and/or generator; protection
22 of existing facilities, utilities, and property; traffic maintenance; signs and barriers;
23 and all incidental work required to satisfactorily complete this item.

24 25 **11.5 – Abandon or Remove Pipe/Structure**

26 27 **Pay Item No. 11.510.110: Abandon-in-Place Pipe:**

- 28 1. Measurement: Abandon-in-Place Pipe, regardless of size and material, shall be
29 measured in actual linear feet satisfactorily abandoned-in-place in accordance with
30 the County requirements and specifications (Section 02 41 50). Pipe abandonment
31 shall be measured along the centerline without deduction for valves and fittings.
- 32 2. Payment: Payment will be made at the contract unit price bid per linear feet as stated
33 in the proposal for Abandon-in-Place Pipe and shall include all labor, materials, and
34 equipment to excavate, backfill and compact; sheet, shore, and brace; dewater;
35 completely drain and properly dispose of pipe contents; grout fill, and plug or cap
36 existing pipes of all services and sizes designated "to be abandoned" on the
37 Drawings. Also included in this item is the removal of existing valve boxes located
38 on valves connected to piping designated to be retired. Valve boxes shall be
39 removed, backfilled and compacted with suitable material.

40 41 **Pay Item No. 11.520.110: Abandon-in-Place Manhole:**

- 42 1. Measurement: Measurement of Abandon-in-Place Manhole shall be made per
43 vertical foot of existing manholes satisfactorily abandoned-in-place in accordance
44 with the County requirements and specifications.
- 45 2. Payment: Payment will be made at the contract unit price bid per vertical foot of
46 existing manhole as stated in the proposal for Abandon-in-Place Manhole and shall
47 include all labor, materials, and equipment to sheet, shore, and brace, dewater,
48 completely drain and properly dispose of manhole contents, remove manhole top
49 riser, grout fill, and cap existing manhole designated "to be abandoned" on the
50 Drawings. Also included in this item is backfilling and compaction complete in place
51 to finish grade of road or natural ground (including additional soil to replace volume
52 of removed manhole).

1 **Pay Item No. 11.530.110: Remove Existing Pipe:**

- 2 1. Measurement: Remove Existing Pipe, regardless of size and material, shall be measured
3 in actual linear feet satisfactorily excavated, removed, and salvaged in accordance with
4 the County requirements and specifications (Section 02 41 50). Pipe removal shall be
5 measured along the centerline without deduction for valves and fittings. Also included in
6 this item is the removal and salvage of other items including valves and valve boxes, air
7 release valves and vaults, and fire hydrant assemblies.
- 8 2. Payment: Payment will be made at the contract unit price bid per linear feet as stated
9 in the proposal for Removal of Existing Pipe and shall include all labor, materials,
10 and equipment to sheet, shore, and brace; dewater; excavate; completely drain and
11 properly dispose of pipe contents; plug or cap; restoration including top soil and sod,
12 clean-up; remove and salvage pipe of all services and sizes designated "to be
13 removed" on the Drawings, backfill and compact. Also included in this item is the
14 removal and salvage of items (as listed in Specification Section 02 41 50) attached to
15 the piping to be removed.

16
17 **Pay Item No. 11.540.110: Remove Existing Manhole:**

- 18 1. Measurement: Measurement for Remove Existing Manhole shall be made per actual
19 number of manholes satisfactorily excavated and removed in accordance with the
20 County requirements and specifications.
- 21 2. Payment: Payment for Remove Existing Manhole shall be made based on the
22 authorized quantity at the unit price indicated in the Bid. Payment of the applicable
23 Contract unit prices shall be full compensation for furnishing all labor, materials, and
24 equipment to sheet, shore, and brace, dewater, completely drain and properly dispose
25 of manhole contents, remove manhole designated "to be removed" on the Drawings.
26 Also included in this item is backfilling and compaction complete in place to finish
27 grade of road or natural ground (including additional soil to replace volume of
28 removed manhole) as well as restoration including top soil and sod.

29
30 **12 Pressure Pipes**

31
32 **12.1 – Pressure Pipes with Fittings and Restrained Joints**

33
34 **Pay Item No. 12.110.110 through 12.110.112: Water Main with Fittings and Restrained**
35 **Joints (4" - 8"):**

- 36 1. Measurement: Water Main installation regardless of type and size shall be measured
37 in actual linear feet satisfactorily furnished and installed, as measured along the
38 length of the centerline of the completed pipeline, regardless of the type of joint
39 required, without deduction for the length of valves and fittings. Pipe included within
40 the limits of lump sum pay items will not be measured for payment under this item.
- 41 2. Payment: Payment will be made at the contract unit price bid per linear feet as stated
42 in the proposal for Water Main w/Fittings and restrained joints and shall include all
43 labor, materials, and equipment to construct the respective pipeline including
44 coordination with existing utilities, protection of existing utilities including service
45 connections, tree protection, excavation, sheeting, shoring and bracing, dewatering,
46 locating wire and pipe straps, backfill, compaction, and grading, all flushing and
47 testing, potable water system protection, disinfection, restoration with topsoil and
48 sod and clean-up. This item also includes all necessary fittings, reducers, bends, tees,
49 wyes, plugs, restraining devices, polyethylene encasement where required, metallic
50 tracer wire, line locator, identification markers, and removal and replacement of
51 fences and gates, mailboxes, trees, shrubs, irrigation sprinklers and other
52 obstructions.

1 **12.2 – Valves**
2

3 **Pay Item No. 12.210.110 through 12.210.112: Gate Valve with Box (4” – 8”):**

- 4 1. Item shall be measured per unit (each). Item includes valves with boxes and
5 extensions of size specified. Item includes all costs for furnishing, excavation,
6 installation, backfilling, accessories, joint restraint(s), blocking to support valve, and
7 appurtenances, and other items required for a complete installation.
8 2. Payment: Payment for the Gate Valve with Box shall be made based on the
9 authorized quantity at the unit price indicated in the Bid. Payment of the applicable
10 Contract unit price shall be full compensation for furnishing all labor, materials and
11 equipment to install the valve, valve box, valve box extensions, operating nut
12 extensions, locating wire, test station box and cap, valve wrenches, restraining
13 devices, covers, concrete collars, excavation, sheeting, shoring, bracing, dewatering,
14 backfill, compaction, restoration with sod, flushing, testing, disinfection, and all
15 other items required for a complete, acceptable and operable installation.
16

17 **Pay Item No. 12.230.110: Blowoff Valve Assembly (2”):**

- 18 1. Measurement: Measurement for Blowoff Valve Assembly shall be made per actual
19 number of blowoff valve assemblies satisfactorily furnished and installed to provide
20 a complete and functional unit.
21 2. Payment: Payment for the Blowoff Valve with Box shall be made based on the
22 authorized quantity at the unit price indicated in the Bid. Payment of the applicable
23 Contract unit price shall be full compensation for furnishing all labor, materials and
24 equipment to install the pipe and fittings, valve, valve box, valve box extensions,
25 locator wire, test station box and cap, operating nut extensions, valve wrenches,
26 restraining devices, covers, concrete collars, excavation, dewatering, sheeting,
27 shoring, bracing, backfill, compaction, restoration with sod, flushing, testing,
28 disinfection, and all other items required for a complete, acceptable and operable
29 installation.
30

31 **12.3 – Tapping Sleeve and Valve Assembly**
32

33 **Pay Item No. 12.310.110 through 12.310.112: Tapping Sleeve and Valve Assembly (various**
34 **sizes):**

- 35 1. Measurement: Measurement for Tapping Sleeve and Valve Assembly shall be made
36 per actual number of tapping sleeves and valves satisfactorily furnished and installed
37 to provide a complete and functional unit.
38 2. Payment: Payment for the Tapping Sleeve and Valve Assembly shall be made based
39 on the authorized quantity at the unit price indicated in the Bid. Payment of the
40 applicable Contract unit price shall be full compensation for furnishing all labor,
41 materials and equipment necessary to perform a wet tap to an existing main
42 including excavation, sheeting, shoring, bracing, dewatering, backfill, compaction,
43 grading, tapping sleeve, tapping valve and bolts, nuts and gasket(s), valve box
44 extensions, operating nut extensions, valve wrenches, restraining devices, protection
45 of potable water system, disinfection, flushing, testing, locator wire, restoration and
46 all other items required for a complete, acceptable and operable installation.
47

48 **12.5 – Piping Appurtenances**
49

50 **Pay Item No. 12.510.110 through 12.510.112 Line Stop Assembly (4” – 8”):**

- 51 1. Measurement: Measurement for Line Stopping Assembly shall be made per actual
52 number of line stops satisfactorily furnished and installed to permanently or
53 temporarily stop the flow within the indicated main at the locations shown on the
54 drawings.

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2. Payment: Payment for the Line Stopping Assembly shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary to perform a permanent or temporary line stop on an existing main including excavation, sheeting, shoring, bracing, dewatering, backfill, compaction, grading, tapping sleeve, plug, restraining devices, valve operator with extension and box to surface, if permanent or if temporary, removal of all appurtenances and sealing of hole, disinfection, flushing, testing, restoration and all other items required for a complete, acceptable and operable installation.

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Pay Item No. 12.540.110: Fire Hydrant Assembly:

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1. Measurement: Measurement for Fire Hydrant Assemblies shall be made per actual number of fire hydrant assemblies satisfactorily furnished and installed to provide a complete and functional unit. The pipe and necessary restraint system connecting the fire hydrant assembly to the water main shall be included in the unit price, regardless of the length necessary to locate the hydrant at the direction of the County.
 2. Payment: Payment for the Fire Hydrant Assembly shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary to install the fire hydrant complete with hydrant tee, hydrant extension, pipe, fittings, isolation valve and box, thrust anchorage, and shear pad. Also included is excavation, sheeting, shoring and bracing, dewatering, backfill, compaction, grading, connection to pipes, restoration, disinfection, flushing, testing, locator wire, and all other items required for a complete, acceptable and operable installation.

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Pay Item No. 12.560.110: Water Service Connection (Single and Double), Short:

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1. Measurement: Measurement for Water Service Connection shall be made per actual number of short service connections satisfactorily furnished and installed to provide a complete and functional unit.
 2. Payment: Payment for the Water Service Connection Short shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary to install the water service connection including service saddle, corporation stop, water service piping, curb stops, disinfection, testing, flushing, and installing meter boxes. Payment also includes excavation sheeting, shoring and bracing, dewatering, backfill, compaction, grading, pressure testing, restoration, sod and all other items required for a complete, acceptable and operable installation.

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Pay Item No. 12.560.111: Water Service Connection (Single and Double), Long:

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1. Measurement: Measurement for Water Service Connection Long shall be made per actual number of service connections satisfactorily furnished and installed to provide a complete and functional unit.
 2. Payment: Payment for the Water Service Connection Long shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary to install the water service connection including service saddle, corporation stop, installation of piping smaller than 4" under existing roadway/sidewalk by a trenchless technology installation method, casing piping, locate wire for casing pipe, water service piping, curb stops, disinfection, testing, flushing, and installing meter boxes. Payment also includes excavation sheeting, shoring and bracing, dewatering, backfill, compaction, grading, pressure testing, restoration, sod and all other items required for a complete, acceptable and operable installation.

1
2 **Pay Item No. 12.570.110: Water Service Connection, Private Property:**

- 3 1. Measurement: Measurement for Water Service Connection Private Property shall be
4 made per actual number of service connections satisfactorily furnished and installed
5 on private property to provide a complete and functional unit regardless of length,
6 fittings, etc.
7 2. Payment: Payment for the Water Service Connection Private Property shall be made
8 based on the authorized quantity at the unit price indicated in the Bid. Payment of the
9 applicable Contract unit price shall be full compensation for furnishing all labor,
10 materials and equipment necessary to locate existing water service at the home,
11 disconnecting existing service, install the new water service connection to the
12 existing including excavation, backfill, service pipe connection, service piping as
13 much as is needed to relocate the water meter as shown in the drawings, valves,
14 fittings, appurtenances, abandonment of existing service, restoration, sod,
15 disinfection, testing, flushing, and all other items necessary to complete installation
16 from the home or business up to property line. Work to be completed by a licensed
17 plumber. Work will not be performed until Contractor has obtained a License
18 Agreement executed by all legal parties.

19
20 **12.6 – Directional Drill**

21
22 **Pay Item No. 12.610.110 through 12.610.112: Directional Drill HDPE/PVC Water Main**
23 **(4" - 8"):**

- 24 1. Measurement: Directional Drill Water Main installation regardless of pipe material
25 shall be measured in actual linear feet satisfactorily furnished and installed, as
26 measured along the length of the centerline of the completed directionally drilled
27 water main in accordance with the County requirements and specifications (Section
28 33 05 20).
29 2. Payment: Payment will be made at the contract unit price bid per linear feet as stated
30 in the proposal to the limits shown on the drawings for Directionally Drill Water
31 Main and shall include all labor, materials, and equipment necessary for a complete
32 directional drill pipe installation and testing including protection of existing utilities,
33 pipe, fittings, mechanical restraint, metallic tracer wire, drilling mud, restoration with
34 sod, testing, disinfection, restoration, disinfection, testing, flushing, and clean-up.
35 Contractor is responsible for extra lengths of directional drilling beyond that shown
36 on the drawings or that is removed to suit proper installation. Any fittings required
37 at the ends of the directional drills to maintain proper installation will also be
38 included in the cost of Directionally Drill Water Main.
39 3. Item shall be measured in linear feet along the ground surface at or near the
40 centerline of the installed pipe. Item includes labor, trench excavation, exploratory
41 excavation, dewatering, erosion and pollution control, trench safety and shoring, site
42 clearing and all offsite disposal costs of excess site material and drilling fluid in an
43 acceptable manner, fluid recycle, marking tape, pipe material per County Standard,
44 pipe restraints, pipe fittings, fusion of pipe, adapters, post restraining of the existing
45 pipe, locating wire, backfill material, importation of acceptable fill material, if
46 required, compaction testing, pressure testing, bacteriologic testing, and any other
47 testing, restoration except in paved areas, including sodding, temporary jumper
48 connections, clearing and grubbing, temporary relocation and reinstallation of trees,
49 shrubs, signs, and mailboxes, thrust collars, socket clamps, and temporary support of
50 existing utilities to remain.
51

1 **Wastewater Collection System**

2
3 **13.2 – CCTV Sanitary Sewer**

4
5 **Pay Item No. 13.210.110: CCTV Inspection Sanitary Sewer Mains – 8” to 12” Dia. (by**
6 **depth of cover):**

- 7 1. Measurement: CCTV Inspection Sanitary Sewer shall be measured in actual linear
8 feet of satisfactory visual inspection completed utilizing closed-circuit television in
9 accordance with the County requirements and specifications (Section 33 01 31).
10 CCTV inspection shall be measured along the length of the centerline of the
11 inspected sanitary sewer.
12 2. Payment: Payment will be made at the contract unit price bid per linear feet as stated
13 in the proposal for CCTV Inspection Sanitary Sewer and shall include, but is not
14 necessarily limited to, all labor, materials, and equipment necessary for a complete
15 CCTV visual inspection of the sanitary sewer and subsequent report including
16 qualified personnel, DVD, and all incidentals related to sewer main inspection.
17

18 **Pay Item No. 13.230.110: CCTV Inspection of Lateral from Cleanout:**

- 19 1. Measurement: CCTV Inspection of Lateral from Cleanout shall be measured by each
20 satisfactory visual inspection of lateral from cleanout completed utilizing closed-
21 circuit television in accordance with the County requirements and specifications
22 (Section 33 01 31). CCTV inspection shall be measured along the length of the
23 centerline of the inspected sanitary sewer.
24 2. Payment: Payment shall be made based on the authorized quantity at the unit price
25 indicated in the Bid as stated in the proposal for CCTV Inspection of Lateral from
26 Cleanout and shall include, but is not necessarily limited to, all labor, materials, and
27 equipment necessary for a complete CCTV visual inspection of the sanitary sewer
28 lateral and subsequent report including qualified personnel, DVD, and all incidentals
29 related to sewer lateral from cleanout inspection.
30

31 **13.3 – Install/Replace Sanitary Sewer Main**

32
33 **Pay Item No. 13.310.110 through 13.310.114: Sanitary Sewer Main 8” Diameter (by depth**
34 **of cover):**

- 35 1. Measurement: The installation and/or replacement of Sanitary Sewer Main shall be
36 measured in actual linear feet satisfactorily furnished and laid, as measured along the
37 length of the centerline of the completed pipeline without deduction for the length of
38 manholes. The depth shall be calculated from the invert to the top of the surface.
39 Pipe included within the limits of lump sum pay items will not be measured for
40 payment under this item.
41 2. Payment: Payment will be made at the contract unit price bid per linear feet as stated in
42 the proposal for Sanitary Sewer Main and shall include all labor, materials, and
43 equipment to construct the respective pipeline including coordination with existing
44 utilities, protection of existing utilities including service connections, connection to
45 existing sewer main, tree protection, excavation, sheeting, shoring and bracing,
46 dewatering, backfill, compaction, and grading, all testing; restoration and clean-up.
47 This item also includes the removal and replacement of fences and gates, mailboxes,
48 trees, shrubs, irrigation sprinklers, sod and other obstructions required for the
49 completed installation.
50

51 **Pay Item No. 13.340.110 through 13.340.111 Sanitary Sewer Point Repair (by depth):**

- 52 1. Measurement: Sanitary Sewer Point Repair shall be made per actual number of
53 repairs of sanitary sewer main for various depths satisfactorily repaired, regardless of
54 main size in accordance with the County requirements and specifications.

- 1 2. Payment: Payment will be made at the contract lump sum price bid as stated in the
2 Bid Schedule for Sanitary Sewer Point Repair, regardless of main size and shall
3 include all labor, materials, and equipment necessary to repair the existing sanitary
4 sewer including coordination with existing utilities; protection of existing utilities
5 including service connections, tree protection, excavation, sheeting, shoring and
6 bracing, dewatering, completely drain and properly dispose of existing pipe contents,
7 removal of existing damaged sanitary sewer, piping, fittings, backfill, compaction,
8 and grading, post-installation video, repair of sags in line, all testing, restoration and
9 clean-up. This item also includes removal and replacement of fences and gates,
10 mailboxes, trees, shrubs, irrigation sprinklers, sod and other obstructions.

11
12 **Pay Item No. 13.350.110 Sanitary Sewer Main Connection to Existing Manhole:**

- 13 1. Measurement: Measurement for Sewer Main Connection to Existing Manhole shall
14 be made per actual number of core bores and connections to existing manholes
15 satisfactorily furnished and installed.
16 2. Payment: Payment for Sewer Main Connection to Existing Manhole shall be made
17 based on the authorized quantity at the unit price indicated in the Bid. Payment of the
18 applicable Contract unit price shall be full compensation for furnishing all labor,
19 materials and equipment necessary for a complete connection to an existing manhole
20 including protection of existing utilities, excavation, sheeting, shoring and bracing,
21 dewatering, backfill, compaction, and grading, wall seal, core drilling, and bench
22 adjustment.

23
24 **13.4 – Install/Replace Sanitary Manholes**

25
26 **Pay Item No. 13.410.110 through 13.410.114: Sanitary Manhole 4’ Diameter (by depth):**

- 27 1. Measurement: Measurement for Sanitary Manhole shall be made per actual number
28 of sanitary manholes of each type and depth satisfactorily furnished and installed.
29 Depth shall be measured from the center of the invert(s) to the top of the lid for
30 depth.
31 2. Payment: Payment for Sanitary Manhole shall be made based on the authorized
32 quantity at the unit price indicated in the Bid. Payment of the applicable Contract
33 unit price shall be full compensation for furnishing all labor, materials and
34 equipment necessary for a complete sanitary manhole installation including
35 excavation, sheeting, shoring and bracing, dewatering, backfill, compaction, and
36 final grading, successful testing, crushed rock base, connection of new or existing
37 sanitary sewer, polyolefin sheeting for exterior joint sealing, adjustment of the
38 manhole rim, interior and exterior surface coatings to provide a complete and
39 operable sanitary manhole. For sanitary manholes replaced in kind unit price will
40 also include replacement of fifteen (15) feet of each gravity sewer connected to the
41 manhole and successful connection to the respective existing gravity sewer.

42
43 **13.5 – Sanitary Manholes Rehabilitation**

44
45 **Pay Item No 13.530.110: Line Manhole (Polyethylene or PVC) (48”):**

- 46 1. Measurement: Line Manhole shall be measured in vertical feet of manhole lined with
47 a polyethylene or PVC interior liner system. Lining of manhole shall be measured
48 along the center vertical length of the manhole.
49 2. Payment: Payment will be made at the contract unit price bid per vertical feet as
50 stated in the proposal for Line Manhole and shall include, but is not necessarily
51 limited to, all labor, materials, and equipment necessary for a complete installation of
52 an interior liner system including qualified personnel, sewer structure interior liner
53 system, plugging infiltration, channel reconstruction, pressure cleaning, and surface
54 preparation, leak repair, and crack repair as required by the liner system
55 manufacturer.

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13.6 – Sanitary Service Laterals and Cleanouts

Pay Item No 13.610.110 through 13.610.112: Install/Repair/Replace 4” Diameter Sanitary Sewer Lateral:

- 1. Measurement: Install/Repair/Replace Sanitary Sewer Lateral shall be measured in actual linear feet satisfactorily repaired or replaced, regardless of depth, as measured along the length of the centerline of the completed lateral installation, repair or replacement without deduction for the length of fittings.
- 2. Payment: Payment will be made at the contract unit price bid per linear feet as stated in the proposal for Install/Repair/Replace Sanitary Sewer Lateral and shall include all labor, materials, and equipment necessary to install, repair or replace the sanitary sewer lateral connection including excavation, sheeting, shoring and bracing, dewatering, backfill, compaction, and grading, removal and disposal of existing service lateral, all incidentals to connect and reactivate sewer service connections, all pipe, wyes, bends and plugs necessary to provide a watertight service connection, leakage testing, protection of existing utilities, structures, and property, restoration and clean-up. This item also includes the removal and replacement of fences and gates, mailboxes, trees, shrubs, irrigation sprinklers, sod and other obstructions.

Pay Item No 13.620.110 through 13.620.112: Install/Repair/Replace 6” Diameter Sanitary Sewer Lateral:

- 1. Measurement: Install/Repair/Replace Sanitary Sewer Lateral shall be measured in actual linear feet satisfactorily repaired or replaced, regardless of depth, as measured along the length of the centerline of the completed lateral installation, repair or replacement without deduction for the length of fittings.
- 2. Payment: Payment will be made at the contract unit price bid per linear feet as stated in the proposal for Install/Repair/Replace Sanitary Sewer Lateral and shall include all labor, materials, and equipment necessary to install, repair or replace the sanitary sewer lateral connection including excavation, sheeting, shoring and bracing, dewatering, backfill, compaction, and grading, removal and disposal of existing service lateral, all incidentals to connect and reactivate sewer service connections, all pipe, wyes, bends and plugs necessary to provide a watertight service connection, leakage testing, protection of existing utilities, structures, and property, restoration and clean-up. This item also includes the removal and replacement of fences and gates, mailboxes, trees, shrubs, irrigation sprinklers, sod and other obstructions.

Pay Item No 13.630.110 through 13.630.111 and 13.630.114 through 13.630.115 Install/Repair/Replace Sanitary Sewer Cleanout (by depth and location):

- 1. Measurement: Measurement for Install/Repair/Replace Sanitary Sewer Cleanout shall be made per actual number of sanitary sewer cleanouts satisfactorily installed, repaired or replaced regardless of cleanout depth.
- 2. Payment: Payment for Install/Repair/Replace Sanitary Sewer Cleanout shall be made based on the authorized quantity at the unit price indicated in the Bid. Payment of the applicable Contract unit price shall be full compensation for furnishing all labor, materials and equipment necessary to repair or replace the sanitary sewer cleanout including excavation, sheeting, shoring and bracing, dewatering, backfill, compaction and grading, all pipe, wyes, bends, sleeves, and plugs necessary to provide a water tight access, protection of existing utilities and property, restoration and clean-up. This item also includes the removal and replacement of fences and gates, mailboxes, trees, shrubs, irrigation sprinklers, asphalt, concrete curb, driveway or sidewalk and other obstructions.

1 **Pay Item No 13.640.110 Service Lateral Connection to Manhole:**

- 2 1. Measurement: Measurement for Service Lateral Connection to Manhole shall be
3 made per actual number of sanitary sewer lateral service connections made to
4 manholes satisfactorily furnished and installed.
5 2. Payment: Payment for Service Lateral Connection to Manhole shall be made based
6 on the authorized quantity at the unit price indicated in the Bid. Payment of the
7 applicable Contract unit price shall be full compensation for furnishing all labor,
8 materials and equipment necessary for a complete connection to an existing manhole
9 including excavation, sheeting, shoring and bracing, dewatering, backfill,
10 compaction and grading, core drilling and wall seal, protection of existing utilities
11 and property, restoration and clean-up. This item also includes the removal and
12 replacement of fences and gates, mailboxes, trees, shrubs, irrigation sprinklers, sod
13 and other obstructions.
14

15 **Pay Item No 13.650.110 Install Sanitary Sewer Lateral and Cleanout on Private Property:**

- 16 1. Measurement: Install Sanitary Sewer Lateral and Cleanout on Private Property shall
17 be made per actual number of service connections satisfactorily furnished and
18 installed to provide a complete and functional unit, regardless of depth.
19 2. Payment: Payment will be made at the contract unit price bid per each as stated in
20 the proposal for Install Sanitary Sewer Lateral and Cleanout on Private Property and
21 shall include all labor, materials, and equipment necessary to install the sanitary
22 sewer lateral, connection to residence, and cleanout including excavation, sheeting,
23 shoring and bracing, dewatering, backfill, compaction, and grading, removal and
24 disposal or abandonment of existing service lateral, all incidentals to connect and
25 reactivate sewer service connections, all pipe, wyes, bends and plugs necessary to
26 provide a watertight service connection, leakage testing, protection of existing
27 utilities, structures, and property, restoration and clean-up. This item also includes
28 the removal and replacement of fences and gates, mailboxes, trees, shrubs, irrigation
29 sprinklers, sod and other obstructions. Work to be completed by a licensed plumber.
30 Work will not be performed until Contractor has obtained a License Agreement
31 executed by all legal parties.
32

33 **13.7 – Cured-In-Place (CIPP) Liner**

34
35 **Pay Item No 13.710.110 through 13.710.111 Sanitary Sewer Main CIPP Liner (8"-10"):**

- 36 1. Measurement: CIPP Liner shall be measured in actual linear feet of furnished and
37 satisfactorily installed cured-in-place liner in the sanitary sewer main from center of
38 manhole to center of manhole, regardless of depth, in accordance with the County
39 requirements and specifications (Section 33 01 98). CIPP liner installation shall be
40 measured along the length of the centerline of the rehabilitated sanitary sewer.
41 2. Payment: Payment will be made at the contract unit price bid per linear feet as stated
42 in the Bid Schedule for CIPP Liner and shall include, but is not necessarily limited
43 to, all labor, materials, and equipment necessary for a complete CIPP liner
44 installation including pre and post CCTV inspection, sanitary sewer cleaning,
45 qualified personnel, providing and processing of liner material, blocking or plugging
46 of incoming lines, grouting, leakage testing, reinstate service laterals, protection of
47 existing utilities, structures, proper disposal of all liquids, and property, restoration
48 and clean-up.
49

50 **Pay Item No 13.720.110 through 13.720.113 4" & 6" Diameter Brim Type - CIPP Lateral**
51 **Liner All Depths:**

- 52 1. Measurement: Measurement for Brim Type – CIPP Lateral Liner - shall be made per
53 actual number of satisfactorily installed cured-in-place brim type liners in the
54 existing sanitary sewer laterals measured from the sewer main to the property clean-

1 out, regardless of depth, in accordance with the County requirement, drawings, and
2 specifications (Section 33 01 99).

- 3 2. Payment: Payment for Brim Type - CIPP Lateral Liner will be made at the contract
4 unit price indicated in the Bid Schedule for Brim Type CIPP Lateral Liner and shall
5 include, but is not necessarily limited to, all labor, materials and equipment
6 necessary to a complete lateral liner installation including pre and post CCTV
7 inspection, sewer lateral cleaning, excavation, sheeting, shoring and bracing,
8 dewatering, backfill, and compaction, qualified personnel, providing and processing
9 of liner material, blocking or plugging of lateral, grouting, leakage testing, protection
10 of existing utilities, structures, and property, restoration and clean-up. This item also
11 includes all necessary removal and replacement of fences and gates, mailboxes, trees,
12 shrubs, irrigation sprinklers, sod and other obstructions.

13
14 **Pay Item No 13.730.110 through 13.730.113 4" & 6" Diameter FCLRL - CIPP Lateral**
15 **Liner All Depths:**

- 16 1. Measurement: Measurement for Full Circumference Lateral Reinforced Liner
17 (FCLRL) - CIPP Lateral Liner shall be made per actual number of satisfactorily
18 installed cured-in-place liners in the existing sanitary sewer laterals measured from
19 the sewer main to the property clean-out, regardless of depth, to determine if they are
20 less than or equal or greater than 30' and in accordance with the County requirement,
21 drawings, and specifications (Section 33 01 99).
- 22 2. Payment: Payment for Full Circumference Lateral Reinforced Liner (FCLRL) - CIPP
23 Lateral Liner shall be made based on the authorized quantity at the unit price indicated
24 in the Bid. Payment of the applicable Contract unit price shall be full compensation for
25 furnishing all labor, materials and equipment necessary to satisfactorily install a CIPP
26 lateral liner system including pre- and post-CCTV inspection, sewer lateral cleaning,
27 excavation, sheeting, shoring and bracing, dewatering, backfill, and compaction,
28 qualified personnel, providing and processing of liner material, blocking or plugging of
29 lateral, grouting, leakage testing, protection of existing utilities, structures, and
30 property, restoration and clean-up. This item also includes all necessary removal and
31 replacement of fences and gates, mailboxes, trees, shrubs, irrigation sprinklers, sod and
32 other obstructions.

33 **1.9. NONPAYMENT FOR REJECTED OR UNUSED PRODUCTS**

- 34 A. Payment will not be made for following:
35 1. Loading, hauling, and disposing of rejected material.
36 2. Quantities of material: wasted or disposed of in manner not called for under Contract
37 Documents.
38 3. Rejected loads of material, including material rejected after it has been placed by reason of
39 failure of Contractor to conform to provisions of Contract Documents.
40 4. Material not unloaded from transporting vehicle.
41 5. Defective Work not accepted by Owner.
42 6. Material remaining on hand after completion of Work.

43 **1.10. PARTIAL PAYMENT FOR STORED MATERIALS AND EQUIPMENT**

- 44 A. Partial Payment:
45 1. Payment for materials and equipment in proper storage at the Site of the Work or other
46 approved storage site will be made for those items for which the Contractor has submitted
47 paid invoices to Engineer, less retainage.
48 2. Proper storage requires that materials are stored in a bonded warehouse and proof of the
49 bonding insurance shall be provided to the County. Contractor shall be wholly responsible
50 to replace items that are lost or stolen whether stored on Site or in a bonded warehouse. This
51 replacement shall be done by Contractor at no additional cost to the County. The County

1 will not be responsible for materials and equipment that become damaged or stolen if
2 Contractor chooses to store said materials and equipment on Site.

3 B. Final Payment: Will be made only for products incorporated in Work; remaining products, for
4 which partial payments have been made, shall revert to Contractor unless otherwise agreed, and
5 partial payments made for those items will be deducted from final payment.

6

7 **PART 2 PRODUCTS (NOT USED)**

8 **PART 3 EXECUTION (NOT USED)**

9

END OF SECTION

1 **SECTION 01 30 00**
2 **SPECIAL CONDITIONS**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

5 A. Section Includes:

- 6 1. Administrative and procedural requirements for:
7 a. Pre-construction Conference
8 b. Project signs
9 c. Drawings and Contract Documents for Contractor use
10 d. Project photographs
11 e. Testing
12 f. Order of Construction and Construction Schedule
13 g. Project meetings
14 h. Video recording equipment
15 i. Special considerations related to adjacent properties and facilities

16 **1.2 PRECONSTRUCTION CONFERENCE**

17 A. A preconstruction conference shall be held no later than twenty (20) days after date of Notice to
18 Proceed at a central site, convenient for all parties, designated by the Owner/Engineer.

- 19 1. Owner's Representative will notify the Contractor as to the date and time of the conference
20 one (1) week in advance of the proposed date.
21 2. Attendees shall include:
22 a. Owner's Representatives
23 b. Contractor's Project Manager
24 c. Contractor's Project Superintendent
25 d. Contractor's Quality Control representative
26 e. Contractor's Subcontractor representative
27 f. Engineer's representatives
28 g. Others as appropriate or as designated by Owner or Owner's representatives
29 3. Contractor shall be prepared to discuss the following subjects as a minimum:
30 a. Required schedules
31 b. Sequencing of critical path work items such as but not limited to:
32 1) Resident notification for start of construction, service transfer, restoration, and
33 repaving.
34 2) Permit approvals
35 3) Flushing (cleaning), testing, disinfection, inspection, and clearance of new facilities
36 4) Traffic control
37 c. Progress payment procedures
38 d. Project changes and clarification procedures
39 e. Use of site, access, storage areas, security and temporary facilities
40 f. Major product delivery and priorities
41 g. Contractor's safety plan and representative

42 **1.3 DRAWINGS AND CONTRACT DOCUMENTS FOR CONTRACTOR USE**

- 43 A. Refer to General Conditions.
44 B. Contractor shall pick up Consolidated Documents within 10 days from date of Notice to
45 Proceed.
46 C. Additional documents after Consolidated Documents will be furnished to Contractor at cost.

1 **1.4 PROJECT SIGNS**

- 2 A. A minimum of two (2) 4 FT by 8 FT project signs shall be posted on site prior to the start of any
3 construction on the project. Refer to Detail in the Construction Drawings for format, color, and
4 text. Location of the construction signs shall be coordinated with the County and/or Engineer.
5 The signs shall be removed at final completion of the project and the area restored to its original
6 condition.

7 **1.5 PROJECT PHOTOGRAPHS AND VIDEO RECORDING**

- 8 A. Prior to beginning of work, Contractor shall have a professional videographer video tape entire
9 work area, including easements to be disturbed. Videographer shall be a reputable commercial
10 firm with experience in continuous Pre-Construction color-audio-visual tape documentation. No
11 construction will be permitted prior to review and acceptance of the video documentation by the
12 County or Engineer. Owner's representative to be present during video documentation.

- 13 1. Video-audio documentation will be provided at the Pre-Construction meeting and copies
14 will be provided at a minimum:

- 15 a. Two (2) copies Owner
16 b. One (1) copy Engineer
17 c. One (1) copy to remain on site during construction

- 18 2. Video Recording Requirements:

- 19 a. E.I.A. standard video with minimum horizontal resolution of 525 lines, 60 fields
20 b. Screen Display
21 1) Time of day
22 2) Date; month, day, year
23 c. Video to be captured under sunny conditions using a stable continuity of coverage
24 d. Recording rate not to exceed 5 miles per hour
25 e. Camera not mounted more than 10 FT above ground

- 26 3. Audio Recording Requirements:

- 27 a. Single voice description in sync with the video recording
28 b. Provide remarks to assist viewer orientation
29 1) Street name
30 2) Direction of travel
31 3) House address
32 4) Engineering station number

- 33 4. Coverage requirements:

- 34 a. Both sides of each street within the Project area
35 b. The condition of all streets, sidewalks and driveways
36 c. The location and condition of all plants, shrubs, and trees
37 d. The location and condition of all water meters
38 e. The location and condition of all sewer cleanouts
39 f. The location and condition of all fences, buildings, etc. that may be located across the
40 existing utility easement(s).

- 41 B. Contractor shall employ a competent photographer to photograph the area prior to alterations of
42 private driveways, trees, landscape, walkways, easement areas, roads, drainage structures.

- 43 1. All photographs shall be dated.

- 44 2. Prints:

- 45 a. Provide digital prints to County and Engineer
46 b. If hard copies requested by County, provide four (4) sets of 8"x10" high resolution
47 glossy single weight color prints. Copies to be distributed as:
48 1) Two (2) copies Owner
49 2) One (1) copy Engineer
50 3) One (1) copy to remain on site during construction

- 1 C. One copy of the photograph and video tape records shall be given to Engineer and Owner and
2 one copy to remain with Contractor for a period of one year following the completion of the
3 project.
- 4 D. Provide full access to site for video recording of construction activities, training sessions, trouble
5 shooting, etc.

6 **1.6 TESTING**

- 7 A. Payment for Soil, Concrete, Soil Compaction, and Other Testing shall be at the Contractor's
8 expense. Use of Geotechnical firm to be approved by Owner.
- 9 B. Costs of corrective action, costs of "Failing" soils and concrete tests, and cost of testing
10 associated with establishment of mix design are the sole responsibility of the Contractor.
- 11 C. Other testing: Required testing, testing procedures, reports, certificates, and costs associated
12 with all phases of securing required satisfactory test information which may be required by
13 individual sections of Specifications or Drawings are the full responsibility of the Contractor.

14 **1.7 ORDER OF CONSTRUCTION AND CONSTRUCTION SCHEDULE**

- 15 A. Construction operations will be scheduled to allow the Owner uninterrupted operation of
16 existing adjacent facilities.
- 17 1. Coordinate connections with existing work to ensure timely completion of interfaced items.
- 18 B. At no time shall Contractor or his employees modify operation of the existing facilities or start
19 construction modifications without approval of the Owner except in emergency to prevent or
20 minimize damage.
- 21 C. Within 10 days after award of Contract, submit for approval a critical path type baseline
22 schedule.
- 23 1. Account for schedule of Subcontracts.
- 24 2. Include earliest and latest start and finish dates, float time for each task, proper sequence of
25 construction, various crafts, purchasing time, Shop Drawing approval, material delivery,
26 equipment fabrication, and similar time consuming factors
- 27 a. Contractor will be responsible for notifying affected residents of work in a timely
28 manner. Contractor to include this notification in the construction schedule for the
29 related work.
- 30 3. Critical Path Method Network Analysis:
- 31 a. The following CPM schedule outputs will be rejected without further review:
- 32 1) Schedules indicating the start of the critical path at a date point beyond the "Start
33 Date."
- 34 a) Schedules with multiple critical paths.
- 35 b) Schedules indicating a completion date beyond the contractual completion
36 date.
- 37 b. Show the order and interdependence of activities.
- 38 1) The start of an activity shall be dependent on the completion of a preceding
39 activity(ies), with Notice to Proceed being the initial activity.
- 40 2) Limit activities to a maximum of 20 days.
- 41 c. Critical (path) activities are defined to have zero (0) total float.
- 42 D. Evaluate schedule no less than monthly.
- 43 1. Update and correct schedule and submit to Owner's Representative in triplicate with pay
44 application to show rescheduling necessary to reflect true job conditions.
- 45 2. When shortening of various time intervals is necessary to correct for behind schedule
46 conditions, indicate actions to implement to accomplish work in shorter duration.
- 47 3. Information shall be submitted to Owner's Representative and Engineer in writing with
48 revised schedule.

- 1 E. If Contractor does not take necessary action to accomplish work according to schedule,
 2 Contractor may be ordered by Owner in writing to take necessary and timely action to improve
 3 work progress.
 4 1. Owner may require increased work forces, extra equipment, extra shifts or other action as
 5 necessary.
 6 2. Should Contractor refuse or neglect to take such action authorized, under provisions of this
 7 contract, Owner may take necessary actions including, but not necessarily limited to,
 8 withholding of payment and termination of Contract.
- 9 F. Upon receipt of approved "Work Schedule," within 10 days, submit to Owner's Representative
 10 a cost-loaded schedule on compact disc and an estimated payment schedule by each month of
 11 project duration.
 12 1. Include a composite curve to show estimated value of work complete and stored materials
 13 less specified retainage.
 14 2. Establish key months when work will be 50, 80, 90, and 100 percent complete.
 15 3. During the course of work, update with new composite curves at key months or whenever
 16 variation is expected to be more than plus or minus 10 percent.
- 17 G. Provide two-week look-ahead schedules every (2) weeks.

18 **1.8 PROJECT MEETINGS**

- 19 A. Construction Meetings:
 20 1. The Owner's Representative will conduct construction meetings which shall be attended by
 21 the following:
 22 a. Contractor's project manager.
 23 b. Contractor's project superintendent.
 24 c. Owner's designated representative(s).
 25 d. Engineer's designated representative(s).
 26 e. Contractor's subcontractors as appropriate to the Work in progress.
 27 f. Owner's Construction Quality Control Consultant.
 28 2. Meetings will be conducted every two (2) weeks unless otherwise determined by Owner's
 29 Representative.
 30 3. The Owner's Representative will prepare an agenda, take meeting minutes, and submit
 31 copies of meeting minutes to participants and designated recipients identified at the
 32 Preconstruction Conference.
 33 a. Corrections, additions or deletions to the minutes shall be noted and addressed at the
 34 following meeting.
 35 4. The Owner's Representative will schedule meetings for most convenient time frame.
 36 5. The Owner's Representative will have available at each meeting full chronological files of
 37 all previous meeting minutes.
 38 6. The Contractor shall have available at each meeting up-to-date record drawings.

39 **1.9 REFERENCE POINTS AND SURVEYS**

- 40 A. Location and elevation of bench marks are shown on Drawings.
- 41 B. Contractor's Responsibilities:
 42 1. Provide additional survey and layout required to layout the Work.
 43 2. Notify Engineer at least three (3) working days before grade and line information from
 44 Owner is to be required.
 45 3. Check and establish exact location of existing facilities prior to construction of new
 46 facilities and any connections thereto.
 47 4. In event of discrepancy in data or staking provided by Owner, request clarification before
 48 proceeding with Work.
 49 5. Retain professional land surveyor civil engineer registered in the state of Florida who shall
 50 perform or supervise engineering surveying necessary for additional construction staking
 51 and layout.

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- 1 a. Field decisions
- 2 b. Proposal requests
- 3 c. Submittals
- 4 d. Change orders
- 5 e. Applications for payment/Schedule of Values
- 6 f. Contractor quality control
- 7 g. Submittal of Shop Drawings, project data and samples
- 8 7. Adequacy of distribution of Contract Documents
- 9 8. Procedures for maintaining as built and record documents
- 10 9. Use of premises:
- 11 a. Office, work and storage areas
- 12 b. County's requirements
- 13 c. Housekeeping
- 14 10. Temporary construction facilities
- 15 11. Temporary utilities
- 16 12. Safety and first aid procedures
- 17 13. Rules and regulations
- 18 14. Security procedures
- 19 15. Place, date and time for regular progress meetings
- 20 16. Completion time for contract and liquidated damages

21 **1.4 PROGRESS MEETINGS**

- 22 A. The County will schedule progress meetings every month and as required by progress of the
- 23 Work with the first meeting one month after the pre-construction meeting. The County will
- 24 prepare and distribute the meeting minutes within 7 calendar days.
- 25 B. Attendance:
- 26 1. County representative
- 27 2. Contractor's project manager and superintendant
- 28 3. Subcontractors as appropriate to the agenda
- 29 4. Suppliers as appropriate to the agenda
- 30 5. Others as appropriate
- 31 C. The Contractor's representative is to attend the project meetings and have the authority to act on
- 32 behalf of the entity represented on field related matters. Contractor's representative is to study
- 33 previous meeting minutes and current agenda items, in order to be prepared to discuss pertinent
- 34 topics and provide specific information including but not limited to:
- 35 1. Status of submittals and actions necessary to expedite them
- 36 2. Status of activities behind schedule and actions necessary to regain the approved schedule
- 37 3. Status of materials and equipment deliveries and action necessary to expedite materials and
- 38 equipment and maintain the approved schedule
- 39 4. Status of open RFI's and actions necessary to address them
- 40 D. To the maximum extent practicable, the Contractor is to assign the same personnel to represent
- 41 the Contractor at Progress Meetings throughout the progress of the Work.
- 42 E. The Contractor is to provide a current shop drawing submittal log at each progress meeting.
- 43 F. The Contractor is to provide copies of the updated Progress Schedule at each project meeting in
- 44 accordance with the General Conditions
- 45 G. Suggested Agenda:
- 46 1. Review and approve minutes from previous meeting
- 47 2. Review of Work progress since previous meeting to include current as-builts
- 48 3. Contractor's/Subcontractor's workforce and equipment
- 49 4. Progressive As-Built Drawings
- 50 5. Surveyor's submittals
- 51 a. As-Built Asset Attribute Data Table (see Table 01 71 23-2)

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1 **SECTION 01 32 00**
2 **PERMITS AND FEES**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

- 5 A. Section Includes:
6 1. Permits to be obtained by Contractor.
7 2. Permits to be obtained by Owner.

8 **1.2 PERMITS TO BE OBTAINED BY CONTRACTOR**

- 9 A. The Contractor shall obtain and pay for all permits and licenses related to the Work. Permits
10 shall include but not be limited to:
11 1. Stormwater Pollution Associated Permits:
12 a. If required by the Florida Department of Environmental Protection (FDEP) in the
13 Permit Determination obtained by Owner, Contractor shall submit to FDEP the
14 following applications forms and associated fees:
15 1) National Pollutant Discharge Elimination System (NPDES) Notice of Intent (NOI)
16 2) NPDES Notice of Termination (NOT)
17 3) Stormwater Pollution Prevention Plan (SPPP)
18 b. Contractor shall submit copies of the approved SPPP, NPDES NOI and NOT as
19 follows:
20 1) Submit copies to Owner and Engineer
21 2. Dewatering:
22 a. If dewatering will be necessary for excavation or utility installation, the Contractor
23 shall obtain a State of Florida Department of Environmental Protection Generic Permit
24 for the Discharge of Produced Groundwater from Any Non-Contaminated Site Activity
25 (FDEP Document 62-621.300(2)).
26 1) Contractor shall submit copies of the permit and required test results to Owner and
27 Engineer.
28 b. If the Contractor uses an Orange County stormwater system as a point of discharge,
29 Contractor shall obtain approval from Orange County Public Works Department by
30 submitting a notarized letter, signed by the Owner, accepting the dewatering discharge
31 prior to starting the dewatering operations.
32 3. Temporary construction/storage easements
33 4. Any other permits incidental to the Construction and not specified herein to be paid for by
34 the Owner.
35 B. Fee Schedule:
36 1. Contractor shall contact the applicable local authority conferring the permit to inquiry about
37 the current fee schedule for the applicable permits, including any foreseeable fee
38 adjustments during the construction period.

39 **1.3 PERMITS TO BE OBTAINED BY OWNER**

- 40 A. The Owner through the Engineer will file the following permit applications related to the
41 proposed Work:
42 1. Florida Department of Environmental Protection (FDEP) Permit for Constructing a
43 Domestic Wastewater Collection/Transmission System for the gravity sewer along
44 Narcissus Lane, Crocus Street, Delphinium Drive, Grayson Drive, and Buttercup Lane.

- 45 2. Florida Department of Environmental Protection (FDEP) Request for Approval to Place a
46 Domestic Wastewater Collection/Transmission System into Operation for the gravity sewer
47 along Narcissus Lane, Crocus Street, Delphinium Drive, Grayson Drive, and Buttercup
48 Lane.
49 3. Florida Department of Environmental Protection (FDEP) Notice of Intent to Use the
50 General Permit for Construction of Water Main Extensions for PWSs.
51 4. Florida Department of Environmental Protection (FDEP) Certification of Construction
52 Completion and Request for Clearance to Place Permitted PWS Components into Operation.
53 B. All other permits will be the responsibility of the Contractor

54 **PART 2 - PRODUCTS – (NOT APPLICABLE TO THIS SECTION)**

55 **PART 3 - PRODUCTS – (NOT APPLICABLE TO THIS SECTION)**

56

57

END OF SECTION

1 **SECTION 01 32 16**
2 **CONSTRUCTION PROGRESS SCHEDULE**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

- 5 A. Section Includes:
- 6 1. Specific requirements for the preparation, submittal, updating, status reporting and
7 management of the construction Progress Schedule.
- 8 B. Related Specification Sections include, but are not necessarily limited to:
- 9 1. Division 00 - Bidding Requirements, Contract Forms and Conditions of the Contract.
10 2. Division 01 - General Requirements.

11 **1.2 REQUIREMENT**

- 12 A. The Contractor will submit precedence method cost-loaded Critical Path Method (CPM)
13 Progress Schedules to the County depicting the approach to prosecution and completion of the
14 Work. This requirement includes, but is not limited to the Contractor's approach to Activity
15 cost-loading, recovering schedule and managing the effect of changes, substitutions and Delays
16 on Work sequencing.
- 17 B. The Progress Schedule shall show how the Contractor's priorities and sequencing for the Work
18 (or Work remaining) conform to the Contract requirements and the sequences of Work indicated
19 in or required by the Contract Documents; reflect how the Contractor anticipates foreseeable
20 events, site conditions and all other general, local and prevailing conditions that may affect cost,
21 progress, schedule, furnishing and performance of the Work; and show how the Contractor's
22 Means and Methods translate into Activities and logic.
- 23 C. The Progress Schedule will consist of the Initial Submittal, Payment Submittals and Revision
24 Submittals. Upon acceptance by the County, the Initial submittal will become the As-Planned
25 Schedule for the Work. Revision submittals upon acceptance will become the As-Planned
26 Schedule for the Work remaining to be completed as of the submittal date for that Revision.
- 27 D. References to the Critical Path Method (CPM) are to CPM construction industry standards that
28 are consistent with the requirements of this Section.

29 **1.3 DEFINITIONS**

- 30 A. The following definitions shall apply to this Specification Section:
- 31 1. Activity Value (Value) – That portion of the Contract Price representing an appropriate
32 level of payment for the part of the Work designated by the Activity.
- 33 2. As-Planned Schedule – The first, complete Initial Progress Schedule submitted by the
34 Contractor with the intent to depict the entire Work as awarded and accepted by the County
35 or returned as no resubmittal required.
- 36 3. Contract Float – Days between the Contractors anticipated date for completion of the Work,
37 or of a specified portion of the Work, if any, and the corresponding Contract Time.
- 38 4. CPM Schedule – The Progress Schedule based on the Critical Path Method (CPM) of
39 scheduling. The term Critical Path means any continuous sequence of Activities in the
40 Progress Schedule controlling, because of their sum duration, the Early Date of a pertinent,
41 specified Contract Time.
- 42 5. Early/Late Dates – Early/late times of performance, based on CPM calculations, for an
43 Activity in the Progress Schedule. Early Dates will be based on proceeding with all or part
44 of the Work on the date when the corresponding Contract Time commences to run. Late
45 Dates will be based on completing all or part of the Work on the corresponding Contract
46 Time, even if the Contractor plans early completion.

- 1 6. Milestones – Key, pre-determined points of progress in the completion of a facility,
2 denoting interim targets in support of the Contract Times. Milestones may pinpoint targets
3 for key excavation and substructure events, significant deliveries, critical path transition
4 from superstructure to piping and electrical rough-in and building enclosure. Also, hook-up
5 of mechanical and electrical equipment, availability of power for testing, equipment
6 shakedown, training of County personnel, start-up, Substantial Completion and other events
7 of like import.
- 8 7. Official Schedule – The Initial or most recent Revision Submittal accepted by the County or
9 returned as no resubmittal required and the basis for Payment Submittals until another
10 Revision Submittal is submitted and accepted. The accepted Initial Submittal is also the As-
11 Planned Schedule.
- 12 8. Payment Submittal – A monthly Progress Schedule update reflecting progress and minor
13 adjustments on the Activities, sequencing and restraints for Work remaining.
- 14 9. Total Float – Days by which an activity may slip from its Early Dates without necessarily
15 extending a pertinent Contract Time. Total Float at least equals Contract Float. Total Float
16 may also be calculated and reported in working Days. When an activity is delayed beyond
17 Early Dates by its Total Float it becomes a Critical Path activity and if delayed further will
18 impact a Contract Time.

19 **1.4 QUALITY ASSURANCE**

- 20 A. The Contractor may self-perform the Work covered by this Section or employ a Subcontractor,
21 subject to the County's consent. Employment of a scheduling Subcontractor shall not in any way
22 alter or reduce the Contractor's obligations under the Contract Documents.
- 23 B. The Contractor will obtain a written interpretation from the County, if the Contractor believes
24 that the selection of activities, logic ties and/or restraints requires a written interpretation of the
25 Contract Documents. With each submission, the Contractor will point out by specific, written
26 notation, any Progress Schedule feature that may reflect variations from any requirements of the
27 Contract Documents.
- 28 C. It is the Contractor's responsibility to obtain information directly from each Subcontractor and
29 Supplier when scoping their respective Activities, Values, logic ties and restraints.
- 30 D. Neither Acceptance nor Review of any Progress Schedule will relieve the Contractor from the
31 obligation to comply with the Contract Times and any sequence of Work indicated in or required
32 by the Contract Documents and to complete, within the Contract Times, any Work omitted from
33 that Progress Schedule.
- 34 E. Neither Acceptance nor Review of any Progress Schedule will imply approval of any
35 interpretation of or variation from the Contract Documents, unless expressly approved by the
36 County through a written interpretation or by a separate, written notation on the returned
37 Progress Schedule Submittal.

38 **1.5 ALLOWANCES**

- 39 A. Work covered by contractual allowances will be completed within the Contract Times. The
40 Progress Schedule will incorporate the Contractor's best estimate of the activities, logic and
41 restraints required, using the information in the Contract Documents or as indicated by the
42 County in writing.

43 **1.6 MILESTONES AND SCHEDULE RECOVERY**

- 44 A. The County will select Milestones and Milestone Dates on the basis of the As-Planned Schedule.
45 As the Official Schedule is revised, Milestone Dates will be revised accordingly. Milestone
46 Dates will serve as target dates.

- 1 B. Whenever any Activity slips by fourteen (14) or more Days from the Late Date for an activity in
2 the Official Schedule, Milestone Dates selected by the County, or a pertinent Contract Time, the
3 Contractor will deliver a Revision Submittal documenting the Contractor's schedule recovery
4 plan and/or a properly supported request for an extension in the Contract Time. The narrative
5 will identify the Delay and actions taken by the Contractor to recover schedule, whether by
6 adding labor, Subcontractors or construction equipment, activity re-sequencing, expediting of
7 submittals and/or deliveries, overtime or shift Work, and so forth. Activity shortening and
8 overlapping shall be explained as to their basis (and be supported by increases in resources).
- 9 C. Upon evaluation of that Revision Submittal, if the County determines there is sufficient cause,
10 the County may withhold liquidated damages or provide a notice of intent to do so, if schedule is
11 indeed not recovered, and/or may give a notice of default.

12 **1.7 PROGRESS SCHEDULE SOFTWARE**

- 13 A. The scheduling software employed by the Contractor to process the Progress Schedule will be
14 the current version of Primavera P6.0®, or Primavera® Contractor 5.0 CPM scheduling
15 software.
- 16 B. If the Contractor intends to use companion schedule reporting, analysis or graphics software
17 tools, the Contractor will furnish to the County descriptive materials and samples describing
18 such software tools.

19 **1.8 NON-PERFORMANCE**

- 20 A. The County may refuse to recommend all or any part of any payment, if the Contractor fails,
21 refuses or neglects to provide the required Progress Schedule information on a timely basis.
22 Partial payments without a properly updated Progress Schedule shall be returned to the
23 Contractor as non-conforming.
- 24 B. If justified under the circumstances, the County also may prepare alternate Progress Schedules,
25 as appropriate, and deduct from the Contract Amount all related costs by Change Order and/or
26 take other action commensurate with the breach.

27 **1.9 REPORTS, SCHEDULES, AND PLOTS**

- 28 A. Schedule Reports will include Activity (ID) code and description, duration, calendar, Early
29 Dates, Late Dates and Total Float. Separate Schedule Reports will tabulate, for each Activity, all
30 preceding and succeeding logic types and lead times, whether CPM Plots displaying logic ties
31 are appended or not.
- 32 B. CPM Schedule Plots will be plotted on a suitable time scale and identify the Contract Times,
33 Critical Paths, phases and work areas on 24-inch x 36-inch or smaller sheets. Activities will be
34 shown on the Early Dates with Total Floats noted by Late Date flags. For Payment and Revision
35 Submittals plot a target comparison based on the current Official Schedule.
- 36 C. The Activity Value report will tabulate Activity code and description and Activity Value,
37 percent complete and earned value as calculated by the scheduling software. Cash flow plots
38 shall be provided showing the monthly and cumulative actual and planned earned values with
39 curves shown for Early and Late Dates in the schedules. For Payment and Revision Schedule
40 submittals, the cash flow curves shall also plot the most current Official Schedule planned
41 earnings curves.
- 42 D. Each submittal shall include listings of all added and deleted activities, logic, constraints,
43 Activity Value changes and update information vs. the previous Progress Schedule submittal.
44 This list may be manually prepared or generated by accessory software that will generate such
45 listings.

1 **1.10 NARRATIVE REQUIREMENTS**

- 2 A. The Initial Submittal narrative will describe the Contractor’s approach to prosecution of the
3 Work and the basis for determination of activity durations, sequence and logic, including the
4 Contractor's management of the site, e.g., lay down, staging, parking, etc.; Contractor’s phasing
5 of the Work; use of crewing and construction equipment; identification of non-work
6 County/Professional’s, shifts, weekend Work and multiple calendars applied to activities and an
7 explanation of the basis for restraint dates.
- 8 B. Revision and Payment Submittal narratives will explain any changes to the approach or planning
9 referred to in Paragraph A above on account of any change, delay, schedule recovery,
10 substitution and/or Contractor-initiated revision occurring since the previous submittal.
- 11 C. Revision and Payment Submittal narratives will explain any changes to the approach or planning
12 referred to in Paragraph A above on account of any change, delay, schedule recovery,
13 substitution and/or Contractor-initiated revision occurring since the previous submittal.
- 14 D. The Initial Submittal narrative will describe all delays occurring since Contract Award and all
15 pending and anticipated “or equal” and substitution proposals. Payment and Revision Submittals
16 narratives will describe any new delays and shall certify that the Contractor has not been
17 delayed, as of the cut-off date, by any acts or omissions of the County, except as otherwise
18 specifically stated.

19 **1.11 ACTIVITY REQUIREMENTS**

- 20 A. Separate activities will identify permits, design when included in the Work, construction,
21 Submittal preparation and review (and resubmission and re-review), deliveries (site or storage),
22 testing, start-up, commissioning and Punch List. Separate Activities will be used for County-
23 furnished equipment, interfaces with other work and other responsibilities of the County.
- 24 B. Activities will be detailed to the extent required to show the transition of trade Work. Activities
25 will delineate the progression of the Work through mass excavation, substructure, superstructure,
26 equipment installation, start of piping and conduit rough-in, building enclosure, mechanical and
27 electrical equipment hook-up phase, building mechanical, electrical and plumbing (MEP),
28 interior finishes, training of County personnel, equipment checkout & testing and start-up.
- 29 C. Submittal Activities will segregate long-lead items, any item requiring structural access and
30 other procurements that, in the Contractor’s judgment, may bear on the rate of progress. If the
31 Contract Documents require MEP coordination drawings, separate MEP coordination drawing
32 Activities will be used for each floor. Allow time for reviews per Section 01 33 00 “Submittals”
33 and the General Conditions, and revisions and re-submittals. Also include activities for or
34 provide a separate tabular schedule of submittal dates for all Shop Drawings, product data, and
35 samples including County furnished products and the dates reviewed submittals will be required
36 from the County. Indicate decision dates for selection of finishes.
- 37 D. Activities will not combine separate or non-concurrent items of Unit Price or lump sum Work,
38 Work in separate structures and Work in distinct areas, locations or floors within an area or
39 structure; or rough-in and finish Work.
- 40 E. Activity durations will equal the work Days required to sufficiently complete the Work
41 designated by the Activity, (i.e., when finish-to-start successors could start, even if the Activity
42 is not quite 100% complete). Installation Activities will last from ten (10) to forty (40)
43 workdays. Submittal review activity durations shall conform to specified timeframes.
- 44 F. Activities will be assigned consistent descriptions and identification codes. Sort codes will group
45 Activities by building or structure, floor or area, Change Order and other meaningful schemes.

- 1 G. Activities will be assigned Activity Values as appropriate and needed to reasonably allocate the
2 Contract Amount to the time periods that they will be earned and eligible for payment based on
3 the Progress Schedule and Schedule of Values. Separate pay activities may be used to simplify
4 cost-loading of the Progress Schedule. When used, pay activities shall be loaded with the cost of
5 Work that is included, at no cost, in related (generally, concurrent) CPM activities. Pay activities
6 shall not control the rate of progress; however, their start and finish dates shall be consistent with
7 those of their related CPM activities to ensure accurate Early Date and Late Date cash-flow plots

8 **1.12 FLOAT TOLERANCE AND FLOAT OWNERSHIP**

- 9 A. Any Progress Schedule with Early Dates after a Contract Time will yield negative Total and
10 Contract Floats, whether shown/calculated or not. Any Revision Submittal with less than
11 negative twenty (20) Days of Float will be returned as "Revise and Resubmit," unless a time
12 extension is requested or the County assesses liquidated damages or gives notice of intent to do
13 so, in the event schedule is not recovered.
- 14 B. Float calculated from the definitions given in this Section, supersede any conflicting Float values
15 in any early completion Progress Schedule.
- 16 C. Neither the County nor the Contractor own the Float time, the Project owns the Float time.
17 Neither the County nor the Contractor use of positive Total Float will impact a Contract
18 Completion Date or justify an extension of Contract Time.

19 **1.13 SUBMITTALS**

- 20 A. Each Progress Schedule Submittal will consist of a narrative, five (5) copies of the required
21 reports and plots and an optical ROM data disk with the Contractor's corresponding schedule
22 and schedule layout files in Primavera ".XER" format.
- 23 B. The County will review Progress Schedule Submittals and return a review copy within 14 Days
24 after receipt and the Contractor shall, if required, resubmit within 7 Days after return of the
25 review copy.
- 26 C. Requirements for the Initial Submittal:
- 27 1. Within twenty (20) Days after receipt of Notice to Proceed and prior to commencing Work
28 on the Project, prepare and submit to the County the Initial Submittal of the Progress
29 Schedule for the Work. The Initial Submittal will show the Work as awarded, without
30 delays, Change Orders or substitutions.
- 31 a. Activity Values will prorate Schedule of Values costs and/or pay items through to
32 Activities. Provide a cross-reference listing with two parts; a part that will list each
33 activity with the respective amounts allocated from each Schedule of Values and Unit
34 Price Item making up the total value of each activity and a second part that will list the
35 Schedule of Values and Unit Price Items with the respective amounts allocated from
36 each activity that make up the total value of each item.
- 37 2. After the As-Planned Schedule is established, the County will select Milestones and record
38 the Milestone Early and Late Dates. As the Official Schedule evolves, Milestone Dates will
39 be revised accordingly.
- 40 3. If the County refuses to endorse the Initial Submittal (or a resubmission) as "Resubmittal
41 Not Required," the As-Planned Schedule will not be established. In that event, the
42 Contractor will continue to submit Payment and Revision Submittals reflecting progress and
43 the Contractor's approach to remaining Work. The County will rely on the available
44 Payment and Revision Submittals, subject to whatever adjustments it determines
45 appropriate.
- 46 D. Requirements for Payment Submittals:
- 47 1. Payment Submittals with progress up to the closing date and updated Early Dates and Late
48 Dates for progress and remaining Activities will be due with each Progress Payment. As-
49 built data will consist of actual dates, percent complete, earned payment, changes, Delays
50 and other significant events occurring before the closing date.

- 1 2. Activity percent complete and earned value should indicate a level of completion that
2 corresponds to the Application for Progress Payment for the same period. The earned value
3 should be calculated by the scheduling software as Activity Value times percent complete.
4 Explanation should be provided whenever the cumulative earned value of activities in a
5 Payment Submittal is not within 10% of the value of work completed as represented in the
6 corresponding Application for Progress for Payment.
7 3. At the Contractor’s option, a Payment Submittal may overlay minor adjustments on
8 activities and sequencing for Work remaining. This excludes Activity re-scoping to reflect
9 Delays, changes, schedule recovery or substitutions.

10 E. Requirements for Revision Submittals:

- 11 1. Revision Submittals will be submitted when necessary because of major changes or delays
12 affecting activities, sequencing or restraints for Work remaining and/or to put forth a
13 schedule recovery plan. Revision Submittals may also be required because of Contractor-
14 initiated re-planning, or when Contractor plans to perform Work ahead or out-of-sequence
15 that will require additional testing or inspection personnel, or when requested by the County
16 when Work is performed out-of-sequence from the current Official Schedule such that the
17 number of Days gained or lost can not be determined or the scheduled dates of completion
18 of the Work in a Payment Submittal are not viewed as reliable.
19 2. If requesting a time extension, the Revision Submittal should show the impact of the delay
20 after incorporating reasonable mitigation to minimize the impact and illustrate how the
21 number of Days requested time extension was determined. The delay should be determined
22 as the change in the forecast Contract Completion Date(s) resulting solely from delays that
23 entitle the Contractor to a time extension as provided in the General Conditions. Any and all
24 Contractor slippage and delay occurring prior to and concurrent with the delay potentially
25 entitling the Contractor to a time extension shall be incorporated in the Revision and
26 explained such that the concurrent and non-concurrent periods of delay are indicated. If the
27 Contractor does not follow the procedures contained in this Section or, if the Contractor's
28 analysis is not verifiable by an independent, objective evaluation by the County using the
29 electronic files and data furnished by the Contractor, any such extension in Contract Time
30 will not be granted.

31 F. Retrospective Delay Analysis:

- 32 1. If the County/Professional refuses to endorse any Revision Submittal as “Resubmittal Not
33 Required,” the Contractor and County will use the latest Official Schedule when evaluating
34 the effect of Delays on Contract Time and/or Contract Price. The procedure to be used will
35 consist of progressively updating the latest Official Schedule at key closing dates
36 corresponding to starting and finishing dates of the delays and/or dates the delays became
37 critical or dates the Critical Path may have changed for other reasons. For each Progress
38 Schedule iteration, slippage between actual Milestone Dates and Initial Milestone Dates will
39 be correlated to Delays occurring solely in that iteration.
40 2. For each iteration, revisions in Activities, logic ties and restraints affecting Work after the
41 closing date will be included in that Progress Schedule only if they meet any of the
42 following conditions. First, they are Progress Schedule revisions that the County consented
43 to contemporaneously (i.e., before the closing date) in writing. Second, they reflect
44 comments or objections raised by or on behalf of the County and that were actually
45 confirmed by the as-built progress. Lastly, they represent Contractor’s schedule recovery
46 plans or other Progress Schedule revisions that were actually confirmed by the as-built
47 progress.

48 **PART 2 - PRODUCTS - (NOT APPLICABLE TO THIS SECTION)**

49 **PART 3 - EXECUTION - (NOT APPLICABLE TO THIS SECTION)**

50 **END OF SECTION**

1 **SECTION 01 33 00**
2 **SUBMITTALS**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

- 5 A. Section Includes:
- 6 1. Mechanics and administration of the submittal process for:
 - 7 a. Shop Drawings.
 - 8 b. Samples.
 - 9 c. Miscellaneous submittals.
 - 10 2. General content requirements for Shop Drawings.

11 **1.2 DEFINITIONS**

- 12 A. Shop Drawings:
- 13 1. See General Conditions.
 - 14 2. Product data and samples are Shop Drawing information.
- 15 B. Miscellaneous Submittals:
- 16 1. Submittals other than Shop Drawings.
 - 17 2. Representative types of miscellaneous submittal items include but are not limited to:
 - 18 a. Construction schedule.
 - 19 b. Concrete, soil compaction, and pressure test reports.
 - 20 c. Installed equipment and systems performance test reports.
 - 21 d. Manufacturer's installation certification letters.
 - 22 e. Warranties.
 - 23 f. Construction photographs.
 - 24 g. Survey data.
 - 25 h. Cost breakdown (Schedule of Values).

26 **1.3 SUBMITTAL SCHEDULE**

- 27 A. Schedule of Shop Drawings:
- 28 1. Submitted and approved within 30 days of receipt of Notice to Proceed.
 - 29 2. Account for multiple transmittals under any Specification Section where partial submittals
30 will be transmitted.
- 31 B. Shop Drawings: Submittal and approval of all planned shop drawings prior to 50 percent
32 completion.

33 **1.4 PREPARATION OF SUBMITTALS**

- 34 A. General:
- 35 1. All submittals and all pages of all copies of a submittal shall be completely legible.
 - 36 2. Submittals which, in the Engineer's sole opinion, are illegible will be returned without
37 review.
- 38 B. Shop Drawings:
- 39 1. Scope of any submittal and letter of transmittal:
 - 40 a. Limited to one (1) Specification Section.
 - 41 b. Do not submit under any Specification Section entitled (in part) "Basic Requirements"
42 unless the product or material submitted is specified, in total, in a "Basic
43 Requirements" Section.
 - 44 2. Numbering letter of transmittal:

- 1 a. Include as prefix the Specification Section number followed by a series number, "-xx",
- 2 beginning with "01" and increasing sequentially with each additional transmittal.
- 3 b. If more than one (1) submittal under any Specification Section, assign consecutive
- 4 series numbers to subsequent transmittal letters.
- 5 3. Describing transmittal contents:
- 6 a. Provide listing of each component or item in submittal capable of receiving an
- 7 independent review action.
- 8 b. Identify for each item:
- 9 1) Manufacturer and Manufacturer's Drawing or data number.
- 10 2) Contract Document tag number(s).
- 11 3) Unique page numbers for each page of each separate item.
- 12 c. When submitting "or-equal" items that are not the products of named manufacturers,
- 13 include the words "or-equal" in the item description.
- 14 4. Contractor stamping:
- 15 a. General:
- 16 1) Contractor's review and approval stamp shall be applied either to the letter of
- 17 transmittal or a separate sheet preceding each independent item in the submittal.
- 18 a) Contractor's signature and date shall be wet ink signature.
- 19 b) Shop Drawing submittal stamp shall read "(Contractor's Name) has satisfied
- 20 Contractor's obligations under the Contract Documents with respect to
- 21 Contractor's review and approval".
- 22 c) Letters of transmittal may be stamped only when the scope of the submittal is
- 23 one (1) item.
- 24 2) Submittals containing multiple independent items shall be prepared with an index
- 25 sheet for each item listing the discrete page numbers for each page of that item, which
- 26 shall be stamped with the Contractor's review and approval stamp.
- 27 a) Individual pages or sheets of independent items shall be numbered in a manner
- 28 that permits Contractor's review and approval stamp to be associated with the
- 29 entire contents of a particular item.
- 30 b. Electronic stamps:
- 31 1) Contractor may electronically embed Contractor's review and approval stamp to either
- 32 the letter of transmittal or a separate index sheet preceding each independent item in
- 33 the submittal.
- 34 2) Contractor's signature and date on electronically applied stamps shall be wet ink
- 35 signature.
- 36 5. Resubmittals:
- 37 a. Number with original root number and a suffix letter starting with "A" on a (new)
- 38 duplicate transmittal form.
- 39 b. Do not increase the scope of any prior transmittal.
- 40 c. Account for all components of prior transmittal.
- 41 1) If items in prior transmittal received "A" or "B" Action code, list them and indicate
- 42 "A" or "B" as appropriate.
- 43 a) Do not include submittal information for items listed with prior "A" or "B"
- 44 Action in resubmittal.
- 45 2) Indicate "Outstanding-To Be Resubmitted At a Later Date" for any prior "C" or "D"
- 46 Action item not included in resubmittal.
- 47 a) Obtain Engineer's approval to exclude items.
- 48 6. For 8-1/2 x 11 IN, 8-1/2 x 14 IN, and 11 x 17 IN size sheets, provide five (5) copies of each
- 49 page for County and Engineer plus the number required by the Contractor.
- 50 a. The number of copies required by the Contractor will be defined at the Preconstruction
- 51 Conference, but shall not exceed five (5).
- 52 b. All other size sheets:
- 53 1) Submit one (1) reproducible transparency or high resolution print and one (1)
- 54 additional print of each Drawing until approval is obtained.
- 55 2) Utilize mailing tube; do not fold.

- 1 3) The Engineer will mark and return the reproducible to the Contractor for his
2 reproduction and distribution.
- 3 7. Provide clear space (3 IN SQ) for Engineer stamping of each component defined in
4 PREPARATION OF SUBMITTALS – Contractor Stamping.
- 5 8. Contractor shall not use red color for marks on transmittals.
- 6 a. Duplicate all marks on all copies transmitted, and ensure marks are photocopy
7 reproducible.
- 8 b. Outline Contractor marks on reproducible transparencies with a rectangular box.
- 9 9. Transmittal contents:
- 10 a. Coordinate and identify Shop Drawing contents so that all items can be easily verified
11 by the Engineer.
- 12 b. Identify equipment or material use, tag number, Drawing detail reference, weight, and
13 other Project specific information.
- 14 c. Provide sufficient information together with technical cuts and technical data to allow
15 an evaluation to be made to determine that the item submitted is in compliance with the
16 Contract Documents.
- 17 d. Submit items such as equipment brochures, cuts of fixtures, product data sheets or
18 catalog sheets on 8-1/2 x 11 IN pages.
- 19 1) Indicate exact item or model and all options proposed.
- 20 e. When a Shop Drawing submittal is called for in any Specification Section, include as
21 appropriate, scaled details, sizes, dimensions, performance characteristics, capacities,
22 test data, anchoring details, installation instructions, storage and handling instructions,
23 color charts, layout Drawings, rough-in diagrams, wiring diagrams, controls, weights
24 and other pertinent data in addition to information specifically stipulated in the
25 Specification Section.
- 26 1) Arrange data and performance information in format similar to that provided in
27 Contract Documents.
- 28 2) Provide, at minimum, the detail specified in the Contract Documents.
- 29 f. If proposed equipment or materials deviate from the Contract Drawings or
30 Specifications in any way, clearly note the deviation and justify the said deviation in
31 detail in a separate letter immediately following transmittal sheet.
- 32 10. Samples:
- 33 a. Identification:
- 34 1) Identify sample as to transmittal number, manufacturer, item, use, type, project
35 designation, tag number, standard Specification Section or Drawing detail reference,
36 color, range, texture, finish and other pertinent data.
- 37 2) If identifying information cannot be marked directly on sample without defacing or
38 adversely altering samples, provide a durable tag with identifying information
39 securely attached to the sample.
- 40 b. Include application specific brochures, and installation instructions.
- 41 c. Provide Contractor's stamp of approval on samples or transmittal form as indication of
42 Contractor's checking and verification of dimensions and coordination with interrelated
43 work.
- 44 d. Resubmit samples of rejected items.
- 45 C. Miscellaneous Submittals:
- 46 1. Prepare in the format and detail specified in Specification requiring the miscellaneous
47 submittal.

48 **1.5 TRANSMITTAL OF SUBMITTALS**

- 49 A. Shop Drawings and Samples:
- 50 1. Transmit all submittals to:

HDR
315 E. Robinson St., Suite 400
Orlando, FL 32801
Attn: Chandler Wilson

- 1 2. Utilize attached Exhibit "A" or other County approved transmittal to transmit all Shop
- 2 Drawings and samples.
- 3 3. All submittals must be from Contractor.
- 4 a. Submittals will not be received from or returned to subcontractors/material suppliers.
- 5 4. Provide submittal information defining specific equipment or materials utilized on the
- 6 Project.
- 7 a. Generalized product information, not clearly defining specific equipment or materials
- 8 to be provided, will be rejected.
- 9 B. Miscellaneous Submittals:
- 10 1. Transmit under Contractor's standard letter of transmittal or letterhead.
- 11 2. Submit five (5) copies for County and Engineer, or as specified in individual Specification
- 12 Section.
- 13 3. Transmit to:
 - HDR
 - 315 E. Robinson St., Suite 400
 - Orlando, FL 32801
 - Attn: Chandler Wilson
- 14
- 15 4. Provide copy of letter of transmittal with attachments to Owner's Representative.
- 16 a. Exception for concrete, soils compaction and pressure test reports.
- 17 1) Transmit one (1) copy of test reports to Project Engineer.
- 18 2) Transmit one (1) copy of test reports to location and individual indicated above for
- 19 other miscellaneous submittals.
- 20 C. Expedited Return Delivery:
- 21 1. Include prepaid express envelope or airbill in submittal transmittal package for any
- 22 submittals Contractor expects or requires express return mail.
- 23 2. Inclusion of prepaid express envelope or airbill does not obligate Engineer to conduct
- 24 expedited review of submittal.
- 25 D. Electronic submittals will not be accepted.
- 26 E. Fax Transmittals:
- 27 1. Permitted on a case-by-case basis to expedite review when approved by Engineer.
- 28 2. Requires hard copy transmittal to immediately follow.
- 29 a. Engineer will proceed with review of fax transmittal.
- 30 b. Engineer's approval or rejection comments will be recorded and returned on hard copy
- 31 transmittal.
- 32 3. Provisions apply to both:
- 33 a. Initial transmittal contents.
- 34 b. Supplemental information required to make initial transmittal contents complete.

35 1.6 ENGINEER'S REVIEW ACTION

- 36 A. Shop Drawings and Samples:
- 37 1. Items within transmittals will be reviewed for overall design intent and will receive one of
- 38 the following actions:
- 39 a. A - FURNISHED AS SUBMITTED.
- 40 b. B - FURNISHED AS NOTED (BY ENGINEER).
- 41 c. C - REVISE AND RESUBMIT.
- 42 d. D - REJECTED.
- 43 e. E - ENGINEER'S REVIEW NOT REQUIRED.
- 44 2. Submittals received will be initially reviewed to ascertain inclusion of Contractor's approval
- 45 stamp.
- 46 a. Submittals not stamped by the Contractor or stamped with a stamp containing language
- 47 other than that specified herein will not be reviewed for technical content and will be
- 48 returned without any action.

- 1 3. In relying on the representation on the Contractor's review and approval stamp, Owner and
2 Engineer reserve the right to review and process poorly organized and poorly described
3 submittals as follows:
- 4 a. Submittals transmitted with a description identifying a single item and found to contain
5 multiple independent items:
- 6 1) Review and approval will be limited to the single item described on the transmittal
7 letter.
- 8 2) Other items identified in the submittal will:
- 9 a) Not be logged as received by the Engineer.
- 10 b) Be removed from the submittal package and returned without review and
11 comment to the Contractor for coordination, description and stamping.
- 12 c) Be submitted by the Contractor as a new series number, not as a re-submittal
13 number.
- 14 b. Engineer, at Engineer's discretion, may revise the transmittal letter item list and
15 descriptions, and conduct review.
- 16 1) Unless Contractor notifies Engineer in writing that the Engineer's revision of the
17 transmittal letter item list and descriptions was in error, Contractor's review and
18 approval stamp will be deemed to have applied to the entire contents of the
19 submittal package.
- 20 4. Submittals returned with Action "A" or "B" are considered ready for fabrication and
21 installation.
- 22 a. If for any reason a submittal that has an "A" or "B" Action is resubmitted, it must be
23 accompanied by a letter defining the changes that have been made and the reason for
24 the resubmittal.
- 25 b. Destroy or conspicuously mark "SUPERSEDED" all documents having previously
26 received "A" or "B" Action that are superseded by a resubmittal.
- 27 5. Submittals with Action "A" or "B" combined with Action "C" (Revise and Resubmit) or
28 "D" (Rejected) will be individually analyzed giving consideration as follows:
- 29 a. The portion of the submittal given "C" or "D" will not be distributed (unless previously
30 agreed to otherwise at the Preconstruction Conference).
- 31 1) One (1) copy or the one (1) transparency of the "C" or "D" Drawings will be
32 marked up and returned to the Contractor.
- 33 a) Correct and resubmit items so marked.
- 34 b. Items marked "A" or "B" will be fully distributed.
- 35 c. If a portion of the items or system proposed are acceptable, however, the major part of
36 the individual Drawings or documents are incomplete or require revision, the entire
37 submittal may be given "C" or "D" Action.
- 38 1) This is at the sole discretion of the Engineer.
- 39 2) In this case, some Drawings may contain relatively few or no comments or the
40 statement, "Resubmit to maintain a complete package."
- 41 3) Distribution to the Owner and field will not be made (unless previously agreed to
42 otherwise).
- 43 6. Failure to include any specific information specified under the submittal paragraphs of the
44 Specifications will result in the submittal being returned to the Contractor with "C" or "D"
45 Action.
- 46 7. Calculations required in individual Specification Sections will be received for information
47 purposes only, as evidence calculations have been performed by individuals meeting
48 specified qualifications, and will be returned stamped "E. Engineer's Review Not Required"
49 to acknowledge receipt.
- 50 8. Transmittals of submittals which the Engineer considers as "Not Required" submittal
51 information, which is supplemental to but not essential to prior submitted information, or
52 items of information in a transmittal which have been reviewed and received "A" or "B"
53 Action in a prior submittal, will be returned with Action "E. Engineer's Review Not
54 Required."
- 55 9. Samples may be retained for comparison purposes.
- 56 a. Remove samples when directed.

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SECTION 01 42 13
ABBREVIATIONS AND SYMBOLS

3 **PART 1 - GENERAL**

4 **1.1 UNITS OF MEASUREMENT**

CU FT	cubic feet
CU IN	cubic inch(es)
CY	cubic yard(s)
°C	degree(s) Centigrade
°F	degree(s) Fahrenheit
F	Fahrenheit
FT	feet, foot
G	gram(s)
GA	gage
GAL	gallon(s)
GPH	gallon(s) per hour
GPM	gallon(s) per minute
GPS	gallon(s) per second
HR	hour(s)
IN	inch(es)
IPS	iron pipe size
KG	kilogram(s)
L	liter(s)
LB	pound(s)
LBF-IN	pound (force) inch
LF	linear foot, linear feet
MIN. min.	minute(s), minimum
ml	milliliter
MO	month(s)
OZ	ounce(s)
QT	quart
RH	relative humidity
SF	square foot, square feet
SQ IN	square inch(es)
YD	yard(s)
YR	year(s)

5 **1.2 TERMINOLOGY**

@	at
AB	anchor bolt
ADJ	adjust, adjustable
ADMIN	administration
AFG	above finished grade
AGGR	aggregate
AL	aluminum
ALT	alternate
APPX	appendix
APX	approximate
ART	article
ASPH	asphalt

ASSY	assembly
AUTO	automatic
AUX	auxiliary
AVE	avenue
AVG	average
AWG	American Wire Gage
BAR	barrier
BCCMP	bituminous coated corrugated metal pipe
BL	base line
BLDG	building
BLKG	blocking
BM	beam
C to C	center to center
CCB	concrete block, masonry
CEM	cement
CIP	cast iron pipe, cast in place
CJ	construction joint
CL	center line, clearance
CM	Construction Manager
CMP	corrugated metal pipe
CO	cleanout
CONC	concrete
CONN	connection
CONST	construction
CONT	continuous
CONTR	contractor
CU, COP	copper
ORR	corridor
CRIT	critical
CTD	coated
CTR	center
CULV	culvert
d	delta
DBL	double
DEM	demolition, demolish
DEPT	department
DET	detail
DIA, D	diameter
DIAG	diagonal
DIM	dimension
DWG	drawing
FEM	female
FUT	future
FV	field verify
FM	force main
FH, HYD	fire hydrant
ID	inside diameter
MAS	masonry
MATL	material
MAX	maximum
MFD	manufactured
MFG	manufacturing
MFR	manufacturer

MH	manhole, metal hallide
MIN	minimum
MISC	miscellaneous
MTL	material
NAT	natural
NATL	national
NOM	nominal
NTS	not to scale
OD	outside diameter
PP	power pole
R	radius
Rd	road
REIN	reinforce
REL A	relief air
REQD	required
REV	revision
RR	railroad
R/W	right-of-way
RWM	reclaimed water main
RY	railway
SAN	sanitary
SCH	schedule
SECT	section
SLV	sleeve
SQ	square
SST	stainless steel
ST	street
STA	station
STD	standard
SURF	surface
SUSP	suspend(ed)
SYM	Symbol, symmetrical
SYS	system
TEMP	Temperature, temporary
TYP	typical
UTIL	utility
W	West
WLD	welded
WM	water main
W/O	without
WT	weight
YD	yard
YR	year
Y W	wye

1 **1.3 ORGANIZATIONS AND STANDARDS**

- 2 ANSI American National Standards Institute
3 ASCE American Society of Civil Engineers
4 ASHRAE American Society of Heating, Refrigeration and Air Conditioning Engineers, Inc.
5 ASME American Society of Mechanical Engineers
6 ASTM ASTM International
7 AWWA American Water Works Association
8 CS Commercial Standard (U.S.Department of Comm.)
9 FM FM Global

1	FS	Federal Specification
2	IEEE	Institute of Electrical and Electronic Engineers
3	IES	Illuminating Engineering Society
4	IPCEA	Insulated Power Cable Engineers Association
5	NBS	National Bureau of Standards
6	NEC	National Electrical Code
7	NECA	National Electrical Contractors Association
8	NECS	National Electrical Code Standards
9	NEMA	National Electrical Manufacturers Association
10	NFPA	National Fire Protection Association
11	NSF	National Science Foundation
12	SMACNA	Sheet Metal and Air Conditioning National Contractors Association, Inc.
13	UL	Underwriters Laboratories, Inc.

14

END OF SECTION

1 **SECTION 01 50 16**
2 **COLLECTION SYSTEM BYPASS**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

- 5 A. The Work covered by this section consists of providing all temporary bypassing to perform all
6 operations in connection with the flow of wastewater around pipe segment(s) or pump stations.
7 The purpose of bypassing is to prevent wastewater overflows and provide continuous service to
8 all wastewater customers. The Contractor shall maintain wastewater flow in the construction
9 area in order to prevent backup and/or overflow and provide reliable wastewater service to the
10 users of the wastewater system at all times.

11 **PART 2 - PRODUCTS**

12 **2.1 GENERAL**

- 13 A. The Contractor shall provide and maintain adequate equipment, piping, tankers, and other
14 necessary appurtenances in order to maintain continuous and reliable wastewater service in all
15 wastewater lines as required for construction. The Contractor shall have tankers, backup
16 pump(s), piping, and appurtenances

17 **PART 3 - EXECUTION**

18 **3.1 GENERAL**

- 19 A. The Contractor shall have all materials, equipment and labor necessary to complete the repair,
20 replacement, or rehabilitation on the job site prior to isolating the gravity main segment,
21 manhole, or pump station. The Contractor shall demonstrate that the pumping system is in good
22 working order and is sufficiently sized to successfully handle flows by performing a test run for
23 a period of 24 hours prior to beginning the work

24 **3.2 TRAFFIC CONSIDERATIONS**

- 25 A. The Contractor shall locate bypass pumping suction and discharge lines so as to not cause undue
26 interference with the use of streets, private driveways, and alleys to include the possible
27 temporary trenching of piping at critical intersections. Ingress and egress to adjacent properties
28 shall be maintained at all times. Ramps, steel plates or others methods shall be deployed by the
29 Contractor to facilitate traffic over methods.

30 **3.3 BYPASS PLAN**

- 31 A. The Contractor shall submit to the County a comprehensive written plan for approval and
32 acceptance that describes the intended bypass for the maintenance of flows during construction.
33 The Contractor shall also provide a sketch showing the location of bypass pumping equipment
34 for each pump station or line segment(s) around which flows are being bypassed. The plan shall
35 include any proposed tanker(s), pump(s), bypass piping, backup plan and equipment, work
36 schedule, monitoring log for bypass pumping, monitoring plan of the bypass pumping operation,
37 and maintenance of traffic plan. The Contractor shall cease bypass operations and return flows to
38 the new and/or existing sewer when directed by the County. All piping shall be designed to
39 withstand at least twice the maximum system pressure or a minimum of 50 psi whichever is
40 greater. During bypassing, no wastewater shall be leaked, dumped, or spilled in or onto, any area

1 outside of the existing wastewater system. When bypass operations are complete, all bypass
2 piping shall be drained into the wastewater system prior to disassembly.

3 **3.4 BYPASS OPERATION**

- 4 A. The County shall accept the bypass plan prior to implementation of the bypass. The Contractor
5 shall plug off and pump down the sewer manhole or line segment in the immediate work area
6 and shall maintain the wastewater system so that surcharging does not occur.
- 7 B. Where work requires the line to be blocked beyond working hours and bypass pumping is being
8 utilized, the Contractor shall be responsible for monitoring the bypass operation 24 hours per
9 day, 7 days per week. If accepted in the bypass plan by the County, any electronic monitoring in
10 lieu of on-site monitoring must be detailed in the comprehensive written plan and approved by
11 the County.
- 12 C. The Contractor shall ensure that no damage will be caused to private property as a result of
13 bypass pumping operations. The Contractor shall complete the work as quickly as possible and
14 satisfactorily pass all tests, inspections and repair all deficiencies prior to discontinuing
15 bypassing operations and returning flow to the sewer manhole or line segment.
- 16 D. The Contractor shall immediately notify the County should a sanitary sewer overflow occur and
17 take the necessary action to clean up and disinfect the spillage to the satisfaction of the County
18 or other governmental agency. If sewage is spilled onto public or private property, the
19 Contractor shall wash down, clean up and disinfect the spillage to the satisfaction of the County.
20 When bypassing a pump station, one back-up pump equal to the primary unit shall be required.
21 Bypass pumps shall have a maximum rating of 55 decibels for sound attenuation.

22 **3.5 CONTROL LIABILITY**

- 23 A. The Contractor shall be responsible for all required pumping, equipment, piping, and
24 appurtenances to accomplish the bypass and for any and all damage that results directly or
25 indirectly from the bypass pumping equipment, piping and/or appurtenances. The Contractor
26 shall also be liable for all County personnel and equipment costs, penalties and fines resulting
27 from sanitary sewer overflows. It is the intent of these specifications to require the Contractor to
28 establish adequate bypass pumping as required regardless of the flow condition.

29 **END OF SECTION**

- 1 B. Prior to operation of permanent equipment for temporary purposes, verify that installation is approved
2 for operation, equipment is lubricated and temporary filters are in place. Provide and pay for operation,
3 maintenance, and regular replacement of filters and worn or consumed parts.
- 4 C. Maintain minimum ambient temperature of 50°F (degrees) and maximum relative humidity of
5 50% in areas where Construction is closed in and final finishes are to be placed, unless indicated
6 otherwise in specifications.

7 **1.5 TEMPORARY VENTILATION**

- 8 A. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent
9 accumulation of dust, fumes, vapors, or gases.

10 **1.6 TEMPORARY WATER SERVICE**

- 11 A. Provide, maintain, and pay for suitable quality water service required for Construction
12 operations. Coordinate with the County if water supply is not separately metered. Pay all costs
13 and expenses associated with such use.
- 14 B. Extend branch piping with outlets located so water is available by hoses with threaded
15 connections.

16 **1.7 TEMPORARY SANITARY FACILITIES**

- 17 A. Provide and maintain required facilities and enclosures on-site. Maintain daily in clean and
18 sanitary condition. Adjacent County office building toilet facilities are not to be used by
19 Contractor.

20 **1.8 BARRIERS**

- 21 A. Provide barriers to prevent unauthorized entry to Construction areas and to protect existing
22 facilities and adjacent properties from damage from Construction operations.
- 23 B. Provide barricades required by governing authorities for public rights-of-way.
- 24 C. Provide protection for plant life designated to remain. Replace damaged plant life.
- 25 D. Protect non-owned vehicular traffic, stored materials, site and structures from damage.

26 **1.9 FENCING**

- 27 A. Unless directed otherwise in other sections of the Contract Documents, provide a 6-foot high fence
28 completely around Construction site; provided with hinged vehicular and pedestrian gates with locks.
29 Fencing will be galvanized, 2-inch mesh, chain link with solid top rail. Provide line posts and end posts
30 as needed to maintain stretched and uniform fencing with no sags.
- 31 B. Fencing plan will be approved by the County for each phase of the project. Submit fencing
32 layout diagram prior to the Pre-Construction meeting.
- 33 C. Provide visual fabric barrier at least 6-foot high on all fencing separating parking areas from
34 Construction activities. Submit barrier fabric for approval before starting fencing. Barrier fabric will be
35 capable of retaining physical integrity and color during the entire Construction period.

36 **1.10 ACCESS ROADS**

- 37 A. Provide and maintain uninterrupted public access to existing buildings. Construction activities
38 will not interfere with access. If Contractor fails to maintain public access after two (2) written
39 notices within a 24-hour period, the County reserves the right to correct such situation and back
40 charge the Contractor.
- 41 B. Construct and maintain temporary roads accessing public thoroughfares to serve Construction
42 area.

- 1 C. Extend and relocate access roads as Work progress requires. Provide detours necessary for
2 unimpeded traffic flow.
- 3 D. Provide and maintain access to fire hydrants, free of obstructions.
- 4 E. Designated existing on-site roads may be used for Construction traffic. Repair or restore any
5 damaged areas caused as a result of Construction activity. Such repair will be to a like-new
6 condition.

7 **1.11 PARKING**

- 8 A. Provide temporary surface parking areas to accommodate Construction personnel.
- 9 B. Do not allow Construction vehicle parking on existing pavement unless approved by County.

10 **1.12 FIELD OFFICES (FOR UTILITIES DEPARTMENT)**

- 11 A. Promptly after starting Work, the Contractor will provide and maintain one (1) field office for
12 the use of the County until Substantial Completion.
- 13 B. The field offices will be an appropriate size required for the use of the County, as well as contain
14 two offices and three desks. The field office structure will be a minimum of 10-feet x 40-feet.
15 The layout of the County's field office will include adequate space to hold project meetings
16 (minimum seating for 15).
- 17 C. Installation of the field offices will meet all local codes and ordinances. The Contractor will as a
18 minimum install the structures on a level, well-drained area. Structures will be designed and
19 installed to resist 130-mph winds or applicable State of Florida code, whichever is more
20 stringent.
- 21 D. The field offices will be provided with structurally sound and safe steps and landings for each
22 door. The doors will have secure locks. Construct appropriate walkway and landings.
23 Construct covers over each door that extends 3-feet from the building and the full width of the
24 landing.
- 25 E. The field offices will be designated as a "No Smoking Area."
- 26 F. The windows will be arranged for cross ventilation with screens.
- 27 G. Provide air conditioning and heating systems with thermostat control.
- 28 H. Provide electric power for the duration of the Work.
- 29 I. The Contractor will provide the following with the field office, at a minimum:
30 1. Electric lights (50 foot-candles at desktop height) and power supply outlets.
31 2. Private telephone line for each facsimile/answering machine and telephone instrument.
32 Telephone outlets and instruments to be provided at each work station/desk area.
33 3. All monthly telephone charges and installation fees will be paid by the Contractor.
34 Maintain the telephone service, including maintenance and repairs, for the duration of the
35 Work.
36 4. When available, provide high-speed Internet access to all desks for the duration of the
37 Work.
38 5. Acceptable toilet facilities with appropriate signage that meet all of the local and State
39 health codes and regulations.
40 6. Fire extinguisher (Halon type, minimum 4 lb. capacity).
41 7. Water coolers, bottled water and paper cups.
42 8. Tables for viewing the Project Drawings.
43 9. Standard office supplies.
44 10. Weekly janitorial services.
45
46

1 **1.13 SPECIFIC REQUIREMENTS FOR THE FIELD OFFICES**

2 Provide the following for the exclusive use of the County: (Unless otherwise noted, the quantity
3 should be sufficient for the duration of the Work.)

- 4 A. Office Furnishings: The furniture will be delivered and placed as directed by the County.
- 5 B. Desks: Flat top, double pedestal, with one box and one file drawer in each pedestal, 60-inches by
6 30-inches. Total quantity will be three (3).
- 7 C. Chairs: Three (3) office-type chairs, adjustable heights, on rollers, with armrests.
- 8 D. Conference Table and Chairs: One (1) table (3' x8' minimum), scratch and stain resistant and
9 fifteen (15) meeting-type chairs.
- 10 E. Drawing Table: Two (2) plywood or standard drawing tables, 3-feet by 6-feet, with all required
11 appurtenances and two (2) extended height stools suitable for use at the drawing tables.
- 12 F. Printer: One (1) color printer with capability to copy, scan, and print pages up to and including
13 11-inch by 17-inch with autofeeding capability. The color printer will have a minimum color
14 print speed of 10-pages per minute. All warranties, maintenance, servicing and sufficient
15 appropriate ink/toner cartridges and paper for the duration of the Work.
- 16 G. One (1) each refrigerator, microwave, coffee machine, and toaster oven.
- 17 H. Computer Systems and Software:
- 18 1. One (1) complete HP Desktop Computer with Intel Dual Core Processor, 3.0 GHz processor
19 speed, 1.0 GB memory, 4 GB memory upgrade, 250 GB hard drive capacity, Windows XP
20 Media Center Edition 2005 operating system, or equal, including a warranty to cover the
21 duration of the Work.
- 22 2. One (1) HP 17-inch LCD flat panel monitors, including a warranty to cover the duration of
23 the Work.
- 24 3. One (1) surge protectors, monitor wipes, and compressed gas duster in sufficient quantities
25 for the duration of the Work.
- 26 4. The latest version of Windows software, as required, for the operation of each computer
27 system. The software will include the latest versions of Microsoft Office Professional
28 (Word, Excel, Access, PowerPoint, Publisher, Outlook, etc.), Visio Professional, Adobe
29 Acrobat latest version, Norton Virus Protection (with annual renewal of updates), Audio and
30 DVD Player, Expedition (or appropriate software to be compatible with the Contractor's
31 Management Plan) and an Internet Browser.
- 32 5. One (1) copy of Primavera P6.0®, or Primavera® Contractor 5.0 CPM scheduling software,
33 depending on the system being used for the Progress Schedule, by Primavera Systems, Inc.,
34 Bala Cynwyd, PA.
- 35 6. Install and maintain for the duration of the Contract an office network that allows all
36 computers to access the Internet with appropriate WiFi router and security firewalls, print to
37 the network printers, and file documents on a common server of at least 300 GB capacity.
38 Provide separate network hard drive backup system of sufficient size using appropriate
39 software loaded on each computer that will backup each changed file. Provide Information
40 Technology (IT) support to respond promptly (within two business hours) to network,
41 connectivity or computer related problems.
- 42 I. File Cabinets, Storage, Bookcases:
- 43 1. Three (3) Lateral Files: HON 600 Series, or equal, 42-inch wide, four-drawer.
- 44 2. Two (2) steel vertical, hanging mobile plan stands, with approximately 12-hanging clamps.
45 Provide all required clamps, of sufficient length to hold the Contract Drawings.
- 46 3. Storage: two (2) industrial grade steel cabinets, locking handles, 36-inches wide by 18-
47 inches deep by 72-inches high.
- 48 4. Bookcases: three (3) HON metal bookcases, or equal, 34-1/2-inches wide by 12-5/8-inches
49 deep by 71-inches high, color to be selected by the Engineer.
- 50

- 1 J. Miscellaneous Field Supplies:
2 1. One (1) minimum/maximum digital thermometer, with batteries for the duration of the
3 Work.
4 2. One (1) rain gauge.
5 3. One (1) paint gauge, magnetic, non-destructive type.
6 4. Three (3) Durabeam lanterns and three (3) rubberized, water-resistant flashlights, with
7 batteries.
- 8 K. Digital Camera.
9 1. One (1) Canon Powershot, 4.0 Megapixel Digital Camera, color, built in flash, rechargeable
10 battery.
11 2. Two (2) compatible Digital Memory Cards, 2 GB per each.
12 3. One (1) compatible Digital Camera Bag.

13 **1.14 REMOVAL OF TEMPORARY UTILITIES, FACILITIES, AND CONTROLS**

- 14 A. Remove all temporary utilities, equipment, facilities, and materials prior to submitting Final
15 Application for Payment.
- 16 B. Remove temporary underground installations to minimum depth of 2-feet and re-grade site.
- 17 C. Clean and repair damage caused by installation or use of temporary Work.
- 18 D. Restore any existing facilities used during Construction to original condition, unless otherwise
19 directed in other sections of Contract Documents. Restore existing landscaping, drainage,
20 paving, etc. to an "as-was" condition, unless otherwise directed in other sections of Contract
21 Documents.

22 **PART 2 - PRODUCTS (NOT USED)**

23 **PART 3 - EXECUTION (NOT USED)**

24 **END OF SECTION**

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1 **SECTION 01 55 00**
2 **MAINTENANCE OF TRAFFIC**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

- 5 A. This section includes identifying safety hazards and then furnishing all necessary labor,
6 materials, tools, and equipment including, but not limited, to signs, barricades, traffic drums,
7 cones, flashers, construction fencing, flag persons, warning devices, temporary pavement
8 markings, delineators, etc., to control vehicular and pedestrian traffic through and adjacent to the
9 project area. These measures and actions shall be taken to safely maintain the accessibility of
10 public and construction traffic by preventing potential construction hazards. This Work shall
11 also include all costs associated with the erecting, maintaining, moving, adjusting, cleaning,
12 relocating, and storing the materials necessary to ensure safe movement of vehicular and
13 pedestrian traffic throughout the project area. The Contractor may request that the County
14 approve the detouring of traffic around the Construction area if it is in the best interest of public
15 safety and the County. Detouring shall be limited to normal construction hours and two way
16 traffic patterns shall be re-established at the end of each work day.

17 **1.2 REQUIREMENTS**

- 18 A. Traffic planning and control for the maintenance and protection of pedestrian and vehicular
19 traffic affected by the Contractor's Work includes, but is not limited to:
20 1. Construction and maintenance of any necessary detour equipment and facilities;
21 2. Providing necessary facilities for access to residences and businesses;
22 3. Furnishing, installing, and maintenance of traffic control and safety devices (e.g. signage,
23 barricades, barriers, message boards, etc.), and flag persons as appropriate during
24 Construction;
25 4. Control of water runoff, dust and any other special requirements for safe and expeditious
26 movement of traffic.
- 27 B. Planning, maintenance and control of traffic shall be provided at the Contractor's expense. The
28 Contractor will bear all expense of maintaining the vehicle and pedestrian traffic throughout the
29 work area.
- 30 C. The Contractor will ensure all personnel involved in traffic control are properly trained and
31 capable of communicating with the public during closures and detours. The Contractor may be
32 required to hire off-duty uniformed police officers, in addition to flag persons, to direct and
33 maintain traffic on heavily traveled thoroughfares on which traffic is subject to delays or detours
34 caused by the Contractor's operations. Locations and conditions requiring such uniformed police
35 officers shall be as directed by the County
- 36 D. The Contractor will remove temporary equipment and facilities when no longer required, restore
37 grounds to original, or to specified conditions.

38 **1.3 SUBMITTALS**

- 39 A. Submit at Contractor's own expense a Traffic Control Plan for approval by the County.
40 Sequence the Work in a manner that will minimize disruption of vehicular and pedestrian access
41 through and around the construction area.
- 42 B. The Traffic Control Plan will detail procedures and protective measures proposed by the
43 Contractor to provide for protection and control of traffic affected by the Work consistent with
44 the following applicable standards:
45 1. Standard Specifications for Road and Bridge Construction, latest edition including all
46 subsequent supplements issued by the Florida Department of Transportation, (FDOT Spec.).

- 1 2. Manual of Traffic Control and Safe Practices for Street and Highway Construction,
- 2 Maintenance and Utility Operations, FDOT.
- 3 3. Right-of-Way Utilization Regulations, Orange County, Florida, latest edition.
- 4 C. All references to the respective agencies in the above referenced standards shall be construed to
- 5 also include the municipality as applicable for this Work.
- 6 D. The Traffic Control Plan will be signed and sealed by a Professional Engineer registered in the
- 7 state of Florida and shall include proposed locations and time durations of the following, as
- 8 applicable:
- 9 1. Pedestrian and public vehicular traffic routing.
- 10 2. Lane and sidewalk closures, other traffic blockage and lane restrictions and reductions
- 11 anticipated to be caused by construction operations. Show and describe the proposed
- 12 location, dates, hours and duration of closure, vehicular and pedestrian traffic routing and
- 13 management, traffic control devices for implementing pedestrian and vehicular movement
- 14 around the closures, and details of barricades.
- 15 3. Location, type and method of shoring to provide lateral support to the side of an excavation
- 16 or embankment parallel to an open travel-way.
- 17 4. Allowable on-street parking within the immediate vicinity of worksite.
- 18 5. Access to buildings immediately adjacent to worksite.
- 19 6. Driveways blocked by construction operations.
- 20 7. Temporary traffic control devices, temporary pavement striping and marking of streets and
- 21 sidewalks affected by construction.
- 22 8. Temporary commercial and industrial loading and unloading zones.
- 23 9. Construction vehicle reroutes, travel times, staging locations, and number and size of
- 24 vehicles involved.

25 **PART 2 - PRODUCTS**

26 **2.1 MATERIAL AND EQUIPMENT**

- 27 A. The Contractor will furnish barricades, warning signs, delineators, pilot cars and other traffic
- 28 control materials and equipment in accordance with the Manual of Uniform Traffic Control
- 29 Devices for Streets and Highways published by the United States Government Printing Office.

30 **2.2 FLAG PERSONS**

- 31 A. All flag persons used on this Project will adhere to the following requirements:
- 32 1. Any person acting as a flag person on this Project will have attended a training session
 - 33 taught by a Contractor’s qualified trainer before the start date of this contract.
 - 34 2. The Contractor’s qualified trainer will have completed a “Flag person Train the Trainer
 - 35 Session” in the five years previous or before the start date of this contract and will be on file
 - 36 as a qualified flag person trainer.
 - 37 3. The flag person trainer’s name and Qualification Number will be furnished by the
 - 38 Contractor at the Pre-Construction meeting. The Contractor will provide all flag persons
 - 39 with the Flag Person Handbook and will observe the rules and regulations contained therein.
 - 40 This handbook will be in the possession of all flag person while flagging on the Project.
 - 41 4. Flag persons will not be assigned other duties while working as authorized flag persons.
 - 42 5. Any person replacing flag person for break shall have the same training.

1 **PART 3 - EXECUTION**

2 **3.1 NOTIFICATIONS**

- 3 A. The Contractor will notify individual owners, owner’s agents, and tenants of buildings adjacent
4 to worksite in writing, with copies to the County, 72 hours in advance of any disruption to their
5 access to those buildings and/or use of public ways adjacent to the buildings or prohibiting the
6 stopping and parking of vehicles.
- 7 B. Before closing any vehicle or pedestrian thoroughfare, the Contractor will give written notice to
8 the County. Notice will be given no less than 72 hours in advance of the proposed closure, or as
9 may be otherwise provided in the accepted Traffic Control Plan, so that the final approval of
10 such closings can be obtained at least 48 hours in advance.
- 11 C. The Contractor is responsible for notifying Fire and Ambulance Departments
12 whenever roads are impassable.
- 13 D. The Contractor will immediately notify the County of any vehicular or pedestrian safety or
14 efficiency problems incurred as a result of the construction of the Project.

15 **3.2 GENERAL TRAFFIC CONTROL**

- 16 A. The Contractor will sequence and plan construction operations and will generally conduct Work
17 in such a manner as not to unduly or unnecessarily restrict or impede normal traffic.
- 18 B. Unless otherwise provided, all roads within the limits of the Work will be kept open to all traffic
19 by the Contractor. The Contractor will keep the portion of the project being used by public
20 traffic, whether it is through or local traffic, in such condition that traffic will be adequately
21 accommodated.
- 22 C. The Contractor will be responsible for installation and maintenance of all traffic control devices
23 and requirements for the duration of the construction period. Necessary precautions for traffic
24 control will include, but not be limited to, warning signs, signals, lighting devices, markings,
25 barricades, canalizations and hand signaling devices.
- 26 D. The Contractor will provide and maintain in a safe condition temporary approaches or crossings
27 and intersections with trails, roads, streets, businesses, parking lots, residences, garages and
28 farms.
- 29 E. The Contractor will provide emergency access to all residences and businesses at all times.
30 Residential and business access will be restored and maintained at all times outside of the
31 Contractor’s normal working hours.
- 32 F. Traffic is to be maintained on one section of existing pavement, proposed pavement, or a
33 combination thereof. Alternating one way traffic may be utilized and limited to a maximum
34 length of 500 feet during construction hours. Lane width for alternating one-way traffic will be
35 kept to a minimum width of 10 feet, or as directed by the County.
- 36 G. Travel lanes and pedestrian passways will be drained and kept reasonably smooth, and in a
37 suitable condition at all times in order to provide minimum interference to traffic consistent with
38 the prosecution of the Work.
- 39 H. The Contractor will make provisions at all “open cut” street crossings to allow for free passage
40 of vehicles and pedestrians, either by bridging or other temporary crossing structures. Such
41 structures will be of adequate strength and proper construction and will be maintained by the
42 Contractor in such a manner as not to constitute an undue traffic hazard.
- 43 I. The Contractor will keep all signs in proper position, clean, and legible at all times. Care will be
44 taken so that weeds, shrubbery, construction materials, equipment, and soil are not allowed to
45 obscure any sign, light, or barricade. Signs that do not apply to construction conditions should be
46 removed or adjusted so that the legend is not visible to approaching traffic.

- 1 J. The County may determine the need for, and extent of, additional striping removal and
2 restriping.
- 3 K. Excavated material, spoil banks, construction materials, equipment and supplies will not be
4 located in such a manner as to obstruct traffic, as practicable. The Contractor will immediately
5 remove from the site all demolition material, exercising such precaution as may be directed by
6 the County. All material excavated shall be disposed of so as to minimize traffic and pedestrian
7 inconvenience and to prevent damage to adjacent property.
- 8 L. During any suspension, the Contractor will make passable and open to traffic such portions of
9 the Project and/or temporally roadways as directed by the County for accommodation of traffic
10 during the anticipated period of suspension. Passable conditions will be maintained until
11 issuance of an order for the resumption of construction operations. When Work is resumed, the
12 Contractor will replace or renew any Work or materials lost or damaged because of such
13 temporary use in every respect as though its prosecution had been continuous and without
14 interferences.

15 **3.3 TEMPORARY SHORING**

- 16 A. Use shoring to maintain traffic when it is necessary to provide lateral support to the side of an
17 excavation or embankment parallel to an open travel-way. Provide shoring when a theoretical
18 2:1 or steeper slope from the bottom of the excavation or embankment intersects the existing
19 ground line closer than 5 feet (1.5 m) from the edge of pavement of the open travel-way.
- 20 B. The Contractor will furnish, install, and remove sheeting, shoring, and bracing necessary to
21 maintain traffic at locations shown on the Traffic Control Plan and other locations determined
22 during construction.

23 **END OF SECTION**

- 1 B. Storage:
- 2 1. Pipeline and materials shall be protected from corrosion, damage, and weather if stored
- 3 outside.
- 4 2. Use of a temporary storage building on-site is optional.

5 **3.3 FIELD QUALITY CONTROL**

- 6 A. Inspect Deliveries:
- 7 1. Inspect all products or equipment delivered to the site prior to unloading.
- 8 a. Reject all products or equipment that are damaged, used, or in any other way
- 9 unsatisfactory for use on Project.
- 10 B. Monitor Storage Area: Monitor storage area to ensure suitable temperature and moisture
- 11 conditions are maintained as required by manufacturer or as appropriate for particular items.
- 12 C. Contractor responsible for the protection of all stored materials.
- 13 D. Contractor responsible for the protection of the public around stored materials.

14 **END OF SECTION**

1 **1.4 SUBMITTALS**

- 2 A. Provide qualifications of the Surveyor or Engineer
- 3 1. A Florida Registered Professional Engineer or Registered Surveyor and Mapper, who is
- 4 proposed by the Contractor to provide services to the Project shall be acceptable to the
- 5 County prior to field services being performed.
- 6 2. A Professional Engineer shall be of the discipline required for the specific service on the
- 7 Project.
- 8 3. Submit name, address and telephone number of the Surveyor and/or Engineer, as
- 9 appropriate to the County for acceptance before starting survey or engineering work.
- 10 B. On request, submit documentation verifying accuracy of survey work.
- 11 C. Surveyor shall certify all elevations and locations included in Table 01 71 23-1, 2, 3, and 4.

12 **PART 2 - PRODUCTS**

13 **2.1 AS-BUILT DRAWINGS**

- 14 A. Survey documents shall comply with the minimum technical standards of Chapter 61G17-6 of
- 15 the Florida Administrative Code (FAC) and Table 01 71 23-1 Minimum Survey/Record
- 16 Drawing Accuracies, whichever are more stringent. The Tables 01 71 23-2, 01 71 23-3, and 01
- 17 71 23-4 shall be signed, sealed and dated by the Surveyor with each pay request. All coordinates
- 18 shall be geographically registered in the Florida State Plan Coordinate System using the contract
- 19 Drawings control points for horizontal and vertical controls.

**Table 01 71 23-1. Minimum SURVEY/RECORD DRAWING Accuracies per Asset
(Water, Wastewater, Reclaimed Water and Existing).**

Asset	Horizontal Accuracy (feet)	Elevation Accuracy (feet)	Location: Horizontal Center and Vertical Top, unless otherwise specified
Bench Marks	0.01	0.01	Point
Baseline Control Locational Accuracy	0.01	N/A	Point
Tract and Easement Corners	*	N/A	Survey Monuments
Mains at 100' max. intervals	0.1	0.1	Pipe, Pipe at Valves, Pipe at Bore & Jack Casing
Fittings, Sleeve, Tapping Saddle, and end of the pipe if Plugged or Capped.	0.1	0.1	Fitting
Restrained Pipe	0.1	N/A	Restrained Joint Limits
Connections	0.1	0.1	Pipe
Bore & Jack Casing	0.1	0.1	Top of Casing at the Casing Limits
Directional Drill	0.1	0.1	10ft intervals during the directional drill operation
Hydrants	0.1	N/A	Operating Nut of Hydrant
Valves	0.1	0.1	Operating Nut
Air Release, Blow-off, and Backflow Valves	0.1	N/A	Valve Enclosure
Master Meters, Deduct Meters & Wastewater Meters	0.1	N/A	Register
Meter Box	0.1	N/A	Meter Box
Clean-out	0.1	N/A	Clean-out
Manhole Rim	0.1	0.1	Manhole
Manhole Inverts	N/A	0.01	Pipe Inverts
Pump Station (Public & Private)	0.1	0.01	Wet Well and Pipe Inverts
Production Well or Monitoring Well	0.1	0.1	Well
Grease Interceptor	0.1	0.1	
Oil / Water Separators	0.1	0.1	
Demolished Pipe (abandoned in place or removed)	0.1	0.1	Limits of Abandoned or Removed Pipe
Existing Utilities water, wastewater, reclaimed water, and appurtenant structures **	0.1	0.1	Pipe or Structure
<p>* Shall conform to the requirements of the "Chapter 5J-17, 'Minimum Technical Standards', FAC", certified by a SURVEYOR. ** Within the limits of construction and shall also include storm water pipes if the Water Main crosses the storm sewer.</p>			

Table 01 71 23-2 As-Built Asset Attribute Data Table

Hydrants Worksheet

	A	C	D	E	F	G	H	I
1	ID Number	Plan Sheet #	Easting	Northing	Elevation	Manufacturer	Model #	Comments
2	FH-1	C-7	518456.40	1483743.63	49.53	Brand B	XJ7-B	
3	FH-2	C-9	518477.68	1483758.95	54.23	Brand B	XJ7-B	

Valves Worksheet

	A	C	D	E	F	G	H	I	J
1	ID Number	Plan Sheet #	Easting	Northing	Elevation	Valve Type	Main Type	Valve Size	Valve Manufacture
2	ARV-1	C301	518060.09	1483231.33	81.72	ARV - Combination	Water Main	2	Brand H
3	ARV-1	C303	518083.55	1483280.50	81.15	ARV - Vacuum	Force Main	4	Brand G
4	BFP-1	C303	518086.00	1483282.88	78.21	Backflow Preventer	Reclaimed Water Main	8	Brand F
5	BO-9	C405	518088.83	1483289.43	78.20	Blowoff	Water Main	2	Brand E
6	BFV-1	C405	518088.11	1483295.00	81.95	Butterfly	Water Main	30	Brand D
7	GV-3	C405	518132.54	1483372.75	81.23	Gate	Water Main	16	Brand C
8	LS-W1	C405	576779.36	1539706.97	64.30	Line Stop	Water Main	16	Brand B
9	PV-22	C405	576880.60	1539718.32	64.52	Plug	Force Main	12	Brand A

	J	K	L	M	N	O	P	Q
1	Valve Manufacturer	Valve Model #	# of Turns to Close	Gear Actuator	Gear Ratio	Side Actuator	uator Manufact	Comments
2	Brand H	100XT						
3	Brand G	1000						
4	Brand F	2000 fgs						
5	Brand E	14 turbo						
6	Brand D	230 xls	200	Yes	3 to 1	Yes	Brand C	
7	Brand C	2225846	300	Yes	3 to 1	NO		
8	Brand B	7n6r44						
9	Brand A	Z100	200	Yes	3 to 1	Yes	Brand A	

Manhole Worksheet

	A	C	D	E	F	G	H	I	J	K	L	M	N	O
1	ID Number	Plan Sheet #	Easting	Northing	Rim Elevation	Invert Elv II	Invert Elv IE	Invert Elv E	Invert Elv SE	Invert Elv S	Invert Elv SW	Invert Elv W	Invert Elv IW	Manufacturer
2	MH-1	C-20	517999.15	1483092.24	82.96	76.96		76.96		76.91				Brand X
3	MH-2	C-20	517999.15	1483492.24	83.54	75.63				75.58				Brand X

Meter Worksheet

	A	C	D	E	F	G	H
1	ID Number	Plan Sheet #	Easting	Northing	Elevation	Main Type	Comments
2	MM-1	C-6	576533.64	1539520.08	58.01	Water Main	
3	RWMM-1	C-6	576937.42	1539598.78	64.84	Reclaimed Water Main	

Fitting Worksheet

	A	C	D	E	F	G	H	I
1	ID Number	Plan Sheet #	Easting	Northing	Elevation	Main Type	Fitting Type	Comments
2	FM-1	C-3	572399.28	1539339.13	46.27	Force Main	Bend 11 1/4°	
3	FM-2	C-3	574840.74	1539856.91	51.73	Force Main	Bend 22-1/2°	
4	FM-3	C-3	574844.01	1539856.71	52.48	Force Main	Bend 45°	
5	FM-4	C-3	574845.72	1539856.61	52.33	Water Main	Bend 90°	
6	FM-5	C-3	574845.85	1539858.77	51.98	Water Main	Cap	
7	RW-1	C-4	574884.06	1539849.64	51.75	Reclaimed Water Main	Cross	
8	RW-2	C-4	574887.22	1539849.56	48.98	Reclaimed Water Main	Reducer	
9	RW-3	C-4	574904.30	1539849.10	49.39	Reclaimed Water Main	Plug	
10	RW-4	C-4	574907.42	1539849.01	52.32	Reclaimed Water Main	Sleeve	
11	WM-1	C-5	574938.65	1539848.16	54.42	Water Main	Tapping Saddle	
12	WM-2	C-5	572532.38	1539337.10	45.27	Water Main	Tee	
13	WM-3	C-5	572631.00	1539338.00	44.13	Water Main	Wye	
14	WM-4	C-5	572731.00	1539334.00	43.77	Water Main	Tapping Sleeve	

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Cleanout Worksheet

	A	C	D	E	F	G
1	ID Number	Plan Sheet #	Easting	Northing	Elevation	Comments
2	CC-1	C-3	576533.64	1539520.08	£8.01	
3	CC-2	C-3	576937.42	1539598.78	£4.84	

Pipes Worksheet

	A	C	D	E	F	G	H	I	J	K	L	
1	ID Number	Plan Sheet #	Easting	Northing	Elevation	Main Type	Type of Shot	Instruction	Metl	Material	Pressure Class	Manufacturer
2	CSNG-1	C-4	517827.57	1482195.46	78.83	Force Main	Bore & Jack (Casing)			PVC	DR18	Brand A
3	CSNG-2	C-4	517848.20	1482195.31	78.38	Force Main	Bore & Jack (Casing)			PVC	DR18	Brand A
4	RW-1	C-7	517731.98	1482237.24	80.42	Reclaimed Water Main	Restraint Joint Limit	Open Cut		DP	Class 250	Brand B
5	RW-2	C-7	517732.848	1482338.1	80.943	Reclaimed Water Main	Restraint Joint Limit	Open Cut		DP	Class 250	Brand B
6	WM-1	C-9	573309.068	1539372.9	56.10	Water main	Shot on Ppe	Open Cut		PVC	DR18	Brand C
7	WM-2	C-9	573308.752	1539375	54.66	Water main	Shot on Ppe	Open Cut		PVC	DR18	Brand C
8	FMDD-1	C-4	504345.94	1488969.2	114.14	Force Main	Shot on Ppe	Directional Drill		HDPE	DR17	Brand X
9	FMDD-2	C-4	504360.86	1488970.5	112.74	Force Main	Shot on Ppe	Directional Drill		HDPE	DR17	Brand X
10	FMDD-3	C-4	504377.19	1488971.2	106.14	Force Main	Shot on Ppe	Directional Drill		HDPE	DR17	Brand X
11	FM-9	C-4	504480.47	1488982.9	105.24	Force Main	Shot on Ppe	Open Cut		PVC	DR18	Brand C

Existing OC Utility Crossing

	A	C	D	E	F	G	H	I
1	ID Number	Plan Sheet #	Easting	Northing	Existing Pipe Elevation	Proposed Crossing Elevation	Existing Main Type	Comments
3	Confl-1	C-750	463464.47	1511013.75	100.54	104.88	Water main	
4	Confl-2	C-750	463163.91	1510693.49	98.32	103.57	Storm Main	

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Table Note 01 71 23-2 and 01 71 23-3. Recommended for ease of coordination between the Engineer and the Contractor's As-built Surveyor for calculating deflections from surveyed coordinates and elevations: Provide a unique asset ID (top of pipe shots and fittings) for each utility and type, numbered sequentially along the pipe run (including changes in direction) from start to finish of the pipe. Then branches and services of the same utility type can be numbered. It is recommended that each utility (water, wastewater or reclaimed water) numbering format be distinguishable from the other. This will allow organization and convenient sorting after the individual asset table worksheet tabs are combined in the spreadsheet program prior to copying and pasting to the deflection table spreadsheet.

TABLE 01 71 23-3 PIPE DEFLECTION TABLE EXAMPLE

Project: Contractor: Progress Mtg Date: Contract # Dwg Sheet # Utility Type Pipe Manufacturer Pipe size & material PVC Manufacturer Deflection County Allowable Deflection 75% Allowable Angle of Offset Allowable Radius of Curvature Laying Length of Pipe	FM National Pipe 16" PVC C905 6 inches 4.5 inches 1.5 degrees 764 feet 20 feet	
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ID	Size and Type	Northing	Easting	Elev.	Calculations Including Elevation (XYZ)							
					Distance between points AB	Distance between points BC	Distance between points AC	Total Deflection Ø ^a	Radius of Curve ^{aa}	Average Offset Angle ^{aaa}	Average Offset ^{aaaa}	
					Length AB ft	Length BC ft	Length AC ft	XYZ (w elevation) degrees	XYZ (w elevation) ft	per laying length degrees	per laying length inches	
14041	16" FM	1505131.50	468948.53	107.68	-	-	-	-	-	-	-	-
7000	16" FM	1505059.60	468932.08	108.15	73.76	38.93	112.66	5.48	1,178.35	0.97	4.07	
2128	16" FM	1505022.11	468921.60	108.55	38.93	39.61	78.54	2.29	1,961.65	0.58	2.45	
2127	16" FM	1504983.85	468911.35	108.29	39.61	38.35	77.96	1.78	2,505.50	0.46	1.92	
2126	16" FM	1504946.67	468901.96	107.81	38.35	39.13	77.42	8.79	505.16	2.27	9.51	
2125	16" FM	1504908.11	468895.31	107.48								

Data that has been inputted
 Values in yellow are over spec

^a Uses law of cosines to determine angle ABC and Ø.
 $\text{angle } ABC = \arccos((AB^2 + BC^2 - AC^2) / (2 * AB * BC))$
 $180 - \text{angle } ABC = \text{angle } \theta$
 Calculate the total deflection Ø.
 to the outer point (A or C) is equal in angle to the approach from the next point along the

^{aa} Uses law of sines, using the chord length AC and radius R.
 $\text{Since } \sin((\theta/2) * (PI/180)) = (\text{Chord}/2) / R \text{ and length } AC = \text{Chord}$
 $R = AC / (2 * \sin(\theta * PI / 360))$
 This calculation assumes an average radius over the bend between three points.

^{aaa} Adds the lengths of AB + BC / 20ft to get an approximate number of bends over the span.
 This value is divided by the total deflection angle to calculate the average bend angle of
 This assumes that the bend angle consistent across the entire length.

^{aaaa} Uses average offset angle and laying length of pipe.

Table 01 71 23-4 Gravity Main Table

Downstream		Upstream		Length (ft)	Design Slope	Constructed Slope	Constructed Allowable Slope
Manhole Number	Invert Elev.	Manhole Number	Invert Elev.				

1 **PART 3 - EXECUTION**

2 **3.1 SURVEY FIELD WORK**

- 3 A. Locate, reference, and preserve existing horizontal and vertical control points and property
4 corners shown on the Drawings prior to starting any construction Work. If the Surveyor
5 performing the Work discovers any discrepancies that will affect the Project, the Contractor
6 must immediately report these findings to the County. All survey Work shall meet the
7 requirements as defined in Florida Administrative Code 61G17-6. Reference and preserve all
8 survey points during Construction. If survey points are disturbed, it is the responsibility of the
9 Contractor's Surveyor to reset the points at the Contractor's expense. Copies of the Surveyor's
10 field notes and/or electronic files for point replacement shall be provided to the County.
11 1. The Surveyor shall locate all improvements for the project As-Built Asset Attribute Data
12 using State Plane Coordinates as the horizontal datum and the benchmark referenced on the
13 Drawings as the vertical datum. The County will provide electronic files of the Drawings to
14 be used by the Surveyor in complying with these specifications.
15 2. The construction layout shall be established from the reference points shown or listed on the
16 Drawings. The accuracy of any method of staking shall be the responsibility of the
17 Contractor. All construction layout staking shall be done such as to provide for easy
18 verification of the Work by the County.
- 19 B. Only a Surveyor licensed in the State of Florida shall be employed for this Work. All control
20 points shall be protected by the Contractor from disturbance. If the monuments are disturbed,
21 any Work that is governed by these monuments shall be held in abeyance until the monuments
22 are reestablished by the Contractor and approved by the County. The accuracy of all the
23 Contractor's stakes, alignments and grades is the responsibility of the Contractor. However, the
24 County has the discretionary right to check the Contractor's stakes, alignments, and grades at
25 any time.
- 26 C. Use survey control points to layout such work tasks including but not limited to:
27 1. Clearing, grubbing, work limits, right-of-way lines and easements.
28 2. Locations for pipelines and all associated structures and appurtenances.
- 29 D. The Surveyor shall reference and replace any project control points, boundary corners,
30 benchmarks, section corners, and right-of-way monuments that may be lost or destroyed, at no
31 additional cost to the County. Establish replacement points based on the original survey control.
32 Copies of all reference field notes and/or electronic files for point replacement shall be submitted
33 to the County.

34 **3.2 SURVEYING**

- 35 A. Locate and protect existing horizontal and vertical control points shown on the construction
36 Drawings prior to starting any work. If the Surveyor performing the Work finds differences that
37 will effect the Work, the Contractor must immediately report the findings to the County.
38 Establish control points, lines and levels by instrumentation and similar appropriate means. The
39 location of these points should minimize the number of sightings necessary to control the work
40 and the likelihood of the points being disturbed. Preserve and reference all permanent reference
41 points during Construction. If permanent reference points are disturbed, it is the responsibility of
42 the Contractor's Surveyor to reset the points at the Contractor's expense. Copies of the
43 Surveyor's field notes shall be provided to the County.
44 1. Record locations, with horizontal and vertical data, on project As-Built survey.
45 2. Make no changes or relocations without prior written notice to the County or without receipt
46 of written approval from the County.
47 3. Report to the County when any control point is lost or destroyed or requires relocation
48 because of necessary changes in grades or locations.

- 1 B. Cover for water, reclaimed water and force mains shall vary to provide long uniform gradient or
2 slope to pipe to minimize air pockets and air release valves. The locations shown on the
3 Drawings for air and vacuum release valve assemblies are approximate and the Contractor shall
4 field adjust these locations to locate these valves at the highest point in the pipeline installed.
- 5 C. To insure a uniform gradient for gravity pipe and pressure pipe, all lines shall be installed using
6 the following control techniques as a minimum:
- 7 1. Gravity lines: Continuous control, using laser beam technology.
 - 8 2. Pressure lines: Control stakes set at 50 ft. intervals using Surveyor's level instrument.

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END OF SECTION

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1 **SECTION 01 74 13**
2 **CLEANING**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

5 A. Section Includes:

- 6 1. Intermediate and final cleaning of Work not including special cleaning of closed systems
7 specified elsewhere.

8 B. Related Sections include but are not necessarily limited to:

- 9 1. Division 1 - General Requirements.

10 **1.2 STORAGE AND HANDLING**

- 11 A. Store cleaning products and cleaning wastes in containers specifically designed for those
12 materials.

13 **PART 2 - PRODUCTS**

14 **2.1 MATERIALS**

15 A. Cleaning Agents:

- 16 1. Compatible with surface being cleaned.
17 2. New and uncontaminated.

18 **PART 3 - EXECUTION**

19 **3.1 CLEANING - GENERAL**

- 20 A. Prevent accumulation of wastes that create hazardous conditions.
21 B. Conduct cleaning and disposal operations to comply with laws and safety orders of governing
22 authorities.
23 C. Do not dispose of volatile wastes such as mineral spirits, oil, or paint thinner in storm or sanitary
24 drains or sewers.
25 D. Dispose of degradable debris at an approved solid waste disposal site.
26 E. Dispose of nondegradable debris at an approved solid waste disposal site or in an alternate
27 manner approved by Engineer and regulatory agencies.
28 F. Handle materials in a controlled manner with as few handlings as possible.
29 G. Do not drop or throw materials from heights greater than 4 FT or less than 4 FT if conditions
30 warrant greater care.
31 H. On completion of work, leave area in a clean, natural looking condition.
32 1. Remove all signs of temporary construction and activities incidental to construction of
33 required permanent Work.
34 I. Do not burn on-site.

35 **3.2 EXTERIOR (SITE) CLEANING**

- 36 A. Cleaning During Construction:

- 1 1. Keep work areas clean so as not to hinder health, safety or convenience of working
- 2 personnel and pedestrians.
- 3 2. Construction debris:
- 4 a. Confine in strategically located container(s):
- 5 1) Cover to prevent blowing by wind.
- 6 2) Haul from site minimum once a week.
- 7 b. Remove from work area to container daily.
- 8 3. Vegetation: Keep weeds and other vegetation trimmed to 3 IN maximum height.
- 9 4. Soils, sand, and gravel deposited on paved areas and walks:
- 10 a. Remove as required to prevent muddy or dusty conditions.
- 11 b. Do not flush into storm sewer system.
- 12 B. Final Cleaning:
- 13 1. Remove trash and debris containers from site.
- 14 a. Re-seed areas disturbed by location of trash and debris containers.
- 15 2. Clean paved roadways.

16 **3.3 FIELD QUALITY CONTROL**

- 17 A. Conduct an inspection with County/Engineer to verify condition of all work areas.

18 **END OF SECTION**

1 **SECTION 01 77 00**
2 **CONTRACT CLOSEOUT**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

- 5 A. Section Includes:
6 1. Contract Closeout Requirements and Procedures.

7 **1.2 SUBMITTALS**

- 8 A. Informational Submittals:
9 1. Submit prior to application for payment.
10 2. Extra Materials: As required by individual Specification Sections.
11 B. Closeout Documents: Contractor shall use Owner's closeout documents.

12 **1.3 RECORD DOCUMENTS**

- 13 A. Quality Assurance
14 1. Furnish qualified and experienced person, whose duty and responsibility shall be to
15 maintain record documents.
16 2. Accuracy of Records:
17 a. Coordinate changes within record documents, making legible and accurate entries on
18 each sheet of drawings and other documents where such entry is required to show
19 change.
20 b. Purpose of Project record documents is to document factual information regarding
21 aspects of the Work, both concealed and visible, to enable future modification of the
22 Work to proceed without lengthy and expensive Site measurement, investigation and
23 examination.
24 3. Record Drawings (Recording As-Builts):
25 a. The Contractor shall maintain at the site one record copy of all Plans in good order and
26 annotated to show changes made during construction. Contractor shall meet monthly
27 with the Engineer to review the record Plans and verify they correctly reflect all changes
28 made during the month.
29 b. The Contractor shall keep an accurate record of the utility type, location, size, and
30 material for all water, wastewater, or reclaimed water piping installed or relocated
31 including related appurtenances both above and below ground.
32 c. Final horizontal and vertical alignment of water, wastewater, or reclaimed water pipes
33 and related appurtenances shall be clearly shown and referenced to permanent surface
34 improvements. Verified vertical and horizontal (Vvh) alignment shall be surveyed and
35 shown every 100 feet (or more often as circumstances dictate) or at any change
36 (horizontal or vertical) in pipe direction. Vvh's shall be conducted by a Florida state
37 registered/professional land surveyor and called out on the Plans. Vvh data may be
38 presented in tabular form on the As-Built Plans. Plans shall clearly show all field
39 changes of dimension and detail including changes made by the Engineer. Contractor
40 shall not conceal any work until required information is recorded. Payment for As-Built
41 Plans shall be included in the cost for pipe installation.
42 d. As-Built Plans are required for all systems to be accepted by the Engineer. As-Builts
43 Plans will be prepared by a surveyor or an engineer registered in the State of Florida and
44 will contain the following information:

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- 1) Location of all valves, service lines, fittings, fire hydrants, water meters, and manholes using at least Three (3) ties to permanent points (manholes, property corners, curbs, or stormwater inlets). State plane coordinates should be provided for all locations.
 - 2) Pipe station of service connection at the gravity main, service length, service invert elevations at the main and distance to the control manhole or cleanout
 - 3) Location of mains from property easement lines or edge of pavement at intervals of 300 feet.
 - 4) Elevations to the top of the water main, reclaimed water main, or force main at intervals of 100 feet, at all drainage, and at all crossings of other water mains, reclaimed water mains, and force mains. Established and known bench marks shall be shown on the As-Built Plans.
 - 5) Separation between reclaimed water mains and potable water mains and between force mains and potable water mains if they are installed within 10 feet of each other.
 - 6) Water main, reclaimed water main, or force main material and distance of mains from buildings or structures within 20 feet of the water main, reclaimed water main, or force main.
 - 7) Distance from hydrant to hydrant valve.
 - 8) Pertinent easement information
 - 9) Certification by the surveyor or engineer accepting responsibility for accuracy of information supplied on the As-Built and a statement certifying that all mains are within easements and/or public rights-of-way.
 - 10) Location of all electronic balls using "EMB" to indicate location.
 - 11) Horizontal values shall be provided relative to the Florida State Plan Coordinate System, Florida East Zone, North American Datum of 1983 (adjustment of 1990) relative to Orange County Geodatic Control Points. Vertical values shall be provided relative to the North American Vertical Datum of 1988 relative to Orange County Vertical Control Points.
- e. The name "Orange County" must appear on all as-built survey information. As-Built Plans will be drawn at a scale of 1 inch = 20 feet. Areas requiring additional detail may be enlarged as necessary. Rights-of-way, easements, and lot lines will be accurately shown. Lots, block numbers, and street names will be included. If the As-Built Plans were prepared with an AutoCAD compatible program or DFX file, a diskette with that file will be provided to the County. One reproducible print and three signed and sealed blue-line prints are required. After the surveyor or engineer has certified the locations, the engineer will certify on F.D.E.P. Form 62-555.910(9) that the system depicted on the As-Built Plans was constructed in substantial conformance with approved plans and will function as intended.
- f. Submittal. At Final Acceptance, the Contractor is to deliver the complete set of 24"x36" original reproducible As-Built Plans and three 24"x36" copies used for recording "as-built" information and marked as "AS-BUILT" Plans, along with any other as-built documents, to the Engineer. In addition to paper copies the contractor shall deliver a compact disk containing a PDF of the As-Built Plans and copies of the CAD files in AutoCAD version 2008. A transmittal letter in duplicate, containing the following shall be attached to the submittal:
- 1) Date
 - 2) Project title and number
 - 3) Contractor's name and address
 - 4) Title and number of each As-Built Document
 - 5) Certification that each document as submitted is complete and accurate
 - 6) Signature of the Contractor or his authorized representative

1 **1.4 RELEASE FROM AGREEMENTS**

- 2 A. Furnish Owner written releases from property owners or public agencies where side agreements
3 or special easements have been made, or where Contractor's operations have not been kept
4 within the Owner's construction right-of-way.
- 5 B. In the event Contractor is unable to secure written releases:
- 6 1. Inform Owner of the reasons.
 - 7 2. Owner or its representatives will examine the Site, and Owner will direct Contractor to
8 complete the Work that may be necessary to satisfy terms of the side agreement or special
9 easement.
 - 10 3. Should Contractor refuse to perform this Work, Owner reserves right to have it done under
11 the Performance Bond.
 - 12 4. When Owner is satisfied that the Work has been completed in agreement with Contract
13 Documents and terms of side agreement or special easement, right is reserved to waive
14 requirement for written release if: (i) Contractor's failure to obtain such statement is due to
15 grantor's refusal to sign, and this refusal is not based upon any legitimate Claims that
16 Contractor has failed to fulfill terms of side agreement or special easement, or (ii)
17 Contractor is unable to contact or has had hardship in contacting grantor.

18 **PART 2 - PRODUCTS - (NOT USED)**

19 **PART 3 - EXECUTION**

20 **3.1 MAINTENANCE OF RECORD DOCUMENTS**

- 21 A. General:
- 22 1. Promptly following commencement of Contract Times, secure from Engineer at no cost to
23 Contractor, one complete set of Contract Documents. Drawings will be full size.
 - 24 2. Label or stamp each record document with title, "RECORD DOCUMENTS," in neat large
25 printed letters.
 - 26 3. Record information concurrently with construction progress and within 24 hours after
27 receipt of information that change has occurred. Do not cover or conceal Work until
28 required information is recorded.
- 29 B. Preservation:
- 30 1. Maintain documents in a clean, dry, legible condition and in good order. Do not use record
31 documents for construction purposes.
 - 32 2. Make documents and Samples available at all times for observation by Engineer.
- 33 C. Making Entries on Drawings
- 34 1. Using an erasable colored pencil (not ink or indelible pencil), clearly describe change by
35 graphic line and note as required.
 - 36 a. Color Coding:
 - 37 1) Green when showing information deleted from Drawings.
 - 38 2) Red when showing information added to Drawings.
 - 39 3) Blue and circled in blue to show notes.
 - 40 2. Date entries
 - 41 3. Call attention to entry by "cloud" drawn around area or areas affected.
 - 42 4. Legibly mark to record actual changes made during construction, including, but not limited
43 to:
 - 44 a. Depths of various elements of foundation in relation to finished first floor data if not
45 shown or where depth differs from that shown.
 - 46 b. Residential project dimensions are to be referenced from a permanent and easily
47 recoverable physical monument (i.e., fire hydrant, property corner, street intersection,
48 center line of road).

- c. Commercial projects shall be referenced from buildings and other pertinent structures.
 - d. Horizontal location of new water mains, valves, blow offs, meters or meter boxes, manholes, force mains, lift stations and reclaimed water lines, and points of connection to existing water mains, force mains, manholes, lift stations, marker balls, and reclaimed water lines shall be referenced by distance to at least two permanent points.
 - e. Vertical location of new and points of connection to existing gravity sewer mains, reclaimed water mains and manholes, lift stations, water mains and force mains shall be referenced by distance to at least one permanent point.
 - f. Location of electronic marker balls installed during construction shall be noted on the record drawings by the symbol "EMB." Dimensions of the actual installed location of utility lines constructed within an easement shall be shown on the record drawings.
 - g. Location of internal utilities and appurtenances concealed in the construction referenced to visible and accessible features of the structure.
 - h. Locate existing facilities, piping, equipment, and items critical to the interface between existing physical conditions or construction and new construction.
 - i. Changes made by Addenda and Field Orders, Work Change Directive, Change Order, and Engineers written interpretation and clarification using consistent symbols for each and showing appropriate document tracking number.
5. Dimensions on Schematic Layouts: Show on record drawings by dimension, the centerline of each run of items such as described above:
 - a. Clearly identify the item by accurate note such as "cast iron drain", galv. water," and the like.
 - b. Show, by symbol or note, vertical location of item ("under slab", "in ceiling plenum", "exposed," and the like)
 - c. Make identification so descriptive that it may be related reliably to specifications.
 6. Water and Sewer Main: Show the following field information.
 - a. Show material used to construct mains
 - b. Show location of mains, tees, crosses, bends, terminal ends, valves, manholes, by distances from known above ground reference points (manholes, catch basins, ROW centerlines).
 - c. Show location of sleeves.
 - d. Show depth of cover over pipe.
 - e. Elevation and horizontal control of gravity sewers, including laterals, pressure sewer mains, etc. which are crossed.
 - f. Elevation and horizontal control of pressure water and sewer stubouts including service laterals.
 - g. Location of existing lines and utilities encountered during construction.
 7. Paving: Show the following information:
 - a. Surveyed layout of structures, buried valves, conduits and piping.
 - b. Revisions and additions to dimensions, elevations or notes.
 - c. Location of connections to existing piping.
 - d. Materials used in construction.

3.2 FINAL CLEANING

- A. At completion of the Work or a part thereof and immediately prior to Contractor's request for certificate of Substantial Completion; or if no certificate is issued, immediately prior to Contractor's notice of completion, clean entire Site or parts thereof, as applicable.
 1. Leave the Work and adjacent areas affected in a cleaned condition satisfactory to Owner and Engineer.
 2. Remove grease, dirt, dust, paint or plaster splatter, stains, labels,
 3. Repair, patch, and touch up marred surfaces to specified finish and match adjacent surfaces.
 4. Broom clean exterior paved driveways and parking areas.
 5. Hose clean sidewalks, loading areas, and others contiguous with principal structures.
 6. Rake clean all other surfaces.

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1 **SECTION 01 78 30**
2 **WARRANTIES AND BONDS**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

5 A. Section Includes:

- 6 1. This Section specifies general administrative and procedural requirements for warranties
7 and bonds required by the Contract Documents, including manufacturer's standard
8 warranties on products and special warranties.

9 **1.2 RELATED WORK**

- 10 A. Refer to Conditions of Contract for the general requirements relating to warranties and bonds.
11 B. General closeout requirements are included in Section 01 77 00 "Contract Closeout".
12 C. Specific requirements for warranties for the Work and products and installations that are
13 specified to be warranted are included in the individual Sections of Division 2 through 50.

14 **1.3 DEFINITIONS**

- 15 A. Standard Product Warranties are preprinted written warranties published by individual
16 manufacturers for particular products and are specifically endorsed by the manufacturer to the
17 County.
18 B. Special Warranties are written warranties required by or incorporated in the Contract
19 Documents, either to extend time limits provided by standard warranties or to provide greater
20 rights for the County.

21 **1.4 SUBMITTALS**

- 22 A. Submit written warranties to the County prior to requesting a Substantial Completion Inspection
23 as outlined in Section 01 77 00 "Contract Closeout". If the Certificate of Substantial Completion
24 designates a commencement date for warranties other than the date of Substantial Completion
25 for the Work, or a designated portion of the Work, submit written warranties upon request of the
26 County.
27 B. When a designated portion of the Work is completed and occupied or used by the County, by
28 separate agreement with the Contractor during the construction period, submit properly executed
29 warranties to the County within fifteen days of completion of that designated portion of the
30 work.
31 C. When a special warranty is required to be executed by the Contractor, or the Contractor and a
32 Subcontractor, supplier or manufacturer, prepare a written document that contains appropriate
33 terms and identification, ready for execution by the required parties. Submit a draft to the
34 County for approval prior to final execution.
35 D. Refer to individual Sections of Divisions 2 through 50 for specific content requirements, and
36 particular requirements for submittal of special warranties.
37 E. Prior to Substantial Completion Inspection, submit to the County two copies of each required
38 warranty and bond properly executed by the Contractor, or by the Contractor, Subcontractor,
39 supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on
40 the table of contents of the Project Manual.
41 1. Bind warranties and bonds in heavy-duty, commercial quality, durable 3-ring vinyl covered
42 loose-leaf binders, thickness as necessary to accommodate contents and sized to receive 8-
43 1/2-inch by 11-inch three-hole punched paper.

2. Table of Contents will be neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification Section in which specified and the name of the product or work item.
3. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address and telephone number of the installer, supplier and manufacturer.
4. Identify each binder on the front and the spine with the typed or printed title "WARRANTIES AND BONDS", the project title or name and the name, address and telephone number of the Contractor.
5. When operating and maintenance manuals are required for warranted construction, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

1.5 WARRANTY REQUIREMENTS

- A. The Contractor will warrant all equipment in the Contractor's one-year warranty period even though certificates of warranty may not be required. For all major pieces of equipment, the Contractor shall submit a warranty from the equipment manufacturer. "Major" equipment is defined as a device having a 5 HP or larger motor or which lists for more than \$1,000.00.
- B. In the event that an equipment manufacturer or supplier is unwilling to provide a one-year warranty commencing at Substantial Completion, the Contractor will obtain from the manufacturer a warranty of sufficient length commencing at the time of equipment delivery to the job site, such that the warranty will extend to at least one year past substantial completion.
- C. If an individual specification section requires a particular warranty more stringent than that required by this Section or the General Conditions, the more stringent requirements will govern for the applicable portion of the Work.
- D. Related Damages and Losses: When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.
- E. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty will be equal to the original warranty with an equitable adjustment for depreciation.
- F. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the County has benefited from use of the Work through a portion of its anticipated useful service life.
- G. County's Recourse: Written warranties made to the County are in addition to implied warranties, and will not limit the duties, obligations, rights and remedies otherwise available under the law, nor will warranty periods be interpreted as limitations on time in which the County can enforce such other duties, obligations, rights, or remedies.
- H. Rejection of Warranties: The County reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.
- I. The County reserves the right to refuse to accept work for the project where a special warranty, certification, or similar commitment is required on such work or part of the work, until evidence is presented that entities required to countersign such commitments are willing to do so.
- J. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products, nor does it relieve suppliers, manufacturers, and Subcontractors required to countersign special warranties with the Contractor.

1 **PART 2 - PRODUCTS - (NOT USED)**

2 **PART 3 - EXECUTION**

3 **3.1 DELIVERABLES**

4 A. Assemble warranties, bonds and service and maintenance contracts, executed by each of the
5 respective manufacturers, suppliers, and Subcontractors, and bind into a commercial quality
6 standard three (3) ring binder; submit five (5) copies of the warranties and bonds to the County
7 for review.

- 8 1. The warranties and bonds shall include:
9 a. Equipment or product description
10 b. Manufacturer's name, principal, address and telephone number
11 c. Contractor, name of responsible principal, address and telephone number
12 d. Local supplier's or representatives name and address
13 e. Scope of warranty or bond
14 f. Proper procedure in case of failure
15 g. Instances which might affect the validity of warranty or bond
16 h. Date of beginning of warranty, bond or service and maintenance contract
17 i. Duration of warranty, bond or service maintenance contract

18 B. Warranties

- 19 1. Furnish an extended warranty for sanitary sewer main liner certified by the manufacturer for
20 specified material properties for a particular job. The manufacturer warrants the liner to be
21 free from defects in raw materials for one year from the date of acceptance. During the
22 warranty period, any defects which affect the integrity or strength of the pipe shall be
23 repaired at the Contractor's expense in a manner acceptable to the County.
24 2. Furnish an extended warranty for sanitary lateral liner certified by the manufacturer for
25 specified material properties for a particular job. The manufacturer warrants the liner to be
26 free from defects in raw materials for one year from the date of acceptance. During the
27 warranty period, any defects which affect the integrity or strength of the pipe shall be
28 repaired at the Contractor's expense in a manner acceptable to the County.

29 **END OF SECTION**

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1 **1.3 ACCEPTANCE**

2 A. The documents defined in this Specification Section are required to be submitted to County for
3 approval prior to the issuance of certificate of completion for the improvements. The system
4 will not be placed into operation until the certificate of completion is issued.

5 **1.4 QUALITY ASSURANCE**

6 A. Delegate the responsibility for maintenance of the Record Documents to one person on the
7 Contractor's staff as approved by the County.

8 B. Thoroughly coordinate changes within the Record Documents, making adequate and proper
9 entries on each page of specifications and each sheet of drawings and other documents where
10 such entry is required to show progress and changes properly.

11 C. Make entries within 24-hours after receipt of information has occurred.

12 **1.5 RECORD DOCUMENTS AT SITE**

13 A. Maintain at the site and always available for County's use one record copy of:

14 1. Construction Contract, Drawings, Specifications, General Conditions, Supplemental
15 Conditions, Bid Proposal, Instruction to Bidders, Addenda, and all other Contract
16 Documents.

17 2. Change Orders, Verbal Orders, and other modifications to Contract.

18 3. Written instructions by the County as well as correspondence related to Requests for
19 Information (RFIs).

20 4. Accepted Shop Drawings, Samples, product data, substitution and "or-equal" requests.

21 5. Field test records, inspection certificates, manufacturer certificates and construction
22 photographs.

23 6. Progressive As-Built Drawings.

24 7. Current Surveyor's tables for the As-Built Assets Attribute Data, Pipe Deflection Data, and
25 Gravity Main Data.

26 B. Maintain the documents in an organized, clean, dry, legible condition and completely protected
27 from deterioration and from loss and damage until completion of the Work, transfer of all record
28 data to the final As-built Drawings for submittal to the County.

29 C. Store As-Built Documents and samples in Contractor's office apart from documents used for
30 construction. Do not use As-Built document for construction purposes. Label each document
31 "AS-BUILT" in neat large printed letters. File documents and samples in accordance with
32 CSI/CSC format.

33 D. Record information concurrently with construction progress. Do not conceal any work until
34 required information is recorded.

35 **PART 2 - PRODUCTS**

36 **2.1 AS-BUILT DRAWINGS**

37 A. Maintain the electronic As-Built Drawings to accurately record progress of Work and change
38 orders throughout the duration of the Contract.

39 B. Date all entries. Enter RFI No., Change Order No., etc. when applicable.

40 C. Call attention to the entry by highlighting with a "cloud" drawn around the area affected.

41 D. In the event of overlapping changes, use different colors for entries of the overlapping changes.

42 E. Design call-outs shall have a thin strike line through the design call-out and all As-Built
43 information must be labeled (or abbreviated "AB") and be shown in a bolder text that is
44 completely legible.

- 1 F. Make entries in the pertinent other documents while coordinating with the County for validity.
- 2 G. Entries shall consist of graphical representations, plan view and profiles, written comments,
 3 dimensions, State Plane Coordinates, details and any other information as required to document
 4 field and other changes of the actual Work completed. As a minimum, make entries to also
 5 record:
- 6 1. Depths of various elements of foundation in relation to finish floor datum and State Plane
 7 Coordinates and elevations.
 - 8 2. As-Built Asset Attribute Data Table shall be completed in the Drawings.
 - 9 3. When electrical boxes, or underground conduits and plumbing are involved as part of the
 10 Work, record true elevations and locations, dimensions between boxes.
 - 11 4. Actually installed pipe or other Work materials, class, pressure rating, diameter, size,
 12 specifications, etc. Similar information for other encountered underground utilities, not
 13 installed by Contractor, their owner and actual location if different than shown in the
 14 Contract Documents.
 - 15 5. Details, not on original contract Drawings, as needed to show the actual location of the
 16 Work completed in a manner that allows the County to find it in the future.
 - 17 6. The Contractor shall mark all arrangements of conduits, circuits, piping, ducts and similar
 18 items shown schematically on the construction documents and show on the As-Built
 19 Drawings the actual horizontal and vertical alignments and locations.
 - 20 7. Major architectural and structural changes including relocation of doors, windows, etc.
 21 Architectural schedule changes according to Contractor's records and shop drawings.

22 **2.2 RECORD DOCUMENTS**

- 23 A. Three (3) hard copy sets and three (3) digital media sets of the final Record Documents and shall
 24 include all of the documents described below under this subsection 2.02.
- 25 B. The following documents shall be signed and sealed by the Surveyor:
- 26 1. As-Built Asset Attribute Data Table
 - 27 2. Boundary Survey of pump station and Survey Map Report
 - 28 3. Survey and Survey Map Report for the location of constructed pipes within any easements
 29 and right-of-way. As a minimum the Survey Map Report shall identify or describe the
 30 locations where the pipe centerline was constructed within three feet of the easement or
 31 right-of-way boundary, where the pipe was constructed outside the easement or right-of-
 32 way boundary, any corners that had to be reset, measurements and computations made,
 33 pump station boundary issues, and accuracies obtained. Survey map report shall be dated
 34 after the Work within the right-of-ways or easements have been completed.
 - 35 4. Gravity Main Table
 - 36 5. Pipe Deflection Table. An electronic blank table will be supplied by the County.
- 37 C. Digital sets of the final Record Documents including but not limited to:
- 38 1. Scanned digital copies of the final As-Built Drawings.
 - 39 2. Electronic Survey documents electronically sealed by the Surveyor.
 - 40 3. Final Record Documents information.
 - 41 4. Digital As-Built Drawing in the Engineer's current version of AutoCAD file (dwg) format
 42 for the Contract Drawings, updated to match the final Record Drawing information.
- 43 D. Survey Documents:
- 44 1. As-Built Asset Attribute Data Table (see Table 01 71 23-2 Asset Attribute Data Table) -
 45 Surveyor shall obtain field measurements of vertical and horizontal dimensions of
 46 constructed improvements for the table and include the Surveyor's statement regarding the
 47 constructed improvements being within the specified accuracies as described in Table 01 71
 48 23-1 Minimum Survey/Record Drawing Accuracies per Asset (Water, Wastewater,
 49 Reclaimed Water and Existing) or if not, indicating the variances. County will provide an
 50 electronic version of a blank table that shall be used to input data.

- 1 2. Survey Map Report - Provide measurements and computations that were made, accuracies
 2 obtained for the replacement of survey traverse, rights-of-way, easements, and pump station
 3 site boundary corners that may have been lost or destroyed.
- 4 E. New Boundary Survey to re-establish easement corners, right-of-way monuments, or pump
 5 station site corners with monuments if destroyed by the Work.
- 6 F. SCANNED DOCUMENTS: Scan the Survey Documents and other Record Documents
 7 reflecting changes from the Bid Documents.
- 8 G. The scanned As-Built drawing sets shall be complete and include the title sheet, plan/profile
 9 sheets, cross-sections, and details. Each individual sheet contained in the printed set of the As-
 10 Built Drawings shall be included in the electronic drawings, with each sheet being converted
 11 into an individual tif (tagged image file). The plan sheets shall be scanned in tif format Group 4
 12 at minimum of 400 dpi resolution to maintain legibility of each drawing. Then, the tif images
 13 shall be embedded into a single pdf (Adobe Acrobat) file representing the complete plan set.
 14 Review all Record Documents to ensure a complete record of the Project.
- 15 H. Provide an encompassing digital AutoCAD file that includes all the information of the As-Built
 16 Drawings and any other graphical information in the As-Built Drawings. It shall include the
 17 overall Work, utility system layout and associated parcel boundaries and easements. Feature
 18 point, line and polygon information for new or altered Work and all accompanying geodetic
 19 control and survey data shall be included. The surveyor's certified As-Built Asset Attribute Data
 20 shall be added to the As-Built Drawings and Surveyor shall electronically seal the data in a
 21 comma-delineated ASCII format (txt).

22 **2.3 COMPLETION/ACCEPTANCE**

- 23 A. One set of bacteriological test reports (Appendix B, "Water Main Disinfection Certification" of
 24 Orange County Utilities Standards and Construction Specifications Manual).
- 25 B. Certification of Completion (FDEP Form) and required materials to obtain clearance of the
 26 system for service.
- 27 C. Owner's Engineer of Record Certification of Completion (FDEP Form).

28 **PART 3 - EXECUTION**

29 **3.1 PRE-CONSTRUCTION MEETING**

- 30 A. Pre-construction Meeting: It is recommended that the Surveyor attend the Pre-construction
 31 meeting. At the pre-construction meeting the *Contractor shall be provided with a blank*
 32 *electronic version of the spreadsheet for the tables: Asset Attribute Data and Pipe Deflection.*
 33 The Contractor's surveyor shall use these tables to input the data and shall not alter the table
 34 format or formulas.

35 **3.2 CONSTRUCTION PROGRESS MEETINGS**

- 36 A. Contractor shall provide progressive Record Documents described below.
- 37 1. Construction Contract, As-Built Drawings, Specifications, General Conditions,
 38 Supplemental Conditions, Bid Proposal, Instruction to Bidders, Addenda, and all other
 39 Contract Documents.
- 40 2. Specifications and Addenda: Record manufacturer, trade name, catalog number and supplier
 41 of each product and item of equipment actually installed as well as any changes made by
 42 Field Order, Change Order or other.
- 43 3. Change orders, verbal orders, and other modifications to Contract.
- 44 4. Written instructions by the County as well as correspondence related to Requests for
 45 Information (RFIs).
- 46 5. Accepted Shop Drawings, samples, product data, substitution and "or-equal" requests.

- 1 6. Field test records, inspection certificates, manufacturer certificates and construction
2 photographs.
- 3 7. As-Built Asset Attribute Data Table: Surveyor shall obtain field measurements of vertical
4 and horizontal dimensions of constructed improvements. The monthly submittal shall
5 include the Surveyor's certified statement regarding the constructed improvements being
6 within the specified accuracies as described in Table 01 71 23-1 or if not, indicating the
7 variances.
- 8 8. Gravity Main Table: Surveyor shall prepare and update a Gravity Main Table to include as a
9 minimum the pipe segment identification, pipe lengths, manhole inverts and tops, and slopes
10 for gravity mains. Surveyor shall certify the data entered are correct and indicate if the
11 minimum slopes have not been met.
- 12 9. Pipe Deflection Table: Surveyor shall input the type of pipe, pipe manufacturer, PVC
13 manufacturer deflection allowance, allowable angle of offset and radius of curvature, laying
14 length of pipe, and coordinates. Surveyor shall certify the data entered are correct and
15 indicate if the deflection allowance, offset or radius of curvature exceeds the manufacturer's
16 recommendations.

17 3.3 RECORD DOCUMENTS

- 18 A. Engineer will develop the Record Drawings from the Construction As-Built Documents supplied
19 by the Contractor and delineate substantive deviations from the original design documents and to
20 state whether the deviations are such that the original engineering design intent has or has not
21 been "materially" accomplished by the finished construction. The Engineer shall fully and
22 completely delineate the scope of the Engineer's work on all Record Drawings and what services
23 were performed by the Engineer or the firm upon which the opinion in the certificate is based.
24 The certification statement shall include: the "Record/As-Built" drawing is a compiled
25 representation of the constructed project; a listing of the sources and the basis of information
26 used in the preparation of the "Record/As-Built" drawing; the drawing is believed to be correct
27 to the best of the Engineer's knowledge; and the drawings meet the design intent including, but
28 not limited to location of installed assets and pipe deflections.

29 Appropriate notes on the Record Drawings or disclosures accompanying the certification can
30 clarify an Engineer's determination that such modifications do or do not "materially" affect the
31 permitted design.

32 B. Contractor's responsibilities

- 33 1. The Contractor shall be responsible for recording information on the approved Plans
34 concurrently with construction progress.
- 35 2. Promptly following commencement of Contract Times, secure from Engineer at no cost to
36 Contractor, one complete set of Contract Documents. Drawings will be full size.
- 37 3. Label or stamp each record document with title, "Record Drawings," in neat large printed
38 letters.
- 39 4. Record information concurrently with construction progress and within 24 hours after
40 receipt of information that change has occurred. Do not cover or conceal Work until
41 required information is recorded.
- 42 5. The Contractor's Surveyor shall be responsible for surveying utility assets concurrently (at
43 minimum monthly) with construction progress and providing As-built data to the
44 Contractor. Monthly Survey data and Contractor As-Built shall be retained on the project
45 site and made available to the County's representative.

46 C. Making Entries on Drawings

- 47 1. Record Drawings shall be legibly marked to record actual construction.
- 48 2. Using an erasable colored pencil (not ink or indelible pencil), clearly describe change by
49 graphic line and note as required.
 - 50 a. Color Coding:
 - 51 1) Green when showing information deleted from Drawings.
 - 52 2) Red when showing information added to Drawings.
 - 53 3) Blue and circled in blue to show notes.

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3. Date all entries.
 4. Call attention to entry by “cloud” drawn around area or areas affected.
 5. Legibly mark to record actual changes made during construction, including, but not limited to:
 - a. Residential project dimensions are to be referenced from a permanent and easily recoverable physical monument (i.e., fire hydrant, property corner, street intersection, center line of road, rights-of-way, property corners, etc.).
 - b. Horizontal location of new and existing water mains, valves, blow offs, meters or meter boxes, manholes, force mains, gravity mains, and points of connection to existing water mains, force mains, manholes, marker balls, and gravity mains shall be referenced by distance to at least two permanent points.
 - 1) State plane coordinates shall be utilized for horizontal locations.
 - 2) Dimensions between all manholes, slope of gravity mains, invert and top elevations shall be shown.
 - c. Vertical location of new and points of connection to existing gravity sewer mains, reclaimed water mains and manholes, lift stations, water mains and force mains shall be referenced by distance to at least one permanent point.
 - d. Location of electronic marker balls installed during construction shall be noted on the record drawings by the symbol “EMB.” Dimensions of the actual installed location of utility lines constructed within an easement shall be shown on the record drawings.
 - e. Location of internal utilities and appurtenances concealed in the construction referenced to visible and accessible features of the structure.
 - f. Locate existing facilities, piping, equipment, and items critical to the interface between existing physical conditions or construction and new construction.
 - g. Changes made by Addenda and Field Orders, Work Change Directive, Change Order, and Engineers written interpretation and clarification using consistent symbols for each and showing appropriate document tracking number.
 - h. All assets, new and existing, shall be attributed with materials, class, pressure rating, specifications, etc.
 - i. Record Drawings shall clearly show all details not on original contract drawings but constructed in the field. All equipment and piping relocation shall be clearly shown.
 - j. Record Drawings shall include the As-built Coordinate Asset Table (see Table 01 71 23-2), Pipe Deflection (see Table 01 71 23-3), and Gravity Main Table (see Table 01 71 23-4).
 6. Dimensions on Schematic Layouts: Show on record drawings by dimension, the centerline of each run of items such as described above:
 - a. Clearly identify the item by accurate note such as “cast iron water”, galv. water,” and the like.
 - b. Make identification so descriptive that it may be related reliably to specifications.
 7. Water and Sewer Main: Show the following field information.
 - a. Show material used to construct mains
 - b. Show location of mains, tees, crosses, bends, terminal ends, valves, manholes, by distances from known above ground reference points (manholes, catch basins, ROW centerlines).
 - c. Show location of sleeves.
 - d. Show depth of cover over pipe.
 - e. Elevation and horizontal control of gravity sewers, including laterals, pressure sewer mains, etc. which are crossed.
 - f. Elevation and horizontal control of pressure water and sewer stubouts including service laterals.
 - g. Location of existing lines and utilities encountered during construction.
 8. Paving: Show the following information:
 - a. Surveyed layout of structures, buried valves, conduits and piping.
 - b. Revisions and additions to dimensions, elevations or notes.
 - c. Location of connections to existing piping.
 - d. Materials used in construction.

1 **3.4 FINAL RECORD DOCUMENTS SUBMITTAL**

- 2 A. Submit the Final Record Documents within 20 days after Substantial Completion.
3 1. Participate in review meetings as required and make required changes and promptly deliver
4 the Final Record Documents to the County.

5 **3.5 STORAGE AND PRESERVATION**

- 6 A. Store Record Documents and samples at a protected location in the project field office apart
7 from documents used for construction.
8 1. Provide files and racks for storage of documents.
9 2. Provide locked cabinet or secure space for storage of samples.
10 B. File documents and samples in accordance with CSI format with section numbers matching
11 those in the Contract Documents.
12 C. In the event of loss of recorded data, use means necessary to again secure the data to the
13 County's approval.
14 1. Such means shall include, if necessary in the opinion of the County, removal and
15 replacement of concealing materials.
16 2. In such cases, provide replacements of the concealing materials to the standards originally
17 required by the Contract Documents.

18 **3.6 FINAL CLEANING**

- 19 A. At completion of the Work or a part thereof and immediately prior to Contractor's request for
20 certificate of Substantial Completion; or if no certificate is issued, immediately prior to
21 Contractor's notice of completion, clean entire Site or parts thereof, as applicable.
22 1. Leave the Work and adjacent areas affected in a cleaned condition satisfactory to Owner
23 and Engineer.
24 2. Hose clean sidewalks, loading areas, and others contiguous areas.
25 3. Rake clean all other surfaces.
26 4. Leave water courses, gutters, and ditches open and clean.

27 **3.7 FINAL INSPECTION**

- 28 A. Final inspection will be held upon completion of the Project. Notify Owner, upon completion,
29 to arrange inspection tour of the completed Project.
30 B. Contractor and Owner's representatives shall be present for the inspection.

31 **3.8 FINAL ACCEPTANCE**

- 32 A. Final acceptance of a water distribution system and wastewater collection system and the release
33 of the performance bond will be made only after all inspections have been made and the
34 improvements found to be in accordance with the applicable regulations of FDEP, and the
35 Contract Document requirements contained herein. Proposed County owned and maintained
36 pipes are deemed as capital assets and will be accepted by County.

37 **END OF SECTION**

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1 **SECTION 02 41 50**

2 **REMOVAL OR ABANDONMENT IN PLACE OF EXISTING PIPE**

3 **PART 1 - GENERAL**

4 **1.1 DESCRIPTION AND GENERAL REQUIREMENTS**

- 5 A. Work included under this Section consists of removal or grouting (infilling) sections of existing
6 pipe.
- 7 B. The Contractor shall furnish all labor, equipment and materials necessary to perform all the work
8 associated with the removal or abandonment in place of existing pipe by injection of
9 cementitious grout.
- 10 C. All work associated with the removal or taking out of service of existing asbestos cement pipes
11 and appurtenances shall be performed by a licensed asbestos abatement Contractor or
12 Subcontractor registered in the State of Florida. All asbestos cement pipes shall be abandoned in
13 place unless removal is specifically required by Owner.
- 14 D. The asbestos abatement Contractor or Subcontractor shall contact the Orange County
15 Environmental Protection Division (407-836-1400) prior to removal or taking out of service of
16 any asbestos material and shall obtain all required permits and licenses and issue all required
17 notices. The Contractor shall be responsible for all fees associated with permits, licenses and
18 notices to the governing regulatory agencies.
- 19 E. All work associated with asbestos cement water mains shall be performed in accordance with the
20 standards listed below and all other applicable local, State, or Federal standards.
- 21 1. Florida Administrative Code, Chapter 17-251, "Asbestos".
22 2. National Emission Standards Hazardous Air Pollution (NESHAP), 40 CFR Part 61, Subpart
23 M, latest revision.
24 3. Occupational Safety and Health Act, 29 CFR
25 4. The Environmental Protection Agency (EPA) Asbestos Abatement Worker Protection Rule.
26 5. Florida Statute 455.300.
- 27 F. Utility lines that are to be removed or taken out of service shall be protected during the
28 construction period and shall be removed or taken out of service only after the following
29 conditions are met.
- 30 1. The replacement line is in service and approved for operation by Florida Department of
31 Environmental Protection and the Engineer and accepted by Orange County Utilities.
32 2. All service connections have been relocated from the utility line to be taken out of service,
33 to the utility line that has been placed in active service with approvals from the Florida
34 Department of Environmental Protection, the Engineer, and Orange County Utilities.
35 3. The utility line to be taken out of service has been depressurized and all water evacuated
36 and disposed of properly.
- 37 G. Pipeline sections that are to be removed or grouted shall be cut, temporarily capped, and then
38 drained prior to removal or grouting. Contractor to ensure all water services and/or sewer
39 laterals that are connected to mains to be grouted are detached from the customer and
40 capped/plugged. The liquid and materials removed from the pipelines during draining shall be
41 collected and disposed of by the Contractor in accordance with all applicable local, State and
42 Federal requirements. The cost of draining the pipeline, collecting the pipeline contents, and
43 disposing of the pipeline contents in an approved and acceptable manner shall be included in the
44 appropriate unit prices in the Bid Form for pipe removal and abandonment.

1 **1.2 SALVAGE OF EXISTING UTILITIES**

- 2 A. For projects including the salvage of existing Orange County Utilities facility(ies), the
3 Contractor shall exercise the appropriate care necessary to remove and stockpile all existing
4 Orange County Utilities facility(ies) (including, but not limited to, all piping, bends, valves, tees,
5 fittings, hydrants, and appurtenances) in such a manner as to preserve the materials for future
6 use. Salvaged materials shall be removed and stockpiled, hauled, unloaded and stored in an
7 orderly manner at the direction of Orange County Environmental Protection Division by the
8 Contractor. The pay item provided in the Bid Form referencing pipe removal is intended to be
9 inclusive of all costs associated with the item description provided above.
- 10 B. The Contractor shall contact the Orange County Environmental Protection Division to arrange
11 for the delivery of any salvaged materials to the location designated by Orange County Utilities
12 Department. The condition of the materials can not be guaranteed as they shall be subject to the
13 normal excavation and handling procedures used on the project.
- 14 C. The Contractor shall be responsible for the removal and disposal of all utility lines taken out of
15 service. The Contractor shall be responsible for Orange County Utilities that are damaged
16 and/or deemed unsalvageable by Orange County Utilities.

17 **1.3 SUBMITTALS**

- 18 A. As a minimum, the Contractor shall submit to the County a weekly schedule of work. At the
19 County's request, the Contractor shall provide daily updates of this schedule.
- 20 B. The Contractor shall submit grout mixture data and the results from grout mixture test to the
21 Engineer for approval prior to performing grouting operations.

22 **PART 2 - PRODUCTS**

23 **2.1 MATERIALS**

- 24 A. The following is a suggested trial grout mixture for a one (1) cubic yard yield, however,
25 the actual grout mixture to be used shall meet all of the requirements specified below.
26
27

28 Cement:	500 pounds
29 Fly Ash:	500 pounds
30 Water:	350 pounds (42 gallons)
31 Sand:	2,248 pounds
32 Darex (W.R.Grace):	3 ounces (Air Entrainment Additive or equivalent)
33 Bentonite:	6 pounds (to be mixed with sufficient water in colloidal 34 mixture and added at the job site)
- 35 B. The mixture used for grouting shall be of a creamy consistency. Samples of the grout
36 mixture when set aside in a standard concrete test mold shall show less than one percent
37 of the mixture height of free water on the surface after standing not less than 12 hours.
- 38 C. One set of three (3) 3" x 6" sample test cylinders shall be made for each mix preparation.
39 The minimum 28 day strength shall be no less than 1000 psi. The required slump is 5
40 inches. The maximum allowable slump is 9 inches. Slump should be as low as practical
41 to maintain viscosity, proper "flow," and still retain ability to pump.
42

1 **PART 3 - EXECUTION**

2 **3.1 REMOVAL OF EXISTING PIPE AND APPURTENANCES**

- 3 A. Contractor shall uncover and remove existing pipe as shown on the Drawings. No pipe shall be
4 removed until the new pipe is installed and placed in operation.
- 5 B. All buried pipe uncovered and removed from the trench shall be properly disposed by the
6 Contractor unless the County has specifically requested that the pipe be salvaged to the County.
- 7 C. Exposing and removing existing asbestos-cement pipe shall be performed in strict accordance
8 with all applicable rules, regulations, laws and standards. The Contractor shall be responsible
9 for ensuring that all rules, regulations, laws, and standards are met and for monitoring quality
10 control.
- 11 D. All asbestos-cement pipes removed shall be properly disposed in accordance with all rules,
12 regulations, laws, and standards.

13 **3.2 IN-PLACE GROUTING OF EXISTING PIPE**

- 14 A. All pipes to be taken out of service that are to remain buried are to be grouted.
- 15 B. Grout shall be introduced into the lowest end of the line section to be grouted in order to displace
16 air and entrapped water within the pipeline. The ends of these sections shall be capped.
17 Grouting of pipes shall be completed in sections not exceeding 400 feet in length and shall not
18 be completed in more than three (3) stages with the final stage containing at least 50 percent of
19 the volume to be grouted for the section.
- 20 C. The grouting program shall consist of pumping sand-cement grout with suitable chemical
21 additives at pressures necessary to fill the pipe sections in order to prevent the potential for
22 future collapse.
- 23 D. The pump used for grouting should be a continuous flow, positive displacement model with a
24 pugmill type mixing vat having a minimum shaft speed of 60 rpm and incorporated as an
25 integral part of the equipment. Alternate equipment may be used subject to the approval of the
26 Engineer. The rate of pumping shall not exceed six (6) cubic feet per minute.
- 27 E. The Contractor shall provide standpipes and/or additional means of visual inspections as
28 required by the County to determine if adequate grout material has filled the entire pipe
29 section(s). The Contractor shall make necessary provisions for the County's representative to
30 monitor all grouting operations.
- 31 F. All pipes to be taken out of service shall be capped or plugged with a fitting or material that will
32 prevent soil or other material from entering the pipe. All caps and plugs shall be subject to
33 approval by the Engineer.

34 **3.3 MONITORING**

- 35 A. The Engineer or County representative may stop the grouting operations at any time, if in his
36 judgment, the operation does not comply with these Specifications or if the work is not to his
37 satisfaction.
- 38 B. The Engineer or County representative shall make all measurements of pipe length grouted and
39 grout quantity pumped, and maintain records of each day's operations for the benefit of the
40 County and the Contractor. The quantities recorded by the County or Engineer's representative
41 shall be considered final.

42 **END OF SECTION**

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1 **SECTION 03 05 05**
2 **CONCRETE TESTING**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

5 A. Section Includes:

- 6 1. Contractor requirements for testing of concrete and grout.
7 2. Definition of Owner provided testing.
8 3. Acceptance criteria for concrete.

9 B. Related Specification Sections include but are not necessarily limited to:

- 10 1. Division 1 - General Requirements.
11 2. Section 03 09 00 - Concrete.

12 **1.2 RESPONSIBILITY AND PAYMENT**

13 A. Contractor will hire an independent Testing Agency/Service Provider to perform the following
14 testing and inspection and provide test results to the Owner and Engineer.

- 15 1. Testing and inspection of concrete and grout produced for incorporation into the work
16 during the construction of the Project for compliance with the Contract Documents.
17 2. Additional testing or retesting of materials occasioned by their failure, retest or inspection,
18 to meet requirements of the Contract Documents, shall be performed at the Contractor's
19 expense.
20 3. Strength testing on concrete required by the Engineer or Owner when the water-cement ratio
21 exceeds the water-cement ratio of the typical test cylinders.
22 4. Other testing services needed or required by Contractor such as field curing of test
23 specimens and testing of additional specimens for determining when forms, form shoring or
24 reshoring may be removed.
25 5. See Specification Section 01 30 00.

26 B. Contractor shall hire a qualified testing agency to perform the following testing and provide test
27 results to the Engineer.

- 28 1. Testing of materials and mixes proposed by the Contractor for compliance with the Contract
29 Documents and retesting in the event of changes.
30 2. Additional testing and inspection required because of changes in materials or proportions
31 requested by Contractor shall be at the Contractor's expense.
32 3. Contractor shall pay for services defined in Paragraphs 1.2B.1. and 1.2B.2.
33 4. See Specification Section 01 30 00.

34 C. Duties and Authorities of Testing Agency/Service Provider:

- 35 1. Any Testing Agency/Service Provider or agencies and their representatives retained by
36 Contractor or Owner for any reason are not authorized to revoke, alter, relax, enlarge, or
37 release any requirement of Contract Documents, nor to reject, approve or accept any portion
38 of the Work.
39 2. Testing Agency/Service Provider shall inform the Contractor and Engineer regarding
40 acceptability of or deficiencies in the work including materials furnished and work
41 performed by Contractor that fails to fulfill requirements of the Contract Documents.
42 3. Testing Agency to submit test reports and inspection reports to Engineer and Contractor
43 immediately after they are performed.
44 a. All test reports to include exact location in the Work at which batch represented by a
45 test was deposited.
46 b. Reports of strength tests to include detailed information on storage and curing of
47 specimens prior to testing.

4. Owner retains the responsibility for ultimate rejection or approval of any portion of the Work.

1.3 QUALITY ASSURANCE

A. Referenced Standards:

1. American Association of State Highway and Transportation Officials (AASHTO):
 - a. T260, Standard Method of Sampling and Testing for Total Chloride Ion in Concrete and Concrete Raw Materials.
2. American Concrete Institute (ACI):
 - a. 318, Building Code Requirements for Structural Concrete.
3. ASTM International (ASTM):
 - a. C31, Standard Practice for Making and Curing Concrete Test Specimens in the Field.
 - b. C39, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
 - c. C42, Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
 - d. C138, Standard Method of Test for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete.
 - e. C143, Standard Test Method for Slump of Hydraulic Cement.
 - f. C172, Standard Practice for Sampling Freshly Mixed Concrete.
 - g. C173, Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
 - h. C231, Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
 - i. E329, Standard Specification for Agencies Engaged in Construction Inspection and/or Testing.

B. Qualifications:

1. Contractor's Testing Agency:
 - a. Meeting requirements of ASTM E329.
 - b. Provide evidence of recent inspection by Cement and Concrete Reference Laboratory (CCRL) of National Bureau of Standards (NBS), and correction of deficiencies noted.

C. Use of Testing Agency and approval by Engineer of proposed concrete mix design shall in no way relieve Contractor of responsibility to furnish materials and construction in full compliance with Contract Documents.

1.4 DEFINITIONS

- A. Testing Agency/Service Provider: An independent professional testing/inspection firm or service hired by Contractor to perform testing, inspection or analysis services as directed, and as provided in the Contract Documents.

1.5 SUBMITTALS

A. Shop Drawings:

1. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
2. Product technical data including:
 - a. Concrete materials and concrete mix designs proposed for use.
 - 1) Include results of all testing performed to qualify materials and to establish mix designs.
 - 2) Place no concrete until approval of mix designs has been received in writing.
 - 3) Submittal for each concrete mix design to include:
 - a) Sieve analysis and source of fine and coarse aggregates.
 - b) Test for aggregate organic impurities.
 - c) Proportioning of all materials.
 - d) Type of cement with mill certificate for the cement.

- 1 e) Brand, quantity and class of fly ash proposed for use along with other
- 2 submittal data as required for fly ash by Specification Section 03 09 00.
- 3 f) Slump.
- 4 g) Brand, type and quantity of air entrainment and any other proposed
- 5 admixtures.
- 6 h) Shrinkage test results.
- 7 i) Total chloride ion content per cubic yard of concrete determined in accordance
- 8 with AASHTO T260.
- 9 j) 28-day compression test results and any other data required by Specification
- 10 Section 03 09 00 to establish concrete mix design.
- 11 3. Certifications:
- 12 a. Testing Agency qualifications.

13 **PART 2 - PRODUCTS - (NOT APPLICABLE TO THIS SECTION)**

14 **PART 3 - EXECUTION**

15 **3.1 TESTING SERVICES TO BE PERFORMED BY CONTRACTOR**

- 16 A. The following concrete testing will be performed by the Contractor:
- 17 1. Concrete strength testing:
 - 18 a. Secure concrete samples in accordance with ASTM C172.
 - 19 1) Obtain each sample from a different batch of concrete on a random basis, avoiding
 - 20 selection of test batch other than by a number selected at random before
 - 21 commencement of concrete placement.
 - 22 b. For each strength test mold and cure four (4) cylinders from each sample in accordance
 - 23 with ASTM C31.
 - 24 1) Record any deviations from requirements on test report.
 - 25 2) Cylinder size: Per ASTM C31.
 - 26 c. Field cure in cylinder for the seven (7) day test.
 - 27 1) Laboratory cure the remaining.
 - 28 d. Test cylinders in accordance with ASTM C39.
 - 29 1) Test two (2) cylinders at 28 days for strength test result and one (1) at seven (7)
 - 30 days for information.
 - 31 2) Hold remaining cylinder in reserve.
 - 32 e. Strength test result:
 - 33 1) Average of strengths of two (2) cylinders from the same sample tested at 28 days.
 - 34 2) If one (1) cylinder in a test manifests evidence of improper sampling, molding,
 - 35 handling, curing, or testing, discard and test reserve cylinder; average strength of
 - 36 remaining cylinders shall be considered strength test result.
 - 37 3) Should all cylinders in a test show any of above defects, discard entire test.
 - 38 f. Frequency of tests:
 - 39 1) Concrete sand cement grout: One (1) strength test for each 4 HR period of grout
 - 40 placement or fraction thereof.
 - 41 2) Precast concrete, concrete topping, concrete fill and lean concrete: One (1)
 - 42 strength test for each 50 CY of each type of concrete or fraction thereof placed.
 - 43 3) All other concrete:
 - 44 a) One (1) strength test consisting to be taken not less than once a day, nor less
 - 45 than once for each 60 CY or fraction thereof placed in any one (1) day.
 - 46 b) If total volume of concrete on Project is such that frequency of testing required
 - 47 in above paragraph will provide less than five (5) strength tests for each
 - 48 concrete mix, tests shall then be made from at least five (5) randomly selected
 - 49 batches or from each batch if fewer than five (5) batches are provided.
 - 50

- 1 2. Slump testing:
 - 2 a. Determine slump of concrete sample for each strength test.
 - 3 1) Determine slump in accordance with ASTM C143.
 - 4 b. If consistency of concrete appears to vary, the Engineer shall be authorized to require a slump test for each concrete truck.
 - 5 1) This practice shall continue until the Engineer deems it no longer necessary.
- 7 3. Air content testing: Determine air content of concrete sample for each strength test in accordance with either ASTM C231, ASTM C173, or ASTM C138.
- 9 4. Temperature testing: Determine temperature of concrete sample for each strength test.
- 10 5. In-place concrete testing (if required).

11 **3.2 ACCEPTANCE**

- 12 A. Completed concrete work which meets applicable requirements will be accepted without qualification.
- 14 B. Completed concrete work which fails to meet one or more requirements but which has been repaired to bring it into compliance will be accepted without qualification.
- 16 C. Completed concrete work which fails to meet one or more requirements and which cannot be brought into compliance may be accepted or rejected as provided in these Contract Documents.
 - 18 1. In this event, modifications may be required to assure that concrete work complies with requirements.
 - 20 2. Modifications, as directed by Engineer, to be made at no additional cost to Owner.
- 21 D. Dimensional Tolerances:
 - 22 1. Formed surfaces resulting in concrete outlines smaller than permitted by tolerances shall be considered potentially deficient in strength and subject to modifications required by Engineer.
 - 24 2. Formed surfaces resulting in concrete outlines larger than permitted by tolerances may be rejected and excess material subject to removal.
 - 27 a. If removal of excess material is permitted, accomplish in such a manner as to maintain strength of section and to meet all other applicable requirements of function and appearance.
 - 30 3. Concrete members cast in wrong location may be rejected if strength, appearance or function of structure is adversely affected or misplaced items interfere with other construction.
 - 34 4. Inaccurately formed concrete surfaces exceeding limits of tolerances and which are exposed to view, may be rejected.
 - 35 a. Repair or remove and replace if required.
 - 36 5. Finished slabs exceeding tolerances may be required to be repaired provided that strength or appearance is not adversely affected.
 - 38 a. High spots may be removed with a grinder, low spots filled with a patching compound, or other remedial measures performed as permitted or required.
- 40 E. Appearance:
 - 41 1. Concrete surfaces exposed to view with defects which, in opinion of Engineer, adversely affect appearance as required by specified finish shall be repaired by approved methods.
 - 43 2. Concrete not exposed to view is not subject to rejection for defective appearance unless, in the opinion of the Engineer, the defects impair the strength or function of the member.
- 45 F. High Water-Cement Ratio:
 - 46 1. Concrete with water in excess of the specified maximum water-cement ratio will be considered potentially deficient in durability.
 - 48 2. Remove and replace concrete with high water-cement ratio or make other corrections as directed by Engineer.

1 G. Strength of Structure:

- 2 1. Strength of structure in place will be considered potentially deficient if it fails to comply
3 with any requirements which control strength of structure, including but not necessarily
4 limited to following:
5 a. Low concrete strength:
6 1) Test results for standard molded and cured test cylinders to be evaluated separately
7 for each mix design.
8 a) Such evaluation shall be valid only if tests have been conducted in accordance
9 with specified quality standards.
10 b) For evaluation of potential strength and uniformity, each mix design shall be
11 represented by at least three (3) strength tests.
12 c) A strength test shall be the average of two (2) cylinders from the same sample
13 tested at 28 days.
14 2) Acceptance:
15 a) Strength level of each specified compressive strength shall be considered
16 satisfactory if both of the following requirements are met:
17 (1) Average of all sets of three (3) consecutive strength tests equal or exceed
18 the required specified 28 day compressive strength.
19 (2) No individual strength test falls below the required specified 28 day
20 compressive strength by more than 500 psi.
21 b. Reinforcing steel size, configuration, quantity, strength, position, or arrangement at
22 variance with requirements in Specification Section 03 09 00 or requirements of the
23 Contract Drawings or approved Shop Drawings.
24 c. Concrete which differs from required dimensions or location in such a manner as to
25 reduce strength.
26 d. Curing time and procedure not meeting requirements of this Specification Section.
27 e. Inadequate protection of concrete from extremes of temperature during early stages of
28 hardening and strength development.
29 f. Mechanical injury, construction fires, accidents or premature removal of formwork
30 likely to result in deficient strength.
31 g. Concrete defects such as voids, honeycomb, cold joints, spalling, cracking, etc., likely
32 to result in deficient strength or durability.
33 2. Structural analysis and/or additional testing may be required when strength of structure is
34 considered potentially deficient.
35 3. In-place testing of concrete may be required when strength of concrete in place is
36 considered potentially deficient.
37 a. Testing by impact hammer, sonoscope, or other nondestructive device may be
38 permitted by Engineer to determine relative strengths at various locations in the
39 structure or for selecting areas to be cored.
40 1) Such tests shall not be used as a basis for acceptance or rejection.
41 b. Core tests:
42 1) Where required, test cores will be obtained in accordance with ASTM C42.
43 a) If concrete in structure will be dry under service conditions, air dry cores
44 (temperature 60 to 80° F, relative humidity less than 60 percent) for seven (7)
45 days before test then test dry.
46 b) If concrete in structure will be wet or subjected to high moisture atmosphere
47 under service conditions, test cores after immersion in water for at least 40
48 HRS and test wet.
49 c) Testing wet or dry to be determined by Engineer.
50 2) Three (3) representative cores may be taken from each member or area of concrete
51 in place that is considered potentially deficient.
52 a) Location of cores shall be determined by Engineer so as least to impair
53 strength of structure.
54 b) If, before testing, one (1) or more of cores shows evidence of having been
55 damaged subsequent to or during removal from structure, damaged core shall
56 be replaced.

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- 3) Concrete in area represented by a core test will be considered adequate if average strength of three (3) cores is equal to at least 85 percent of specified strength and no single core is less than 75 percent of specified strength.
- 4) Fill core holes with non-shrink grout and finish to match surrounding surface when exposed in a finished area.
- 4. If core tests are inconclusive or impractical to obtain or if structural analysis does not confirm safety of structure, load tests may be required and their results evaluated in accordance with ACI 318, Chapter 20.
- 5. Correct or replace concrete work judged inadequate by structural analysis or by results of core tests or load tests with additional construction, as directed by Engineer, at Contractor's expense.
- 6. Contractor to pay all costs incurred in providing additional testing and/or structural analysis required.

END OF SECTION

1 **SECTION 03 09 00**
2 **CONCRETE**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

5 A. Section Includes:

- 6 1. Cast-in-place concrete and grout.
7 2. Concrete mixes, proportioning, and source quality control for precast concrete.

8 B. Related Sections include but are not necessarily limited to:

- 9 1. Division 1 - General Requirements.
10 2. Section 03 41 33 - Precast and Prestressed Concrete.

11 **1.2 QUALITY ASSURANCE**

12 A. Referenced Standards:

- 13 1. American Concrete Institute (ACI):
14 a. 116R, Cement and Concrete Terminology.
15 b. 212.3R, Chemical Admixtures for Concrete.
16 c. 304R, Guide for Measuring, Mixing, Transporting, and Placing Concrete.
17 d. 305R, Hot Weather Concreting.
18 e. 318, Building Code Requirements for Structural Concrete.
19 f. 347R, Recommended Practice for Concrete Formwork.
20 2. ASTM International (ASTM):
21 a. A82, Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
22 b. A185, Standard Specification for Steel Welded Wire Reinforcement, Plain, for
23 Concrete.
24 c. C31, Standard Practice for Making and Curing Concrete Test Specimens in the Field.
25 d. C33, Standard Specification for Concrete Aggregates.
26 e. C39, Standard Test Method for Compressive Strength of Cylindrical Concrete
27 Specimens.
28 f. C94, Standard Specification for Ready-Mixed Concrete.
29 g. C138, Standard Method of Test for Density (Unit Weight), Yield, and Air Content
30 (Gravimetric) of Concrete.
31 h. C143, Standard Test Method for Slump of Hydraulic Cement Concrete.
32 i. C150, Standard Specification for Portland Cement.
33 j. C172, Standard Practice for Sampling Freshly Mixed Concrete.
34 k. C173, Standard Test Method for Air Content of Freshly Mixed Concrete by the
35 Volumetric Method.
36 l. C231, Standard Test Method for Air Content of Freshly Mixed Concrete by the
37 Pressure Method.
38 m. C260, Standard Specification for Air-Entraining Admixtures for Concrete.
39 n. C494, Standard Specification for Chemical Admixtures for Concrete.
40 o. D994, Standard Specification for Preformed Expansion Joint Filler for Concrete
41 (Bituminous Type).
42 p. E329, Standard Specification for Agencies Engaged in Construction Inspection and/or
43 Testing.
44 3. Latest version of the Orange County Utilities Standards and Construction Specifications
45 Manual.

46 B. Quality Control:

- 47 1. Concrete testing agency:
48 a. Contractor to employ and pay for services of a testing laboratory to:

- 1) Perform materials evaluation.
 - 2) Design concrete mixes.
 - b. Concrete testing agency to meet requirements of ASTM E329.
 2. Do not begin concrete production until proposed concrete mix design has been approved by Engineer.
 - a. Approval of concrete mix design by Engineer does not relieve Contractor of his responsibility to provide concrete that meets the requirements of this Specification.
 3. Adjust concrete mix designs when material characteristics, job conditions, weather, strength test results or other circumstances warrant.
 - a. Do not use revised concrete mixes until submitted to and approved by Engineer.
- C. Qualifications:
1. Ready mixed concrete batch plant certified by National Ready Mixed Concrete Association (NRMCA).
 2. Formwork, shoring and reshoring for slabs and beams except where cast on ground to be designed by a professional engineer currently registered in the state where the project is located.

1.3 DEFINITIONS

- A. Per ACI 116R except as modified herein:
1. Concrete fill: Non-structural concrete.
 2. Concrete Testing Agency: Testing agency employed to perform materials evaluation, design of concrete mixes or testing of concrete placed during construction.
 3. Exposed concrete: Exposed to view after construction is complete.
 4. Indicated: Indicated by Contract Documents.
 5. Nonexposed concrete: Not exposed to view after construction is complete.
 6. Required: Required by Contract Documents.
 7. Specified strength: Specified compressive strength at 28 days.
 8. Submitted: Submitted to Engineer.

1.4 SUBMITTALS

- A. Shop Drawings:
1. See Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
 2. Concrete mix designs proposed for use.
 - a. Concrete mix design submittal to include the following information:
 - 1) Sieve analysis and source of fine and coarse aggregates.
 - 2) Test for aggregate organic impurities.
 - 3) Test for deleterious aggregate per ASTM C289.
 - 4) Proportioning of all materials.
 - 5) Type of cement with mill certificate for cement.
 - 6) Type of fly ash with certificate of conformance to specification requirements.
 - 7) Slump.
 - 8) Air content.
 - 9) Brand, type, ASTM designation, and quantity of each admixture proposed for use.
 - 10) 28-day cylinder compressive test results of trial mixes per ACI 318 and as indicated herein.
 - 11) Shrinkage test results.
 - 12) Standard deviation value for concrete production facility.
 - 13) Admixture for waterproofing
 3. Product technical data including:
 - a. Acknowledgement that products submitted meet requirements of standards referenced.
 - b. Manufacturer's installation instructions.
 - c. Manufacturers and types:
 - 1) Joint fillers.

- 1 2) Curing agents.
- 2 3) Chemical sealer.
- 3 4) Bonding and patching mortar.
- 4 5) Construction joint bonding adhesive.
- 5 6) Non-shrink grout with cure/seal compound.
- 6 7) Waterstops.
- 7 4. Reinforcing steel:
- 8 a. Show grade, sizes, number, configuration, spacing, location and all fabrication and
- 9 placement details.
- 10 b. In sufficient detail to permit installation of reinforcing without having to make
- 11 reference to Contract Drawings.
- 12 c. Obtain approval of Shop Drawings by Engineer before fabrication.
- 13 d. Mill certificates.
- 14 5. Strength test results of in place concrete including slump, air content and concrete
- 15 temperature.

16 **1.5 DELIVERY, STORAGE, AND HANDLING**

- 17 A. Storage of Material:
- 18 1. Cement and fly ash:
- 19 a. Store in moisture-proof, weather-tight enclosures.
- 20 b. Do not use if caked or lumpy.
- 21 2. Aggregate:
- 22 a. Store to prevent segregation and contamination with other sizes or foreign materials.
- 23 b. Obtain samples for testing from aggregates at point of batching.
- 24 c. Do not use frozen or partially frozen aggregates.
- 25 d. Do not use bottom 6 IN of stockpiles in contact with ground.
- 26 e. Allow sand to drain until moisture content is uniform prior to use.
- 27 3. Admixtures:
- 28 a. Protect from contamination, evaporation, freezing, or damage.
- 29 b. Maintain within temperature range recommended by manufacturer.
- 30 c. Completely mix solutions and suspensions prior to use.
- 31 4. Reinforcing steel: Support and store all rebar above ground.
- 32 B. Delivery:
- 33 1. Concrete:
- 34 a. Prepare a delivery ticket for each load for ready-mixed concrete.
- 35 b. Truck operator shall hand ticket to Owner's Representative at the time of delivery.
- 36 c. Ticket to show:
- 37 1) Mix identification mark.
- 38 2) Quantity delivered.
- 39 3) Amount of each material in batch.
- 40 4) Outdoor temp in the shade.
- 41 5) Time at which cement was added.
- 42 6) Numerical sequence of the delivery.
- 43 7) Amount of water added.
- 44 2. Reinforcing steel:
- 45 a. Ship to jobsite with attached plastic or metal tags with permanent mark numbers.
- 46 b. Mark numbers to match Shop Drawing mark number.

1 **PART 2 - PRODUCTS**

2 **2.1 ACCEPTABLE MANUFACTURERS**

- 3 A. All materials furnished for this work shall be in accordance with the "Orange County Utilities
4 Appendix D, List of Approved Products" as appended to these specifications unless otherwise
5 noted. All products not listed in Appendix D shall be subject to the County's approval.
- 6 B. Subject to compliance with the Contract Documents, the following products and manufacturers
7 are acceptable:
- 8 1. Nonshrink, nonmetallic grout:
 - 9 a. Sika "SikaGrout 212."
 - 10 b. Euclid Chemical "NS Grout."
 - 11 c. BASF Admixtures, Inc. "Masterflow 713."
 - 12 2. Epoxy grout:
 - 13 a. BASF Admixtures, Inc. "Brutem MPG."
 - 14 b. Euclid Chemical Company, "E3-G."
 - 15 c. Fosroc, "Conbextra EPHF".
 - 16 3. Expansion joint fillers:
 - 17 a. Permaglaze Co.
 - 18 b. Rubatex Corp.
 - 19 c. Williams Products, Inc.
 - 20 4. Waterstops, PVC:
 - 21 a. Greenstreak Plastic Products, Inc.
 - 22 b. W.R.Meadows, Inc.
 - 23 c. Burke Company.
 - 24 5. Form coating:
 - 25 a. Richmond "Rich Cote."
 - 26 b. Industrial Lubricants "Nox-Crete Form Coating."
 - 27 c. Euclid Chemical "Eucoslip VOX."
 - 28 6. Prefabricated forms:
 - 29 a. Simplex "Industrial Steel Frame Forms."
 - 30 b. Symons "Steel Ply."
 - 31 c. Universal "Uniform."
 - 32 7. Chemical sealer:
 - 33 a. L & M Construction Chemicals, Inc.
 - 34 b. Euclid Chemical Company.
 - 35 c. Dayton Superior.
 - 36 8. Epoxy Bonding agent:
 - 37 a. Siasitix 370
 - 38 b. Sikadur Hi Mod
 - 39 c. Concesive 1001-LPL
 - 40 9. Crystalline Waterproofing Materials
 - 41 a. Xypex Admix C-1000R (with red dye) @ 3.5% by weight of Portland Cement.
 - 42 b. Kryton – Krystol Internal Membrade (KIM) with color or UV tracer
 - 43 c. Penetron Admix with tracer.
- 44 C. Submit request for substitution in accordance with Specification Section 01 25 13.

45 **2.2 MATERIALS**

- 46 A. Portland Cement: Conform to ASTM C150 Type I modified or II.
- 47 B. Fly Ash:
- 48 1. ASTM C618, Class F or Class C.
 - 49 2. Nonstaining.
 - 50 a. Hardened concrete containing fly ash to be uniform light gray color.
 - 51 3. Maximum loss on ignition: 6 percent.

- 1 4. Compatible with other concrete ingredients.
- 2 5. Obtain proposed fly ash from a source approved by the State Highway Department in the
- 3 state where the Project is located for use in concrete for bridges.
- 4 6. Do not use for precast concrete.
- 5 C. Admixtures:
- 6 1. Air entraining admixtures: ASTM C260.
- 7 2. Water reducing, retarding, and accelerating admixtures:
- 8 a. ASTM C494 Type A through E.
- 9 b. Conform to provisions of ACI 212.3R.
- 10 c. Do not use retarding or accelerating admixtures unless specifically approved in writing
- 11 by Engineer and at no cost to Owner.
- 12 d. Follow manufacturer's instructions.
- 13 e. Use chloride free admixtures only.
- 14 3. Maximum total water soluble chloride ion content contributed from all ingredients of
- 15 concrete including water, aggregates, cementitious materials and admixtures by weight
- 16 percent of cement:
- 17 a. 0.06 prestressed concrete.
- 18 b. 0.10 all other concrete.
- 19 4. Do not use calcium chloride.
- 20 5. Pozzolanic admixtures: ASTM C618.
- 21 6. Provide admixtures of same type, manufacturer and quantity as used in establishing required
- 22 concrete proportions in the mix design.
- 23 D. Water: Potable, clean, free of oils, acids and organic matter.
- 24 E. Aggregates:
- 25 1. Normal weight concrete: ASTM C33, except as modified below.
- 26 2. Fine aggregate:
- 27 a. Clean natural sand.
- 28 b. No manufactured or artificial sand.
- 29 3. Coarse aggregate:
- 30 a. Crushed rock, natural gravel, or other inert granular material.
- 31 b. Maximum amount of clay or shale particles: 1 percent.
- 32 4. Gradation of coarse aggregate:
- 33 a. Lean concrete and concrete topping: Size #7.
- 34 b. All other concrete: Size #57 or #67.
- 35 F. Concrete Grout:
- 36 1. Nonshrink nonmetallic grout:
- 37 a. Nonmetallic, noncorrosive, nonstaining, premixed with only water to be added.
- 38 b. Grout to produce a positive but controlled expansion.
- 39 c. Mass expansion not to be created by gas liberation.
- 40 d. Minimum compressive strength of nonshrink grout at 28 days: 6500 psi.
- 41 e. In accordance with COE CRD-C621.
- 42 2. Epoxy grout:
- 43 a. 3-component epoxy resin system.
- 44 1) Two liquid epoxy components.
- 45 2) One inert aggregate filler component.
- 46 b. Each component packaged separately for mixing at jobsite.
- 47 G. Reinforcing Steel:
- 48 1. Reinforcing bars: ASTM A615, Grade 60.
- 49 2. Welded wire reinforcement: ASTM A185.
- 50 a. Minimum yield strength: 60,000 psi.
- 51 3. Column spirals: ASTM A82.
- 52

- 1 H. Forms:
- 2 1. Prefabricated or job built.
- 3 2. Wood forms:
- 4 a. New 5/8 or 3/4 IN 5-ply structural plywood of concrete form grade.
- 5 b. Built-in-place or prefabricated type panel.
- 6 c. 4 x 8 FT sheets for built-in-place type except where smaller pieces will cover entire
- 7 area.
- 8 d. When approved, plywood may be reused.
- 9 3. Metal forms:
- 10 a. Metal forms excluding aluminum may be used.
- 11 b. Forms to be tight to prevent leakage, free of rust and straight without dents to provide
- 12 members of uniform thickness.
- 13 4. Chamfer strips: Clear white pine, surface against concrete planed.
- 14 5. Form ties:
- 15 a. Removable end, permanently embedded body type with cones on outer ends not
- 16 requiring auxiliary spreaders.
- 17 b. Cone diameter: 3/4 IN minimum to 1 IN maximum.
- 18 c. Embedded portion 1-1/2 IN minimum back from concrete face.
- 19 d. If not provided with threaded ends, constructed for breaking off ends without damage to
- 20 concrete.
- 21 e. Provide ties with built-in waterstops at all walls that will be in contact with process
- 22 liquid during plant operation.
- 23 6. Form release: Nonstaining and shall not prevent bonding of future finishes to concrete
- 24 surface.
- 25 I. Expansion Joint Filler:
- 26 1. In contact with water or sewage:
- 27 a. Closed cell neoprene.
- 28 b. ASTM D1056, Class SC (oil resistant and medium swell) of 2 to 5 psi compression
- 29 deflection (Grade SCE41).
- 30 2. Exterior driveways, curbs and sidewalks:
- 31 a. Asphalt expansion joint filler.
- 32 b. ASTM D994.
- 33 3. Other use:
- 34 a. Fiber expansion joint filler.
- 35 b. ASTM D1751.

36 **2.3 CONCRETE MIXES**

- 37 A. General:
- 38 1. All concrete to be ready mixed concrete conforming to ASTM C94.
- 39 2. Provide concrete of specified quality capable of being placed without segregation and, when
- 40 cured, of developing all properties required.
- 41 3. All concrete to be normal weight concrete.
- 42 B. Strength:
- 43 1. Provide specified strength and type of concrete for each use in structure(s) as follows:

TYPE	WEIGHT	SPECIFIED STRENGTH*
Precast concrete	Normal weight and lightweight	5000 psi
All other general use concrete	Normal weight	4000 psi

51 * Minimum 28-day compressive strength.

- 1 C. Air Entrainment:
 2 1. Provide air entrainment in all concrete resulting in a total air content percent by volume as
 3 follows:
 4

MAX AGGREGATE SIZE	TOTAL AIR CONTENT PERCENT
1 IN or 3/4 IN	5 to 7
1/2 IN	5 1/2 to 8

- 5
 6 2. Air content to be measured in accordance with ASTM C231, ASTM C173, or ASTM C138.

- 7 D. Slump - 4 IN maximum, 1 IN minimum:
 8 1. Measured at point of discharge of the concrete into the concrete construction member.
 9 2. Concrete of lower than minimum slump may be used provided it can be properly placed and
 10 consolidated.
 11 3. Pumped concrete:
 12 a. Provide additional water at batch plant to allow for slump loss due to pumping.
 13 b. Provide only enough additional water so that slump of concrete at discharge end of
 14 pump hose does not exceed maximum slump specified above.
 15 4. Determine slump per ASTM C143.

- 16 E. Selection of Proportions:
 17 1. General:
 18 a. Proportion ingredients to:
 19 1) Produce proper workability, durability, strength, and other required properties.
 20 2) Prevent segregation and collection of excessive free water on surface.
 21 2. Minimum cement contents and maximum water cement ratios for concrete to be as follows:
 22

SPECIFIED STRENGTH	MINIMUM CEMENT, LB/CY			MAXIMUM WATER CEMENT RATIO BY WEIGHT
	MAXIMUM AGGREGATE SIZE 1/2 IN	3/4 IN	1 IN	
4000	611	611	611	0.45
5000	---	686	665	0.40

- 23
 24 3. Substitution of fly ash: Maximum of 25 percent by weight of cement at rate of 1 LB fly ash
 25 for 1 LB of cement.
 26 4. Sand cement grout:
 27 a. Three parts sand.
 28 b. One part Portland cement.
 29 c. Entrained air: Six percent plus or minus one percent.
 30 d. Sufficient water for required workability.
 31 e. Minimum 28-day compressive strength: 3,000 psi.
 32 5. Concrete waterproofing admix shall be added to the concrete during the batching operation.
 33 a. The amount of cement shall remain the same and not be reduced.
 34 b. A colorant shall be added to verify that the admix was added to the concrete. Colorant
 35 shall be added at the admix manufacturing facility, not at the concrete batch plant.
 36 c. Admix must be added to the concrete at the time of batching. It is recommended that
 37 the admix powder be added first to the rock and sand and blended thoroughly before
 38 adding cement and water.
 39 d. Dosage Rate.
 40 1) The Crystalline Waterproofing Additive shall be added to the concrete mix per the
 41 manufacturer's specifications at the following rates:
 42 2) Xypex Admix C-1000R (with red dye) at 3.5% by weight of Portland Cement.
 43 e. Application, Batching and Mixing
 44 1) Comply with manufacturer's product data regarding installation, including
 45 technical bulletins, product catalogue, installation instructions and product
 46 packaging labels.

- 1 6. Normal weight concrete:
2 a. Proportion mixture to provide desired characteristics using one of methods described
3 below:
4 1) Method 1 (Trial Mix): Per ACI 318, Chapter 5, except as modified herein.
5 a) Air content within range specified above.
6 b) Record and report temperature of trial mixes.
7 c) Proportion trial mixes per ACI 211.1.
8 2) Method 2 (Field Experience): Per ACI 318, Chapter 5, except as modified herein:
9 a) Field test records must be acceptable to Engineer to use this method.
10 b) Test records shall represent materials, proportions and conditions similar to
11 those specified.
12 7. Required average strength to exceed the specified 28-day compressive strength by the
13 amount determined or calculated in accordance with the requirements of Paragraph 5.3 of
14 ACI 318 using the standard deviation of the proposed concrete production facility as
15 described in Paragraph 5.3.1 of ACI 318.

16 **PART 3 - EXECUTION**

17 **3.1 FORMING AND PLACING CONCRETE**

- 18 A. Formwork:
19 1. Contractor is responsible for design and erection of formwork.
20 2. Construct formwork so that concrete members and structures are of correct size, shape,
21 alignment, elevation and position.
22 a. Allowable tolerances: As recommended in ACI 347R.
23 3. Chamfer strips: Place 3/4 IN chamfer strips in forms to produce 3/4 IN wide beveled edges
24 on permanently exposed corners of members.
25 4. Clean and adjust forms prior to concrete placement.
26 5. Tighten forms to prevent mortar leakage.
27 6. Coat form surfaces with form release agents prior to placing reinforcing bars in forms.
- 28 B. Reinforcement:
29 1. Position, support and secure reinforcement against displacement.
30 2. Locate and support with chairs, runners, bolsters, spacers and hangers, as required.
31 3. Set wire ties so ends do not touch forms and are directed into concrete, not toward exposed
32 concrete surfaces.
33 4. Lap splice lengths: ACI 318 Class B top bar tension splices unless indicated otherwise on
34 the Drawings.
35 5. Extend reinforcement to within 2 IN of concrete perimeter edges.
36 a. If perimeter edge is earth formed, extend reinforcement to within 3 IN of the edge.
37 6. Minimum concrete protective covering for reinforcement: As shown on Drawings.
38 7. Do not weld reinforcing bars.
39 8. Welded wire reinforcement:
40 a. Install welded wire reinforcement in maximum practical sizes.
41 b. Splice sides and ends with a splice lap length measured between outermost cross wires
42 of each fabric sheet not less than:
43 1) One spacing of cross wires plus 2 IN.
44 2) 1.5 x development length.
45 3) 6 IN.
46 c. Development length: ACI 318 basic development length for the specified fabric yield
47 strength.
- 48 C. Construction, Expansion, and Contraction Joints:
49 1. Install construction joints perpendicular to main reinforcement with all reinforcement
50 continued across construction joints.
51 2. At least 48 HRS shall elapse between placing of adjoining concrete construction.

- 1 3. Thoroughly clean and remove all laitance and loose and foreign particles from construction
- 2 joints.
- 3 4. Before new concrete is placed, coat all construction joints with an approved bonding
- 4 adhesive used and applied in accordance with manufacturer's instructions.

- 5 D. Placing Concrete:
- 6 1. Place concrete in compliance with ACI 304R and ACI 304.2R.
- 7 2. Place in a continuous operation within planned joints or sections.
- 8 3. Begin placement when work of other trades affecting concrete is completed.
- 9 4. Place concrete by methods which prevent aggregate segregation.
- 10 5. Do not allow concrete to free fall more than 4 FT.
- 11 6. Where free fall of concrete will exceed 4 FT, place concrete by means of tremie pipe or
- 12 chute.

- 13 E. Consolidation: Consolidate all concrete using mechanical vibrators supplemented with hand
- 14 rodding and tamping, so that concrete is worked around reinforcement and embedded items into
- 15 all parts of forms.

- 16 F. Protection:
- 17 1. Protect concrete from physical damage or reduced strength due to weather extremes.
- 18 2. In cold weather comply with ACI 306R except as modified herein.
- 19 a. Do not place concrete on frozen ground or in contact with forms or reinforcing bars
- 20 coated with frost, ice or snow.
- 21 b. Minimum concrete temperature at the time of mixing:
- 22

OUTDOOR TEMPERATURE AT PLACEMENT (IN SHADE)	CONCRETE TEMPERATURE AT MIXING
Below 30° F	70° F
Between 30-45° F	60° F
Above 45° F	50° F

- 23 c. Do not place heated concrete that is warmer than 80° F.
- 24 d. If freezing temperatures are expected during curing, maintain the concrete temperature
- 25 at or above 50° F for 7 days or 70° F for 3 days.
- 26 e. Do not allow concrete to cool suddenly.
- 27
- 28 3. In hot weather comply with ACI 305R except as modified herein.
- 29 a. At air temperature of 90° F and above, keep concrete as cool as possible during
- 30 placement and curing.
- 31 b. Do not allow concrete temperature to exceed 90° F at placement.
- 32 c. Prevent plastic shrinkage cracking due to rapid evaporation of moisture.
- 33 d. Do not place concrete when the actual or anticipated evaporation rate equals or exceeds
- 34 0.2 LBS/SF/HR as determined from ACI 305R, Figure 2.1.5.

- 35 G. Curing:
- 36 1. Begin curing concrete as soon as free water has disappeared from exposed surfaces.
- 37 2. Cure concrete by use of moisture retaining cover, burlap kept continuously wet or by
- 38 membrane curing compound.
- 39 3. Provide protection as required to prevent damage to concrete and to prevent moisture loss
- 40 from concrete during curing period.
- 41 4. Provide curing for minimum of 7 days.
- 42 5. Form materials left in place may be considered as curing materials for surfaces in contact
- 43 with the form materials except in periods of hot weather.
- 44 6. In hot weather follow curing procedures outlined in ACI 305R.
- 45 7. If forms are removed before 7 days have elapsed, finish curing of formed surfaces by one of
- 46 above methods for the remainder of the curing period.
- 47 8. Curing vertical surfaces with a curing compound:
- 48 a. Cover vertical surfaces with a minimum of two coats of the curing compound.

- 1 b. Allow the preceding coat to completely dry prior to applying the next coat.
- 2 c. Apply the first coat of curing compound immediately after form removal.
- 3 d. Vertical surface at the time of receiving the first coat shall be damp with no free water
- 4 on the surface.
- 5 e. A vertical surface is defined as any surface steeper than 1 vertical to 4 horizontal.

6 H. Form Removal:

- 7 1. Remove forms after concrete has hardened sufficiently to resist damage from removal
- 8 operations or lack of support.
- 9 2. Where no reshoring is planned, leave forms and shoring used to support concrete until it has
- 10 reached its specified 28-day compressive strength.

11 **3.2 CONCRETE FINISHES**

12 A. Tolerances:

- 13 1. Class A: 1/8 IN in 10 FT.

14 B. Surfaces Exposed to View:

- 15 1. Remove fins and projections, and patch voids, air pockets, and honeycomb areas with
- 16 cement grout.

- 17 C. Broom Finish: Immediately after concrete has received a float finish as specified, give it a
- 18 transverse scored texture by drawing a broom across surface.

19 **3.3 GROUT**

20 A. Preparation:

- 21 1. Nonshrinking nonmetallic grout:
 - 22 a. Clean concrete surface to receive grout.
 - 23 b. Saturate concrete with water for 24 HRS prior to grouting.
- 24 2. Epoxy grout: Apply only to clean, dry, roughened, sound surface.

25 B. Application:

- 26 1. Nonshrinking nonmetallic grout:
 - 27 a. Mix in a mechanical mixer.
 - 28 b. Use no more water than necessary to produce flowable grout.
 - 29 c. Place in accordance with manufacturer's instructions.
 - 30 d. Completely fill all spaces and cavities below the bottom of baseplates.
 - 31 e. Provide forms where baseplates and bedplates do not confine grout.
 - 32 f. Where exposed to view, finish grout edges smooth.
 - 33 g. Except where a slope is indicated on Drawings, finish edges flush at the baseplate,
 - 34 bedplate, member, or piece of equipment.
 - 35 h. Protect against rapid moisture loss by covering with wet rags or polyethylene sheets.
 - 36 i. Wet cure grout for 7 days, minimum.
- 37 2. Epoxy grout:
 - 38 a. Mix and place in accordance with manufacturer's instructions.
 - 39 b. Completely fill all cavities and spaces around dowels and anchors without voids.
 - 40 c. Obtain manufacturer's field technical assistance as required to ensure proper placement.

41 **3.4 FIELD QUALITY CONTROL**

- 42 A. Employ and pay for services of a concrete testing laboratory to perform testing of concrete
- 43 placed during construction.

44 B. Concrete Quality Control During Construction:

- 45 1. Strength tests:
 - 46 a. Secure concrete samples in accordance with ASTM C172.
 - 47 b. Obtain each sample from a different batch of concrete on a random basis.
 - 48 c. For each strength test mold and cure three cylinders from each sample in accordance
 - 49 with ASTM C31.

- 1) Record any deviations from requirements on test report.
 - d. Test cylinders in accordance with ASTM C39.
 - e. Test 1 cylinder at 7 days.
 - f. Test 2 cylinders at 28 days.
- C. Evaluation of Tests:
- 1. Strength test results:
 - a. Average of 28-day strength of two cylinders from each sample.
 - 1) If one cylinder manifests evidence of improper sampling, molding, handling, curing or testings, strength of remaining cylinder will be test result.
 - 2) If both cylinders show any of above defects, test will be discarded.
- D. Acceptance of Concrete:
- 1. Strength level of each type of concrete shall be considered satisfactory if both of the following requirements are met:
 - a. Average of all sets of three consecutive strength tests equals or exceeds the required specified 28-day compressive strength.
 - b. No individual strength test falls below the required specified 28-day compressive strength by more than 500 psi.
 - 2. If tests fail to indicate satisfactory strength level, perform additional tests and/or corrective measures as directed by Engineer.
 - a. Perform additional tests and/or corrective measures at no additional cost to Owner.

3.5 SCHEDULES

- A. Form Types:
- 1. Surfaces exposed to view:
 - a. Prefabricated or job-built wood forms.
 - b. Laid out in a regular and uniform pattern with long dimensions vertical and joints aligned.
 - c. Produce finished surfaces free from offsets, ridges, waves, and concave or convex areas.
 - d. Construct forms sufficiently tight to prevent leakage of mortar.
 - 2. Surfaces normally submerged or not normally exposed to view: Wood or steel forms sufficiently tight to prevent leakage of mortar.
 - 3. Other types of forms may be used:
 - a. For surfaces not restricted to plywood or lined forms.
 - b. As backing for form lining.
- B. Grout:
- 1. Nonshrinking nonmetallic grout: General use.
 - 2. Epoxy grout:
 - a. Grouting of dowels and anchor bolts into existing concrete.
 - b. Other uses indicated on Drawings.
 - 3. Sand cement grout: Keyways of precast members.
- C. Concrete:
- 1. Precast concrete: Where indicated on Drawings.
 - 2. General use concrete: All other locations.
- D. Concrete Finishes:
- 1. Slab finishes:
 - a. Use following finishes as applicable, unless otherwise indicated:
 - 1) Floated finish: Surfaces intended to receive roofing, concrete topping, lean concrete, concrete fill and waterproofing.
 - 2) Troweled finish: Interior floor slabs, exposed roof slabs and base slabs of structures, equipment bases, and column bases.
 - 3) Broom finish: Sidewalks, docks, concrete stairs, and ramps.

END OF SECTION

1 **SECTION 03 41 33**
2 **PRECAST AND PRESTRESSED CONCRETE**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

- 5 A. Section Includes:
6 1. Precast and prestressed concrete.
7 B. Related Sections include but are not necessarily limited to:
8 1. Division 1 - General Requirements.
9 2. Section 03 09 00 - Concrete.
10 3. Section 03 05 05 – Concrete Testing.

11 **1.2 QUALITY ASSURANCE**

- 12 A. Referenced Standards:
13 1. American Association of State Highway and Transportation Officials (AASHTO):
14 a. Standard Specification for Highway Bridges.
15 2. American Concrete Institute (ACI):
16 a. 211.2, Standard Practice for Selecting Proportions for Structural Lightweight Concrete.
17 b. 318, Building Code Requirements for Structural Concrete.
18 3. ASTM International (ASTM):
19 a. A36, Standard Specification for Carbon Structural Steel.
20 b. A108, Standard Specification for Steel Bars, Carbon, Cold-Finished, Standard Quality.
21 c. A416, Standard Specification for Steel Strand, Uncoated Seven-Wire for Prestressed
22 Concrete.
23 d. A496, Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement.
24 e. C33, Standard Specification for Concrete Aggregates.
25 f. C150, Standard Specification for Portland Cement.
26 g. C330, Standard Specification for Lightweight Aggregates for Structural Concrete.
27 h. E329, Standard Specification for Agencies Engaged in Construction Inspection and/or
28 Testing.
29 4. American Welding Society (AWS):
30 a. A5.1, Specification for Carbon Steel Electrodes for Shielded Metal Arc Welding.
31 b. A5.5, Specification for Low-Alloy Steel Electrodes for Shielded Metal Arc Welding.
32 c. D1.1, Structural Welding Code - Steel.
33 d. D1.4, Structural Welding Code - Reinforcing Steel.
34 5. Occupational Safety and Health Administration (OSHA).
35 6. Precast/Prestressed Concrete Institute (PCI):
36 a. MNL 116, Manual for Quality Control for Plants and Production of Precast and
37 Prestressed Concrete Products.
38 b. PCI Design Handbook - Precast and Prestressed Concrete.
39 7. Building code:
40 a. International Code Council (ICC):
41 1) International Building Code and associated standards, 2009 Edition including all
42 amendments, referred to herein as Building Code.
43 8. Latest version of the Orange County Utilities Standards and Construction Specifications
44 Manual.
45 B. Qualifications:
46 1. Provide precast and prestressed concrete units produced by an active member of PCI.
47 2. Provide units manufactured by plant which has regularly and continuously engaged in
48 manufacture of units of same type as those required for a minimum of three (3) years.

3. Assure manufacturer's testing facilities meet requirements of ASTM E329.
4. Welding operators and processes to be qualified in accordance with:
 - a. AWS D1.1 for welding steel shapes and plates.
 - b. AWS D1.4 for welding reinforcing bars.
5. Welding operators to have passed qualification tests for type of welding required during the previous 12 months prior to commencement of welding.

1.3 SUBMITTALS

A. Shop Drawings:

1. See Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
2. Product technical data including:
 - a. Acknowledgement that products submitted meet requirements of standards referenced.
 - b. Manufacturer's installation instructions.
 - c. Sizes, types and manufacturer of neoprene bearing pads.
 - d. Hardware to be utilized to support suspended appurtenances.
3. Shop Drawings and erection plans for precast units, their connections and supports showing:
 - a. Member size and location.
 - b. Size, configuration, location and quantity of reinforcing bars and prestressing strands.
 - c. Initial prestress forces.
 - d. Size and location of openings verified by Contractor.
 - e. Size, number, and locations of embedded metal items and connections.
 - f. Required concrete strengths.
 - g. Identification of each unit using same standard marking numbers as used to mark actual units.
4. Concrete mix design(s) including submittal information defined in Section 03 09 00.
5. Copies of source quality control tests.
6. Certification of manufacturer's testing facility qualifications.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. All materials furnished for this work shall be in accordance with the "Orange County Utilities Appendix D, List of Approved Products" as appended to these specifications unless otherwise noted. All products not listed in Appendix D shall be subject to the County's approval.
- B. Submit request for substitution in accordance with Specification Section 01 25 13.

2.2 MATERIALS

- A. Coat the surface of the precast unit that is exposed to the corrosive atmosphere with a corrosive-resistant lining. See Section 33 05 16, Precast Concrete Manhole Structures.
- B. Provide minimum of 2 IN concrete cover on all rebars and prestressing strands.
- C. Indicate that such units are to be designed for no tension in top and bottom of units when supporting all dead and live loads.
- D. Cement:
 1. Comply with ASTM C150, Type I or III.
 2. Type II cement to be used in the following precast units:
- E. Aggregates for Normal Weight Concrete:
 1. ASTM C33 with coarse aggregate meeting the gradation for size 67 as stated in ASTM C33.
 2. Provide aggregates approved for bridge construction by the State Highway Department in the state where the precast units are fabricated or in the state where the Project is located.
 3. All fine aggregate to be natural not manufactured.

- 1 F. Water:
- 2 1. Potable, clean.
- 3 2. Free of oils, acids, and organic matter.
- 4 G. Maximum total chloride ion content contributed from all ingredients of concrete including water,
- 5 aggregates, cement and admixtures measured as a weight percent of cement to not exceed 0.06
- 6 for prestressed concrete and 0.10 for all other precast concrete.
- 7 H. Prestressing Strands:
- 8 1. Either 250K or 270K high tensile strength uncoated seven (7) wire strand.
- 9 2. Manufacture and test strands in accordance with ASTM A416.

10 **2.3 MIXES**

- 11 A. New concrete structures shall contain a crystalline waterproofing concrete admix for all new
- 12 concrete structures including but not limited to manholes, ARV vaults, wetwells, and wetwell
- 13 top slabs. Crystalline waterproofing concrete admix shall be added to the concrete during the
- 14 batching operation. Admixture concentration shall be added based upon manufacturer's design
- 15 percent concentration of admixture to the required weight of cement. The amount of cement
- 16 shall remain the same and not be reduced. A colorant shall be added to verify the admixture was
- 17 added to the concrete. Colorant shall be added and provided at the admixture manufacturing
- 18 facility, not at the concrete batch plant. It is recommended that the admixture be added first to
- 19 the rock and sand and blended thoroughly before adding cement and water or per the
- 20 manufacturer's recommendations. Concrete structures without crystalline waterproofing
- 21 admixture or admixture without colorant for field verification shall be rejected. Contractor shall
- 22 provide certification from the pre-caster that the admixture was added in accordance with the
- 23 manufacturer's recommendations.
- 24 B. See Section 03 09 00.
- 25 C. Do not begin fabrication of units until concrete mix design(s) have been approved by Engineer.

26 **2.4 DESIGN**

- 27 A. General Design Requirements:
- 28 1. Design units and connections in strict accordance with ACI 318 and the PCI Design
- 29 Handbook - Precast and Prestressed Concrete.

30 **2.5 FABRICATION**

- 31 A. Cast all members in smooth rigid forms which will provide straight, true members of uniform
- 32 thickness and uniform color and finish.
- 33 B. Use sand cement grout mixture to fill all air pockets and voids, and to repair chipped edges.
- 34 C. Finish all repairs smooth and to match adjacent surface texture and color.
- 35 D. Where units are to receive concrete topping, provide units having heavy broom finish on top
- 36 surface for bond.
- 37 1. Provide roughness of top surface to provide bond with topping and design for horizontal
- 38 shear at topping and unit interface in accordance with requirements of Paragraph 17.5 of
- 39 ACI 318.
- 40 2. Make all other surfaces smooth.
- 41 E. Incorporate embedded plates, angles, and flange welding strips into members at time of
- 42 manufacture.
- 43 1. Provide embedded items as shown on the Drawings unless prior approval is received from
- 44 Engineer to do otherwise.
- 45 F. Minimum concrete compressive strength at time of strand release: 3500 psi.
- 46 G. Coat or finish ends of exposed prestressing strands to prevent rusting.

1 **SECTION 09 91 00**
2 **PAINTING FOR UTILITIES**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

5 A. Section Includes:

- 6 1. Furnishing all materials, equipment and labor to accomplish all surface preparation, painting
7 and related work for satisfactory completion of the project.
8 2. The terms "paint" or "painting" as used in this section, includes the use of emulsions,
9 enamels, paints, scalers, and other coatings, organic or inorganic whether used as prime,
10 intermediate, or finish coats.
11 3. Painting for utility systems:
12 a. All fire hydrants
13 b. All exposed piping and appurtenances
14 c. Work under this section shall also include touch-up or repair of any damaged or
15 defective painted surface
16 d. Pipe identification markings
17 4. The omission of minor items in the schedule of work shall not relieve the Contractor of his
18 obligation to include such items where they come within the general intent of the
19 Specifications.
20 5. Minimum surface preparation requirements

21 B. Related Specification Sections include but are not necessarily limited to:

- 22 1. Division 1 - General Requirements.
23 2. Section 10 14 00 - Identification Devices.

24 **1.2 QUALITY ASSURANCE**

25 A. Referenced Standards:

- 26 1. ASTM International (ASTM):
27 a. D4258, Standard Practice for Surface Cleaning Concrete for Coating.
28 b. D4259, Standard Practice for Abrading Concrete.
29 c. D4261, Standard Practice for Surface Cleaning Concrete Unit Masonry for Coating.
30 d. D4262, Standard Test Method for pH of Chemically Cleaned or Etched Concrete
31 Surfaces.
32 e. D4263, Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet
33 Method.
34 f. E84, Standard Test Method for Surface Burning Characteristics of Building Materials.
35 2. American Water Works Association (AWWA).
36 3. National Association of Corrosion Engineers (NACE).
37 4. National Bureau of Standards (NBS):
38 a. Certified Coating Thickness Calibration Standards.
39 5. National Fire Protection Association (NFPA):
40 a. 101, Life Safety Code.
41 6. National Sanitation Foundation International (NSF).
42 7. The Society for Protective Coatings (SSPC):
43 a. PA 2, Measurement of Dry Paint Thickness with Magnetic Gages.
44 b. SP 1, Solvent Cleaning.
45 c. SP 2, Hand Tool Cleaning.
46 d. SP 3, Power Tool Cleaning.
47 8. The Society for Protective Coatings/NACE International (SSPC/NACE):
48 a. SP 5/NACE No. 1, White Metal Blast Cleaning.

- 1 b. SP 6/NACE No. 3, Commercial Blast Cleaning.
- 2 c. SP 7/NACE No. 4, Brush-off Blast Cleaning.
- 3 d. SP 10/NACE No. 2, Near-White Blast Cleaning.
- 4 e. SP 12/NACE No. 5, Surface Preparation and Cleaning of Steel and Other Hard
- 5 Materials by High and Ultrahigh Pressure Water Jetting Prior to Recoating.
- 6 f. SP 13/NACE No. 6, Surface Preparation of Concrete.
- 7 B. Latest version of the Orange County Utilities Standards and Construction Specifications Manual.
- 8 C. Qualifications:
- 9 1. Coating manufacturer's authorized representative shall provide written statement attesting
- 10 that applicator has been instructed on proper preparation, mixing and application procedures
- 11 for coatings specified.
- 12 2. Applicators shall have minimum of five (5) years experience in application of similar
- 13 products on similar project.
- 14 a. Provide references for minimum of three (3) different projects completed in last five (5)
- 15 years with similar scope of work.
- 16 b. Include name and address of project, size of project in value (painting) and contact
- 17 person.
- 18 D. Miscellaneous:
- 19 1. Furnish paint through one (1) manufacturer unless noted otherwise.
- 20 E. Deviation from specified mil thickness or product type is not allowed without written
- 21 authorization of Engineer.
- 22 F. Material shall not be thinned unless approved, in writing, by paint manufacturer's authorized
- 23 representative.

24 **1.3 DEFINITIONS**

- 25 A. Installer or Applicator:
- 26 1. Installer or applicator is the person actually installing or applying the product in the field at
- 27 the Project site.
- 28 2. Installer and applicator are synonymous.
- 29 B. Approved Factory Finish: Finish on a product in compliance with the finish specified in the
- 30 Specification Section where the product is specified.
- 31 C. Finished Area: An area that is listed in or has finish called for on Room Finish Schedule or is
- 32 indicated on Drawings to be painted.
- 33 D. Scarify: Roughen the entire existing coating surface by use of brush off blasting, hand tools,
- 34 sanding, etc to provide an anchor profile for adhesion by new coating systems. Scarified surface
- 35 shall be approved by the Coatings manufacturer and County prior to over-coating. Existing rust
- 36 spots, weld slag, sharp edges, defects etc shall be removed by SSPC-SP3 Power tool cleaning.

37 **1.4 SUBMITTALS**

- 38 A. Shop Drawings:
- 39 1. See Specification Section 01 33 00 for requirements for the mechanics and administration of
- 40 the submittal process.
- 41 2. Product technical data including:
- 42 a. Acknowledgement that products submitted meet requirements of standards referenced.
- 43 b. Manufacturer's application instructions.
- 44 c. Manufacturer's surface preparation instructions.
- 45 d. If products being used are manufactured by Company other than listed in Appendix D
- 46 or Section 3119 of the Orange County Utilities Specifications and Standards Manual,
- 47 provide complete individual data sheet comparison of proposed products with specified
- 48 products including application procedure, coverage rates and verification that product is
- 49 designed for intended use.

- 1 e. Detailed procedures for routine maintenance and cleaning.
- 2 f. Detailed procedures for light repairs, such as dents, scratches and staining.
- 3 3. Manufacturer's statement regarding applicator instruction on product use.
- 4 4. Applicator experience qualifications.
- 5 a. No submittal information will be reviewed until Engineer has received and approved
- 6 applicator qualifications.
- 7 B. Miscellaneous Submittals:
- 8 1. See Specification Section 01 33 00 for requirements for the mechanics and administration of
- 9 the submittal process.
- 10 2. Product name and number.
- 11 3. Name, address and telephone number of the manufacturer and local distributor.
- 12 4. Approval of application equipment.
- 13 5. Applicator's daily records:
- 14 a. Submit daily records at end of each week in which painting work is performed unless
- 15 requested otherwise by Engineer's on-site representative.

16 **1.5 DELIVERY, STORAGE, AND HANDLING**

- 17 A. Deliver in original containers, labeled as follows:
- 18 1. Name or type number of material.
- 19 2. Manufacturer's name and item stock number.
- 20 3. Contents, by volume, of major constituents.
- 21 4. Warning labels.
- 22 5. VOC content.
- 23 6. Store paints in protected area that is heated or cooled to maintain temperature range
- 24 recommended by paint manufacturer.

25 **1.6 JOB CONDITIONS**

- 26 A. The Manufacturer's recommendations concerning environmental conditions under which a
- 27 material can be applied shall be strictly followed. No finishes shall be applied in areas where
- 28 dust is being generated.

29 **1.7 TESTING EQUIPMENT**

- 30 A. The Contractor shall furnish and make available to the Project Manager the following items of
- 31 testing equipment for use in determining if the requirement of this section is being satisfied. The
- 32 specified items of equipment shall be available for use at all times when field painting or surface
- 33 preparation is in progress.
- 34 1. Surface thermometer
- 35 2. Set of NACE visual standards.
- 36 3. Dry film gauge
- 37 4. Holiday (pinhole) detector
- 38 5. Sling-psychometer
- 39 B. See Orange County Utilities Standards and Construction Specifications Manual Section 3119
- 40 *Coatings and Linings* for additional testing requirements.

1 **PART 2 - PRODUCTS**

2 **2.1 ACCEPTABLE MANUFACTURERS**

- 3 A. All materials furnished for this work shall be in accordance with the “Orange County Utilities
4 Appendix D, List of Approved Products” as appended to these specifications and *Section 3119:*
5 *Coating and Linings* of the OCU Standards and Construction Specifications Manual unless
6 otherwise noted. All products not listed in Appendix D shall be subject to the County’s
7 approval.
- 8 B. Submit request for substitution in accordance with Specification Section 01 25 13.
- 9 1. Products of manufacturers other than those named, which are comparable in quality to that
10 specified in “Orange County Utilities Appendix D, List of Approved Products,” will be
11 considered if said paints are offered by the Contractor with satisfactory data on past
12 performance of similar applications, composition, direction for use and other information
13 required.
- 14 2. Product VOC content will be an important factor when determining acceptability of
15 substitution.

16 **2.2 LEAD BASED PAINTS**

- 17 A. Applicants must comply with Lead Based Paints Poisoning and Prevention Act and National
18 Consumer Health Information and Health Promotion Act of 1976.
- 19 B. No paint containing lead shall be allowed.

20 **2.3 PAINTING SCHEDULE**

- 21 A. Exterior Coating
- 22 1. Primer: Prime coat all surfaces in the factory with a product compatible with the below
23 specified finish coats. Prime coating shall be as specified by the manufacturer of the finish
24 coating.
- 25 2. Finish: Finish coat all surfaces as specified by the Owner.
- 26 3. Piping and Appurtenances Color Code/Identification Markings: Color shall be in
27 accordance with the policies and practices of Orange County Fire and Rescue Division, and
28 OCU.
- 29 4. Specific painting schedules approved by County for ferrous metal surfaces can be found in
30 *Section 3119* of the OCU Standards and Construction Specifications Manual.
- 31 a. Any items not listed here but requires paint shall be so as directed by the County.
- 32 b. Surface preparation for exterior coating included in this section.
- 33 B. Corrosive Resistant Lining/Coating
- 34 1. See Orange County Utilities Standards and Construction Specifications Manual Section
35 *3119 Coatings and Linings*.
- 36 2. See Section 33 05 16, Precast Concrete Manhole Structures.

37 **2.4 COATING SYSTEMS**

- 38 A. The painting schedule has been prepared on the basis of Tnemec and Carboline products, and
39 their recommendations for application.
- 40 B. The following summarizes the painting systems for various types of applications.
- 41 C. The Contractor shall have the coating color matched or tinted by the coating supplier to exactly match
42 Tnemec Color Codes as shown below. Manufacturers other than Tnemec shall submit a color
43 matched swatch to the County for approval prior to ordering materials.
- 44
- 45
- 46

Generic Name	Application	Tnemec
Safety Blue	Water Master Meters / Assemblies	True Blue / Safety 11SF
Safety Green	Wastewater Master Meters	Hunter Green 08SF
Safety Green	Pump Station Piping	Hunter Green 08SF
Safety Red	Fire Backflow Assemblies	Candy Apple Red / Safety 06SF
Pantone Purple 522C	Reclaimed Master Meters / Assemblies	Purple Rain / Safety 14 SF
Safety Green	Hydrant Bonnet & Caps	Hunter Green 08SF
Safety Orange	Hydrant Bonnet & Caps	Tangerine Orange / Safety 04 SF
Safety Red	Hydrant Bonnet & Caps	Candy Apple Red / Safety 06SF
TBD	Hydrant Barrel	TBD

1

2 D. Minimum film thickness shall be per manufacturer's recommendations unless a greater thickness
3 is specified. The Contractor shall measure minimum film thickness in the field by utilizing a
4 wet film gauge, which the County shall verify. Regardless of anchor profile, the Contractor shall
5 utilize a wet film gauge to verify that the County-specified average minimum dry film thickness
6 (MDFT) is being applied. The calculated value for wet film thickness (WFT) shall be derived
7 from County's average MDFT unless the manufacturer's minimum range is greater. Following
8 the manufacturer's recommended drying time, the Contractor shall measure and provide results
9 to the County verifying that the average minimum dry film thickness meets the MDFT for each
10 coat and final system, utilizing a dry film gauge. The County may conduct side-by-side
11 verification.

12 E. Coating systems shall incorporate the paints specified below, applied at the average dry film
13 thickness (DFT) in mils per coat noted, and have the specified minimum average dry film
14 thickness (MDFT) for each individual coat and total system.

15 **HP – High Performance Coatings of FERROUS METALS**

16

System HP-1
EXTERIOR EXPOSURE, UV EXPOSURE (NON-IMMERSION)
Complete removal of existing coating system

Coat	Tnemec	Carboline
Prime	Zinc Series 90-97 2.5 to 3.5 DFT Avg 3.0 MDFT	Carbozinc 621 3.0 to 8.0 DFT Avg 3.5 MDFT
Intermediate	Endura-Shield Series 73 2.0 to 3.0 DFT Avg 2.5 MDFT	Carbothane 133 HB 3.0 to 5.0 DFT Avg 3.5 MDFT
Finish	Hydroflon Series 700 2.0 to 3.0 DFT Avg 2.5 MDFT	Carboxane 950 2.0 to 3.0 DFT Avg 2.5 MDFT
Total	8 MDFT	9.5 MDFT

17

System HP-2
 EXTERIOR EXPOSURE, UV EXPOSURE (NON-IMMERSION)
 Over-coating of localized inaccessible existing coatings and galvanized metal

Coat	Tnemec	Carboline
Prime	Chembuild 135 4.0 to 9.0 DFT Avg 5.0 MDFT	Carboguard 553 3.0 to 4.0 DFT Avg 3.5 MDFT
Intermediate	Endura-Shield Series 73 2.0 to 3.0 DFT Avg 2.5 MDFT	Carbothane 133 HB 3.0 to 5.0 DFT Avg 3.5 MDFT
Finish	Hydroflon Series 700 2.0 to 3.0 DFT Avg 2.5 MDFT	Carboxane 950 2.0 to 3.0 DFT Avg 2.5 MDFT
Total	9.5 MDFT	9.5 MDFT

1

System HP-3
 EXTERIOR EXPOSURE, UV EXPOSURE (NON-IMMERSION)
 Over-coating of existing solvent based coating system exposed to UV

Coat	Tnemec	Carboline
Existing	Existing coating system	Existing coating system
Spot Prime	Chembuild 135 4.0 to 9.0 DFT Avg 5.0 MDFT	Carboguard 553 3.0 to 4.0 DFT Avg 3.5 MDFT
Intermediate	Chembuild 135 4.0 to 9.0 DFT Avg 5.0 MDFT	Carboguard 553 3.0 to 4.0 DFT Avg 3.5 MDFT
Finish	Hydroflon Series 700 2.0 to 3.0 DFT Avg 2.5 MDFT	Carboxane 950 2.0 to 3.0 DFT Avg 2.5 MDFT
Total	7.5 MDFT	6.0 MDFT

2

System HP-4
 INTERIOR/EXTERIOR EXPOSURE, NON-UV EXPOSURE (NON-IMMERSION)
 Over-coating of existing coating, or manufacturer epoxy-primed surface not exposed to UV

Coat	Tnemec	Carboline
Existing	Existing coating system	Existing coating system
Spot Prime	Chembuild 135 4.0 to 9.0 DFT Avg 5.0 MDFT	Carboguard 553 3.0 to 4.0 DFT Avg 3.5 MDFT
Intermediate	Chembuild 135 4.0 to 9.0 DFT Avg 5.0 MDFT	Carboguard 553 3.0 to 4.0 DFT Avg 3.5 MDFT
Finish	Hi-Build Epoxoline II Series N69 4.0 to 8.0 DFT Avg 4.5 MDFT	Carboguard 60 4.0 to 6.0 DFT Avg 4.5 MDFT
Total	9.5 MDFT	8.0 MDFT

3

4

5

System HP-5
 EXTERIOR EXPOSURE, (IMMERSION)
 Complete removal of existing coating system for immersion surfaces

Coat	Tnemec	Carboline
Prime	Zinc Series 90-97 2.5 to 3.5 DFT Avg 3.0 MDFT	Carbozinc 621 3.0 to 8.0 DFT Avg 3.5 MDFT
Intermediate	Hi-Build Epoxoline II Series N69 4.0 to 8.0 DFT Avg 4.5 MDFT	Carboguard 60 4.0 to 6.0 DFT Avg 4.5 MDFT
Finish	Hi-Build Epoxoline II Series N69 4.0 to 8.0 DFT Avg 4.5 MDFT	Carboguard 60 4.0 to 6.0 DFT Avg 4.5 MDFT
Total	12.0 MDFT	12.5 MDFT

1

System HP-6
 INTERIOR/EXTERIOR EXPOSURE, UV EXPOSURE (NON-IMMERSION)
 Over-coating of existing water based or unknown coating surface exposed to UV

Coat	Tnemec	Carboline
Existing	Existing coating system	Existing coating system
Spot Prime	Typoxy Series 27WB 4.0 to 14.0 DFT Avg 4.5 MDFT	NA
Intermediate	Typoxy Series 27WB 4.0 to 14.0 DFT Avg 4.5 MDFT	NA
Finish	Hydroflon Series 700 2.0 to 3.0 DFT Avg 2.5 MDFT	NA
Total	7.0 MDFT	NA

2

System HP-7
 EXTERIOR EXPOSURE, UV EXPOSURE (NON-IMMERSION)
 Over-coating of localized inaccessible existing coatings

Coat	Tnemec	Carboline
Prime	Chembuild 135 4.0 to 9.0 DFT Avg 5.0 MDFT	Carboguard 553 3.0 to 4.0 DFT Avg 3.5 MDFT
Intermediate	Chembuild 135 4.0 to 9.0 DFT Avg 5.0 MDFT	Carboguard 553 3.0 to 4.0 DFT Avg 3.5 MDFT
Finish	Hydroflon Series 700 2.0 to 3.0 DFT Avg 2.5 MDFT	Carboxane 950 2.0 to 3.0 DFT Avg 2.5 MDFT
Total	9.5 MDFT	8.0 MDFT

3

System HP-8
 INTERIOR/EXTERIOR EXPOSURE, NON-UV EXPOSURE (NON-IMMERSION)
 Over-coating of localized inaccessible existing coating

Coat	Tnemec	Carboline
Existing	Existing coating system	Existing coating system
Spot Prime	Typoxy Series 27WB 4.0 to 14.0 DFT Avg 4.5 MDFT	NA
Intermediate	Enduratone Series 1029 2.0 to 3.0 DFT Avg 2.5 MDFT	NA
Finish	Enduratone Series 1029 2.0 to 3.0 DFT Avg 2.5 MDFT	NA
Total	5.0 MDFT	NA

1
2

System HP-9
 EXTERIOR EXPOSURE, UV EXPOSURE (NON-IMMERSION)
 Over-coating of existing coating of Hydrants

Coat	Tnemec	Carboline
Existing	Existing coating system	Existing coating system
Prime	Typoxy Series 27WB 4.0 to 14.0 DFT Avg 4.5 MDFT	NA
Intermediate	Hi-Build Epoxoline II Series N69 4.0 to 8.0 DFT Avg 4.5 MDFT	NA
Finish	Endura-Shield Series 73 2.0 to 3.0 DFT Avg 2.5 MDFT	NA
Total	11.5 MDFT	NA

3

System HP-10
 EXTERIOR EXPOSURE, UV EXPOSURE (NON-IMMERSION)
 Complete removal of existing coating system of Hydrants

Coat	Tnemec	Carboline
Prime	Zinc Series 90-97 2.5 to 3.5 DFT Avg 3.0 MDFT	Carbozinc 621 3.0 to 8.0 DFT Avg 3.5 MDFT
Intermediate	Hi-Build Epoxoline II Series N69 4.0 to 8.0 DFT Avg 4.5 MDFT	Carboguard 60 4.0 to 6.0 DFT Avg 4.5 MDFT
Finish	Endura-Shield Series 73 2.0 to 3.0 DFT Avg 2.5 MDFT	Carbothane 133 HB 3.0 to 5.0 DFT Avg 3.5 MDFT
Total	10.0 MDFT	11.5 MDFT

4

1
2 DFT = Dry Film Thickness
3 MDFT = Minimum Dry Film Thickness
4

5 **2.5 EQUIPMENT**

- 6 A. The Contractor's surface preparation, coating and painting equipment shall be designed and suitable
7 for the application of the specific materials herein specified. The Contractor shall submit a list of all
8 applicable equipment owned by the Contractor. The Contractor's equipment shall be subject to the
9 approval of the County based on the manufacturer's data.
- 10 B. Effective oil and water separators shall be used in all compressed air lines serving spray painting
11 and sandblasting operations to remove oil or moisture from the air before it is used. Separators
12 shall be placed as far as practical from the compressor.
- 13 C. The Contractor shall furnish all equipment for application of the paint and the completion of the
14 Work in first-class condition and shall comply with recommendations of the paint manufacturer.

15 **2.6 MAINTENANCE MATERIAL**

- 16 A. The Contractor shall provide the Owner at final inspection one gallon of each type and final
17 color of paint used on the project.

18 **PART 3 - EXECUTION**

19 **3.1 SCHEDULE OF ITEMS TO BE PAINTED**

- 20 A. Ferrous metals:
21 1. Specific painting schedules approved by County for ferrous metal surfaces can be found in
22 *Section 3119 of the OCU Standards and Construction Specifications Manual*.
23 a. Any item not listed here but requires paint shall be so as directed by the County.
24 b. Surface preparation for exterior coating included in this section.
- 25 B. Precast Structures:
26 1. See Orange County Utilities *Standards and Construction Specifications Manual Section*
27 *3119 Coatings and Linings*.
28 2. See Section 33 05 16, Precast Concrete Manhole Structures

29 **3.2 PREPARATION**

- 30 A. General:
31 1. Verify that atmosphere in area where painting is to take place is within paint manufacturer's
32 acceptable temperature, humidity and sun exposure limits.
33 a. Provide temporary heating, shade and/or dehumidification as required to bring area
34 within acceptable limits.
35 1) Provide temporary dehumidification equipment properly sized to maintain
36 humidity levels required by paint manufacturer.
37 2) Provide clean heat with heat exchanger type equipment sufficient in size to
38 maintain temperature on a 24 HR basis.
39 3) No exhaust gases (no direct fired heating equipment) shall be allowed to vent into
40 the space being painted or any adjacent space.
41 2. Prepare surfaces to be painted in accordance with coating manufacturer's instructions and
42 this Specification Section unless noted otherwise in this Specification Section.
43 a. Where discrepancy between coating manufacturer's instructions and this Specification
44 Section exists, the more stringent preparation shall be provided unless approved
45 otherwise, in writing, by the Engineer.

- 1 3. Remove all dust, grease, oil, compounds, dirt and other foreign matter which would prevent
2 bonding of coating to surface.
- 3 4. Adhere to manufacturer's recoat time surface preparation requirements.
- 4 a. Paint manufacturer's recommended recoat time surface preparation requirements will be
5 strictly enforced.
- 6 B. Protection:
- 7 1. Protect surrounding surfaces not to be coated.
- 8 2. Remove and protect hardware, accessories, plates, fixtures, finished work, and similar
9 items; or provide ample in-place protection.
- 10 C. Prepare and paint before assembly all surfaces which are inaccessible after assembly.
- 11 D. Ferrous Metal:
- 12 1. Prepare ductile iron pipe in accordance with pipe manufacturer's recommendations and
13 AWWA.
- 14 a. All piping, pumps, valves, fittings and any other component used in the water piping
15 system that requires preparation for painting shall be prepared in accordance with
16 requirements for immersion service.
- 17 b. Prepare all areas requiring patch painting in accordance with recommendations of
18 manufacturer and AWWA.
- 19 c. Remove bituminous coating per piping manufacturer, paint manufacturer and AWWA
20 recommendations.
- 21 1) The most stringent recommendations shall apply.
- 22 2. Complete fabrication, welding or burning before beginning surface preparation.
- 23 a. Chip or grind off flux, spatter, slag or other laminations left from welding.
- 24 b. Remove mill scale.
- 25 c. Grind smooth rough welds and other sharp projections.
- 26 3. Solvent or water jet and detergent clean in accordance with SSPC SP 1 or
27 SSPC SP 12/NACE No. 5 all surfaces scheduled to receive additional SSPC surface
28 preparation.
- 29 4. Surfaces subject to corrosive or highly corrosive environment and all surfaces subject to
30 immersion service:
- 31 a. Near-white blast clean in accordance with SSPC SP 10/NACE No. 2.
- 32 5. All interior and exterior structural steel not included in corrosive, highly corrosive or
33 immersion service surfaces:
- 34 a. Minimum commercial blast clean in accordance with SSPC SP 6/NACE No. 3.
- 35 6. All fusion bonded epoxy coated surfaces identified to be field painted:
- 36 a. Remove all traces of gloss finish by sanding or by abrasive brush blasting.
- 37 b. Clean surface after removing gloss finish to remove sanding or blasting residue.
- 38 7. Restore surface of field welds and adjacent areas to original surface preparation.
- 39 8. Black iron piping: Remove surface varnish by solvent or waterjet and detergent cleaning or
40 brush-off blast cleaning in accordance with SSPC SP 7/NACE No. 4.
- 41 E. Galvanized Metal:
- 42 1. Solvent clean in accordance with SSPC SP 1 followed by brush-off blast clean in
43 accordance with SSPC SP 7/NACE No. 4 to uniform profiled surface removing zinc oxide
44 and other foreign contaminants.
- 45 a. Provide 1 mil profile.
- 46 F. Concrete:
- 47 1. Cure for minimum of 28 days.
- 48 2. Verify that concrete surfaces have been cleaned and that voids have been patched in
49 accordance with Specification Section 03 09 00.
- 50 a. Concrete surfaces shall be cleaned in accordance with ASTM D4258.
- 51 3. Mechanically abrade concrete surfaces in accordance with ASTM D4259 as recommended
52 by coating manufacturer.

- 1 4. Abrasive blast concrete surfaces in accordance with SSPC SP 13/NACE No. 6 to provide
- 2 profile recommended by coatings manufacturer.
- 3 5. Test pH of surface to be painted in accordance with ASTM D4262.
- 4 a. If surface pH is not within coating manufacturer's required acceptable range, use
- 5 methods acceptable to coating manufacturer as required bringing pH within acceptable
- 6 range.
- 7 b. Retest pH until acceptable results are obtained.
- 8 6. Verify that moisture content of surface to be painted is within coating manufacturer's
- 9 recommended acceptable limits.
- 10 a. Test moisture content of surface to be coated in accordance with ASTM D4263.
- 11 b. After remedial measures have been taken to lower or raise moisture content, retest
- 12 surface until acceptable results are obtained.

13 G. Preparation by Abrasive Blasting:

- 14 1. All abrasive-blasted ferrous metal surfaces shall be inspected and approved in writing by
- 15 NACE certified coatings inspector immediately prior to application of paint coatings.
- 16 a. Inspection shall be performed to determine cleanliness and profile depth of blasted
- 17 surfaces and to certify that surface has been prepared in accordance with these
- 18 Specifications.
- 19 2. Schedule the abrasive blasting operation so blasted surfaces will not be wet after blasting
- 20 and before painting.
- 21 3. Perform additional blasting and cleaning as required to achieve surface preparation required.
- 22 a. Prior to painting, reblast surfaces allowed to set overnight and surfaces that show rust
- 23 bloom.
- 24 b. Surfaces allowed to set overnight or surfaces which show rust bloom prior to painting
- 25 shall be reinspected and approved by NACE certified coatings inspector prior to paint
- 26 application.
- 27 4. Profile depth of blasted surface: Not less than 1 mil or greater than 2 mils unless required
- 28 otherwise by coating manufacturer.
- 29 5. Provide compressed air for blasting that is free of water and oil.
- 30 a. Provide accessible separators and traps.
- 31 6. Confine blast abrasives to area being blasted.
- 32 a. Provide shields of polyethylene sheeting or other such barriers to confine blast material.
- 33 b. Plug pipes, holes, or openings before blasting and keep plugged until blast operation is
- 34 complete and residue is removed.
- 35 7. Protect nameplates, valve stems, rotating equipment, motors and other items that may be
- 36 damaged from blasting.
- 37 8. Reblast surfaces not meeting requirements of these Specifications.
- 38 9. Abrasive blasting media may be recovered, cleaned and reused providing Contractor
- 39 submits, for Engineer's review, a comprehensive recovery plan outlining all procedures and
- 40 equipment proposed in reclamation process.
- 41 10. Properly dispose of blasting material contaminated with debris from blasting operation not
- 42 scheduled to be reused.

43 H. All Plastic Surfaces and Non-Ferrous Surfaces Except Galvanized Steel:

- 44 1. Sand using 80-100 grit sandpaper to scarify surfaces.

45 **3.3 APPLICATION**

46 A. General:

- 47 1. Thin, mix and apply coatings by brush, roller, or spray in accordance with manufacturer's
- 48 installation instructions.
- 49 a. Application equipment must be inspected and approved in writing by coating
- 50 manufacturer.
- 51 b. Hollow metal shall be spray applied only.
- 52 2. Temperature and weather conditions:

- 1 a. Do not paint surfaces when surface temperature is below 50° F or above 95° F, nit
- 2 when the relative humidity is greater than 75%, nor when ambient temperature is
- 3 falling.
- 4 b. Avoid painting surfaces exposed to hot sun.
- 5 c. Do not paint on damp surfaces.
- 6 3. Provide complete coverage to mil thickness specified.
- 7 a. Thickness specified is dry mil thickness.
- 8 b. All paint systems are "to cover." In situations of discrepancy between manufacturer's
- 9 square footage coverage rates and mil thickness, mil thickness requirements govern.
- 10 c. When color or undercoats show through, apply additional coats until paint film is of
- 11 uniform finish and color.
- 12 4. If so directed by Engineer or Owner's Representative, do not apply consecutive coats until
- 13 Engineer or Owner's Representative has had an opportunity to observe and approve
- 14 previous coats.
- 15 5. Apply materials under adequate illumination.
- 16 6. Evenly spread to provide full, smooth coverage.
- 17 7. Work each application of material into corners, crevices, joints, and other difficult to work
- 18 areas.
- 19 8. Avoid degradation and contamination of blasted surfaces and avoid intercoat contamination.
- 20 a. Clean contaminated surfaces before applying next coat.
- 21 9. Smooth out runs or sags immediately, or remove and recoat entire surface.
- 22 10. Allow preceding coats to dry before recoating.
- 23 a. Recoat within time limits specified by coating manufacturer.
- 24 b. If recoat time limits have expired re-prepare surface in accordance with coating
- 25 manufacturer's printed recommendations.
- 26 11. Allow coated surfaces to cure prior to allowing traffic or other work to proceed.
- 27 12. When coating rough surfaces which cannot be backrolled sufficiently, hand brush coating to
- 28 work into all recesses.
- 29 13. Backroll concrete and masonry surfaces with a roller if paint coatings are spray applied.
- 30 B. Prime Coat Application:
- 31 1. Prime all surfaces indicated to be painted.
- 32 a. Apply prime coat in accordance with coating manufacturer's written instructions and as
- 33 written in this Specification Section.
- 34 2. Ensure field-applied coatings are compatible with factory-applied coatings.
- 35 a. Ensure new coatings applied over existing coatings are compatible.
- 36 b. Employ services of coating manufacturer's qualified technical representative.
- 37 1) Certify through material data sheets.
- 38 2) Perform test patch.
- 39 c. If field-applied coating is found to be not compatible, require the coating
- 40 manufacturer's technical representative to recommend, in writing, product to be used as
- 41 barrier coat, thickness to be applied, surface preparation and method of application.
- 42 d. At Contractor's option, coatings may be removed, surface re-prepared, and new coating
- 43 applied using appropriate paint system.
- 44 1) All damage to surface as result of coating removal shall be repaired to original
- 45 condition or better by Contractor at no additional cost to the County.
- 46 3. Prime ferrous metals embedded in concrete to minimum of 1 IN below exposed surfaces.
- 47 4. Apply zinc-rich primers while under continuous agitation.
- 48 5. Ensure abrasive blasting operation does not result in embedment of abrasive particles in
- 49 paint film.
- 50 6. Brush or spray bolts, welds, edges and difficult access areas with primer prior to primer
- 51 application over entire surface.
- 52 7. Touch up damaged primer coats prior to applying finish coats.
- 53 a. Restore primed surface equal to surface before damage.
- 54

- 1 C. Finish Coat Application:
2 1. Apply finish coats in accordance with coating manufacturer's written instructions and in
3 accordance with this Specification Section; manufacturer instructions take precedent over
4 these Specifications.
5 2. Touch up damaged finish coats using same application method and same material specified
6 for finish coat.
7 a. Prepare damaged area in accordance with Article 3.4 - PREPARATION.

8 3.4 COLOR CODING

- 9 A. Color code and identification markings shall be in accordance with the policies and practices of
10 Orange County Fire and Rescue Division and Orange County Utilities Department.

11 3.5 FIELD QUALITY CONTROL

- 12 A. Contractor to provide protection for surfaces painted with epoxy coatings to prevent chalking.
13 1. Surfaces showing chalking will not be accepted regardless of condition of paint film.
14 B. Wet Film Gauge. Both the Contractor and the County shall use a wet film gauge to verify the
15 applied coating desired wet film thickness (WFT) to produce the required minimum DFT.

16
$$\text{Target WFT} = \text{County specified average MDFT} / \text{Volume Solids} \times 100\%$$

17 If thinner is applied per the manufacturer's recommendations, the volume of solids shall be
18 reduced accordingly. Regardless of anchor profile, surface pattern or base metal calculation of
19 the substrate, the gauge reported WFT shall meet the target WFT value for the substrate or
20 previously coated surface to ensure the required average MDFT will be achieved

- 21 C. DFT Magnetic Gauge. Dry Film Magnetic Pull-Off Gauge (Type I) shall be utilized to
22 determine DFT in accordance with SSPC-PA 2 "Measurement of Dry Coating Thickness with
23 Magnetic Gages." The average of the readings shall meet the County-specified MDFT for each
24 coating application. Electromagnetic Gauge (Type II) shall not considered acceptable for use
25 on ductile iron pipe.
26 D. Holiday Testing: Each coating layer shall be holiday tested at the recommended 100-125 volts
27 DC per mil in accordance with the latest edition of the following standards: NACE SP0188-
28 2006, NACE Standard RP0490, ASTM G62 and per the manufacturers recommendations. All
29 low voltage holiday testing shall be performed using a Tinker & Razor Model M-1 Holiday
30 Detector, or equal. Areas found to have holidays shall be marked and repaired in accordance
31 with the paint manufacturer's instructions.
32 E. Destructive Testing: Destructive testing using a Tooke gauge shall only be utilized in cases of
33 dispute regarding DFT. The County shall be permitted up to three (3) cuts using the Tooke
34 Gauge and the Contractor shall be responsible for repairing the areas examined at no additional
35 cost.
36 F. Environmental Testing: humidity, dew point and temperature shall be constantly measured and
37 logged. Any electronic gauges shall be first calibrated against a sling psychrometer each day.
38 1. The temperature of the substrate shall be checked at regular intervals to be certain the
39 surface is 5° F above the dew point.
40 G. Provide wet paint signs.

41 3.6 CLEANING

- 42 A. Clean paint spattered surfaces.
43 1. Use care not to damage finished surfaces.
44 B. Upon completion of painting, replace hardware, accessories, plates, fixtures, and similar items.
45 C. Remove surplus materials and debris.

1 D. The Contractor is responsible for the removal and proper disposal of all hazardous materials
2 from the jobsite in accordance with Local, State, and Federal requirements as outlined by the
3 Environmental Protection Agency

4 **3.7 FINAL INSPECTION**

5 A. Before application of the prime coat and each succeeding coat, all surfaces to be coated shall be
6 subject to inspection and approval by the County. The Contractor shall correct any defects or
7 deficiencies before application of any subsequent coating. Coatings applied without County
8 approval shall be removed and reapplied at no cost to the County.

9 B. The Contractor shall furnish samples of surface preparation and of painting systems to be used
10 as a standard throughout the job, unless omitted by the County.

11 C. When any appreciable time has elapsed or has exceeded the manufactures recommendations
12 between coatings, the County shall carefully inspect previously coated areas and surfaces that
13 are damaged or contaminated, in the opinion of the County shall be cleaned and recoated at the
14 Contractor’s expense. Re-coating times of manufacturer’s printed instructions shall be adhered
15 to.

16 D. Coating thickness shall be determined by the use of a properly calibrated “DeFelsko Positest
17 FM” Type 1 Coating Thickness Gauge (or equal) for ferrous metal or a “Tooke” Paint Inspection
18 gauge (or equal) for non-ferrous and cementitious surfaces. Please note that use of the “Tooke”
19 gauge is classified as a destructive test.

20 E. The Contractor shall protect all painted surfaces against damage until the date of final
21 acceptance of the work. The County will conduct a final inspection of all work and the
22 Contractor will be required to repaint or retouch any areas found which do not comply with the
23 requirements of this section.

24 **END OF SECTION**

1 **SECTION 10 14 00**
2 **IDENTIFICATION DEVICES**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

- 5 A. Section Includes:
6 1. Tag, wire, tape and stenciling systems for piping, valves and similar items.
7 B. Related Sections include but are not necessarily limited to:
8 1. Division 1 - General Requirements.

9 **1.2 QUALITY ASSURANCE**

- 10 A. Referenced Standards:
11 1. American Society of Mechanical Engineers (ASME):
12 a. A13.1, Scheme for the Identification of Piping Systems.
13 2. Instrumentation, Systems, and Automation Society (ISA).
14 3. National Electrical Manufacturers Association/American National Standards Institute
15 (NEMA/ANSI):
16 a. Z535.1, Safety Color Code.
17 b. Z535.2, Environmental and Facility Safety Signs.
18 c. Z535.3, Criteria for Safety Symbols.
19 d. Z535.4, Product Safety Signs and Labels.
20 4. National Fire Protection Association (NFPA):
21 a. 70, National Electrical Code (NEC).
22 5. Occupational Safety and Health Administration (OSHA):
23 a. 29 CFR 1910.145, Specification for Accident Prevention Signs and Tags.
24 6. Latest version of the Orange County Utilities Standards and Construction Specifications
25 Manual.

26 **1.3 SUBMITTALS**

- 27 A. Shop Drawings:
28 1. See Section 01 33 00 for requirements for the mechanics and administration of the submittal
29 process.
30 2. Product technical data including:
31 a. Catalog information for all identification systems.
32 b. Acknowledgement that products submitted meet requirements of standards referenced.
33 3. Identification register, listing all items in Part 3 to be identified, type of identification
34 system to be used, lettering, location and color.

35 **PART 2 - PRODUCTS**

36 **2.1 ACCEPTABLE MANUFACTURERS**

- 37 A. All materials furnished for this work shall be in accordance with the "Orange County Utilities
38 Appendix D, List of Approved Products" as appended to these specifications unless otherwise
39 noted. All products not listed in Appendix D shall be subject to the County's approval.
40 B. Submit request for substitution in accordance with Specification Section 01 25 13.

41 **2.2 MANUFACTURED UNITS**

- 42 A. Rectangle Metal Tags:

1. Materials: Stainless steel.
 2. Size:
 - a. 3-1/2 IN x 1-1/2 IN minimum.
 - b. Thickness: 0.036 IN (20 GA) minimum.
 3. Fabrication:
 - a. 3/16 IN minimum mounting hole.
 - b. Legend: Stamped and filled with black coloring.
 4. Color: Natural.
- B. Underground Marking Tape:
1. Materials: Polyethylene and Metalized Foil.
 2. Size:
 - a. 2 IN wide (minimum).
 - b. Thickness: 3.5 mils.
 3. Fabrication:
 - a. Detectable by pipeline locating equipment.
 - b. Legend: Preprinted and permanently imbedded.
 - c. Message continuous printed.
 - d. Tensile strength: 1750 psi.
 4. Color: Water (blue), Force Main and Gravity Sewer Main (green), Reclaimed (purple)
 5. Provide non-metallic tape for ductile iron pipe.
 6. Provide metallic tape for all other piping.
- C. Underground Tracer Wire:
1. Materials:
 - a. Wire:
 - 1) 10 GA AWG.
 - 2) Continuous
 - 3) Insulated.
 - b. Wire nuts: Waterproof type.
 - c. Split bolts: Brass.
 2. Color coded in accordance with AWWA Utility Location and Coordination Council.
- D. Electronic Marker Balls:
1. 4 IN diameter.
 2. High density polyethylene shell.
 3. Passive device capable of reflecting a specifically designated repulse frequency tuned to the utility being installed.
 4. Color coded in accordance with AWWA's Utility Location and Coordination Council Standards.

38 **2.3 ACCESSORIES**

- 39 A. Fasteners:
- 40 1. Bead chain: #6 brass, aluminum or stainless steel.
 - 41 2. Plastic strap: Nylon, urethane or polypropylene.
 - 42 3. Screws: Self-tapping, stainless steel.
 - 43 4. Adhesive, solvent activated.

44 **2.4 MAINTENANCE MATERIALS**

- 45 A. Where stenciled markers are provided, clean and retain stencils after completion and include in
46 extra stock, along with required stock of paints and applicators.

1 **PART 3 - EXECUTION**

2 **3.1 GENERAL INSTALLATION**

- 3 A. Install identification devices at specified locations.
- 4 B. All identification devices to be printed by mechanical process, hand printing is not acceptable.
- 5 C. Marking Tape:
- 6 1. During the backfilling operation, continuously place pipe locating tape along centerline of
- 7 buried pipe halfway between top of piping and finished grade with the printed side up for
- 8 visual identification.
- 9 a. Detectable Marking Tape: Install with nonmetallic piping and waterlines.
- 10 b. Non-detectable Marking Tape: Install with metallic piping.
- 11 D. Electronic Marker/Tracer Wire:
- 12 1. All pipes shall be installed with a continuous insulated 10-gauge solid core copper wire
- 13 installed directly on top of pipe.
- 14 2. Coil enough wire at each valve box or manhole to extend wire a foot above the ground
- 15 surface.
- 16 3. If split bolts are used for splicing, wrap with electrical tape.
- 17 4. If wire nuts are used for splicing, knot wire at each splice point leaving 6 IN of wire for
- 18 splicing.
- 19 5. Use continuous strand of wire between valve boxes and manholes where possible.
- 20 a. Continuous length shall be no shorter than 100 FT.
- 21 6. Marker balls shall be placed in a position directly above the pipe and hand backfilled 1 foot
- 22 above the ball to prevent damage or movement during subsequent backfilling. Depth of
- 23 burial shall not be less than 1-1/2 IN or more than 2 feet.
- 24 7. Place at changes in direction, tees, or other points of connection and as directed by the
- 25 County.
- 26 8. Marker balls shall be placed at all sanitary sewer service cleanouts.

27 **3.2 SCHEDULES**

- 28 A. Systems:
- 29 1. Buried piping:
- 30 a. Underground Marking Tape
- 31 1) Location: Halfway between top of piping and finished grade and parallel to the
- 32 pipe run.
- 33 2) Letter height: 1 IN minimum.
- 34 3) Potable water:
- 35 a) Color: Blue with black letters.
- 36 b) Legend:
- 37 (1) "CAUTION BURIED WATER LINE BELOW"
- 38 4) Sanitary force mains:
- 39 a) Color: Green with black letters.
- 40 b) Legend:
- 41 (1) "CAUTION BURIED FORCE MAIN BELOW"
- 42 5) Sanitary sewer mains
- 43 a) Color: Green with black letters.
- 44 b) Legend:
- 45 (1) "CAUTION BURIED SEWER LINE BELOW"
- 46 6) (Non-potable) water piping, except 3 IN and smaller irrigation pipe:
- 47 a) Color: Purple with black letters.
- 48 b) Legend:
- 49 (1) "RECLAIMED WATER BURIED BELOW"
- 50 b. Tracing Wire
- 51 1) Install on directly top of all piping

- 1 2) Attach to centerline of installed piping with nylon ties.
- 2 3) Wire insulation shall be color coded (like the marking tape) for the pipe being
- 3 installed with.
- 4 2. Valves, buried, with valve box and concrete pad:
- 5 a. Tag type: Rectangle Metal Tags.
- 6 b. Fastener: 3/16 IN x 7/8 IN plastic screw anchor with 1 IN #6 stainless steel pan head
- 7 screw.
- 8 c. Legend:
- 9 1) Letter height: 1/4 IN minimum.
- 10 2) Valve designation as indicated in the Asset Attribute Table (e.g., "V-xxx").
- 11 3. Curb stop
- 12 a. Locate curb stop with 2" x 2" stake rising 24" above ground
- 13 b. Color top of stake based on service type.
- 14 c. Provide lot number on stake served.

15

END OF SECTION

1 **SECTION 31 10 00**
2 **SITE CLEARING**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

- 5 A. Section Includes:
6 1. Site clearing, tree protection, stripping topsoil and demolition.
7 B. Related Sections include but are not necessarily limited to:
8 1. Division 1 - General Requirements.
9 2. Section 32 91 05 - Topsoiling and Finished Grading.
10 3. Section 31 25 00 - Soil Erosion and Sediment Control.

11 **1.2 DEFINITIONS**

- 12 A. Interfering or objectionable material: Trash, rubbish, and junk; vegetation and other organic
13 matter, whether alive, dead, or decaying; topsoil.
14 B. Clearing: Removal of interfering objectionable material lying on or protruding above ground
15 surface.
16 C. Grubbing: Removal of vegetation and other organic matter including stumps, buried logs, and
17 roots greater than 2 inches caliper to a depth of 6 inches and below subgrade.
18 D. Scalping: Removal of sod without removing more than 3 inches of topsoil.
19 E. Stripping: Removal of topsoil remaining after applicable scalping is completed.
20 F. Project Limits: Area, as shown or specified, within which Work is to be performed.

21 **1.3 SUBMITTALS**

- 22 A. Drawings clearly showing clearing, grubbing, and stripping limits.

23 **1.4 QUALITY ASSURANCE**

- 24 A. Obtain Engineer's approval of staked clearing, grubbing, and stripping limits, prior to
25 commencing clearing, grubbing, and stripping.
26 B. Refer to Florida Department of Transportation Standard Specifications for Road and Bridge
27 Construction, Section 110.
28 C. Latest version of the Orange County Utilities Standards and Construction Specifications Manual.
29 If there is a conflict between this manual and these specifications the more stringent will apply.

30 **1.5 SCHEDULING AND SEQUENCING**

- 31 A. Prepare Site only after adequate erosion and sediment controls are in place. Limit areas exposed
32 uncontrolled to erosion during installation of temporary erosion and sediment controls of 0.5
33 acres.

34 **PART 2 - PRODUCTS - (NOT APPLICABLE TO THIS SECTION)**

35 **PART 3 - EXECUTION**

36 **3.1 PREPARATION**

- 37 A. Clear, grub, and strip area actually needed for site improvements within limits shown or
38 specified.

- 1 B. Protect existing trees and other vegetation to remain against damage.
- 2 1. Do not smother trees by stockpiling construction materials or excavated materials within
- 3 drip line.
- 4 2. Do not injure or deface vegetation that is not designated for removal
- 5 3. Avoid foot or vehicular traffic or parking of vehicles within drip line.
- 6 4. Provide temporary protection as required.
- 7 C. Repair or replace trees and vegetation damaged by construction operations.
- 8 1. Repair to be performed by a qualified tree surgeon.
- 9 2. Remove trees which cannot be repaired and restored to full-growth status.
- 10 a. If necessary, Contractor will hire an expert to verify that damaged trees are capable of
- 11 full-growth status within the warranty period. Cost of expert will be borne by
- 12 Contractor.
- 13 3. Replace with new trees of minimum 4 IN caliper.
- 14 a. Contractor shall provide sufficient quantity of trees to equal the caliper inch of removed
- 15 trees.

16 **3.2 SITE CLEARING**

- 17 A. Topsoil Removal:
- 18 1. Strip topsoil to depths encountered.
- 19 a. Remove heavy growths of grass before stripping.
- 20 b. Stop topsoil stripping sufficient distance from trees and plants to prevent damage to
- 21 main root system.
- 22 c. Separate from underlying subsoil or objectionable material.
- 23 2. Stockpile topsoil where directed by County.
- 24 a. Contractor is responsible for obtaining any areas required to stockpile topsoil.
- 25 b. Construct storage piles to freely drain surface water.
- 26 c. Seed or cover storage piles to prevent erosion.
- 27 3. Do not strip topsoil in wooded areas where no change in grade occurs.
- 28 4. Borrow topsoil: Reasonably free of subsoil, objects over 2 IN diameter, weeds and roots.
- 29 B. Clearing and Grubbing:
- 30 1. Clear from within limits of construction.
- 31 a. All trees and plants are to remain, unless damaged by construction and then Contractor
- 32 is responsible for replacement.
- 33 b. Include shrubs, brush, downed timber, rotten wood, heavy growth of grass and weeds,
- 34 vines, rubbish, structures and debris.
- 35 2. Grub (remove) from within limits of construction all stumps, roots, root mats, logs and
- 36 debris encountered.
- 37 C. Disposal of Waste Materials:
- 38 1. Woody debris may be chipped. Chips may be sold to Contractor's benefit or used for
- 39 landscaping onsite as mulch or uniformly mixed with topsoil, provided that resulting mix
- 40 will be fertile and not support combustion.
- 41 2. Do not burn combustible materials on site.
- 42 3. Remove all waste materials from site.
- 43 4. Do not bury organic matter on site.

44 **3.3 TEMPORARY REMOVAL OF INTERFERING PLANTINGS**

- 45 A. Remove and store plants, shrubs, and trees that interfere with construction or could be damaged
- 46 by construction activities.
- 47 1. Contractor to clearly identify all plants, shrubs and trees that interfere and need to be
- 48 removed prior to beginning any work.
- 49 2. Contractor, Owner and Engineer will review all identified plants, shrubs and trees.

- 1 B. Photograph and document location, orientation, and condition of each plant prior to its removal.
2 Record sufficient information to uniquely identify each plant removed and to assure
3 replacement.

4 **3.4 ACCEPTANCE**

- 5 A. Upon completion of the site clearing, obtain Engineer's acceptance of the extent of clearing,
6 depth of stripping and rough grade.

7

END OF SECTION

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1 **SECTION 31 21 33**

2 **TRENCHING, BACKFILLING, AND COMPACTING FOR UTILITIES**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

- 5 A. Section Includes:
- 6 1. Excavation, trenching, backfilling and compacting for all underground utilities.
- 7 B. Related Sections include but are not necessarily limited to:
- 8 1. Division 1 - General Requirements.

9 **1.2 QUALITY ASSURANCE**

- 10 A. Referenced Standards:
- 11 1. ASTM International (ASTM):
- 12 a. D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using
- 13 Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
- 14 b. D1557, Standard Test Methods for Laboratory Compaction Characteristics of Soil
- 15 Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)).
- 16 c. D2321, Standard Practice for Underground Installation of Thermoplastic Pipe for
- 17 Sewers and Other Gravity-Flow Applications.
- 18 d. D4253, Standard Test Methods for Maximum Index Density and Unit Weight of Soils
- 19 Using a Vibratory Table.
- 20 e. D4254, Standard Test Methods for Minimum Index Density and Unit Weight of Soils
- 21 and Calculation of Relative Density.
- 22 f. D4832, Standard Test Method for Preparation and Testing of Controlled Low Strength
- 23 Material (CLSM) Test Cylinders.
- 24 B. Qualifications: Hire an independent soils laboratory, at the Contractor's expense, to conduct in-
- 25 place moisture-density tests for backfilling to assure that all work complies with this
- 26 Specification Section.
- 27 C. Latest version of the Orange County Utilities Standards and Construction Specifications Manual.
- 28 If there is a conflict between this manual and these specifications the more stringent will apply.

29 **1.3 DEFINITIONS**

- 30 A. Excavation: All excavation will be defined as unclassified.

31 **1.4 SUBMITTALS**

- 32 A. Shop Drawings:
- 33 1. See Section 01 33 00 for requirements for the mechanics and administration of the submittal
- 34 process.
- 35 2. Product technical data including:
- 36 a. Acknowledgement that products submitted meet requirements of standards referenced.
- 37 b. Manufacturer's installation instructions.
- 38 3. Submit respective pipe or conduit manufacturer's data regarding bedding methods of
- 39 installation and general recommendations.
- 40 4. Submit sieve analysis reports on all granular materials.
- 41 B. Flowable Fill: (Controlled Low Strength Material)
- 42 1. Certified mix design and test results. Include material types and weight per cubic yard for
- 43 each component of mix.
- 44 C. Dewatering
- 45 1. Well permits, including well locations (shown on a Product Plan Views, well details.)
- 46 2. Discharge permits.

- 1 3. Calculations based on the geotechnical information establishing pumping rates and flows to
- 2 be accommodated.
- 3 4. Additional equipment to remove onsite to accommodate any mechanical malfunctions or
- 4 failures.
- 5 D. Miscellaneous Submittals:
- 6 1. See Section 01 33 00 for requirements for the mechanics and administration of the submittal
- 7 process.
- 8 2. Certified Gradation Analysis: Submit not less than 30 days prior to delivery for imported
- 9 materials or anticipated use for excavated materials, except for trench stabilization material
- 10 that will be submitted prior to material delivery to Site.
- 11 3. Trench safety plan and shield (trench box) certification if employed:
- 12 a. Specific to Project conditions.
- 13 b. Re-certified if members become distressed.
- 14 c. Certification by registered Structural Professional Engineer, registered in the state of
- 15 Florida.
- 16 d. Owner is not responsible to, and will not, review and approve.
- 17 4. Construction materials testing laboratory.

18 1.5 PROJECT CONDITIONS

- 19 A. Avoid overloading or surcharge a sufficient distance back from edge of excavation to prevent
- 20 slides or caving.
- 21 1. Maintain and trim excavated materials in such manner to be as little inconvenience as
- 22 possible to public and adjoining property owners.
- 23 B. Provide full access to public and private premises and fire hydrants, at street crossings,
- 24 sidewalks and other points as designated by the County to prevent serious interruption of travel.
- 25 C. Protect and maintain bench marks, monuments or other established points and reference points
- 26 and if disturbed or destroyed, replace items to full satisfaction of the County and controlling
- 27 agency.
- 28 D. Verify location of existing underground utilities prior to the start of excavation.

29 PART 2 - PRODUCTS

30 2.1 MATERIALS

- 31 A. Backfill Material:
- 32 1. As approved by County.
- 33 a. Soil, loam, or other excavated material suitable for use as backfill.
- 34 b. Free of rock cobbles, roots, sod or other organic matter. Rocks may not be bigger than
- 35 3 ½ inches diameter.
- 36 c. Maximum of 12 percent of fines passing No. 200 sieve as determined in accordance
- 37 with ASTM D1140.
- 38 d. Moisture content at time of placement: 3 percent plus/minus of optimum moisture
- 39 content as specified in accordance with ASTM D698.
- 40 B. Subgrade Stabilization Materials: Provide subgrade stabilization material consisting of 57 stone.
- 41 C. Bedding Materials:
- 42 1. Unfrozen, friable, and no clay balls roots, or other organic material.
- 43 2. Clean or gravelly sand with less than 5 percent passing No. 200 sieve, as determined in
- 44 accordance with ASTM D1140
- 45 3. Gravel or crushed rock within maximum particle size and other requirements as follows
- 46 unless otherwise specified.
- 47 4. Bedding rock shall conform to FDOT No. 57 aggregate.
- 48

1 D. Flowable fill:

- 2 a. Description: Flowable fill shall be a mixture of cement, fly ash, fine sand, water, and
3 air having a consistency which will flow under a very low head.
- 4 b. Material characteristics:
- 5 1) The approximate quantities of each component per cubic yard of mixed material
6 shall be as follows:
- 7 a) Cement (Type I or II): 50 LBS.
8 b) Fly ash: 200 LBS.
9 c) Fine sand: 2,700 LBS.
10 d) Water: 420 LBS.
11 e) Air content: 10 percent.
- 12 2) Actual quantities shall be adjusted to provide a yield of 1 cubic yard with the
13 materials used.
- 14 3) Approximate compressive strength should be 50 to 150 psi at 28 days in
15 accordance with ASTM D4832.
- 16 4) Fine sand shall be an evenly graded material having not less than 95 percent
17 passing the No. 4 sieve and not more than 5 percent passing the No. 200 sieve.
- 18 5) Mixing and handling of the material shall be in accordance with Manufacturer's
19 Specification.

20 **PART 3 - EXECUTION**

21 **3.1 GENERAL**

- 22 A. Remove and dispose of unsuitable materials to another site away from the Project provided by
23 Contractor.

24 **3.2 EXCAVATION**

- 25 A. Unclassified Excavation: Remove rock excavation, clay, silt, gravel, hard pan, loose shale, and
26 loose stone.
- 27 B. Excavation for Appurtenances:
- 28 1. 12 IN (minimum) clear distance between outer surface and embankment.
29 2. Stake all fittings, piping, valve locations, and establish their elevations.
- 30 C. Groundwater Dewatering:
- 31 1. Continuously control water during course of construction, including weekends and holidays
32 and during periods of work stoppages, and provide adequate backup systems to maintain
33 control of water. At no time allow groundwater to rise within any excavation until all work
34 is complete, and then only with acceptance of the County.
- 35 2. Prior to commencing excavation and construction, obtain Engineer's agreement with
36 detailed plans showing procedures intended to handle and dispose of dewatering pump
37 discharges. Direct all surface run-off away from excavations to an area where they can be
38 properly controlled.
- 39 3. Where groundwater is, or is expected to be, encountered during excavation, install a
40 dewatering system to prevent softening and disturbance of subgrade to allow subgrade
41 stabilization, pipe, bedding and backfill material to be placed in the dry, and to maintain a
42 stable trench wall or side slope.
- 43 4. Groundwater shall be drawn down and maintained at least 1 FT below the bottom of any
44 trench or manhole excavation prior to excavation.
- 45 5. Review soils investigation before beginning excavation and determine where groundwater is
46 likely to be encountered during excavation.
- 47 a. Employ dewatering specialist for selecting and operating dewatering system.
- 48 6. Keep dewatering system in operation until dead load of pipe, structure and backfill exceeds
49 possible buoyant uplift force on pipe or structure.
- 50 7. Disposal of Groundwater

- 1 a. Dispose of groundwater to an area which will not interfere with construction operations
- 2 or damage existing construction.
- 3 b. Obtain discharge permit for water disposal from authorities having jurisdiction.
- 4 c. Treat water collected by dewatering operations, as required by regulatory agencies,
- 5 prior to discharge.
- 6 d. Discharge water as required by discharge permit and in a manner that will not cause
- 7 erosion or flooding, or otherwise damage existing facilities, completed Work, or
- 8 adjacent property.
- 9 8. Install groundwater monitoring wells as necessary.
- 10 9. Shut off dewatering system at such a rate to prevent a quick upsurge of water that might
- 11 weaken the subgrade.
- 12 10. Securely support existing facilities, completed Work, and adjacent property vulnerable to
- 13 settlement due to dewatering operations. Support shall include, but not limited to, bracing,
- 14 underpinning, or compaction grouting.
- 15 11. If dewatering reduces quantity or quality of water produced by existing wells, temporarily
- 16 supply water to affected well owners from other sources. Furnish water of a quality and
- 17 quantity equal to or exceeding the quality and quantity available to well owner prior to
- 18 beginning the Work or as satisfactory to each well owner.

19 D. Trench Excavation:

- 20 1. Excavate trenches by open cut method to depth shown on Drawings and necessary to
- 21 accommodate work.
- 22 a. For structures, excavate to the elevations and dimensions shown on drawings within a
- 23 tolerance of ± 0.10 FT.
- 24 b. Support existing utility lines where proposed work crosses at a lower elevation.
- 25 1) Stabilize excavation to prevent undermining of existing utility.
- 26 2. Open trench outside buildings, units, and structures:
- 27 a. No more than the distance between two manholes, structures, units, or 300 LF,
- 28 whichever is less.
- 29 b. Field adjust limitations as weather conditions dictate.
- 30 3. Trenching within buildings, units, or structures:
- 31 a. No more than 100 LF at any one time.
- 32 4. No trench or portion of trench shall remain open at the end of each day's work.
- 33 5. Observe following trenching criteria:
- 34 a. Trench size:
- 35 1) Excavate width to accommodate free working space.
- 36 2) Maximum trench width at top of pipe or conduit may not exceed outside diameter
- 37 of utility service by more than the following dimensions:
- 38

OVERALL DIA. OF UTILITY SERVICE	EXCESS DIMENSION
33 IN and less	18 IN
more than 33 IN	24 IN

- 39
- 40 3) Cut trench walls vertically from bottom of trench to 1 FT above top of pipe,
- 41 conduit, or utility service.
- 42 4) Keep trenches free of surface water runoff.
- 43 a) Include cost in Bid.
- 44 b) No separate payment for surface water runoff pumping will be made.

45 E. Flowable Fill:

- 46 1. Flowable fill shall be:
- 47 a. Discharged from a mixer by any means acceptable to the County into the area to be
- 48 filled.
- 49 1) Fall shall be a maximum of 5 feet.
- 50 b. Placed in 4 FT maximum lifts to the elevations indicated.

- 1 1) Allow 12 HR set-up time before placing next lift or as approved by the County.
2 2) Contractor shall place flowable fill lifts in such a manner as to prevent flotation of
3 the pipe.
4 2. Flowable fill shall not be placed on frozen ground.
5 3. Subgrade on which flowable fill is placed shall be free of disturbed or softened material and
6 water.
7 4. Flowable fill batching, mixing, and placing may be started if weather conditions are
8 favorable, and the air temperature is 34° F and rising.
9 5. At the time of placement, flowable fill must have a temperature of at least 40° F.
10 6. Mixing and placing shall stop when the air temperature is 38° F or less and falling.
11 7. Each filling stage shall be as continuous an operation as is practicable.
12 8. Contractor shall prevent traffic contact with flowable fill for at least 24 HRS after placement
13 or until flowable fill is hard enough to prevent rutting by construction equipment.
14 9. Flowable fill shall not be placed until water has been controlled or groundwater level has
15 been lowered in conformance with the requirements of Paragraph 3.2C in this Specification
16 Section.

17 **3.3 PREPARATION OF FOUNDATION FOR PIPE LAYING**

- 18 A. Over-Excavation:
19 1. Backfill and compact to 95 percent outside of roadway and 98 percent within roadway of
20 maximum dry density per ASTM D698.
21 2. Backfill with granular bedding material as option.
22 B. Rock Excavation:
23 1. Excavate minimum of 6 IN below bottom exterior surface of the pipe or conduit.
24 2. Backfill to grade with suitable earth or granular material.
25 3. Form bell holes in trench bottom.
26 C. Subgrade Stabilization:
27 1. Stabilize the subgrade when directed by the County.
28 2. Observe the following requirements when unstable trench bottom materials are encountered.
29 a. Notify County when unstable materials are encountered.
30 1) Define by drawing station locations and limits.
31 b. Remove unstable trench bottom caused by Contractor failure to dewater, rainfall, or
32 Contractor operations.
33 1) Replace with subgrade stabilization with no additional compensation.

34 **3.4 BACKFILLING METHODS**

- 35 A. Do not backfill until tests to be performed on system show system is in full compliance to
36 specified requirements.
37 B. Pipe embedment
38 1. Type A – Bedding - Rock conforming to FDOT No. 57 aggregate.
39 2. Backfill up to pipe haunch at the minimum.
40 C. Select Common Backfill:
41 1. Furnish where indicated on Drawings, specified for compacted backfill conditions up to 12
42 IN above top of pipe or conduit.
43 2. Comply with the following:
44 a. Place backfill in lifts not exceeding 8 IN (loose thickness).
45 b. Hand place, shovel slice, and pneumatically tamp all carefully compacted backfill.
46 c. Observe specific manufacturer's recommendations regarding backfilling and
47 compaction.
48 d. Compact each lift to specified requirements.
49 D. Common Trench Backfill:
50 1. Perform in accordance with the following:
51 a. Place backfill in lift thicknesses capable of being compacted to densities specified.

- 1 b. Observe specific manufacturer's recommendations regarding backfilling and
 2 compaction.
 3 c. Avoid displacing joints and appurtenances or causing any horizontal or vertical
 4 misalignment, separation, or distortion.
- 5 E. Water flushing for consolidation is not permitted.

6 **3.5 COMPACTION**

- 7 A. General:
- 8 1. Place and assure bedding, backfill, and fill materials achieve an equal or higher degree of
 9 compaction than undisturbed materials adjacent to the work.
 10 2. In no case shall degree of compaction below minimum compactions specified be accepted.
- 11 B. Compaction Requirements:
- 12 1. Unless noted otherwise on Drawings or more stringently by other Specification Sections,
 13 comply with following minimum trench compaction criteria.
 14 a. Bedding material:

LOCATION	SOIL TYPE	COMPACTION DENSITY
All locations	Cohesionless soils	95 percent of maximum relative density by ASTM D4253 and ASTM D4254

- 16 b. Common trench backfill:

LOCATION	SOIL TYPE	COMPACTION DENSITY
Under pavements, roadways, surfaces within highway right-of-ways	Cohesive soils	98 percent of maximum dry density by ASTM D698
	Cohesionless soils	98 percent of relative density by ASTM D4253 and ASTM D4254
Under turfed, sodded, plant seeded, non-traffic areas	Cohesive soils	95 percent of maximum dry density by ATM D698
	Cohesionless soils	95 percent of relative density by ASTM D4253 and ASTM D4254

19

20 **3.6 FIELD QUALITY CONTROL**

- 21 A. Testing:
- 22 1. Perform in-place moisture-density tests per Orange County Utilities Standards and
 23 Construction Specifications Manual.
 24 2. Perform tests through recognized testing laboratory approved by County.
 25 3. Costs of all tests shall be at the Contractor's expense.
 26 4. Perform additional tests as directed until compaction meets or exceeds requirements.
 27 5. Ensure excavations are safe for testing personnel.

28 **END OF SECTION**

1 **SECTION 31 23 19**
2 **DEWATERING**

3 **PART 1 - GENERAL**

4 **1.1 DESCRIPTION**

- 5 A. Scope of Work: This Section specifies the furnishing of equipment; labor and materials
6 necessary to remove storm or subsurface waters from excavation areas in accordance with the
7 requirements set forth, as shown on the Drawings, and/or geotechnical report.

8 **1.2 QUALITY ASSURANCE**

- 9 A. Qualifications: The Contractor shall engage a Geotechnical Engineer registered in the State of
10 Florida, to design the temporary dewatering system. The Contractor shall submit conceptual
11 plan for the dewatering system prior to commencing work. The dewatering system installed
12 shall be in conformity with the overall construction plan and certification of this shall be
13 provided by the Geotechnical Engineer. The dewatering system shall be designed by a firm who
14 regularly engages in the design of dewatering systems and who is fully experienced, reputable
15 and qualified in the design of such dewatering systems.
- 16 B. The dewatering of any excavation areas and the disposal of the water shall be in strict
17 accordance with the latest revision of all local and state government rules and regulations.
- 18 C. Permits: The Contractor shall obtain and pay respective fees for all local, state, and federal
19 permits (including the Orange County, St. Johns River Water Management District, and/or South
20 Florida Management District discharge permits) required for the withdrawal, treatment and
21 disposal/discharge of water from the dewatering operation, prior to start of work.
- 22 D. Comply with Florida Administrative Code, Chapter 62-621.300 (2).

23 **1.3 SHOP DRAWINGS AND SUBMITTALS**

- 24 A. Submittals shall be submitted to the County for review and acceptance prior to construction in
25 accordance with the General Conditions and specifications Section 01300 "Submittals".
- 26 B. In accordance with FAC 62-621.300(2), submit analytical test results from a certified laboratory
27 for the parameters listed in the FDEP "Generic Permit for the Discharge of Produced Ground
28 Water from Any Non-Contaminated Site Activity" to the FDEP and the County. The submitted
29 information shall show the location of the work, where the water will be going to, as well as an
30 estimate for the amount, rate and duration of discharge being proposed.
- 31 C. Provide notification to all jurisdictional permitting agencies in accordance with the requirements
32 of the respective agency.
- 33 D. Provide a detailed plan and operation schedule for dewatering of excavations.
34 1. Provide descriptive literature of the dewatering system.
35 2. Provide a plan for erosion and sedimentation control during dewatering.
36 3. Provide copies of all permits/approvals for disposal/discharge of water during dewatering.

1 **PART 2 - PRODUCTS (NOT USED)**

2 **PART 3 - EXECUTION**

3 **3.1 GENERAL**

- 4 A. Results of groundwater testing as performed by *Nodarse & Associates, Inc.* shown in Table 1 at
5 the end of this specification section. Locations of samples are shown on Drawings
6 corresponding to the sample ID as seen in Table 1. Results only to serve as indication that some
7 areas of the Park Manor Estates Subdivision may not meet regulatory limits for groundwater
8 discharge. Contractor to ensure any discharged groundwater meets the appropriate
9 requirements.
- 10 B. Electronic copy of the “National Pollutant Discharge Elimination System Groundwater Testing
11 and Database Search” for the Park Manor Estates Water System Improvements project by
12 *Nodarse & Associates, Inc.* will be made available upon request.
- 13 C. The Contractor shall have on-site and available the analytical test results performed in
14 accordance with the FDEP "Generic Permit for the Discharge of Produced Ground Water from
15 Any Non-Contaminated Site Activity" (FAC 62-621.300(2)).
- 16 D. The Contractor shall provide adequate equipment for the removal of storm or subsurface waters
17 which may accumulate within the excavation.
- 18 E. The Contractor's attention is directed to the water surface elevations discussed in the report(s) on
19 subsurface investigations. Water levels will normally vary from season to season.
- 20 F. The Contractor shall be required to monitor the performance of the dewatering system during the
21 progress of the Work and make such modifications as may be required to assure that the systems
22 will perform satisfactorily. The dewatering system shall be designed in such a manner as to
23 preserve the undisturbed bearing capacity of the sub-grade soils at the bottom of the trench or
24 excavation.
- 25 G. Prior to excavation, the Contractor shall submit his proposed method of dewatering and
26 maintaining dry conditions to the County. Approval of the dewatering plan shall not relieve the
27 Contractor of the responsibility for the satisfactory performance of the system. The Contractor
28 shall be responsible for correcting any disturbance of natural bearing soils or damage to
29 structures caused by an inadequate dewatering system or by interruption of the continuous
30 operation of the system as specified.
- 31 H. If subsurface water is encountered, the Contractor shall utilize suitable equipment to adequately
32 dewater the excavation. A wellpoint system or other County acceptable dewatering method shall
33 be utilized if necessary to maintain the excavation in a dry condition for preparation of the trench
34 bottom and for pipe laying. Within and adjacent to residential areas and other areas as required
35 by the County, engines driving dewatering pumps shall be equipped with residential type
36 mufflers and the noise shall not exceed 55 decibels within 50 feet.

37 **3.2 DEWATERING AND DISPOSAL**

- 38 A. The Contractor shall construct and place all pipelines, structures, concrete work, structural fill,
39 backfill and bedding material in-the-dry. In addition, the Contractor shall make the final 24-
40 inches of excavation in-the-dry and not until the water level is a minimum of two foot below
41 proposed bottom of excavation. For purposes of this Contract, in-the-dry is defined as $\pm 2\%$ of
42 the optimum moisture content of the soil.

- 1 2. Permit for all Other Contaminated Sites (62-04; 62-302; 62-620 & 62-660). The coverage is
- 2 available only through the individual NPDES permit issued by FDEP, allows discharges
- 3 from sites with general contaminant issues i.e. ground water and/or soil contamination other
- 4 than petroleum fuel contamination; or
- 5 3. Generic Permit for the Discharge of Produced Ground Water from Any Non-Contaminated
- 6 Site Activity (62-621.300(2), F.A.C.); or
- 7 4. Generic Permit for Stormwater Discharge from Large or Small Construction Activities (62-
- 8 621.300(4)(a), F.A.C.); or
- 9 5. An Individual Wastewater Permit (62-604.300(8) (a)
- 10 E. The Contractor shall implement the appropriate treatment that is acceptable to FDEP and County
- 11 to attain compliance for all excess limits encountered during dewatering activities. Treatment
- 12 may include, but is not limited to: Chemical, Biological, Electrolysis or any combination of the
- 13 three.
- 14 F. The Contractor shall make every effort to minimize the spread of contamination into
- 15 uncontaminated areas. Provide for the health and safety of all workers at the job site and make
- 16 provisions necessary for the health and safety of the public that may be exposed to any
- 17 potentially hazardous conditions. Ensure provision adhere to all applicable laws, rules or
- 18 regulations covering hazardous conditions and will be in a manner commensurate with the level
- 19 of severity of the conditions.
- 20 G. If necessary, provide contamination assessment and remediation personnel to handle site
- 21 assessment, determine the course of action necessary for site security and perform the necessary
- 22 steps under applicable laws, rules and regulations for additional assessment and/or remediation
- 23 work to resolve the contaminations issue.
- 24 H. Delineate the contamination area(s) and any staging or holding area required and develop a work
- 25 plan that will provide the schedule of projected completion dates for the final resolution of the
- 26 contamination issue.
- 27 I. Maintain jurisdiction over activities inside any delineated contamination areas and any
- 28 associated staging or holding areas. Be responsible for the health and safety of workers within
- 29 the delineated areas. Provide continuous access to representatives of regulatory or enforcement
- 30 agencies having jurisdiction.

31 **3.4 REMOVAL**

32 Immediately upon completion of the dewatering system, the Contractor shall remove all of his

33 equipment, materials, and supplies from the site of the Work, remove all surplus materials and

34 debris, fill in all holes or excavations, and grade the site to elevations of the surface levels which

35 existed before work started. The site shall be thoroughly cleaned and approved by the County.

36 **END OF SECTION**

**TABLE 1
GROUNDWATER ANALYTICAL SUMMARY FINAL
RESULTS OF NPDES CONCENTRATIONS PARK
MANOR ESTATES SUBDIVISION ORLANDO,
ORANGE COUNTY, FLORIDA
NODARSE/TERRACON PROJECT NO. H1115484
SAMPLING DATES: JUNE 20 - AUGUST 9, 2012**

PARAMETER	Sample ID														Limits*	Units
	TMW-1	TMW-2	TMW-3	TMW-4	TMW-5	TMW-6	TMW-7	TMW-8	TMW-9	TMW-10	TMW-11	TMW-12	TMW-13	TMW-14		
DATE SAMPLED	7/19	6/20	7/19	7/19	6/21	6/21	6/27	6/21	6/21	6/27	6/27	7/30	7/19	7/19		
Benzene	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.29	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	1.0	µg/L
Naphthalene	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	100	µg/L
Cadmium, Total	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	9.3	µg/L
Copper, Total	2.0 U	2.3 i	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.9	µg/L
Lead, Total	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	30.0	µg/L
Mercury, Total	0.0058	0.00076	0.0032	0.0033	0.0018	0.0043	0.0117	0.00051	0.00049 i	0.0022	0.001	0.0031	0.0035	0.0021	0.012	µg/L
Zinc, Total	5.0 U	6.1 i	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.4 i	5.0 U	5.0 U	5.0 U	5.2 i	8.91 i	86.0	µg/L
Chromium, Hexavalent	3.0 U	4.0 i	3.0 U	3.0 i	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	6.0 i	3.0 U	10	5.0 i	3.0 U	11.0	µg/L
Total Organic Carbon (TOC)	17.2	3.2	33.8	8.7	1.6	5.5	5.4	1.5	2.1	5.7	3.6	2.6	9.8	9.9	10.0	mg/L
TRPH	140 U	NA	226	150 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5000.0	µg/L
pH- Laboratory	6.67	6.87	6.82	6.22	6.55	6.47	5.73	5.75	5.22	5.44	5.40	5.57	5.26	5.11	6.0 - 8.5	µg/L

NOTES:

Bold values represent a concentration exceeding the respective NPDES criteria
mg/L- milligrams per liter; i= indicates value < method detection limit but > than practical quantitation limit
µg/L - micrograms per liter;
U - not detected above method detection limit
* Based on the Florida Department of Environmental Protection's Effluent Discharge
Generic Dewatering Permit Table 4 Screening Values (Doc # 62-621.300(1), eff. 2-14-2000
NS - No applicable limitation or standard referenced
NA - Not applicable

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1 **SECTION 31 25 00**
2 **SOIL EROSION AND SEDIMENT CONTROL**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

- 5 A. Section Includes:
6 1. Soil erosion and sediment control.
7 B. Related Sections include but are not necessarily limited to:
8 1. Division 1 - General Requirements.

9 **1.2 QUALITY ASSURANCE**

- 10 A. Referenced Standards:
11 1. Erosion control standards: "Standards and Specifications for Soil Erosion and Sediment
12 Control in Developing Areas" by the United States Department of Agriculture (USDA), Soil
13 Conservation Service, College Park, Maryland.
14 2. Florida Department of Transportation Standard Specifications for Road and Bridge
15 Construction, Section 104.

16 **PART 2 - PRODUCTS**

17 **2.1 MATERIALS**

- 18 A. Straw bales, twine tied.
19 B. Pipe Riser and Barrel: 16 GA corrugated metal pipe (CMP) of size indicated.
20 C. Stone for Stone Filter: 2 IN graded gravel or crushed stone.
21 D. Grass Seed: Annual ryegrass for temporary coverage.

22 **PART 3 - EXECUTION**

23 **3.1 PREPARATION**

- 24 A. Prior to General Stripping Topsoil and Excavating:
25 1. Install perimeter dikes and swales.
26 2. Excavate and shape sediment basins and traps.
27 3. Construct pipe spillways and install stone filter where required.
28 4. Machine compact all berms, dikes and embankments for basins and traps.
29 5. Install straw bales where indicated.
30 a. Provide two stakes per bale.
31 b. First stake angled toward previously installed bale to keep ends tight against each other.
32 B. Construct sediment traps where indicated on Drawings during rough grading as grading
33 progresses.
34 C. Temporarily seed basin slopes and topsoil stockpiles:
35 1. Rate: 1/2 LB/1000 SF.
36 2. Reseed as required until good stand of grass is achieved.
37

1 **SECTION 32 11 34**
2 **SOIL CEMENT BASE**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

- 5 A. Section Includes:
- 6 1. : Furnish and install base course using a combination of soil, Portland cement, and water.
- 7 B. Related Sections include but are not necessarily limited to:
- 8 1. Division 1 - General Requirements.
- 9 2. Section 03 05 05 - Concrete Testing
- 10 3. Section 03 09 00 - Concrete
- 11 4. Section 32 12 16 – Asphaltic Concrete Vehicular Paving

12 **1.2 QUALITY ASSURANCE**

- 13 A. Referenced Standards:
- 14 1. American Association of State Highway and Transportation Officials (AASHTO):
- 15 a. T-88: Particle Size Analysis of Soils.
- 16 b. T-89: Determining the Liquid Limit of Soils.
- 17 c. T-90: Determining the Plastic Limit and Plasticity Index of Soils.
- 18 d. T-134: Moisture-Density Relations of Soil-Cement Mixtures.
- 19 e. T-135: Wetting and Drying Test of Compacted Soil-Cement Mixtures.
- 20 f. T-267: Determination of Organic Content in Soils by Loss on Ignition.
- 21 2. State of Florida Department of Transportation (FDOT) 2010 Standard Specification for
- 22 Road and Bridge Construction:
- 23 a. Specification Section 911: Limerock Material for Base and Stabilized Base.
- 24 b. Specification Section 916: Bituminous Materials.
- 25 c. Specification Section 921: Portland Cement and Blended Cement.
- 26 B. For density and thickness determination, a LOT is defined as 2,500 square yards of base, plus
- 27 any small section of base at the end of a day's operation in the preceding LOT. The County may
- 28 include small irregular areas as part of another LOT. Areas such as an intersection, crossover,
- 29 and ramp will be considered as a separate LOT. No LOT shall include more than 3,500 square
- 30 yards or it shall be considered as a separate LOT.
- 31 C. Five (5) density tests shall be performed at locations randomly selected by the County within
- 32 each LOT.
- 33 D. Five (5) thickness measurements shall be performed at locations randomly selected by the
- 34 County within each LOT. Three-inch minimum diameter test holes are required to determine the
- 35 thickness.

36 **1.3 SUBMITTALS**

- 37 A. Shop Drawings:
- 38 1. See Section 01 33 00 for requirements for the mechanics and administration of the submittal
- 39 process.
- 40 2. Product technical data including:
- 41 a. Acknowledgement that products submitted meet requirements of standards referenced.
- 42 b. Manufacturer's installation instructions.
- 43 3. Soil-cement design mix in accordance with this Specification Section.
- 44 4. Qualifications of concrete installer.
- 45 5. Test reports:
- 46 a. Test results from field quality control in accordance with this Specification Section.

- 1 B. Samples:
 2 1. See Section 01 33 00 for requirements for the mechanics and administration of the submittal
 3 process.

4 **PART 2 - PRODUCTS**

5 **2.1 GENERAL**

- 6 A. All material supplied shall be one of the products specified in Appendix D "List of Approved
 7 Products" appended to these technical specifications.

8 **2.2 MATERIALS**

- 9 A. Portland Cement: Type I, II, III, or Type 1-P per FDOT Specification Section 921.
 10 B. Use water that is free from substances deleterious to hardening of the soil-cement mixture.
 11 C. Curing Material shall be per FDOT Specification Section 916.
 12 D. Emulsified asphalt shall be Grade SS, RS, or MS as approved by the County. Dilute as
 13 recommended by the manufacturer.
 14 E. Soils for base course construction shall be either limerock material per FDOT Specification
 15 Section 911 or soils meeting the following requirements:
 16

**Table 32 11 34-1
 Soil Requirements**

Physical Characteristic	Acceptance Level	Testing Standard
Organic Material	Maximum 5%	AASHTO T-267
Total Clay and Silt Content (Minus No. 200 Sieve)	Maximum 25%	AASHTO T-88
Plastic Index	Maximum 10%	AASHTO T-90
Liquid Limit	Maximum 25%	AASHTO T-89

17
 18

**Table 32 11 34-2
 Soil Gradation Requirements**

Soil Gradation Requirements (Per AASHTO T-88)	
Passing 2-inch sieve	Minimum 100%
Passing No. 4 sieve	Minimum 55%
Passing No. 10 sieve	Minimum 37%

19

1 **2.3 PROPORTIONING OF MIX**

- 2 A. Submit for approval a design mix for the soil proposed for use in soil-cement construction
 3 prepared by a testing laboratory approved by the County. The design mix submittal shall include
 4 the results of tests run to verify that the soil meets the requirements; results of tests used to
 5 establish the cement content; and a final design laboratory sample. Submit the design mix to the
 6 County for approval a minimum of 60-calendar days prior to beginning of soil-cement
 7 construction for Brush Loss Design Method or 15-calendar days prior to beginning of soil-
 8 cement construction for Strength Design Method. Express the cement as a percentage of the dry
 9 unit weight of the soil. For mixed-in-place construction, use a ratio of cement based on the
 10 maximum density of the soil determined in accordance with AASHTO T-99 and rounded up to
 11 the nearest pound per cubic yard.
- 12 B. When proportioning the soil-cement mixture in accordance with strength design, determine the
 13 minimum cement content using FM 5-520. The design compressive strength specified shall be
 14 achieved in 7-days. Ensure that the cement content is not less than 5% by weight except as
 15 noted below.
- 16 C. When proportioning the soil-cement mixture in accordance with Brush Loss Design criteria,
 17 determine the minimum cement content in accordance with AASHTO T-135. Ensure that the
 18 cement content is not less than 5% by weight except as noted below. Ensure that the soil-cement
 19 loss at the completion of 12 cycles of testing conforms to the limits in the following table.
 20

**Table 32 11 34-3
 Soil Limits**

Soil Group	Limits
AASHTO Soils Groups A-1, A-2-4, A-2-5, and A-3	Not over 14%
AASHTO Soils Groups A-2-6, A-2-7, A-4, and A-5	Not over 10%
AASHTO Soils Groups A-6 and A-7	Not over 7%

- 21
- 22 D. When proportioning of soil-cement mixture by the Brush Loss Design Criteria Method and
 23 processing by Central-Plant-Mixing where the requirements noted below are met, the County
 24 will not require strength testing of field specimens. Verify the properties of the parent material
 25 during the processing, on a random frequency, to ensure that the final mix has not changed from
 26 the original design. Provide the County a printout of each day's production that shows
 27 proportioning of the mixture meets the approved Brush Loss Design, including cement.
- 28 E. Do not apply the minimum 5% cement content specified above if obtaining the soil material
 29 used in producing a soil-cement mixture from a commercial source (not to exclude recycled
 30 materials) where soil properties are consistently uniform, and if processing the mixture in a
 31 central mix plant that automatically weighs components and automatically records the weight of
 32 each component on a printed ticket, tape, or other digital record.

33 **PART 3 - EXECUTION**

34 **3.1 PREPARATION**

- 35 A. Use any machine, combination of machines, or equipment that is in good, safe working
 36 condition and that will produce results meeting the requirements for cement application, soil
 37 pulverization, mixing water application, compaction, finishing, and curing, as required herein.
 38 Compaction equipment shall be used that will produce a base at the required density:

1 **3.2 SUBGRADE PREPARATION**

- 2 A. Subgrade shall be completed before beginning base construction operations. Ensure that the
3 subgrade is firm enough to support the equipment used in the soil-cement base operations
4 without appreciable distortion or displacement. Remove any unsuitable material and replace it
5 with suitable material.
- 6 B. When constructing the base with central-plant-mixed soil-cement, grade and shape the subgrade
7 to the lines, grades, and typical cross-section shown in the plans. Ensure that the subgrade is
8 moist but not ponded at the time of placing the mixed base course material.

9 **3.3 BASE SOIL FOR MIXED IN-PLACE PROCESSING**

- 10 A. Grade and shape the area over which the base is to be constructed to an elevation that will
11 provide a base in conformance with the grades, lines, thickness, and typical cross-sections shown
12 on the plans. Remove all roots, sticks, and other deleterious matter during processing.

13 **3.4 PROCESSING OF THE SOIL CEMENT MIXTURE**

- 14 A. Mix the soil, cement, and water either by mixed-in-place or central-plant-mix methods.
- 15 B. Do not allow the percentage of moisture in the soil at the time of cement application to exceed
16 the quantity that will permit a uniform and intimate mixture of soil and cement during mixing
17 operations.
- 18 C. During seasons of freezing temperature, do not spread any cement or soil-cement mixture unless
19 the ambient temperature is at least 40°F in the shade.
- 20 D. At the completion of moist-mixing, pulverize the soil so that 100% passes a 1-1/2-inch sieve, 95
21 to 100% passes the 1-inch sieve and a minimum of 80% passes a No. 4 sieve, exclusive of
22 gravel, shell, or stone.
- 23 E. Operations shall be completed within a period of 4-hours starting at the time mixing commences.

24 **3.5 MIXED-IN-PLACE METHOD**

- 25 A. Where feasible, process the entire width of the base in a single operation. Uniformly spread the
26 design quantity of cement on the soil at the required rate of application, by means of an approved
27 method. Replace spread cement that becomes displaced before starting mixing. Check the
28 uniformity of spread rate by:
29 1. Weight of cement spread/square yards covered for a short trial section that is between 100
30 and 300-feet in length; or
31 2. Use of a square yard cloth/box.
- 32 B. After applying the cement, begin mixing within 60-minutes. Initially mix the soil and cement
33 until the cement has sufficiently blended with the soil to prevent formation of cement balls when
34 applying additional water; then add water if necessary, and re-mix the soil-cement mixture. Do
35 not perform windrow mixing.
- 36 C. Process up to the full depth in 1 course, provided the distribution of cement and water and the
37 specified density are satisfactory to the County. If not, construct courses of such thickness to
38 obtain satisfactory results. Make provisions to achieve adequate bonding between courses.
- 39 D. Immediately after mixing of the soil and cement, add any additional water that is necessary. If
40 the moisture content exceeds that specified, manipulate the soil-cement mixture by re-mixing or
41 grading as required to reduce the moisture content to within the specified range. Avoid
42 excessive concentrations of water. Continue mixing during and after applying water until
43 obtaining a uniform mixture of soil, cement, and water.
- 44 E. As an alternative to the above-described procedure, the Contractor may use an approved
45 machine that will blend the cement and the soil. Additional water may be added and mixed as
46 necessary.

1 **3.6 CENTRAL-PLANT-MIXED METHOD**

- 2 A. Mix the soil, cement, and water in a pugmill of either the batch or continuous-flow type. Equip
- 3 the plant with feeding and metering devices that will accurately proportion the soil, cement, and
- 4 water in the quantities specified. Mix soil and cement sufficiently to prevent cement balls from
- 5 forming when adding additional water. Continue mixing until obtaining a uniform mixture of
- 6 soil, cement, and water.
- 7 B. Haul the mixture to the roadway in trucks equipped with protective covers. Place the mixture on
- 8 the moistened subgrade in a uniform layer with suitable equipment. Do not allow more than 60-
- 9 minutes to elapse between placing of soil-cement in adjacent passes of the spreader at any
- 10 location, except at construction joints. Ensure that the layer of soil-cement is uniform in
- 11 thickness and surface contour and in such quantity that the completed base will conform to the
- 12 required grade and cross-section. Do not perform windrow mixing.

13 **3.7 CONSTRUCTION JOINTS**

- 14 A. Prior to joining any previously constructed section of base, form a vertical construction joint by
- 15 cutting back into the completed work to form a true vertical face of acceptable soil-cement to the
- 16 full depth of the base course. Moisten the vertical face as needed prior to placing new material
- 17 against it.

18 **3.8 SHAPING AND FINISHING**

- 19 A. Prior to final compaction, shape the surface of the soil-cement to the required lines, grades, and
- 20 cross-section. In all cases where adding soil-cement mixture to any portion of the surface,
- 21 lightly scarify the surface with a spring tooth harrow, spike drag, or other approved device to
- 22 uniformly loosen the surface prior to adding material and prior to the initial set of the soil-
- 23 cement mixture. Compact the resulting surface to the specified density. Continue rolling until
- 24 all rutting ceases and until the base conforms to the density requirements.
- 25 B. Ensure that the surface material is moist but not ponded, and maintained at not less than 2%
- 26 below its specified optimum moisture content, during finishing operations. Perform surface
- 27 compaction and finishing in such a manner as to produce a smooth dense surface, free of
- 28 compaction planes, construction cracks, ridges, and loose material.
- 29 C. If the time limits specified above are exceeded, either remove and replace the base or leave the
- 30 base undisturbed for a period of 7-days, after which, the County will examine it to determine its
- 31 suitability. If found unsuitable, remove and replace the base at no additional cost to County.

32 **3.9 COMPACTION**

- 33 A. Begin compacting the soil-cement mixture immediately after mixing or placing. Do not allow
- 34 more than 30-minutes to elapse between the last pass of moist-mixing or spreading and the start
- 35 of compaction of the soil-cement mixture at a particular location.
- 36 B. Determine the optimum moisture content and the maximum density in the field by the methods
- 37 prescribed in AASHTO T-134 on representative samples of the soil-cement mixture obtained
- 38 immediately after the initial mixing. Determine the density for each day's run or change of
- 39 material.
- 40 C. Uniformly compact the loose material to meet the density requirements specified below. During
- 41 compaction operations, reshape the material to obtain required grade and cross-section.

1 **3.10 PROTECTION AGAINST DRYING**

- 2 A. While finishing and correcting the surface, keep the surface of the base continuously moist by
3 sprinkling water as necessary until applying the emulsified asphalt curing material. As soon as
4 practicable, protect the base from drying for 7-days by applying the emulsified asphalt at the rate
5 of 0.20 to 0.25-gallons of the diluted mixture per square yard. Provide complete coverage
6 without excessive runoff. While applying the bituminous material, ensure that the soil-cement
7 surface is dense, free of all loose and extraneous material, and contains sufficient moisture to
8 prevent excessive penetration of the bituminous materials.
- 9 B. If it is necessary to allow construction equipment or other traffic to use the completed base
10 before the bituminous material has cured sufficiently to prevent pickup or displacement, sand the
11 bituminous material, using approximately 10-lbs of clean sand per square yard. Do not use
12 cover material containing organic acids or other compounds detrimental to the soil-cement base.

13 **3.11 OPENING TO TRAFFIC**

- 14 A. Do not allow traffic on the base subsequent to completion of the finishing operations for a
15 minimum period of 72-hours. As an exception to this requirement, allow equipment necessary
16 for correction of surface irregularities, application of water, and application of curing materials
17 on the base, if the tire contact pressures of such equipment do not exceed 45-psi. Under special
18 conditions (i.e. low speed limit, low traffic volume, urban conditions), the County may waive the
19 72-hour period.

20 **3.12 MAINTENANCE**

- 21 A. Maintain the base to a true and satisfactory surface until the wearing surface is constructed. If
22 the County requires any repairing or patching, extend the repair or patch to the full depth of the
23 base, and make them in a manner that will ensure restoration of a uniform base course in
24 accordance with the requirements of these Specifications. Do not repair the base by adding a
25 thin layer of soil-cement or concrete to the completed work. Make full depth repairs to small or
26 minor areas, such as at manholes or inlets, with Class I concrete.
- 27 B. For patching of deficient areas less than 100-square feet and less than 1-inch in depth, correct the
28 areas using Type S-III Asphalt Concrete. For patching of deficient areas less than 100-square
29 feet and greater than 1-inch in depth, remove the areas to full depth and replace them using
30 Asphalt Base Course Type 3, Type S Asphaltic Concrete, or soil-cement.

31 **3.13 DENSITY TESTING REQUIREMENTS**

- 32 A. As soon as possible after completing compaction, perform field density testing to ensure that the
33 density is 97% of the maximum density as determined by methods prescribed in AASHTO T-
34 134.
- 35 B. If an individual test value within a LOT is less than 94% of the maximum density, determine the
36 extent of this deficiency by performing density tests using a 5-foot grid pattern until a test value
37 of 95% or greater is located in all directions. Remove the delineated area of base, and replace it
38 with base meeting all requirements of this section, at no cost to the County.
- 39 C. As an exception to the foregoing, if 3 or more of the original 5 individual test values within a
40 LOT are less than 94% of the maximum density, the County will reject the entire LOT, and the
41 Contractor shall remove all base within the LOT and replace it with base meeting all
42 requirements of this Section, at no expense to the County.

1 **3.14 SURFACE FINISH ACCEPTANCE REQUIREMENTS**

- 2 A. After compacting and finishing, and not later than the beginning of the next calendar day after
- 3 constructing any section of base, measure the surface with a template cut to the required cross-
- 4 section and a 15-foot straightedge placed parallel to the centerline of the road. Both templates
- 5 shall be provided by the Contractor. Correct all irregularities greater than 1/4-inch to the
- 6 satisfaction of the County with a blade adjusted to the lightest cut which will ensure a surface
- 7 that does not contain depressions greater than 1/4-inch under the template or the straightedge.
- 8 The County may approve other suitable methods for measurement.

9 **3.15 THICKNESS ACCEPTANCE REQUIREMENTS**

- 10 A. Construction tolerances for thickness are as follows:

11 **Table 32 11 34-4**
Thickness Tolerances

	Allowable Deviation From Plan Thickness
Central-Plant-Mixed Processing	-1-inch
Mixed-in-Place Processing	+/- 1-inch

- 12
- 13 B. When any thickness measurement is outside the construction tolerance, the County will take
- 14 additional thickness measurements at 10-foot intervals parallel to the centerline in each direction
- 15 from the measurement which is outside the construction tolerance until a measurement in each
- 16 direction is within the construction tolerance.
- 17 C. The County will evaluate an area of base found to have a thickness outside the construction
- 18 tolerance and may require the Contractor to remove and replace it with acceptable base of the
- 19 thickness shown in the plans at no expense to the County.

20 **3.16 STRENGTH TESTING OF FIELD SPECIMENS**

- 21 A. Check the adequacy of cement content and uniformity of distribution of cement within the base
- 22 by sampling and testing the completed mix.
- 23 B. Take samples at the project site just prior to final compaction and perform a minimum of 2
- 24 Strength Test Values (STV) each day, with at least 1 STV per each 2,500 square yards mixed.
- 25 C. Ensure that each STV is the average strength value of a minimum of 3 individual specimens.
- 26 D. Take representative samples of the mixed soil-cement material for determining an STV just prior
- 27 to final compaction, recording the sample location, and ensuring that the samples are large
- 28 enough to mold 3 or more compressive strength test specimens as prescribed in FM 5-520.
- 29 E. Mold test specimens at the field moisture content and cast the individual test specimens as close
- 30 to identical as possible.
- 31 F. Rest the molds during compaction of strength test specimens on a 200-pound concrete block that
- 32 the Contractor provides.
- 33 G. Gently extrude these test specimens from the compaction mold, and carefully place them in a
- 34 moist curing environment (not in direct contact with water) such as a tightly closed container
- 35 under wet cloth or burlap at locations where they will not be disturbed.

- 1 H. Continue the initial field cure for at least 24-hours, and if after 24-hours it is determined that the
2 specimens have not gained sufficient strength to be moved without probable damage, continue
3 field curing until the County determines that each specimen can be safely moved without
4 probable damage occurring. When the County determines that the specimens can be safely
5 moved, transport them to the laboratory where they will be cured, as described in the design
6 procedure (FM 5-520), to 7-days of age. At 7-days of age, test the individual specimen for
7 determination of compressive stress and ensure that the loading procedure and rates are the
8 same, as described in FM 5-520.
- 9 I. If an STV is less than 60% of the Laboratory Design Strength, remove and replace the material
10 represented by the STV, at no expense to the County.
- 11 J. When the LOT average thickness of soil-cement base is deficient by more than 1-inch and the
12 judgment of the County is that the area of such deficiency should not be removed and replaced,
13 payment for the area retained will be at 50%
- 14 K. When multiple deficiencies occur, the applicable percent payment schedule will be applied to the
15 LOT of base that is identified with each deficiency. The penalty for each deficiency will be
16 applied separately to the unit price.

17

END OF SECTION

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SECTION 32 12 16
ASPHALTIC CONCRETE VEHICULAR PAVING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Asphaltic concrete vehicular paving.
- B. Related Sections include but are not necessarily limited to:
 - 1. Division 1 - General Requirements

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. Federal Specifications (FS):
 - a. TT-P-115F, Paint, Traffic (Highway, White and Yellow).
 - 2. Construction standards: State of Florida, Department of Transportation, "Standard Specification for Road and Bridge Construction", as amended to date.
- B. Miscellaneous:
 - 1. Should conflicts arise between standard specifications of government agencies mentioned herein and Contract Documents, Contract Documents shall govern.

1.3 SUBMITTALS

- A. Shop Drawings:
 - 1. See Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
 - 2. Product technical data including:
 - a. Acknowledgement that products submitted meet requirements of standards referenced.
 - b. Manufacturer's installation instructions.
 - 3. Asphalt design mix.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Asphaltic Concrete: Type SP-12.5 as specified in Section 334 of the FDOT Standard Specifications for Road and Bridge Construction.
- B. Soil Cement Base Course: As specified in Specification Section 32 11 34 Soil Cement Base.
- C. Gravel Surfacing: Florida DOT No. 57 stone.
- D. Line Paint:
 - 1. Nonreflective.
 - 2. White.
 - 3. FS TT-P-115F.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Construct to line, grade and section to match existing and in accordance with referenced State Specifications.
- B. Construct base course using soil cement or 3000 psi concrete.

- 1 C. Spread a prime coat uniformly on compacted aggregate base course at rate of 0.05 to 0.10 GAL
2 per square yard in accordance with Section 230 of FDOT Specifications.
- 3 D. Install a 6 IN lift of gravel surfacing.
- 4 E. Tolerance
- 5 1. Finished Surface of Soil Cement: Within plus or minus 0.05 FT of grade shown at any
6 individual point.
- 7 2. Gravel Surfacing: 0.05 FT from lower edge of 10-foot straightedge placed on finished
8 surface, parallel to centerline.
- 9 F. Line Painting:
- 10 1. Thoroughly clean surfaces which are to receive paint.
- 11 2. Make completely dry before paint is applied.
- 12 3. Do not paint until minimum of five (5) days has elapsed from time surface is completed.
- 13 a. A longer period may be required if directed by Engineer.
- 14 4. Do not apply paint over wet surfaces, during wet or damp weather, or when temperature is
15 below 40° F.
- 16 5. Lay out markings and striping in accordance with Drawings. Width of painted lines: 4 IN.

17

END OF SECTION

1 **SECTION 32 13 13**

2 **CONCRETE PAVEMENT, CURB, GUTTER, AND SIDEWALK**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

5 A. Section Includes:

- 6 1. Concrete pavement, curb, gutter, and sidewalk.

7 B. Related Sections include but are not necessarily limited to:

- 8 1. Division 1 - General Requirements.
9 2. Section 03 05 05 - Concrete Testing.
10 3. Section 03 09 00 - Concrete.

11 C. Payment Adjustment for Deficient Thickness of Concrete Pavement:

- 12 1. A deduction in price shall be made for each lane of concrete pavement 1 block (400 FT) or
13 more in length, or for any lane less than 1 block (400 FT) in total length, if the average
14 concrete pavement thickness, when determined as provided herein, is within 1 IN tolerance
15 but not within the 1/4 IN tolerance permitted.
16 a. Payment reduction formula:

17
18
$$\text{Payment} = (\text{Contract Price}) [-2x(d/ts)x(\text{Contract Price})]$$

19
20 Where d = thickness deficiency determined by coring = ts - ta, but less than 1 IN
21 ts = design thickness
22 ta = actual thickness determined by coring

- 23
24 2. When any core shows a deficiency of more than 1 IN, the length of adjacent pavement
25 deducted, and for which payment shall be withheld, shall be the sum of the distance,
26 measured parallel to the centerline, from the deficient boring to the nearest borings, in both
27 directions, which show a thickness not more than 1 IN deficient.
28 3. Deductions in all cases shall be for the full width of the lane which the borings represent.

29 **1.2 QUALITY ASSURANCE**

30 A. Referenced Standards:

- 31 1. American Association of State Highway and Transportation Officials (AASHTO):
32 a. M153, Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint
33 Fillers (ASTM D1752) for Concrete Paving and Structural Construction.
34 b. M171, Sheet Materials for Curing Concrete.
35 c. M182, Burlap Cloth Made from Jute or Kenef.
36 d. M213, Standard Specification for Preformed Expansion Joint Fillers (ASTM D1751)
37 for Concrete Paving and Structural Construction.
38 e. M224, Protective Coatings for Portland Cement Concrete.
39 f. M233, Boiled Linseed Oil Mixture for Treatment of Portland Cement Concrete.
40 2. American Concrete Institute (ACI):
41 a. 305R, Hot Weather Concreting.
42 b. 306R, Cold Weather Concreting.
43 3. Americans with Disability Act (ADA):
44 a. ADA Standards for Accessible Design.
45 4. ASTM International (ASTM):
46 a. A185, Standard Specification for Steel Welded Wire Reinforcement, Plain, for
47 Concrete Reinforcement.

- 1 b. A615, Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete
- 2 Reinforcement (Including Supplementary Requirements S1).
- 3 c. C33, Standard Specification for Concrete Aggregates.
- 4 d. C150, Standard Specification for Portland Cement.
- 5 e. C174, Standard Test Method for Measuring Thickness of Concrete Elements Using
- 6 Drilled Concrete Cores.
- 7 f. C309, Standard Specification Liquid Membrane-Forming Compounds for Curing
- 8 Concrete.
- 9 g. D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using
- 10 Standard Effort (12,400 ft-lbf/ft³).
- 11 h. D1751, Standard Specification for Preformed Expansion Joint Filler for Concrete
- 12 Paving and Structural Construction (Nonextruding Bituminous Type).
- 13 i. D1752, Standard Specification for Preformed Sponge Rubber and Cork Preformed
- 14 Expansion Joint Filler for Concrete Paving and Structural Construction.
- 15 j. D4253, Standard Test Methods for Maximum Index Density and Unit Weight of Soils
- 16 Using a Vibratory Table.
- 17 k. D4254, Standard Test Methods for Minimum Index Density and Unit Weight of Soils
- 18 and Calculation of Relative Density.
- 19 5. State Specification:
- 20 a. State of Florida Department of Transportation Standard Specification for Road and
- 21 Bridge Construction.
- 22 6. Federal Specification (FS):
- 23 a. SS-S-1614, Sealants, Joint, Jet-Fuel-Resistant, Hot-Applied for Portland Cement and
- 24 Tar Concrete Pavements.
- 25 b. TT-P-115, Paint, Traffic (Highway, White and Yellow).
- 26 c. TT-S 00227 E(3), Sealing Compound: Elastomeric Type, Multi-Component (for
- 27 Calking, Sealing, and Glazing in Buildings and Other Structures.

28 **1.3 SUBMITTALS**

- 29 A. Shop Drawings:
- 30 1. See Section 01 33 00 for requirements for the mechanics and administration of the submittal
- 31 process.
- 32 2. Product technical data including:
- 33 a. Acknowledgement that products submitted meet requirements of standards referenced.
- 34 b. Manufacturer's installation instructions.
- 35 3. Mix design in accordance with Section 03 09 00 and Section 03 05 05.
- 36 4. Qualifications of concrete installer.
- 37 5. Drawings detailing all reinforcing.
- 38 6. Scaled cross section detail of crown template with dimensions showing off sets from level
- 39 line.
- 40 7. Concrete pavement joint pattern for paved areas.
- 41 8. Test reports:
- 42 a. Concrete cylinder test results from field quality control.
- 43 B. Samples:
- 44 1. See Section 01 33 00 for requirements for the mechanics and administration of the submittal
- 45 process.
- 46 2. Samples of fabricated jointing materials and devices.

47 **PART 2 - PRODUCTS**

48 **2.1 MATERIALS**

- 49 A. Portland Cement: ASTM C150, Type I or II.
- 50 B. Aggregates:

- 1 1. ASTM C33, gradation size #67, 3/4 IN to #4.
- 2 2. Clean, crushed gravel.
- 3 C. Water: Potable quality.
- 4 D. Admixtures: Comply with Section 03 09 00.
- 5 E. Reinforcing Bars: ASTM A615, Grade 60.
- 6 F. Welded Wire Reinforcement:
 - 7 1. ASTM A185.
 - 8 2. Flat.
 - 9 3. Clean, free from dirt, scale, rust.
- 10 G. Preformed Joint Filler:
 - 11 1. Non-extruding cork, self-expanding cork, sponge rubber or cork rubber.
 - 12 2. AASHTO M153 or AASHTO M213.
- 13 H. Hot-Poured Joint Sealing Material:
 - 14 1. FS SS-S-1614.
- 15 I. Sidewalk Joint Sealant:
 - 16 1. Two (2) compound polyurethane.
 - 17 2. Class A, Type 1.
 - 18 3. Self-leveling.
 - 19 4. Non-tracking.
 - 20 5. FS TT-S 00227 E(3).
- 21 J. Membrane Curing Compound: ASTM C309.
- 22 K. Cover Materials for Curing:
 - 23 1. Burlap:
 - 24 a. AASHTO M182.
 - 25 b. Minimum Class 2, 8 OZ material (1 YD x 42 IN).
 - 26 2. Polyethylene film, AASHTO M171.
- 27 L. Paper Subgrade Cover: Polyethylene film, AASHTO M171.
- 28 M. Concrete Treatment:
 - 29 1. Boiled linseed oil mixture.
 - 30 2. AASHTO M233.
- 31 N. Traffic Paint: FS TT-P-115, Type 1 - Alkyd.
- 32 O. Forms:
 - 33 1. Steel or wood.
 - 34 2. Size and strength to resist movement during concrete placement and able to retain horizontal
 - 35 and vertical alignment.
 - 36 3. Free of distortion and defects.
 - 37 4. Full depth.
 - 38 5. Metal side forms:
 - 39 a. Minimum 7/32 IN thick.
 - 40 b. Depth equal to edge thickness of concrete.
 - 41 c. Flat or rounded top minimum 1-3/4 IN wide.
 - 42 d. Base 8 IN wide or equal to height, whichever is less.
 - 43 e. Maximum deflection 1/8 IN under center load of 1,700 LBS.
 - 44 f. Use flexible spring steel forms or laminated boards to form radius bends.

45 **2.2 MIXES**

- 46 A. Mix design to provide 4,000 psi 28-day compressive strength, 1-1/2 IN +1 IN slump, 6 percent
 - 47 air.

1 B. Comply with Section 03 09 00.

2 **PART 3 - EXECUTION**

3 **3.1 PREPARATION**

4 A. Subgrade Preparation:

- 5 1. Prepare using methods, procedures, and equipment necessary to attain required compaction
6 densities, elevation and section.
7 2. Scarify and recompact top 6 IN of fills and embankments which will be under paved areas.
8 3. Remove soft or spongy areas.
9 4. Replace with aggregate material.
10 5. Compact to the following densities:
11 a. Cohesive soils: 95 percent per ASTM D698.
12 6. Assure moisture content is within limits prescribed to achieve required compaction density.
13 7. Following compaction, trim and roll to exact cross section. Check with approved grading
14 template.
15 8. Perform density tests on subgrade to determine that subgrade complies with the
16 specification.

17 B. Aggregate Course:

- 18 1. Place material in not more than 6 IN thick layers.
19 2. Spread, shape, and compact all material deposited on the subgrade during the same day.
20 3. Compact to 98 percent relative per ASTM D4253 and ASTM D4254.

21 C. Loose and Foreign Material: Remove loose and foreign material immediately before application
22 of paving.

23 D. Appurtenance Preparation:

- 24 1. Block out or box out curb inlets and curb returns.
25 2. Provide for joint construction as detailed and dimensioned on Drawings.
26 3. Adjust manholes, inlets, valve boxes and any other utility appurtenances to design grade.
27 a. Secure to elevation with concrete.
28 b. Place concrete up to 5 IN below design grade.
29 4. Headers:
30 a. Construct at open ends of pavements.
31 b. Use same concrete to construct headers as that used in the abutting structure.
32 c. Extend header full width of pavement and crown same as pavement.
33 5. Clean and oil forms.

34 **3.2 INSTALLATION**

35 A. Concrete Production: Comply with Section 03 09 00.

36 B. Sidewalks to be compliant with all applicable ADA Standards for Accessible Design

37 C. Forms:

- 38 1. Form support:
39 a. Compact soil foundation and cut to grade to support forms and superimposed machine
40 loads.
41 b. Use bearing stakes driven flush with bottom of form to supplement support as
42 necessary.
43 c. Do not use earth pedestals.
44 2. Staking forms:
45 a. Joint forms neatly and tightly.
46 b. Stake and pin securely with at least three (3) pins for each 10 FT section.
47 3. Clean and oil forms prior to placement of concrete.
48 4. Set forms sufficiently in advance of work (minimum of 2 HRS) to permit proper inspection.

- 1 5. Previously finished concrete pavement, curb or sidewalk contiguous with new work may
2 serve as side form when specifically approved.
- 3 D. Reinforcing:
- 4 1. Use #3 for reinforcement.
- 5 2. Locate longitudinal edge bars 3 IN from edge of slab.
- 6 3. Lap mats one (1) full space.
- 7 4. Tie end transverse member of upper mat securely to prevent curving.
- 8 5. Lap non-welded bars 12 IN minimum.
- 9 6. Support:
- 10 a. Place bars and heavy mats securely on chairs at called-for height.
- 11 b. Place other fabric on the first of a two-course pour and cover promptly with final pour,
12 or place fabric by a fabric-placer if procedure is reviewed and approved by Engineer.
- 13 E. Joints:
- 14 1. Hold joint location and alignment to within +1/4 IN.
- 15 2. Finish concrete surface adjacent to previously placed slab to within +1/8 IN, with tooled
16 radius of 1/4 IN.
- 17 3. Metal keyway joints:
- 18 a. Form by installing metal joint strip left in place.
- 19 b. Stake and support like side form.
- 20 c. Provide dowels or tie bars.
- 21 4. Weakened plane joints:
- 22 a. Tooled joints:
- 23 1) Form groove in freshly placed concrete with tooling device.
- 24 2) Groove dimensions shall be 3/8 IN at surface and 1/4 IN at root.
- 25 b. Sawed joints:
- 26 1) Saw 1/4 IN groove in green concrete.
- 27 2) Commence sawing as soon as concrete is hard enough to withstand operation
28 without chipping, spalling or tearing, regardless of nighttime or weather.
- 29 3) Thoroughly wet surface to protect membrane cure and recoat afterward.
- 30 4) Complete saw cutting before shrinkage stresses cause cracking.
- 31 c. Locate at 5 FT intervals.
- 32 5. Stake in place load transfer device for expansion joints consisting of dowels:
- 33 a. Supporting and spacing means and premolded joint filler as per Drawing details.
- 34 b. Located at 48 FT intervals and at all intersection curb returns.
- 35 c. Provide preformed joint filler at all junctions with existing curb, sidewalk, steps, or
36 other structures.
- 37 6. Install construction joints at end of day's work or wherever concreting must be interrupted
38 for 30 minutes or more.
- 39 7. Thoroughly clean and fill joints with joint sealing material as specified.
- 40 8. Fill joints without overflowing onto pavement surface.
- 41 9. Upper surface of filled joint to be flush to 1/8 IN below finish surface.
- 42 F. Place Concrete:
- 43 1. Comply with Section 03 09 00.
- 44 2. Construct driveway openings, ramps, and other features as per Drawing details or to match
45 existing.
- 46 3. Remove and replace driveway, sidewalk, curb and gutter to nearest joint as needed to
47 construct proposed pipe, manholes, and associated appurtenances.
- 48 G. Cold and Hot Weather Concreting:
- 49 1. Cold weather:
- 50 a. Cease concrete placing when descending air temperature in shade falls below 40° F.
- 51 b. Do not resume until ambient temperature rises to minimum 40° F.
- 52 c. If placing below 40° F is authorized by Engineer, maintain temperature of mix between
53 60 and 80° F.

- 1 d. Heat aggregates or water or both.
- 2 e. Water temperature may not exceed 175° F.
- 3 f. Aggregate temperature may not exceed 150° F.
- 4 g. Remove and replace frost damaged concrete.
- 5 h. Salt or other antifreeze is not permitted.
- 6 i. Comply with ACI 306R.
- 7 2. Hot weather:
- 8 a. Cease concrete placing when plastic mix temperature cannot be maintained under 90°
- 9 F.
- 10 b. Aggregates or water or both may be cooled.
- 11 c. Cool water with crushed ice.
- 12 d. Cool aggregates by evaporation of water spray.
- 13 e. Never batch cement hotter than 160° F.
- 14 f. Comply with ACI 305R.

15 H. Finishing:

- 16 1. As soon as placed, strike off and screed to crown and cross section, slightly above grade, so
- 17 that consolidation and finishing will bring to final Drawing elevations.
- 18 2. Maintain uniform ridge full width with first pass of first screed.
- 19 3. Pavement and similar surfaces:
- 20 a. Float by longitudinally reciprocating float, passing gradually from edge to edge.
- 21 b. Assure successive advances do not exceed half the length of the float.
- 22 c. Test level of slab with minimum 10 FT straightedge.
- 23 d. Fill depressions with fresh material, consolidate and refinish.
- 24 e. Cut down high areas and retest.
- 25 f. Belt surface with two-ply canvas belt, using transverse strokes while advancing along
- 26 center line.
- 27 g. Provide final finish by full width burlap or carpet drag, drawn longitudinally.
- 28 h. Keep drag clean to avoid build up and consequent scarring.
- 29 i. Tool pavement edges with suitable edger.
- 30 j. Retest with straightedge and if pavement shows deviation of more than 1/8 IN in 10 FT,
- 31 remove and replace.
- 32 4. Curb and similar surfaces:
- 33 a. Bring curb to grade by running straightedge over steel templates with sawing motion.
- 34 b. Float surface with a wood float to draw cement to surface.
- 35 c. Broom finish after floating.
- 36 d. Tool edges with suitable edger.
- 37 e. Upon removal of forms, fill honeycombed or unevenly filled sections immediately with
- 38 cement mortar.
- 39 f. Assure that expansion joints are cleared of concrete.
- 40 5. Sidewalk, ramps, and similar surfaces:
- 41 a. Test with 6 FT straightedges equipped with long handles and operated from off the
- 42 sidewalk.
- 43 b. Draw excess water and laitance off from surface.
- 44 c. Float finish so as to leave no disfiguring marks but to produce a uniform granular or
- 45 sandy texture.
- 46 d. Broom finish after floating.
- 47 e. Tool pavement edges with suitable edger.
- 48 f. Provide exposed aggregate surfaces in areas indicated on the Drawings.
- 49 g. Provide method such as abrasive blasting, bush hammering, or surface retarder
- 50 acceptable to the Engineer.

51 I. Curing:

- 52 1. Apply membrane curing compound complying with ASTM C309, and in accordance with
- 53 manufacturer's directions but at a minimum rate of 200 SF per gallon.
- 54 2. Apply curing compound within 4 HRS after finishing or as soon as surface moisture has
- 55 dissipated.

- 1 3. Cure for minimum of 7 days.
- 2 4. When average daily temperature is below 50° F, provide insulative protection of 12 IN
- 3 minimum thickness loose dry straw, or equivalent, for 10 days.
- 4 5. Linseed oil sealant:
- 5 a. For concrete pavement or sidewalk, seal surface with linseed oil.
- 6 b. Apply linseed oil to clean surface as per AASHTO M224 after concrete has cured for 1
- 7 month.
- 8 c. Apply first application at minimum rate of 67 SY per gallon.
- 9 d. Apply second application to a dry surface at minimum rate of 40 SY per gallon.
- 10 J. Protection of Concrete:
- 11 1. Protect concrete surfaces and appurtenances from traffic for minimum of 14 days.
- 12 2. Erect and maintain warning signs, lights, watchmen to direct traffic.
- 13 3. Repair or replace parts of concrete surfaces damaged by traffic, or other causes, occurring
- 14 prior to final acceptance.
- 15 4. Protect concrete pavement against public traffic, construction traffic and traffic caused by
- 16 employees and agents.
- 17 5. No equipment shall be driven or moved across concrete surfaces unless such equipment is
- 18 rubber-tired and only if concrete is designed for and capable of sustaining loads to be
- 19 imposed by the equipment.
- 20 6. Do not drive over new or existing concrete with tracked vehicles and equipment.
- 21 K. Painting and Striping:
- 22 1. Stripe and mark pavement per the Drawings following sufficient cure time for pavement.
- 23 2. Lay out markings with guidelines, templates, and forms.
- 24 3. Apply 6 IN wide stripe with self-contained striping machine to a clean and dry pavement
- 25 surface.
- 26 4. Temperature must be above 40° F and precipitation should not be expected during drying
- 27 period.
- 28 5. Use yellow or white paint as approved complying with FS TT-P-115.
- 29 6. Apply at 1 GAL per 105 SF.
- 30 L. Opening to Traffic:
- 31 1. After 14 days, pavement may, at County's discretion, be opened to traffic if job cured test
- 32 cylinders have attained a compressive strength of 3,000 LBS per square inch when tested in
- 33 accordance with ASTM standard methods.
- 34 2. Prior to opening to traffic, clean and refill joints as required with the specified filler
- 35 material.
- 36 M. Clean Up:
- 37 1. Assure clean up work is completed within 2 weeks after pavement has been opened to
- 38 traffic.
- 39 2. No new work will begin until clean up work has been completed, or is maintained within 2
- 40 weeks after pavement has been opened to traffic.
- 41 N. Pavement Patching:
- 42 1. Comply with material and density requirements as mentioned elsewhere in this
- 43 Specification except provide minimum 6 IN aggregate immediately below the patch.
- 44 2. Place pavement patch providing a thickened edge.
- 45 3. Assure that patch in plane of "cold" joint has a thickness 6 IN greater than that of the
- 46 existing pavement.
- 47 4. Extend patch under existing pavement for a distance of 6 IN minimum.
- 48 5. Fill void under existing pavement with concrete.
- 49 6. Undercut existing pavement 6 IN all around patch and to a depth of 6 IN.
- 50 7. Prior to placing patch, sawcut edge of existing concrete to 1/4 depth and remove to provide
- 51 a vertical face for a straight and true joint.

1 **3.3 FIELD QUALITY CONTROL**

2 A. Provide test cylinders in accordance with Section 03 05 05 for each cubic yard CY of concrete
3 placed.

4 B. Pavement Thickness Testing:

5 1. General:

- 6 a. Core pavement to determine the actual thickness as directed by Engineer.
- 7 b. Determine thickness by ASTM C174.
- 8 c. Fill holes from removal of cores with concrete of the same mixture as specified.
- 9 d. Cost incidental to coring of cores shall be paid by the Contractor.
- 10 e. If average pavement thickness, as directed by core measurement, is outside specified
11 tolerances, payment will be reduced per PART 1 of this Specification.
- 12 f. If deficiency in pavement thickness is 1 IN or more, remove and replace pavement at
13 Contractor's expense.

14 2. Core categories:

- 15 a. In determining the average thickness of acceptable pavement for which payment will be
16 made, utilize the following core categories:

CATEGORY NUMBER	CORE THICKNESS IN RELATION TO DESIGN	CORE LENGTH USED IN CALCULATING
1	1 IN or more deficiency	NOT USED
2	Less than 1 IN deficiency through 1/2 IN excess	Actual Core Thickness
3	More than 1/2 IN excess	Design Thickness plus 1/2 IN

18 b. Core sampling:

- 19 1) See Section 03 05 05 for frequency of tests.
- 20 c. Take cores at locations where the cement content was found to be low when checking
21 the quantities of cement used during the progress of the work.
- 22 d. Each separately poured lane of the pavement to be considered as a unit.
- 23 e. A lane shall be considered to be the pavement surface between longitudinal
24 construction joints, between a longitudinal construction joint and the edge, or between
25 two (2) pavement edges in cases where the entire width of the pavement is poured in
26 one (1) operation.
- 27 f. Should any core show a deficiency in thickness in excess of 1 IN, check cores shall be
28 taken 5 FT on either side of this location parallel to the centerline of the pavement.
- 29 g. If both of these cores are within the 1 IN tolerance, no further special borings for this
30 individual zone of deficiency will be made.
- 31 h. If either one or both of these cores are not within the 1 IN tolerance, the procedure will
32 be to cut cores in the following order on either side of the original short core parallel to
33 the centerline of the pavement:
34 1) 25 FT, 50 FT, the same to be measured from the location of original core found to
35 be deficient in thickness, then at 50 FT intervals until a thickness within the 1 IN
36 tolerance is found in both directions.
37 2) On either side of the original deficient core, the procedure will then be to make a
38 coring approximately half the distance within the first core which comes within the
39 1 IN tolerance.
40 3) The above procedure shall be repeated until the station (+5 FT), at which the
41 pavement comes within the 1 IN tolerance is located.
42 4) If for some reason two (2) or more cores are taken at the same station and at least
43 one (1) of them is beyond the 1 IN tolerance, the section of pavement at the station
44 shall be considered as unacceptable.
45

46 **END OF SECTION**

1 **SECTION 32 90 00**
2 **SODDING AND LANDSCAPING**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

5 A. Section Includes:

- 6 1. Seeding, sodding and landscape planting:
7 a. Soil preparation.

8 B. Related Sections include but are not necessarily limited to:

- 9 1. Division 1 - General Requirements.
10 2. Section 32 91 05 - Topsoiling and Finished Grading.

11 **1.2 QUALITY ASSURANCE**

12 A. Referenced Standards:

- 13 1. American Nursery and Landscape Association/American National Standards Institute
14 (ANLA/ANSI):
15 a. Z60.1, American Standard for Nursery Stock.
16 2. AOAC International (AOAC).
17 3. ASTM International (ASTM):
18 a. D2028, Standard Specification for Cutback Asphalt (Rapid-Curing Type).
19 b. D5276, Standard Test Method for Drop Test of Loaded Containers by Free Fall.
20 4. Florida Department of Transportation (FDOT) Standard Specifications for Road and Bridge
21 Construction.

22 B. Quality Control:

- 23 1. Fertilizer:
24 a. If Engineer determines fertilizer requires sampling and testing to verify quality, testing
25 will be done at Contractor's expense, in accordance with current methods of the AOAC.
26 b. Upon completion of Project, a final check of total quantities of fertilizer used will be
27 made against total area seeded.
28 c. If minimum rates of application have not been met, Contractor will be required to
29 distribute additional quantities to make up minimum application specified.

30 **1.3 SUBMITTALS**

31 A. Shop Drawings:

- 32 1. See Section 01 33 00 for requirements for the mechanics and administration of the submittal
33 process.
34 2. Product technical data including:
35 a. Acknowledgement that products submitted meet requirements of standards referenced.
36 b. Manufacturer's installation instructions.
37 c. Signed copies of vendor's statement for seed mixture required, stating botanical and
38 common name, place of origin, strain, percentage of purity, percentage of germination,
39 and amount of Pure Live Seed (PLS) per bag.
40 d. Fertilizer to be used.
41 e. Type of herbicide to be used during first growing season to contain annual weeds and
42 application rate.
43 f. Source and location of sod, plants, and plant material, as described in this Section.
44 3. Certification that each container of seed delivered will be labeled in accordance with
45 Federal and State Seed Laws and equals or exceeds Specification requirements.

- 1 B. Miscellaneous Submittals:
2 1. See Section 01 33 00 for requirements for the mechanics and administration of the submittal
3 process.
4 2. Copies of invoices for fertilizer showing how much was used on Project showing grade
5 furnished, along with certification of quality and warranty.
6 3. Installation schedule as specified in section 1.4 below.

7 **1.4 SEQUENCING AND SCHEDULING**

- 8 A. Installation Schedule:
9 1. Provide schedule showing when trees, shrubs, groundcovers and other plant materials are
10 anticipated to be planted, if required.
11 2. Show schedule of when lawn type and other grass areas are anticipated to be planted.
12 3. Indicate planting schedules in relation to schedule for finish grading and topsoiling.
13 4. Indicate anticipated dates County will be required to review installation for initial
14 acceptance and final acceptance.
15 5. Complete Work under this Section within 10 days following completion of soil preparation.
16 6. Planting Season: Those times of the year that are normal for such Work as determined by
17 accepted local practice.

18 **PART 2 - PRODUCTS**

19 **2.1 MATERIALS**

- 20 A. Sod: Healthy, certified, weed-free sod meeting the requirements of FDOT Section 981. Unless
21 the Drawings require another species of grass, St. Augustine will be used to replace grass in
22 locations of like type and Argentine Bahia will be used for all other sodding.
23 B. Mulch: Dry or green mulch meeting the requirements of FDOT Section 981.
24 C. Fertilizer: Uniform 12-8-8 grade meeting the requirements of FDOT Section 982.
25 D. Limestone: Agricultural grade limestone meeting the requirements of FDOT Section 982.
26 E. Water: Suitable water meeting the requirements of FDOT Section 983.
27 F. Plants:
28 1. Plant types and species shall meet the requirements of FDOT Section 580.
29 2. Only use nursery grown plant materials purchased from Florida based Nurseryman Stock
30 that comply with all required inspection, grading standards, and plant regulations in
31 accordance with the latest edition of the Florida Department of Agriculture's "Grades and
32 Standards for Nursery Plants."
33 3. Sound, healthy, vigorous, with normal top and root systems, free from disease, insect pests
34 or their eggs, grown in same or colder climatic zone as project.
35 a. Nursery grown stock, freshly dug.
36 1) No heeled-in, cold storage or collected stock.
37 4. Species and size to replace that removed and/or during .construction.

38 **PART 3 - EXECUTION**

39 **3.1 SOIL PREPARATION**

- 40 A. General:
41 1. Limit preparation to areas which will be planted soon after.
42 2. Provide facilities to protect and safeguard all persons on or about premises.
43 3. Protect existing trees designated to remain.
44 4. Verify location and existence of all underground utilities.

- 1 a. Take necessary precaution to protect existing utilities from damage due to construction
- 2 activity.
- 3 b. Repair all damages to utility items at sole expense.
- 4 5. Provide facilities such as protective fences and/or watchmen to protect work from
- 5 vandalism.
- 6 a. Contractor to be responsible for vandalism until acceptance of work in whole or in part.
- 7 B. Preparation for Lawn-Type Plugging or Sodding:
- 8 1. Loosen surface to minimum depth of 4 IN.
- 9 2. Remove stones over 1 IN in any dimension and sticks, roots, rubbish, and other extraneous
- 10 matter.
- 11 3. Prior to applying fertilizer, loosen areas to be seeded with a double disc or other suitable
- 12 device if the soil has become hard or compacted.
- 13 4. Correct any surface irregularities in order to prevent pocket or low areas which will allow
- 14 water to stand.
- 15 5. Distribute fertilizer uniformly over areas to be seeded:
- 16 a. For lawn-type seeding: 500 LBS per acre.
- 17 6. Incorporate fertilizer into soil to a depth of at least 2 IN by disking, harrowing, or other
- 18 approved methods.
- 19 7. Remove stones or other substances from surface which will interfere with turf development
- 20 or subsequent mowing operations.
- 21 8. Grade lawn areas to a smooth, even surface with a loose, uniformly fine texture.
- 22 a. Roll and rake, remove ridges and fill depressions, as required to meet finish grades.
- 23 b. Limit fine grading to areas which can be planted soon after preparation.
- 24 9. Restore lawn areas to specified condition if eroded or otherwise disturbed after fine grading
- 25 and before planting.
- 26 C. Native Grass Seeding: Soil preparation shall be performed in accordance with FDOT Section
- 27 570.

28 3.2 INSTALLATION

- 29 A. Sodding, planting and landscaping shall be performed in accordance with the requirements of
- 30 FDOT Sections 570, 575, and 580. Should the FDOT requirements conflict with this
- 31 specification, the more stringent requirements apply.

32 3.3 PLANTING TREES, SHRUBS, AND GROUND COVERS

- 33 A. Notification:
- 34 1. Notify County of source of plants and plant materials at least 30 days prior to planting to
- 35 permit County's inspection of source qualifications.
- 36 B. Preparation:
- 37 1. Handle plants so that roots or balls are adequately protected from breakage of balls, from
- 38 sun or drying winds.
- 39 a. Ensure tops or roots of plants are not permitted to dry out.
- 40 2. During transportation, protect materials from wind and sun to prevent tops and roots from
- 41 drying out.
- 42 3. Protect tops of plants from damage.
- 43 a. Plants with damaged tops will be rejected.
- 44 4. For purpose of inspection and planting identification, attach durable, legible labels to bundle
- 45 or container of plant material delivered at the planting site.
- 46 a. State correct plant name and size of each plant in weather-resistant ink on labels.
- 47 5. Do not prune trees and shrubs at nursery.
- 48 C. Planting Season:
- 49 1. Plant deciduous shade trees and shrubs any time the ground is suitable between October 15
- 50 and June 1.
- 51 2. Plant evergreen material between September 1 and June 1.

- 1 3. Plant ground covers between March 15 to June 1.
- 2 D. Planting Procedure:
- 3 1. Indicate locations of plants for approval by County before excavating plant locations.
- 4 2. In event underground construction, utilities, obstructions, or rock are encountered in
- 5 excavation of plantings, secure alternate locations from County.
- 6 a. Make said changes without additional compensation.
- 7 b. Where tree locations fall under existing overhead wires, or crowd existing trees, adjust
- 8 locations as directed by County.
- 9 3. Excavate pits and beds as necessary and in accordance with ANLA/ANSI Z60.1.
- 10 a. Loosen bottom of pits prior to planting.
- 11 b. Excavation is unclassified, excavate all materials without additional cost.
- 12 4. Tree and shrub pits to be circular in shape with vertical sides at least 1 FT greater in
- 13 diameter than ball diameter.
- 14 a. Pit to be of sufficient depth to provide 6 IN of planting soil under ball when set to
- 15 natural grade.
- 16 5. Shrub and ground cover beds:
- 17 a. Plant shrubs used in mass plantings in individual holes of required size.
- 18 b. Strip all sod from among mass planting.
- 19 c. For ground cover beds, remove sod from within limits of bed.
- 20 d. Add soil amendments as specified and mix or rototill with existing topsoil to a depth of
- 21 6 IN.
- 22 6. Set plants straight or plumb, in locations when indicated and at such level that after
- 23 settlement they bear same relationship to finished grade as they did in their former setting.
- 24 a. Carefully tamp planting soil under and around base of balls to prevent voids.
- 25 b. Remove burlap, rope and wires from top of balls.
- 26 c. Do not remove burlap from sides and bottom of balls.
- 27 7. Backfill plants with planting soil.
- 28 a. Tamp to 1/2 depth of pit and thoroughly water and puddle before bringing backfill to
- 29 proper grade.
- 30 b. After planting has been completed, flood pit again so that backfill is thoroughly
- 31 saturated and settled.
- 32 8. After planting is complete, form a level saucer 3 IN high around each tree extending to limit
- 33 of plant pit for watering purposes.
- 34 9. Mulch plant pit after saucer has been shaped.
- 35 a. Mulch to limits of pit and uniformly over ground cover beds to a depth of 3 IN.
- 36 b. In mass plantings of shrubs, mulch entire area uniformly among shrubs to a depth of 3
- 37 IN.
- 38 c. If mulching is delayed and soil has dried out, water plants thoroughly before spreading
- 39 mulch.
- 40 10. Staking: Stake trees immediately after planting as detailed on Drawings or in accordance
- 41 with Nursery Standards.
- 42 11. Wrap deciduous trees 2 IN or more in caliper by neatly overlapping wrapping material
- 43 between ground line and second branch.
- 44 a. Place ties at top and bottom of wrapping material and not more than 12 IN apart
- 45 between top and bottom ties.
- 46 12. Remove dead or damaged branches.
- 47 a. Thin deciduous material to about two-thirds of initial branching.
- 48 b. Remove only dead or damaged branches from evergreens.
- 49 13. Water plants during planting operations.
- 50 a. Water each plant a minimum of once each week until final acceptance.
- 51 b. Apply sufficient water to moisten backfill about each plant so that moisture will extend
- 52 into the surrounding soil.

1 **3.4 MAINTENANCE AND REPLACEMENT**

2 A. General:

- 3 1. Begin maintenance of planted areas immediately after each portion is planted and continue
4 until final acceptance or for a specific time period as stated below, whichever is the longer.
5 2. Provide and maintain temporary piping, hoses, and watering equipment as required to
6 convey water from water sources and to keep planted areas uniformly moist as required for
7 proper growth.
8 3. Protection of new materials:
9 a. Provide barricades, coverings or other types of protection necessary to prevent damage
10 to existing improvements indicated to remain.
11 b. Repair and pay for all damaged items.
12 4. Replace unacceptable materials with materials and methods identical to the original
13 specifications unless otherwise approved by the County.

14 B. Sodded Lawns:

- 15 1. Maintain lawns: 90 days, minimum, after installation and review of entire project area to be
16 planted.
17 2. Maintenance period begins at completion of planting or installation of entire area to be
18 sodded.
19 3. County will review seeded or sodded lawn area after installation for initial acceptance.
20 4. Maintain lawns by watering, fertilizing, weeding, mowing, trimming, and other operations
21 such as rolling, regrading, and replanting as required to establish a smooth, uniform lawn,
22 free of weeds and eroded or bare areas.
23 5. Lay out temporary lawn watering system and arrange watering schedule to avoid walking
24 over muddy and newly restored areas.
25 a. Use equipment and water to prevent puddling and water erosion.
26 b. Uses of residences' hoses are not permitted.
27 6. Mow lawns as soon as there is enough top growth to cut with mower set at recommended
28 height for principal species planted.
29 a. Repeat mowing as required to maintain height.
30 b. Do not delay mowing until grass blades bend over and become matted.
31 c. Do not mow when grass is wet.
32 d. Time initial and subsequent mowings as required to maintain a height of 1-1/2 to 2 IN.
33 e. Do not mow lower than 1-1/2 IN.
34 7. Remulch with new mulch in areas where mulch has been disturbed by wind or maintenance
35 operations sufficiently to nullify its purpose.
36 a. Anchor as required to prevent displacement.
37 8. Unacceptable plantings are those areas that do not meet the quality of the specified material,
38 produce the specified results, or were not installed to the specified methods.
39 9. Replant bare areas using same materials specified.
40 10. County will review final acceptability of installed areas at end of maintenance period.
41 a. At least 98% of the grassed area will have full coverage.
42 11. Maintain repaired areas until remainder of maintenance period or approved by County,
43 whichever is the longer period.

44 **END OF SECTION**

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1 **SECTION 32 91 05**
2 **TOPSOILING AND FINISHED GRADING**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

- 5 A. Section Includes:
6 1. Topsoiling and finished grading.
7 B. Related Sections include but are not necessarily limited to:
8 1. Division 1 - General Requirements.
9 2. Section 31 10 00 - Site Clearing.
10 3. Section 31 25 00 - Soil Erosion and Sediment Control.
11 4. Section 32 90 00 - Seeding, Sodding and Landscaping.
12 C. Location of Work: All areas within limits of grading and all areas outside limits of grading
13 which are disturbed in the course of the work.

14 **1.2 SUBMITTALS**

- 15 A. Shop Drawings:
16 1. See Section 01 33 00 for requirements for the mechanics and administration of the submittal
17 process.
18 2. Project Data: Test reports for furnished topsoil.

19 **1.3 PROJECT CONDITIONS**

- 20 A. Verify amount of topsoil stockpiled and determine amount of additional topsoil, if necessary to
21 complete work.

22 **1.4 QUALITY ASSURANCE**

- 23 A. Refer to the latest version of the Orange County Utilities Standards and Construction
24 Specifications Manual.

25 **PART 2 - PRODUCTS**

26 **2.1 MATERIALS**

- 27 A. Topsoil:
28 1. General: Natural, friable, sandy loam, obtained from well-drained areas, free from objects
29 larger than 1-1/2 IN maximum dimension, and free of subsoil, roots, grass, other foreign
30 matter, hazardous or toxic substances, and deleterious material that may be harmful to plant
31 growth or may hinder grading, planting, or maintenance.
32 2. Composition: As determined in accordance with Section 987 of the Florida Department of
33 Transportation Standard Specification for Road and Bridge Construction.
34 3. Organic Matter Minimum 2.5 percent dry weight as determined in accordance with United
35 States Bureau of Reclamation 514.8.7.
36 4. pH Range: 4.5 to 8.5
37 5. Existing topsoil stockpiled under Section 31 10 00.
38 6. Capable of supporting native plant growth.

39 **2.2 TOLERANCES**

- 40 A. Finish Grading Tolerance: 0.1 FT plus/minus from required elevations.

1 **PART 3 - EXECUTION**

2 **3.1 PREPARATION**

- 3 A. Correct, adjust and/or repair rough graded areas.
4 1. Cut off mounds and ridges.
5 2. Fill gullies and depressions.
6 3. Perform other necessary repairs.
7 4. Bring all sub-grades to specified contours, even and properly compacted.
8 B. Loosen surface to depth of 2 IN, minimum.
9 C. Remove all stones and debris over 2 IN in any dimension.

10 **3.2 ROUGH GRADE REVIEW**

- 11 A. Reviewed by Engineer in Section 31 10 00, Site Clearing.

12 **3.3 PLACING TOPSOIL**

- 13 A. Do not place when subgrade is wet enough to cause clodding.
14 B. Spread to compacted depth of 4 IN for all disturbed earth areas.
15 C. If topsoil stockpiled is less than amount required for work, furnish additional topsoil at no cost to
16 County.
17 D. Provide finished surface free of stones, sticks, or other material 1 IN or more in any dimension.
18 E. Provide finished surface smooth and true to required grades.
19 F. Restore stockpile area to condition of rest of finished work.

20 **3.4 ACCEPTANCE**

- 21 A. Upon completion of topsoiling, obtain County's acceptance of grade and surface.
22 B. Make test holes where directed to verify proper placement and thickness of topsoil.

23

END OF SECTION

1 **SECTION 33 01 13**
2 **SANITARY SEWER**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

- 5 A. Section Includes:
- 6 1. Construction of gravity sanitary sewer lines
 - 7 2. Connections to existing sewer main.
- 8 B. Related Sections include but are not necessarily limited to:
- 9 1. Division 1 - General Requirements.
 - 10 2. Section 31 21 33 – Trenching, Backfilling, and Compacting for Utilities
 - 11 3. Section 33 01 31 – Televising Sanitary Sewer Systems
 - 12 4. Section 33 05 16 – Pre-cast Concrete Manhole Structures
 - 13 5. Section 33 05 01.09 – Polyvinyl Chloride Pipe and Fittings

14 **1.2 QUALITY ASSURANCE**

- 15 A. Referenced Standards:
- 16 1. ASTM International (ASTM):
 - 17 a. A48, Standard for Gray Iron Castings
 - 18 b. A438, Standard for Traverse Testing of Gray Cast Iron
 - 19 c. C150, Standard for Portland Cement
 - 20 d. C478, Standard for Precast Reinforced Concrete Manhole Sections
 - 21 e. C1244, Standard Test method for Concrete Sewer Manholes by the Negative Air
22 Pressure (Vacuum) Test Prior to Backfill
 - 23 f. D3034, Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe
24 and Fittings
 - 25 g. D3350, Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.
 - 26 h. F1417-11a, Standard Practice for Installation Acceptance of Plastic Non-Pressure
27 Sewer Lines Using Low-Pressure Air
 - 28 i. F1417-92(2005), Standard Test Method for Installation Acceptance of Plastic Gravity
29 Sewer Lines Using Low-Pressure Air
 - 30 2. American Association of State Highway and Transportation Officials (AASHTO):
 - 31 a. M45, Cement Mortar.
 - 32 3. Latest version of the Orange County Utilities Standards and Construction Specifications
33 Manual.

34 **1.3 SUBMITTALS**

- 35 A. Shop Drawings:
- 36 1. See Section 01 33 00 for requirements for the mechanics and administration of the submittal
37 process.
 - 38 2. Fabrication and/or layout drawings:
 - 39 a. Exterior yard piping drawings (minimum scale 1 IN equals 10 FT) with information
40 including:
 - 41 1) Dimensions of piping lengths.
 - 42 2) Invert or centerline elevations of piping crossings.
 - 43 3) Acknowledgement of bury depth requirements.
 - 44 4) Details of fittings, tapping locations, and related appurtenances.
 - 45 5) Acknowledge designated valve or gate tag numbers, manhole numbers, instrument
46 tag numbers, pipe and line numbers.
 - 47 6) Line slopes and vents.
 - 48 3. Product technical data including:
 - 49 a. Acknowledgement that products submitted meet requirements of standards referenced.

- 1 b. Copies of manufacturer's written directions regarding material handling, delivery,
2 storage and installation.
- 3 c. Separate schedule sheet for each piping system scheduled in this Section showing
4 compliance of all system components.
5 1) Attach technical product data on gaskets, pipe, fittings, and other components
- 6 4. Certification of factory hydrostatic testing.
- 7 B. Submit work plan for maintaining temporary wastewater service to affected facilities during
8 construction.
- 9 C. Submit results of the hydrostatic tests, identifying the specific length of pipe tested, the test
10 pressure, the duration of test and the amount of leakage.

11 **PART 2 - PRODUCTS**

12 **2.1 PIPE**

- 13 A. Polyvinyl Chloride Pipe and Fittings
- 14 1. Refer to Section 33 05 01.09

15 **2.2 BEDDING MATERIAL**

- 16 A. Refer to Section 31 21 33

17 **2.3 BACKFILL MATERIAL**

- 18 A. Refer to Section 31 21 33

19 **2.4 SANITARY SEWER MANHOLES**

- 20 A. Refer to Section 33 05 16 Pre-Cast Concrete Manhole Structures.

21 **2.5 ELECTRONIC MARKERS**

- 22 A. See Section 10 14 00, Identification Devices

23 **2.6 UNDERGROUND WARNING TAPE**

- 24 A. See Section 10 14 00, Identification Devices

25 **PART 3 - EXECUTION**

26 **3.1 GENERAL**

- 27 A. All pipe shall be installed in strict accordance with manufacturer's recommendations, drawings
28 and/or specifications and in the best commercial trade practice. Remove scale and dirt on inside
29 and outside of pipe ends before assembly.
- 30 B. Pipe and Fittings: Size as indicated on the Drawings. Install as shown in accordance with
31 manufacturer's recommendations.
- 32 C. HAULING, UNLOADING and DISTRIBUTING PIPE: During loading, transportation and
33 unloading, every precaution shall be taken to prevent injury to the pipe. No pipe shall be dropped
34 from cars or trucks, or allowed to roll down slides without proper retaining ropes. During
35 transportation each pipe shall rest on suitable pads, strips, skids or blocks securely wedged or
36 tied in place. Any pipe damaged shall be replaced.
- 37 D. The manhole frames and covers shall be brought to the grades shown on the Drawings. Manhole
38 grade rings shall be set in and made secure by use of Butyl-Tite (or equal). Each manhole must
39 have a minimum of one (1) seven inch (7") grade ring and two courses of brick or five inch (5")
40 HDPE pavement adjusting ring.

- 1 E. All portions of precast manholes must be approved by the County prior to installation in the
2 sanitary sewer systems. The precast manhole manufacturer shall provide timely notice (at least
3 two working days in advance) to allow time for the County to arrange for necessary inspections.
4 Installation, of manhole sections will not be allowed prior to the County written approval. This
5 approval does not relieve the Contractor of the responsibility for protection of manholes against
6 damage during handling and installation.
- 7 F. For manholes that are being replaced, a minimum of fifteen (15) feet of gravity main is to be
8 replaced for all sewer connections.

9 **3.2 INSTALLATION**

- 10 A. Excavation and backfill for furnishing and installing gravity sanitary sewer mains and services
11 shall be in accordance with Section 31 21 33 – Trenching, Backfilling, and Compacting for
12 Utilities
- 13 B. Each pipe shall be laid true to line and grade and in such a manner as to form a close concentric
14 joint with the adjoining pipe. Pipe laying shall proceed upgrade with spigot ends pointing in the
15 direction of flow. The alignment of the installed pipe shall appear straight to visual observation
16 and shall be such that a full circle of light can be seen between manholes, etc., when sighting
17 along all points of the pipe circumference. Each section of pipe shall be handled carefully and
18 placed accurately; each pipe shall be joined in accordance with the pipe manufacturer’s
19 recommended standards. Each section of pipe shall be properly supported to ensure true
20 alignment and an invert which is smooth and free from roughness or irregularity.
- 21 C. Field joints shall be filled with urethane foam insulation or finished with cured foam half shells
22 trimmed to fill the joint space. On pipe segments where jackets are indicated, joints shall be
23 either sprayed with protective coating or wrapped and sealed with heat shrink sleeves.
- 24 D. Minimum horizontal and vertical separation from sanitary sewers shall be maintained in
25 accordance with FDEP requirements and as indicated on Drawings.
- 26 E. Bedding - Sanitary sewer gravity mains and service connections shall be bedded in accordance
27 with the Drawings and compacted to ninety-five percent (98%) maximum density.
- 28 F. Service connections shall be constructed in accordance with the details as shown or indicated on
29 the Drawings. Laterals shall be extended to the right-of-way line and plugged with cleanout
30 connection to existing service. All connections and changes in direction will be made using
31 standard fittings for the purpose. Residential services shall not be less than 6 IN in diameter.
32 Mark exact location of lateral by etching or cutting “S” in the concrete curb. Where no curb
33 exists use an approve method approved by the County to mark location of lateral.
- 34 G. PVC C-900 DR 14 Pipe Section: PVC C-900 DR 14 pipe shall be substituted for the specified
35 PVC pipe where:
- 36 1. The sewer or service pipe is to be constructed with less than 30-inches of cover between the
37 top of the pipe and the final top of pavement or ground line.
- 38 2. The PVC sewer main crosses over a water main, or is at a depth which results in less than
39 18-inches clear distance between pipes when crossing under a water main. The DR 14 pipe
40 shall extend a minimum of 10 feet on each side of the point of crossing.
- 41 3. The lateral separation of the sewer pipe and potable water piping is less than 10 feet.
- 42 H. Concrete encasement: Class C concrete encasement shall be constructed in accordance with
43 details shown on the Drawings.
- 44 1. The County may order the line encased when:
- 45 a. The sewer main crosses over a water main, or is at a depth which results in less than 18-
46 inches clear distance between pipes when crossing under a water main. Encasement
47 shall extend a minimum of 10 feet on each side of the point of crossing. In lieu of
48 encasement, the sewer line may be constructed of PVC DR 14 pipe and shall be laid
49 such that both joints will be a distance of 10 feet from the crossing.

- 1 b. The maximum width for trench excavations is exceeded. The Contractor shall construct
2 concrete encasement around the pipe for the length of the excessive excavation. No
3 payment will be made for the concrete encasement required due to excessive trench
4 widths.
- 5 2. The points of beginning and ending of pipe encasement shall be not more than 6-inches
6 from a pipe joint to protect the pipe from cracking due to uneven settlement of its
7 foundation or the effects of superimposed live loads.
- 8 I. Concrete protective slabs: Concrete protective slabs as shown on the Drawings shall be
9 constructed over gravity sewers that have less than 3 feet of cover from finished grade.
- 10 J. Manholes shall be installed at the locations shown on the Drawings such that primary leads enter
11 radially at the invert elevations specified. The base section shall be set plumb on a prepared
12 surface.
- 13 K. Sanitary Sewer Manhole Invert Construction - The invert channels shall be smooth and
14 semicircular in shape conforming to the inside of the connecting sanitary sewer section. Changes
15 in directions of flow shall be made by forming a smooth radius sized to allow adequate access of
16 a TV camera and/or maintenance equipment into the served sanitary sewer pipe. Changes in size
17 and grades of the channels shall be made gradually and evenly. The invert channels may be
18 formed directly in the concrete of the manhole base, or may be formed and poured in place, or
19 may be constructed by laying a full section of sanitary sewer pipe through the manhole and
20 breaking out the top half after the surrounding concrete has hardened. The floor of the manhole
21 outside the channels shall be smooth and shall slope towards the channels at a grade of one inch
22 (1in/ft) per foot.
- 23 L. Install underground warning tape halfway between top of piping and finished grade.
- 24 M. Install tracer wiring on top of the pipe.
- 25 N. Alignment and Grade:
- 26 1. The Contractor shall not deviate from the line and grade indicated on the Drawings, except
27 with approval from the County.
- 28 2. The sanitary sewer system shall be installed according to the following tolerances:
- 29 a. The maximum deviation of any invert from plan grade shall be within +/- 0.05 feet.
- 30 b. The total deviation of both inverts at each end of a particular line shall be within +/-
31 0.08 feet.
- 32 c. The maximum slope deviation between any two points in the line from the plan slope
33 shall be +/- 0.02%.

34 **3.3 INTERRUPTION OF SERVICE**

- 35 A. Interruption of service to users shall not exceed 4 HRS. Notify County of interruption a
36 minimum of 24 HRS in advance.

37 **3.4 UNDERGROUND SERVICES**

- 38 A. Notify County prior to construction to obtain available information on location of existing
39 utilities. The Contractor shall be responsible for locating all utilities.

40 **3.5 PROTECTION OF EXISTING UTILITIES**

- 41 A. Contractor to verify the location of all underground utilities. Omission from, or the inclusion of
42 utility locations on the plans is not to be considered as the nonexistence of or a definite location
43 of existing underground utilities.
- 44 B. A representative of the underground utilities shall be notified 24 HRS in advance of crossings.

45 **3.6 CONNECTIONS TO EXISTING SEWER MAINS**

- 46 A. Make connections to existing sewer main as shown on the Drawings.

1 **3.7 ASPHALT PAVEMENT REMOVAL AND REPLACEMENT**

- 2 A. All Portland cement concrete and asphalt noted for removal and replacement shall be cut prior to
3 removal. Cut by sawing, vertical cut to be 1 IN minimum. The remaining depth of section may
4 be broken out in a manner subject to County's approval. Width of section removed to be either a
5 width not greater than the outside diameter of the utility pipe plus 4 FT-0 IN or broken out to the
6 nearest joint.
- 7 B. Debris resulting from the above operations shall be removed and hauled as directed by the
8 County.
- 9 C. Refer to Sections 32 13 13 and 32 12 16 of these Specifications.

10 **3.8 TREES**

- 11 A. Do not remove trees without written instructions from the County unless tree removal is shown
12 on drawings.

13 **3.9 FENCES, SIGNS, ETC.**

- 14 A. Restore all damaged fences, signs, etc., to their original conditions.

15 **3.10 FLUSHING AND CLEANING**

- 16 A. General
- 17 1. After all backfilling and pavement restoring operations have been completed, the Contractor
18 shall flush and clean all sanitary sewer lines under the supervision of the County.
- 19 2. During the flushing and cleaning operation, a wire screen with a ¼ inch mesh or smaller
20 shall be placed over the downstream outlet of the lower manhole to prevent any debris from
21 being washed into the existing sewer system.

22 **3.11 INSPECTION OF GRAVITY MAINS**

- 23 A. All gravity mains shall be inspected with CCTV for alignment, grade variation, separated pipe,
24 leaks, deflections, cracked, broken or defective pipe.
- 25 B. All mains shall be cleaned to remove debris and stains from the pipe prior to televising.
- 26 1. Flushing water or debris will not be allowed to enter downstream pump station wet wells.
- 27 2. Water is to be pumped from the sewer system during flushing to an acceptable discharge
28 location.
- 29 3. A visual inspection shall be made to determine that all obstructions are removed.
- 30 4. After inspecting, if any pipes are found to be dirty and/or stained shall be re-flushed and
31 clean before CCTV inspection. If necessary, swabbing may be required.
- 32 5. After cleaning is acceptable, the Contractor shall pass a mandrel through the pipe to confirm
33 ring deflection is less than five percent (5%). The base inside diameter shall be used to
34 determine mandrel size per ASTM D-3034.
- 35 6. The piping shall be backfilled in accordance with the Contract Documents to the subgrade
36 prior to CCTV inspection.
- 37 C. The procedures, data requirements and QA/QC procedures will be in accordance with County
38 Specifications Contract Manual Section 4310.

39 **3.12 TESTING**

- 40 A. General:
- 41 1. The Contractor shall furnish the necessary labor, equipment, and materials necessary to
42 perform testing of the sewer mains before the system is place into operation or connected to
43 other lines.
- 44 2. In no case shall the Contractor place the newly constructed sewer lines into operation
45 without written approval of the County.
- 46 3. The Contractor shall notify the County at least 48 hours (2 working days) prior to schedule
47 testing and inspection.
- 48 4. Only properly functioning and clean equipment shall be used for cleaning and testing.

- 1 5. All testing activities require compliance with the Occupational Safety and Health Agency
- 2 (OSHA) in regard to confined space entry.
- 3 6. The Contractor is responsible for repairing any deficient Work at no additional cost to the
- 4 County.
- 5 7. The gravity mains are to remain out of service until Owner receives clearance from local
- 6 regulatory agency and/or FDEP

7 B. Pipe Testing of New Gravity Lines:

- 8 1. Visual Test – All manhole covers shall be removed by the Contractor as a prerequisite to
- 9 conducting the visual test. The Contractor shall certify that all manhole entries are in
- 10 compliance with confined space entry procedures and mechanical ventilation shall be
- 11 provided. A visual inspection shall consist of the following:
- 12 a. Inspection for visible leaks in the lines or manholes
- 13 b. Inspection of condition of grout in the interior of joints of manholes
- 14 c. Inspection of manhole frames and covers for proper type and installation
- 15 d. Inspection to see if lines are free of debris
- 16 e. Inspection of manhole benches and inverts
- 17 f. Check alignment and grade by introducing sufficient water into the line to verify the
- 18 absence of sags, or as directed by the County
- 19 g. Check that manholes have been completely and properly coated on all surfaces
- 20 h. Mirror test the line
- 21 2. Deflection Test – The entire length of all flexile gravity sanitary sewer lines shall be tested
- 22 by means of a rigid mandrel to assure that deformation or deflection does not exceed 5% of
- 23 the base inside diameter per ASTM 3034. A mandrel will be manually pulled through the
- 24 line by the Contractor in the presence of the County, no sooner than 30 days after
- 25 completion of backfill. The mandrel contact length will be equal to the nominal diameter of
- 26 the pipe. The mandrel, one for each size of pipe, shall be a nine-arm mandrel, with a
- 27 proving ring sized at 5% of the base inside diameter. Contractor is responsible for removal
- 28 of mandrel if it becomes stuck in the pipe. Lines must be free of debris for this test and the
- 29 Contractor shall be responsible for installing a string line in the pipe for the test. Any
- 30 sections that do not pass the test shall be corrected or replaced by the Contractor.
- 31 3. Leakage Test – Test lines for leakage by low-pressure air tests. Prior to testing for leakage,
- 32 backfill trench up to at least lower half of pipe. When necessary to prevent pipeline
- 33 movement during testing, place additional backfill around pipe sufficient to prevent
- 34 movement, but leaving joints uncovered to permit inspection. When pressure drop exceeds
- 35 the allowable amount specified, make satisfactory correction and retest pipeline section in
- 36 the same manner. Correct visible leaks regardless of leakage test results.
- 37 a. Test requirements:
- 38 1) Test medium: Air
- 39 2) Pressure: 25 psig
- 40 3) Duration: 6 HRS

41 C. Manhole Testing:

- 42 1. All manholes shall be vacuum tested by the Contractor prior to acceptance.
- 43 2. Leakage Test – There shall be no visible leakage through the walls or pipe connection(s).
- 44 3. Vacuum Test:
- 45 a. The vacuum test shall be in accordance with ASTM C1All manholes shall meet the
- 46 requirements of the vacuum test per the current “Standard Test Method for Concrete
- 47 Sewer Manholes by the Negative Air Pressure “Vacuum” Test,” ASTM C1244 prior to
- 48 acceptance.
- 49 b. Any manhole that fails the vacuum test or develops a leak during the one year warranty
- 50 period shall be rejected, removed and replaced with new manhole at no cost to the
- 51 Owner. No field repair is acceptable.
- 52 c. All pipe entries into the manhole shall be plugged. The compression band of the
- 53 manhole vacuum testing equipment shall be inflated to effect a seal between the
- 54 vacuum equipment base and the top of the manhole.

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- d. Manholes may be tested either prior to backfill or post backfill as directed by the County. For pre-backfill testing, a vacuum of 10 inches of Mercury (IN Hg) shall be drawn on the manhole, the valve on the vacuum line of the head closed, and vacuum pump shut off. The time shall be measured for the vacuum to drop to 9 inches of Mercury (IN Hg). The manhole is acceptable if the time for the vacuum reading to drop from 10 inches of Mercury to 9 inches of Mercury meets or exceeds the values indicate below:

Manhole Depth in Feet	Manhole Diameter in Inches			
	48	60	72	96
	Minimum Test Time in Seconds for Each Manhole Depth and Diameter			
4	30	30	30	30
8	30	30	32	38
12	30	39	48	57
16	40	52	64	76
20	50	65	80	95
24	60	78	96	114

9

10 **3.13 ACCEPTANCE OF GRAVITY MAINS**

- 11 A. The gravity main must pass both the inspection and leakage test prior to acceptance.
- 12 B. If any portion of the gravity main(s) fails, the Contractor shall present a repair and/or
- 13 replacement plan for acceptance prior to beginning any work.
- 14 1. Pressure grouting of the pipe or manhole is not an acceptable repair method.
- 15 C. The gravity mains are to remain out of service until Owner receives clearance from local
- 16 regulatory agency and/or FDEP.
- 17 1. As-built drawing(s) of all section(s) requested must be submitted and approved prior to
- 18 submission of clearance request to local agency and/or FDEP.
- 19 2. Partial clearance may be obtained for sections of the project.
- 20 D. Lateral work may not begin until the gravity mains are accepted and in service.

21 **3.14 GRADE ADJUSTMENTS TO SURFACE STRUCTURES**

- 22 A. Frames and Covers
- 23 1. Frames and covers of all surface structures (manholes, cleanouts, etc.) shall be adjusted to
- 24 proposed finish grade. Grade rings shall be supplied and installed as required.
- 25 B. Structures within Paved Areas
- 26 1. A structure located in area resurfaced with asphalt concrete shall not be constructed to final
- 27 grade until the adjacent pavement or surfacing has been compacted.
- 28 2. The Contractor shall be responsible for referencing structures prior to paving and locating
- 29 them after paving operations are complete.

30

END OF SECTION

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SECTION 33 01 31
TELEVISIONING SANITARY SEWER SYSTEMS

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. The work covered within this section is for the internal closed circuit television (CCTV) inspection of sanitary sewer pipes. The Contractor shall perform sewer televising work as necessary to thoroughly document the condition of all sewers, service lateral connections, and manhole corbel, barrel and cone-sections in the project area. The sanitary sewer and service laterals shall be carefully inspected to determine alignment, grade variations, separated joints, location and extent of any deterioration, breaks, obstacles, obstructions, debris, quantities of infiltration/inflow and the locations of service connections.
- B. The quality of all work specified in this section shall meet or exceed the requirements of the National Association of Sewer Service Companies (NASSCO) Recommended Specifications for Sewer Collection System Rehabilitation (latest edition), except as described in this section. Applicable portions of this section that inadvertently fall below those standards shall be corrected and maintained at the NASSCO standards as a minimum requirement, at no additional cost to the County.

1.02 REQUIREMENTS

- A. CCTV Contractor must be a County Approved Contractor.
- B. The contractor shall inspect the sewer interior using a color closed circuit television camera (CCTV) and document the inspection on a digital recorder. All inspection video shall be captured in either MPEG or Windows Media Video (.WMV) file format and saved to portable hard drives for submittal. Each inspected main line sewer reach, referenced manhole to manhole, and each inspected sewer lateral referenced to the property address and corresponding sewer main should have an associated MPEG or WMV file. Digital photographs (.JPG files), inspection reports (.PDF files) and any handwritten inspection logs or field maps shall accompany the video inspections for each sewer reach (manhole-to-manhole) or lateral inspected.
- C. Contractor shall provide inspection video, data and reports in accordance with the requirements specified herein. Contractor shall provide all video on portable hard drive as specified. All work will conform to current NASSCO Pipeline Assessment Certification Program (PACP) coding conventions and all software used by the Contractor will be PACP compliant. An electronic database will be provided by the Contractor in a PACP exported format approved by the County.
- D. Contractor shall maintain a copy of all inspection records including video files, photographs, database and reports for a minimum 3 years after completion of the inspection work.
- E. The contractor shall provide comments as necessary to fully describe the existing condition of the sewer on the inspection forms.
- F. Contractor shall be responsible for modifications to equipment and/or inspection procedures to achieve report material of acceptable quality.
- G. No work shall commence prior to approval of the submitted material by County. Once accepted, the report material shall serve as a standard for the remaining work.

1.03 QUALITY ASSURANCE

- A. Refer to Section 01 30 00 Special Conditions for Contractor's Qualification requirements.
- B. Each CCTV field inspection supervisor shall be NASSCO PACP certified. Use of PACP certified technicians to review/document defects in the office (post process) is not acceptable.

- 1 C. The inspection contractor must have an internal quality assurance/quality control program in place and
2 all inspection data shall be subjected to the procedures prior to submittal to the County. The County
3 will perform QA/QC audits on submitted data.
4 D. QA/QC shall be performed by NASSCO PACP certified personnel.

5 **1.04 SUBMITTALS**

- 6 A. The following deliverables shall be submitted on a portable hard drive at the completion of inspection:
7 1. Inspection videos saved in MPEG format or Windows Media video format
8 2. Electronic version (.pdf) of the pipe inspection reports
9 3. PACP export pipe inspection database (.mdb)
10 4. Inspection digital photographs in JPEG format
11 5. Map of sub area depicting area inspected, inspection status, asset identification numbers and
12 mark ups
13 6. QA/QC report
14 B. The above deliverables shall be submitted for approval.
15 C. The sewer inspection video, report documents, and sewer inspection database shall be in accordance
16 with County data standards and NASSCO PACP.

17 **1.05 NOTIFICATION**

18 Contractor shall notify the County a minimum of 48 hours prior to performing any inspection work. No
19 payment will be made for inspections performed without proper notification.

20 **PART 2 -PRODUCTS**

21 **2.01 EQUIPMENT**

- 22 A. Closed Circuit Television Camera: The television camera used for the inspection shall be one
23 specifically designed and constructed for sanitary sewer inspection. Lighting for the camera shall be
24 suitable to allow a clear picture of the entire periphery of the pipe. The camera shall be operative in
25 100 percent humidity/submerged conditions. The CCTV camera equipment will provide a view of the
26 pipe ahead of the equipment and of features to the side of the equipment through turning and rotation
27 of the lens. The camera shall be capable of tilting at right angles along the axis of the pipe while
28 panning the camera lens through a full circle about the circumference of the pipe. The lights on the
29 camera shall also be capable of panning 90-degrees to the axis of the pipe.

30 The radial view camera must be solid state color and have remote control of the rotational lens. The
31 camera shall be capable of viewing the complete circumference of the pipe and manhole structure,
32 including the cone-section or corbel. Cameras incorporating mirrors for viewing sides or using exposed
33 rotating heads are not acceptable. The camera lens shall be an auto-iris type with remote controlled
34 manual override.

35 If the equipment proves to be unsatisfactory, it shall be replaced with adequate equipment. The camera
36 unit shall have sufficient quantities of line and video cable to inspect two complete, consecutive sewer
37 reaches with access approximately 750 feet apart.

38 The camera, television monitor, and other components of the video system shall be capable of
39 producing picture quality to the satisfaction of the County. The television camera, electronic systems
40 and monitor shall provide an image that meets the following specifications, or approved equal.

- 41 1. The gray scale shall show equal changes in brightness ranging from black to white with a
42 minimum of five stages.
43 2. With the monitor control correctly adjusted, the six colors - Yellow, Cyan, Green, Magenta,
44 Red, and Blue, plus black and white shall be clearly resolved with the primary colors in order of

1 decreasing luminance. The gray scale shall appear in contrasting shades of gray with no color
2 tint.

- 3 3. The picture shall show no convergence or divergence over the whole of the picture. The monitor
4 shall be at least 13 inches diagonally across the picture tube.
- 5 4. The live picture on the CCTV monitor shall be capable of registering a minimum of 470 lines
6 horizontal resolution and be a clear, stable image with no interference.
- 7 5. Lighting intensity shall be remote controlled and shall be adjusted to minimize reflective glare.
8 Lighting and camera quality shall provide a clear, in-focus picture of the entire inside periphery
9 of the sewers and laterals for all conditions except submergence. Under ideal conditions (no fog
10 in the sewer) the camera lighting shall allow a clear picture up to five pipe diameter lengths
11 away for the entire periphery of the sewer. The lighting shall provide uniform light free from
12 shadows or hot spots. 6. The camera light head shall include a high-intensity side viewing
13 lighting system to allow illumination of internal sections of lateral sewer connections.
- 14 7. Camera focal distance shall be remotely adjustable through a range of 6 inches to infinity.
- 15 8. Picture quality and definition shall be to the satisfaction of the County.
- 16 9. The monitor and software shall also be able to capture and save screen images of typical sewer
17 details and all defects. Screen images shall be embedded into the pipe inspection report
18 document submitted with the inspection video.
- 19 10. The video camera shall be capable of displaying on screen data as specified in Section 3.08 Data
20 Displays. Depth gage: The camera shall have a depth gage or approved method to measure
21 deflection in the pipe and joint separation approved by the County.
- 22 11. The camera shall have zoom capabilities to be able to view the entire depth of a 20 foot deep
23 manhole from the bottom during inspection.

24 B. Lateral Video Camera:

25 Lateral cameras may be push type or launched from the sewer main line. Lateral cameras shall be
26 color, shall be self leveling, and equipped with a footage counter to provide on screen display of
27 footage measurement. Monitor resolution shall be as specified above in paragraph 2.01 A Close
28 Circuit Television Camera, or approved equal

29 C. Video Capture System:

30 The video and audio recordings of the sewer inspections shall be made using digital video equipment.
31 A video enhancer may be used in conjunction with, but not in lieu of, the required equipment. The
32 digital recording equipment shall capture sewer inspection on DVD disks or hard drive, with each
33 sewer reach inspection recorded as an individual movie file (.MPEG, .MPG, or .WMV) or approved
34 equal. The video files will be named in accordance with the County file naming convention contained
35 in Section 3.11:

- 36 1. The video file names will be referenced in the inspection database and in an inspection report
37 generated in PDF format. The pipeline collection and real time video capture and data
38 acquisition systems shall be provided.
- 39 2. The system shall use the most current PACP compliant application software and shall be fully
40 object oriented or approved equal. It shall be capable of printing pipeline inspection reports
41 with captured images of defects or other related significant visual information on a standard
42 color printer.
- 43 3. The imaging capture system shall store digitized color picture images and be saved in digital
44 format on a DVD, hard drive or approved equal. Also, this system shall have the capability to
45 supply the County with inspection data reports for each line segment.
- 46 4. The contractor shall have the ability to store the compressed video files in industry standard and
47 approved County format and be transferable with the PACP compliant inspection database.

- 1 5. The contractor's equipment shall have the ability to "Link". "Linking" is defined as storing the
2 video time frame code with each observation or defect with the ability to navigate from/to any
3 previously recorded observation or defect instantaneously.
- 4 6. The system shall be able to produce data reports to include, at a minimum, all observation points
5 and pertinent data. All data reports shall match the defect severity codes in accordance with
6 PACP naming conventions
- 7 7. The data-sorting program shall be capable of sorting all data stored using generic sort key and
8 user defined sort fields.
- 9 8. Camera footage, date & manhole numbers shall be maintained in real time and shall be
10 displayed on the video monitor as well as the video character generators illuminated footage
11 display at the control console.
- 12 9. Digital video shall be defined as ISO-MPEG Level 1 (MPEG-1) coding having a resolution of
13 352 pixels (x) by 240 pixels (y) (minimum) and an encoded frame rate of 29.97 frames per
14 second. The digital recording shall include both audio and video information that accurately
15 reproduces the original picture and sound of the video inspection. The video portion of the
16 digital recording shall be free of electrical interference and shall produce a clear and stable
17 image. The audio portion shall be sufficiently free of background and electrical noise so as to
18 produce an oral report that is clear and discernible.
- 19 10. Inspection software shall be PACP compliant versions of CUES Granite XP, WinCam,
20 Flexidata, or approved equal.
- 21 11. The CCTV equipment/software shall be capable of producing digitized images of all sewer line
22 defects, manhole defects, and sewer line service connections in .jpeg format. Contractor shall
23 plan to take digital still images of each defect, construction features and service connection to
24 clearly depict it. More images may be necessary depending upon the condition of the pipe.
- 25 12. County standard forms and report templates will be provided to Contractor prior to the start of
26 Work. These forms and report templates will be PACP based, but will have some fields
27 customized by County. All CCTV inspection operators, or any person who may add, modify or
28 delete inspection information, must be PACP certified by NASSCO. Contractor shall supply the
29 County a copy of the PACP certificate or certification card of all personnel responsible for
30 inputting and modifying said data. The rules of PACP shall be in effect for these inspections
31 unless modified by County.

32 **2.02 REPORTING CAPABILITIES**

- 33 A. The CCTV system shall be capable of printing pipeline inspection reports with pipeline schematics
34 and captured images of defects and other related significant visual information. The system shall have
35 the ability to display any combination of the following formats and features simultaneously.

36
37 The following information is mandatory for all inspections.

- 38 1. Inspection Information – Refers to the area of pipe to be inspected between two manholes or the
39 address of the lateral to be inspected.
 - 40 a. Project Name;
 - 41 b. Surveyed by (Operator/Surveyor's name);
 - 42 c. Operator/Surveyor Certificate number;
 - 43 d. System Owner;
 - 44 e. Date;
 - 45 f. Drainage Area (tributary pump station number);
 - 46 g. Time;
 - 47 h. Sheet number (report sheet number
 - 48 i. Street Name and Number;
 - 49 j. Locality (Orange County);

- 1 k. Additional Location Information (e.g. backyard, parking lot, etc);
2 l. Upstream Manhole Number (County standard Asset Number);
3 m. Upstream MH rim to invert (depth);
4 n. Downstream Manhole Number (County standard Asset Number);
5 o. Downstream MH rim to invert (depth);
6 p. Direction of inspection (Upstream or Downstream);
7 q. DVD Identification Number;
8 r. Flow control (e.g. plugged, lift station, bypassed, not controlled);
9 s. Type of Pipe;
10 t. Pipe Height;
11 u. Pipe Width;
12 v. Pipe Shape;
13 w. Pipe Material;
14 x. Lining Material (for lined sewers);
15 y. Pipe Joint Length;
16 z. Purpose of Inspection (new line, year end warranty, CIP R/R project, etc.);
17 aa. Pre Cleaning (jetter, heavy cleaning, no pre-cleaning);
18 bb. Media Number (Video file name) ;
19 cc. Weather;
20 dd. Additional information/Comments
- 21 2. Observation Data – Refers to the portion of pipe where an observation is discovered. Observations
22 shall be noted by text descriptions and defect code number using PACP defects codes, still frame
23 pictures and video clips captured and recorded. Each observation shall include the following:
24 a. Actual observation footage;
25 b. Video reference;
26 c. Location of defect; clock position;
27 d. Code (Group/Descriptor/Modifier/Severity)
28 e. Whether it is a continuous defect
29 f. Whether the defect occurs at a joint
30 g. Severity level;
31 h. DVD Identification number;
32 i. DVD counter;
33 j. Final footage;
34 k. Video clip ID for each observation
35 l. Image reference (file name of photos)
36 m. Remarks (as appropriate or needed)
- 37 3. Formats - Standard and/or custom designed reports shall have the following formats available and
38 shall be able to be produced in hard copy or viewed on the monitor.
39 a. Site Observation: Displays detailed site observation reports in landscape or portrait views.
40 b. Directory Report: Displays a list of all the projects sorted by pump station number and
41 manhole number
42 c. Picture Reports: Displays site data and include full size single photos or half size double
43 photos of discrepancies
44 d. Pipe Run: Displays a graphical display of the site indicating footage, observations, and
45 comments.
46 e. Project Data: Displays the project, client, and contractor information.
47 f. Custom Sort: Creates user-defined reports of selected site, project, and observation data.
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1 **PART 3 - EXECUTION**

2 **3.01 GENERAL**

- 3 A. Prior to inspection the Contractor shall obtain pipe and manhole asset identification numbers from
4 County to be used during inspections. Inspections performed using identification numbers other than
5 the County assigned numbers will be rejected.
- 6 B. Inspection shall not commence until the sewer section to be televised has been completely cleaned in
7 conformance with Specification Section 33 01 35.
- 8 C. Inspection of newly installed sewers (not yet in service) shall not begin prior to completion of the
9 following:
- 10 a. Pipe air testing
 - 11 b. All manhole work, including installation of inverts
 - 12 c. Installation of all lateral services
 - 13 d. Vacuum tests of all manholes
 - 14 e. Lamping of sewers (to be done prior to air testing)
- 15 D. After the sewer main and/or lateral cleaning operation is completed, the line sections shall be visually
16 inspected internally by means of color closed-circuit television. The television inspection shall be
17 performed one line section at time.
- 18
- 19 E. Contractor shall perform sewer televising work within 24 hours of said sewer being cleaned. If said
20 sewer is not televised within the required 24-hour time limit, the sewer shall be re-cleaned prior to
21 televising at no additional expense to County.
- 22
- 23 F. The Contractor shall also inspect and document all manholes included in this Work. The video
24 recording shall begin as the camera is lowered down the manhole all the way to the preset footage and
25 continuously throughout the pipe reach until the down stream manhole is reached.
- 26
- 27 G. The Contractor shall lower the camera into the start manhole and record the camera entry into the
28 sewer, observing the manhole as the camera enters.
- 29
- 30 H. The camera shall pan the periphery of the start and finish manhole from casting to invert. To achieve
31 this, the CCTV camera operator shall pan and zoom the manhole to obtain the best possible image of
32 the manhole, including the wall, cone and chimney section(s).
- 33
- 34 I. The depth of each manhole shall be measured to the nearest 1/10th of a foot and documented on the
35 inspection forms. Estimates of manhole depths will not be accepted.
- 36
- 37 J. The CCTV camera shall be positioned as close to the spring line as possible while maintaining the
38 required equipment stability.
- 39
- 40 K. Wherever possible the inspections shall be performed in the upstream to downstream direction. All
41 sewer segments shall be recorded in a logical order in the same direction they are cleaned and
42 televised.
- 43
- 44 L. In the event that access to some manholes is restricted, permission may be granted by County to direct
45 the camera through the sewer in an upstream direction, against the flow.
- 46
- 47 M. When sewer conditions prevent forward movement of the camera, the camera shall be withdrawn, and
48 Contractor shall televise the line from the opposite direction.
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- 1 N. The camera shall be directed through the sewer in a downstream direction, with the flow, at a uniform,
2 slow rate. In no case will the video camera record while moving at a speed greater than 30 feet per
3 minute. If, during the course of the project, the inspection is rejected due to camera speeds exceeding
4 30 feet per minute, the inspection recordings shall be redone, at no additional cost to County.
5
- 6 O. If a new manhole is discovered in the field that was not on current maps, a new manhole identification
7 number will be assigned by Contractor. The Contractor shall assign the manhole the next number
8 above the highest manhole number within the sub area. The data / video files shall then be re-named to
9 include the new MH ID, and a new CCTV inspection shall be started from the new MH ID. Contractor
10 shall consult with County for assignment of new manhole identification numbers.
11
- 12 P. Flow levels within existing sewers to be inspected shall not exceed 5% of the pipe diameter. If water
13 levels prevent adequate televising of the sewer, then conducting the work during low flow periods or
14 other methods like plugging and bypass pumping shall be implemented.
15
- 16 Q. For inspection of new sewers (not yet in service), the Contractor shall introduce clean water into the
17 upstream manhole and keep water flowing until flow is observed at the downstream manhole location.
18
- 19 R. The survey unit shall be slowed, stopped, or backed-up to perform detailed inspections of significant
20 features. The camera shall be stopped at all defects, changes in material, water level, size, side
21 connections, manholes, junctions, or other unusual areas. When stopped at the defect or feature, the
22 operator shall pan the camera to the area and along the circumference of the pipe.
23
- 24 S. The camera unit shall be paused long enough at areas suspected of leaking to determine if a leak exists
25 currently or if deposits have occurred.
26
- 27 T. The operator shall also record audio of the type of defect or feature, clock position, footage, extent or
28 other pertinent data.
29
- 30 U. Digital photographs or screen captures shall be taken at all laterals, defects and general condition
31 photographs shall be taken at least every 200 feet.
32
- 33 V. At the contractor's discretion or direction of the owner, the camera shall be stopped or backed up
34 (when conditions allow) to view and analyze conditions that appear to be unusual or uncommon for a
35 sound sewer. The lens and lighting shall be readjusted, if need be, in order to ensure a clear, distinct,
36 and properly lighted feature.
37
- 38 W. Audio shall be recorded during each inspection by the operating technician, electronic voice text
39 recognition or approved equal on the inspection video as the sewer is inspected and shall include the
40 sewer location, identification of beginning and terminating manholes including location (address or cross
41 streets), inspection direction, length of inspection, side sewer identification, flow information, complete
42 descriptions of the sewer line conditions as they are encountered, description of the rehabilitation work,
43 reason for termination, and other relevant commentary to the inspections. Voice descriptions should be
44 made: 1) at points of pipe failure or weakness, 2) at points of infiltration, 3) at the location of service
45 connections, 4) at points where unusual conditions are noted, and 5) at points where digital still photos are
46 taken.
47

48 In addition, the audio reports shall include the distance traveled on the specific run, a description of
49 abnormal conditions in the sewer and side sewer connections as they are encountered, explanations for
50 pausing, backing up, or stopping the survey, and the final measured center to center distances between
51 consecutive manholes. The audio portion of the composite video shall be sufficiently free from electrical
52 interference and background noise to provide complete intelligibility of the oral report. Audio dubbing
53 after the inspection is prohibited.

- 1 X. Video recordings shall include a continuous video display / readout of similar information, as described in
2 section 3.08. A separate digital video file shall be made for each pipe reach inspected.
3
4 Y. Contractor shall coordinate with Engineer prior to commencement of work to ensure inspection is
5 accomplished in a manner acceptable to Engineer.
6
7 Z. If the video and/or audio recording is of poor quality, the Engineer has the right to require a re-submittal
8 of the affected sewer sections and no payment will be made until an acceptable video and audio recording
9 is made, submitted to, and accepted by Engineer.
10
11 AA. Measurement for location of defects and actual length of pipe shall be by means of a calibrated meter on
12 the camera with a digital readout on the video monitor. This readout shall be included in the video
13 recording. Marking on cable, or the like, which would require interpolation for depth of manhole, will not
14 be allowed. Measurement will be accurate to one foot per 100 feet of inspected pipe.
15
16 BB. The Contractor inspection units shall be equipped with adequate back up equipment and spare parts so
17 field repairs to equipment can be made and down time is minimized.
18
19 CC. The contractor shall be responsible for all traffic control measures required to perform the work.
20
21 DD. Lateral inspections shall be performed from the main line using a lateral launch camera or shall be
22 pushed from cleanouts to the sewer main using sewer rods. Lateral camera travel measurements shall
23 be displayed on screen and on the captured video.
24
25 EE. If lateral inspections are performed from the sewer main as part of the main line inspection, the lateral
26 shall be logged in the main line inspection report per PACP requirements and the "comment" field of
27 the main line inspection report shall be used to document the lateral identification number, defects
28 observed, footage of all lateral defects, connecting pipes and clean outs. If lateral inspections are not
29 performed as part of the main sewer inspection, a separate PACP pipe inspection record shall be
30 created for each lateral. Refer to paragraph 3.10 for numbering requirements.

30 3.02 PRECONSTRUCTION INSPECTION

31 A. Procedure:

- 32 1. Prior to any repair work, the entire sewer line (from manhole to manhole) shall be televised. The
33 pre-construction inspection shall be used to determine whether the line has been cleaned
34 sufficiently; to confirm the location and nature of defects; and to confirm that the proposed method
35 of repair is proper method for the defects observed.
36
37 2. The camera shall be moved through the line in either direction at a moderate rate, stopping when
38 necessary to permit documentation of the sewer's condition. In no case will the television camera
39 be pulled at a speed greater than 30 feet per minute. Manual winches, power winches, TV cable,
40 and power rewinds or other devices that do not obstruct the camera view or interfere with proper
41 documentation of the sewer conditions shall be used to move the camera through the sewer line.
42 If, during the inspection operation, the television camera will not pass through the entire manhole
43 section, the contractor shall set up his equipment so that the inspection can be performed from the
44 opposite manhole (reverse set-up).
45
46 3. When manually operated winches are used to pull the television camera through the line,
47 telephones, radios or other suitable means of communication shall be set up between the two
48 manholes of the section being inspected to insure good communication between members of the
49 crew.
50
51 4. The importance of accurate distance measurements is emphasized. The location of defects shall be
within two (2) feet ±.
5. During the internal inspection the television camera shall be temporarily stopped at each defect
along the line. The contractor shall record the nature and location of the defect. Where defects are

1 also active infiltration sources, the rate of infiltration in gallons per minute shall be estimated by
2 the contractor and recorded. The camera shall also be stopped at active service connections where
3 flow is discharging. Flows from service connections that are determined to be infiltration/inflow
4 shall also be recorded.

5 B. Documentation of Television Inspection:

- 6 1. Television Inspection Logs - Printed location records shall be kept by the contractor and will
7 clearly show the location in relation to an adjacent manhole of each infiltration point observed
8 during inspection. In addition, other points of significance such as locations of building sewers,
9 unusual conditions, roots, storm sewer connections, broken pipe, presence of scale and corrosion,
10 and other discernible features will be recorded and a copy of such records will be supplied to the
11 County. The contractor shall record all visual observations on a "Television Inspection Report"
12 form.
13 2. Once recorded, the digital data shall be labeled and become the property of the County. The
14 contractor shall have all readings and necessary playback equipment readily accessible for review
15 by the County during the project.
16

17 **3.03 POST CONSTRUCTION INSPECTION**

18 A. Procedure:

- 19 1. After the sewer line rehabilitation has been completed, the entire sewer line from manhole to
20 manhole shall be televised. The post construction inspection shall be used to determine whether or
21 not all of the approved sewer line defects and infiltration sources previously located have been
22 fully repaired to the satisfaction of the County.
23 2. The camera shall be moved through the line in either direction at a moderate rate, stopping when
24 necessary to permit documentation of the sewer's condition. In no case will the television camera
25 be pulled at a speed greater than 30 feet per minute. Manual winches, power winches, TV cable,
26 power rewinds or other devices that do not obstruct the camera view or interfere with proper
27 documentation of the sewer conditions shall be used to move the camera through the sewer line.
28 If, during the inspection operation, the television camera will not pass through the entire manhole
29 section, the contractor shall set up his equipment so that the inspection can be performed from the
30 opposite manhole or direction.(reverse-setup)
31 3. When manually operated winches are used to pull the television camera through the line,
32 telephones, radios or other suitable means of communication shall be set up between the two
33 manholes of the section being inspected to insure good communication between members of the
34 crew.
35 4. The importance of accurate distance measurements is emphasized. The location of defects shall be
36 within one foot.
37 5. During the internal inspection the television camera shall be temporarily stopped at each repair.
38 The camera shall also be stopped at any unnoticed or non-repaired point source of infiltration.
39

40 **3.04 SEWER BYPASSING AND DEWATERING**

- 41 A. Contractor shall be responsible for bypassing sewer flow around his work and dewatering of sewer
42 lines in accordance with the requirements in most recent Orange County Utilities Standards and
43 Construction Specifications Manual Section 3312: Collection System Bypass and Specification Section
44 01 50 16. Where sags or submerged sections of the sewer are encountered during TV inspection, the
45 contractor shall first complete inspection of the entire reach to determine the extent of such areas prior
46 to dewatering the sewer. Dewatered sections of the sewer shall then be TV inspected.
47
48 B. On all sewer mains which have sags or dips, to an extent that the television camera lens becomes
49 submerged during the television inspection, the contractor shall use a high pressure cleaner to draw the

1 water out of the pipe, or other means, to allow inspection of the pipe and identification of pipe defects,
2 cracks, holes and location of service connections.
3

4 **3.05 LINEAR MEASUREMENT**

5 A. The CCTV camera location footage counter shall be zeroed at the beginning of each inspection. The
6 survey unit location entered on the footage counter at the start of the inspection shall allow for the
7 distance from the accepted start of the length of the sewer to the initial point of observation of the
8 camera (pre-set footage). In the case of resuming an inspection at an intermediate point within a sewer
9 reach, the footage counter shall be set to start at the distance from the upstream maintenance hole to
10 that point, as previously recorded by the counter. The Contractor shall ensure that the footage counter
11 starts to register immediately when the survey unit starts to move.

12
13 B. The lateral camera shall be pushed from cleanouts to the sewer main and be equipped with a footage
14 counter to display and record inspection footage. Maximum rate of travel shall be 30 feet per minute
15 when recording.

16
17 C. Prior to commencing inspections, the Contractor shall demonstrate compliance with the linear
18 measurement tolerance specified below:

19 1 The equipment shall measure the location of the camera unit in 1-foot increments from the
20 beginning (upstream end) of each continuous section. This footage location must be
21 displayed on the CCTV monitor and recorded on the videotapes.

22 2 The accuracy of the measured location shall be within + 0.5% of the actual length of the
23 sewer reach being surveyed, or 1 foot, whichever is greater.

24 **3.06 MEASUREMENT OF SAGS**

25 A. The CCTV camera shall be equipped with a measuring device capable of accurately measuring the
26 depth of standing water up to 3 inches. The measuring device shall be mounted to the front of the unit
27 and be capable of being read as the unit advances through the pipe. This applies only to new
28 construction inspection.

29 **3.07 CCTV MONITOR DISPLAY**

30 A. The images displayed on the CCTV monitors will be a view of the pipe above the water surface as
31 seen by the CCTV camera as the unit is conveyed through the sewer.

32 B. The camera lighting shall be fixed in intensity prior to commencing the survey and the white balance
33 set to the color temperature emitted. In order to ensure color constancy, no variation in illumination
34 shall take place during the survey.

35 C. The video equipment shall be checked using an approved test card with a color bar prior to
36 commencing each day's survey. The camera shall be positioned centrally and parallel to the test card at
37 a distance where the full test card just fills the monitor screen. The card shall be illuminated evenly
38 and uniformly without any reflection.

39 **3.08 DATA DISPLAYS**

40 A. The CCTV images shall include an initial data display that identifies the sewer reach being surveyed
41 and a survey status display that provides continuously updated information on the location of the
42 survey unit as the survey is being performed. These data displays shall be in alphanumeric form. The
43 size and position of the data shall not interfere with the main subject of the monitor picture.

- 1 B. The on-screen display should be white during inspections where the background behind the display is
2 dark and, conversely, black where the background is light.
- 3 C. At the beginning of each reach of sewer being inspected, the following information shall be
4 electronically generated and displayed on the CCTV monitors as well as included in the audio track:
5 1 Date of survey
6 2 Inspection company name and inspector
7 3 Street name or location
8 4 Manhole number to manhole number (in order of inspection)
9 5 Direction of survey (upstream or downstream)
10 6 Time of start of survey
11
- 12 D. During inspections, the following information shall be electronically generated, automatically updated,
13 and displayed on the CCTV monitors:
14 1 Survey unit location in the sewer line in feet and tenths of feet from adjusted zero
15 2 Sewer diameter
16 3 Upstream and downstream manholes reference numbers as per approved drawings or County GIS.
17 4 During Lateral inspections the video display shall contain the lateral location and the footage of
18 the camera within the lateral.

19 **3.09 PHOTOGRAPHS**

- 20 A. During CCTV inspections, screen captures will be taken from the monitor images and saved electronically
21 by the in-sewer inspection crew of typical conditions every 200 feet and at all defects, construction
22 features, manholes and laterals. The screen capture shall have the pipe reach (identified by the upstream
23 and downstream manholes), survey direction, footage, and date when photograph was taken. The
24 annotation shall be clearly visible and in contrast to its background, shall have a figure size no greater than
25 1/4-inch, and shall be type-printed. The annotation shall be positioned on the front of the photograph so as
26 to not interfere with the subject of the photograph. Photograph files shall be named by the video capture
27 system and automatically referenced to the logged defect.
- 28 B. The image of the sewer shall fill the photographic image. Photographs must clearly and accurately show
29 what is displayed on the monitor, which shall be in proper adjustment. Where significant features exist
30 within 6-feet of each other, one photograph shall be made to record these features. Where there is a
31 continuous feature, photographs shall not be taken at intervals of less than 6-feet unless absolutely
32 necessary to show a change in the feature.
- 33 C. The images shall be kept electronically, copied to a hard drive, and submitted with the inspection videos,
34 database and reports.
- 35 D. It is preferred that the name of each digital still image shall be based on the video / data file name of the
36 sewer reach in which the image was taken. The name shall be recorded as follows: Video / data file name,
37 followed by the PACP code for the item pictured, followed by the footage at which the item was found, i.e.
38 *(File Name)(PACP Code)@(Footage).jpg*. Contractor will establish reasonable naming convention prior
39 to Work if this naming convention is unreasonable.

40 **3.10 MANHOLE NUMBERING, INSPECTION FORMS AND DEFECT CODES**

- 41 A. The Contractor will be required to use the manhole numbering as shown on sewer maps provided by
42 County when performing the inspections for this project.
43
- 44 B. The County inspection forms and standard defect codes shall be used. The defect codes, inspection
45 forms, inspection database and inspection protocols shall be in accordance with the National
46 Association of Sewer Service Companies (NASSCO) Pipeline Assessment and Certification Program
47 (PACP).

- 1
2 C. When lateral inspections are performed as part of the main sewer inspection, lateral numbers shall be
3 referenced in the “comment” field of the main sewer PACP report. The lateral number shall be as
4 follows:

5
6 <Upstream Manhole ID>_<footage>_<clock position>_<L>

7
8 Example: 39550020_212_02_L
9

- 10 D. When lateral inspections are not performed as part of the main sewer inspection, the main sewer
11 inspection shall be performed first to obtain the footage and clock positions needed to identify the
12 lateral.

13 **3.11 DELIVERABLES**

14 The Contractor will be required to submit the following deliverables at the completion of inspection.

15 A. Inspection Reports to include:

- 16 1. Inspection session header information (see required fields above)
17 2. Defect log report including photo captures from CCTV video
18 3. Schematic drawing of pipe showing defects
19 4. Format:
20 a. Adobe Acrobat PDF files – 1 report PDF per pipe
21 b. Main sewer inspection report file name: <upstream MH ID>_<downstream MH ID>_<Date
22 (year_mo_day format)>.PDF
23

24 Example: 30060002_30060001_2010_02_16.pdf
25

- 26 c. Lateral inspection report file name: <upstream MH ID>_<footage>_<clock
27 position>_<L>_<Date (year_mo_day format)>.PDF_
28 Example: 30060002_210_02_L_2010_02_16.pdf

29 B. Inspection video files on portable hard drive. Typed labels shall be attached to the face of each hard drive.
30 The typed index labels shall include the following information:

- 31 1. Content (CCTV)
32 2. Contractor name
33 3. Purpose of Survey
34 4. Tributary Pump station number
35 5. Reaches included (from Manhole Number ## to Manhole Number ##)
36 6. Date of survey
37 7. Contract Number / Delivery Order Number (if applicable)
38

39 C. Main sewer video files shall be MPEG or Windows Media File named according to the following
40 standard:

41
42 <Upstream MH ID>_<Downstream MH ID>_<Inspection>_<Date (year_month_day)>.wmv
43

44 Example: 39540008_39540007_2009_08_05.wmv

45 In instances where a reverse set up is necessary to perform or complete the inspection the file name shall
46 incorporate a “R” at the end of the file name to indicate “reverse” direction. Using the file example above,
47 if the inspection from the upstream end was halted due to an obstruction and the pipe was televised from
48 the opposite end, the video file from the downstream to upstream direction would be assigned the
49 following file name:

- D. Lateral connection inspection video files shall be MPEG or Windows Media File named according to the following standard:
<Upstream MH ID>_<footage>_<clock position>_<L>_<date (year_mo_day format)>.wmv
Example: 39540008_145_10_L_2009_08_05.wmv
- E. Electronic Inspection Data stored and exported in a NASSCO Pipeline Assessment and Certification Program (PACP) compliant Microsoft Access database (.MDB) version 4.4 or newer delivered on DVD or portable hard drive.
- F. Inspection photograph digital files (jpeg) indexed to NASSCO PACP compliant database.
- G. Map of sub area depicting area inspected, inspection status, asset identification numbers and mark ups,
- H. Acceptable media for the video recordings portable hard drive.
- I. Inspection data noted above shall be provided County weekly throughout the inspection work.
- J. Contractor Quality Control report detailing data validation performed, pipe inspection records reviewed and results.
- K. All inspection data shall be submitted on a portable hard drive. Each hard drive shall be filled with as much data as practical to minimize the number of hard drives submitted. Sections of a single segment of sewer main shall not be recorded to more than one hard drive. Video footage of recorded segments shall be grouped by area and shall be submitted in sequential order relating to the area mapping designation.
- L. Upon approval by the County of all, or portions of, the data delivered via the portable hard drives, the approved CCTV data shall be delivered to County on a portable hard drive labeled with project information. The hard drive shall clearly indicate the date of the inspection, the designated segment(s) of sewer mains(s) contained on the disk, the name of the project, the project CIP number, the pump station number, and Contractor name. The hard drive shall contain separate digital files for each manhole-to-manhole section.
- M. The database shall be comprehensive for the entire project, and additional data shall be added to the database each week.

3.12 ACCEPTANCE

- A. Inspection deliverables will be validated to check conformance with the specified requirements for file names, formats, quantity, resolution, data table references, in addition to checks for null fields, asset numbers, duplicate records, connectivity, material, size, and depth. Any data not passing the data validation checks will be returned to the Contractor for resubmittal.
- B. Inspection submittals will be reviewed for quality control. A minimum of 5% of the submitted inspections will be randomly reviewed. A quality control check will be performed for each CCTV operator and each operator must exceed 90% accuracy. Reference Section 01 30 00 Special Conditions.
- C. Throughout the duration of the project, should County discover inaccuracies in data or quality issues with any of the videos, Contractor shall re-inspect those segments at no additional cost to the County. County will provide comments regarding acceptance of the data within 21 days of receiving the data from the Contractor. Neither the CCTV inspections nor the Work inspected is accepted by County until such time that an acceptance letter is issued by County.

END OF SECTION

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1 **SECTION 33 01 33**
2 **SANITARY SEWER PIPELINE POINT REPAIRS**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

- 5 A. Section Includes:
6 1. Point repair of sewer pipelines by trimming intruding laterals, or open cut excavation to
7 remove and replace short pieces of pipe.
- 8 B. Related Sections include but are not necessarily limited to:
9 1. Division 1 - General Requirements.
10 2. Section 31 21 33 – Trenching, Backfilling, and Compacting for Utilities
11 3. Section 33 01 31 – Televising Sanitary Sewer Systems
12 4. Section 33 01 99 – Cured-in-Place Pipe (CIPP) Lining of Existing Piping
13 5. Section 33 05 01.02 – Ductile Iron Pipe and Fittings.
14 6. Section 33 05 01.09 – Polyvinyl Chloride Pipe and Fittings.

15 **1.2 REQUIREMENTS**

- 16 A. Pipe sections which are not in continuous alignment with the remainder of the sewer main or
17 sections which are obstructed (after mechanical or hydraulic, cleaning has been attempted)
18 preventing liner insertion shall be repaired, as directed by the County.
- 19 B. The Work in this section describes point repair by excavation and shall include furnishing and
20 installing pipe and fittings, couplings, excavation, sheeting/shoring, backfill, dewatering, testing,
21 bypass pumping, removal and disposal of existing pipe and structures (where required)
22 connection of existing laterals, pavement removal and disposal, temporary and permanent
23 pavement replacement and other miscellaneous Work required to complete a watertight point
24 repair.
- 25 C. All point repairs shall be approved by the County.
- 26 D. Pertinent information required prior to a point repair includes the main line size, material and
27 approximate location, depths and length of defect.
- 28 E. The Contractor shall perform all required permanent landscape restoration of disturbed areas on
29 private property and within locality or County right-of-way upon completion of the point repair
30 to the satisfaction of the County.

31 **1.3 SUBMITTALS**

- 32 A. Submittals shall be in accordance with Section 01 33 00.
- 33 B. Contractor shall provide submittals to the Engineer for approval on all materials and methods to
34 be used for point repairs.
- 35 C. Traffic control plan for point repairs.
- 36 D. Quality Control Submittals
37 1. Shop Drawings: Contractor shall submit catalog cuts, specifications, dimensioned drawings,
38 installation details and sketches (including proposed locations of all excavations), and other
39 pertinent information for point repair equipment, materials, and methods.

40 **PART 2 - PRODUCTS**

41 **2.1 GENERAL**

- 42 A. All materials furnished for this work shall be in accordance with the “Orange County Utilities
43 Appendix D, List of Approved Products” as appended to these specifications unless otherwise
44 noted. All products not listed in Appendix D shall be subject to the County’s approval.

- 1 B. Only equipment approved by the County shall be used for point repairs for the different
2 methods.
- 3 C. Use of remote controlled cutter suitable for the material being cut shall be used for trimming
4 intruding laterals.

5 **2.2 PIPE MATERIALS**

- 6 A. Open-cut Point Repairs
- 7 1. PVC pipe conforming to Section 33 05 01.09 for sewer applications.
- 8 2. Repair Couplings
- 9 a. Full-circle, flexible, rubber coupling with Type 316 stainless steel bands.
- 10 b. All materials shall be compatible with the waste water environment.

11 **PART 3 - EXECUTION**

12 **3.1 GENERAL**

- 13 A. Sections of sewer mains not suitable for rehabilitation shall be replaced with new sections, in
14 accordance with the contract Documents and as directed by the Owner.
- 15 B. Pertinent information required for the main line sewer such as line size, approximate depth at
16 manholes, description of the line location, the number of points to be repaired, and the location
17 of each point will be listed and shown in the Contract Documents. The depths shown do not
18 necessarily reflect the excavation depth required to make the repair but is for reference only.
- 19 C. Traffic control per Florida Department of Transportation Manual on Traffic Control and Safe
20 Practices for Street and Highway Construction, Maintenance and Utility Operation, the Manual
21 of Uniform Traffic Control Devices (MUTCD), and *Section 3110: General Construction*
22 *Requirements* (3.03 Maintenance of Traffic and Closing of Streets) in the current Orange County
23 Utilities Standards and Construction Specifications Manual.
- 24 D. Temporary bypass pumping and flow control as specified in the current Orange County Utilities
25 Standards and Construction Specifications Manual Section 3312: Collection System Bypass.

26 **3.2 OPEN-CUT POINT REPAIR**

- 27 A. Excavate repair pit as detailed on the Contract Documents and uncover the sewer line to obtain a
28 minimum one foot clearance all around at the damaged section or as directed by the County.
- 29 B. A minimum of twenty (20) feet of pipe is to be replaced centered on the location of the pipe
30 defect.
- 31 C. Remove defective pipe or fitting at least 10 feet to each side of defect by cutting the pipe
32 perpendicular to the pipe axis, leaving a clean, plain end.
- 33 D. Cut replacement section of new PVC pipe matching the existing pipe internal diameter. Clean
34 pipe ends shall meet so that no more than one-quarter of an inch (1/4-inch) space is left at either
35 end.
- 36 E. Reshape and compact the bottom of the trench as required in the Contract Documents so that the
37 grade for the new pipe will match that of the existing main line sewer.
- 38 F. Install replacement pipe section in accordance with the requirements of Section 33 01 13.
- 39 G. Connect replacement pipe to existing pipe with repair couplings. Install repair couplings as
40 recommended by the coupling manufacturer.
- 41 H. Backfill in accordance with Section 31 21 33.
- 42 I. The finished installation shall be free from visual defects, damage, deflection, holes, etc. There
43 shall be no visual infiltration.

1 J. Surface restoration shall be in strict accordance with applicable County Road Construction
2 Specifications and Standard FDOT Specifications.

3 **3.3 TRIMMING INTRUDING LATERALS**

4 A. Contractor shall trim intruding lateral so that the service connection is flush with the internal
5 pipe wall. Lateral cutting shall be documented by internal inspection methods.

6 B. Contractor shall ensure that existing pipe is not damaged during cutting operations.

7 **3.4 TRIMMING PIPE CONNECTION SEALS**

8 A. Contractor shall trim loose or hanging/intruding pipe connection seals to be flush with the
9 internal pipe wall. The Contractor shall not fold the hanging/intruding material.

10 **3.5 ACCEPTANCE INSPECTION**

11 A. Contractor shall perform internal inspection as specified in Section 33 01 31 of repaired sections
12 of pipe after completion of point repair and prior to any lining of the sewer main should it be
13 required.

14 B. Provide copies of inspection records to Engineer/County for acceptance of point repair.

15

16

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SECTION 33 01 35
CLEANING SANITARY SEWER SYSTEMS

3 **PART 1 - GENERAL**

4 **1.01 SCOPE OF WORK**

- 5 A. The work covered in this section consists of cleaning sewer lines and manholes prior to the internal
6 television inspection(s) for new or existing wastewater systems.
- 7 B. Gravity Main and Sewer Lateral Cleaning:
- 8 a. The intent of gravity main cleaning is to remove debris that may be causing a reduction in
9 flow capacity, potential sewer backups, or limits the ability to evaluate the structural condition
10 of the pipe segment.
- 11 b. On all existing sewers to be rehabilitated in this Project, Contractor shall perform sewer
12 cleaning work to an acceptable level as necessary to perform a thorough television inspection
13 of the sewer. An acceptable level is defined as the removal of all debris, or enough debris to
14 restore a minimum of 95 percent of the internal pipe diameter throughout the pipe segment
15 cleaned.
- 16 c. If the pipe condition is such that cleaning may cause a potential collapse, then the pipe shall
17 be televised without attempting to clean it to the 95 or 98 percent condition, pending approval
18 by County.
- 19 C. Water for Cleaning:
- 20 a. The Contractor will be responsible for obtaining a transient water meter and paying for water
21 used during course of cleaning.
- 22 D. Recovering of Equipment:
- 23 a. The Contractor will be responsible for recovering any equipment that becomes lodged or lost
24 in the sewer line including, but not limited to, any cost associated with required evacuation,
25 restoration of roads and easements, repairs to pipes and manholes as needed to restore the
26 pipeline and appurtenances back to their original conditions.
- 27 b. Video documentation of pre-removal conditions will apply prior to any excavation.

28 **1.02 CLEANING EQUIPMENT**

- 29 A. Hydraulically Propelled Equipment:
- 30 a. The equipment used shall be of a movable dam type and be constructed in such a way that a
31 portion of the dam may be collapsed at any time during the cleaning operation to protect
32 against flooding of the sewer.
- 33 b. The movable dam shall be equal in diameter to the pipe being cleaned and shall provide a
34 flexible scraper around the outer periphery to insure removal of grease.
- 35 c. Special precautions to prevent flooding of the sewers and public or private property shall be
36 taken at all times.
- 37 B. High-Velocity Jet (Hydro-Cleaning) Equipment:
- 38 a. All high-velocity sewer-cleaning equipment shall be constructed for ease and safety of
39 operation.
- 40 b. The equipment shall have a selection of two or more high-velocity nozzles. The nozzles shall
41 be capable of producing a scouring action from 15 to 45 degrees in all size mains.
- 42 c. Equipment shall also include a high-velocity gun for washing and scouring manhole walls and
43 floor. The gun shall be capable of producing flows from a fine spray to a solid stream.
- 44 d. The equipment shall carry its own water tanks, auxiliary engines, pumps, and hydraulically
45 driven hose reel.
- 46

- 1 C. Mechanically Powered Equipment:
- 2 a. Bucket machines shall be in pairs with sufficient power to perform the work in an efficient
- 3 manner.
- 4 b. Machines shall be belt operated or have an overload device.
- 5 c. Machines with direct drive that could cause damage to the pipe will not be used.
- 6 d. A power rodding machine shall be either a sectional or continuous rod type capable of holding
- 7 a minimum of 750 feet of rod. The rod shall be specially heat-treated steel.
- 8 e. To insure safe operation, the machine shall be fully enclosed and have an automatic safety
- 9 clutch or relief valve.
- 10 D. Vacuum machines may be used for removal of materials from manholes when other cleaning
- 11 equipment is used to dislodge and transport material to the access point.
- 12 E. Combination Cleaner:
- 13 a. For cleaning small and large diameter sewer, the Contractor may use a combination hydraulic
- 14 high volume water and solids separation system.
- 15 b. Water volume of up to 250 gpm at 2000 psi+ will move solids to the downstream manhole in
- 16 high flow conditions.
- 17 c. The separation system will dewater solids to 95 percent (passing a paint filter test) and
- 18 transfer them to a dump truck, if needed, for transport to a sewage treatment plant, approved
- 19 landfill, or other location specified by the Engineer/County.
- 20 d. Sewer water will be filtered to a point where it can be used in the pump for continuous
- 21 cleaning.
- 22 e. No by-passing of sewer flows will be necessary.
- 23 f. The unit shall be capable of 24-hour operation and the unit shall not leave the manhole until a
- 24 section is fully cleaned.

25 **1.03 SUBMITTALS**

- 26 A. The proposed method and equipment to be used shall be submitted.
- 27 B. Material safety data sheet and manufacturer's recommendations and instructions for all chemicals
- 28 proposed for cleaning or root removal.
- 29 C. A daily log shall be maintained to record the location of the manholes and sewer lines cleaned,
- 30 lengths of the lines cleaned, method of cleaning, line sizes and volume and type of debris
- 31 removed. Observations are to be recorded on a cleaning report form.
- 32 a. Daily photo documentation (at least 5 photos a day) shall be provided with all photos labeled
- 33 as to date, time, and location with a description of performed activity and/or debris found.
- 34 D. Weigh tickets and disposal manifests from licensed disposal facility of all debris removed.
- 35 E. Traffic control plan shall be submitted.

36 **PART 2 - PRODUCTS (NOT USED)**

37 **PART 3 - EXECUTION**

38 **3.01 GENERAL**

- 39 A. The equipment shall remove dirt, grease, rocks, sand, and other materials and obstructions from
- 40 the sewer mains, laterals and manholes.
- 41 B. A high velocity sewer cleaner will be used for the majority of the cleaning work. Other equipment,
- 42 such as bucket machines, rod machines, hydraulic root cutters, vacuum trucks and balling
- 43 equipment, appropriate to the need, shall be available.

1 **3.02 CLEANING PRECAUTIONS**

- 2 A. All necessary precautions shall be taken to protect the sewer from damage during all cleaning and
3 preparation operations. Precautions shall also be taken to insure that no damage is caused to
4 public or private property adjacent to or served by the sewer or its branches. The Contractor shall
5 pay for and restore, at no additional costs to County, any damage caused to public or private
6 property because of such cleaning and preparation operations.
- 7 B. Satisfactory precautions shall be taken in the use of cleaning equipment. When hydraulically
8 propelled cleaning tools (which depend upon water pressure to provide their cleaning force) or
9 tools which retard the flow in the sewer line are used, precautions shall be taken to insure that the
10 water pressure created does not damage or cause flooding of public or private property being
11 served by the sewer. When possible, the flow of sewage in the sewer shall be utilized to provide
12 the necessary pressure for hydraulic cleaning devices. When additional water from fire hydrants is
13 necessary to avoid delay in normal work procedures, the water shall be conserved and not used
14 unnecessarily. No fire hydrant shall be obstructed in case of a fire in the area served by the
15 hydrant. All requirements shall be met when accessing a fire hydrant including but not limited to
16 meters, backflow preventers and properly trained personnel. It shall be the Contractor's
17 responsibility to meet all state and local requirements.

18 **3.03 CLEANING**

- 19 A. If cleaning of an entire sewer section cannot be successfully performed from one manhole, the
20 equipment shall be set up on the other manhole and cleaning attempted again. If results of the
21 cleaning are favorable, the Contractor will proceed with the TV inspection. All sludge, dirt, sand,
22 rocks and other solid or semi solid materials resulting from the cleaning operation shall be removed
23 from the downstream manhole of the section being cleaned. The Contractor shall not be responsible
24 for removing mortar or other material that is securely attached to the pipe walls or joints.
- 25 B. Materials shall be disposed of from the site at least once at the end of each workday. The Contractor
26 will be responsible for the disposal of materials removed from the sewer system. All sewer cleaning
27 efforts shall require documentation of all quantities and types of materials removed during
28 cleaning.
- 29 C. The designated sewer manhole sections shall be cleaned using hydraulically propelled, high-
30 velocity jet, or mechanically powered equipment approved by County. Cleaning shall consist of
31 normal hydraulic jet cleaning to facilitate the internal CCTV inspection.
- 32 1. Types of cleaning of sanitary sewers
- 33 a. Light cleaning consists of a maximum of one pass of the jet nozzle. Light cleaning of
34 laterals will consist of flushing water into a cleanout.
- 35 b. Medium cleaning consists of two to four passes of the jet nozzle. Medium cleaning of
36 laterals will consist of one to four passes with a jet nozzle.
- 37 c. Heavy cleaning consists of five or more passes of the jet nozzle such as removing heavy
38 grease, debris and roots.
- 39 2. Selection of the equipment used shall be based on the conditions of lines at the time the work
40 commences. The equipment and methods selected shall be satisfactory to County. The
41 equipment shall be capable of removing dirt, grease, rocks, sand, debris, other materials and
42 obstructions from the sewer lines and manholes.
- 43 3. If cleaning of an entire section cannot be successfully performed from one manhole, the
44 equipment shall be set up on the other manhole and cleaning again attempted. The intent of
45 preparatory cleaning is to provide sufficient cleaning to ensure camera passage and the
46 internal conditions of the pipeline can be fully assessed.
- 47 4. If County establishes that a particular section of the pipeline cannot be adequately cleaned due
48 to broken, collapsed, or void areas, then inspection will be attempted up to the obstruction.

1 **3.04 ROOT REMOVAL**

- 2 A. Roots shall be removed in the designated sections and manholes where root intrusion is a problem
3 and where authorized by the Engineer/Owner. Special attention should be used during the
4 cleaning operation to assure almost complete removal of roots from the joints. Any roots that
5 could prevent the proper application of chemical sealants, or could prevent the proper seating and
6 application of cured-in-place liners shall be removed. Procedures may include the use of
7 mechanical equipment such as, rodding machines, bucket machines, winches using root cutters,
8 porcupines and equipment such as high-velocity jet cleaners. Chemical root treatment shall be
9 used before or following the root removal operation, depending on the manufacturer's
10 recommendation. The Contractor shall capture and remove all roots from the line.

11 **3.05 CHEMICAL ROOT TREATMENT**

- 12 A. To aid in the removal of roots, manhole sections that have root intrusion shall be treated with an
13 acceptable herbicide. The application of the herbicide to the roots shall be done in accordance
14 with the manufacturer's recommendations and specifications in such a manner to preclude damage
15 to surrounding vegetation. Any damaged vegetation, so designated by County, shall be replaced
16 by the Contractor at no additional cost to County. All safety precautions as recommended by the
17 manufacturer shall be adhered to for handling and application of the herbicide.

18 **3.06 MATERIAL REMOVAL AND DISPOSAL**

- 19 A. All sludge, dirt, sand, rocks, grease, roots, and other solid or semisolid material resulting from the
20 cleaning operation shall be removed at the downstream manhole of the section being cleaned.
21 Contractor shall provide appropriate screening to stop passing of materials into downstream
22 sewers. All solid or semisolid materials dislodged during cleaning operations shall be removed
23 from the sewer by Contractor at the downstream manhole of the sewer section being cleaned. The
24 passing of dislodged materials downstream of the sewer segment being cleaned shall not be
25 permitted. In such an event, as observed or detected by County or any third party, Contractor shall
26 be responsible for cleaning the affected downstream sewers in their entirety, at no additional cost
27 to County.
- 28 B. These materials shall become the property of the Contractor, shall be removed from the site at the
29 end of each workday, and shall be disposed of in a lawful manner by Contractor. Copies of
30 records of all disposals shall be furnished to County, indicating disposal site, date, amount and a
31 brief description of material disposed. Disposal manifests from the licensed disposal facility shall
32 be submitted with invoices.
- 33 C. The Contractor shall keep his haul route and work area(s) neat, clean, and reasonably free of odor,
34 and shall bear all responsibility for the cleanup of any spill.

35 **3.07 ACCEPTANCE OF CLEANING OPERATION**

- 36 A. Acceptance of sanitary sewer cleaning shall be made upon the successful completion of the
37 television inspection to the satisfaction of County. If television inspection shows the cleaning to
38 be unsatisfactory, the Contractor shall be required to re-clean and re-inspect the sewer line at no
39 additional cost until the cleaning is shown to be satisfactory.
- 40 B. In addition, on all sanitary sewers which have sags or dips, to an extent that the television camera
41 lens becomes submerged during the television inspection, the Contractor shall use a high pressure
42 cleaner to draw the water out of the pipe, or other means, to allow the full circumferential view of
43 the pipe and identification of pipe defects, cracks, holes and location of service connections.

44 **END OF SECTION**

1 **SECTION 33 01 91**
2 **MANHOLE REHABILITATION**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

- 5 A. Section Includes:
- 6 1. Repair, rehabilitation, or replacement of deteriorated, leaking, or structurally unsound
 - 7 manholes.
 - 8 2. Where required by the approved plans, existing manholes shall be rehabilitated and an
 - 9 approved corrosion protective coating applied to their interior surfaces, as specified herein.
 - 10 3. Manhole lining will take place after all CIPP lining work.
- 11 B. Related Sections include but are not necessarily limited to:
- 12 1. Division 1 - General Requirements.
 - 13 2. Section 31 21 33 – Trenching, Backfilling, and Compacting for Utilities
 - 14 3. Section 33 01 13 – Sanitary Sewer Systems
 - 15 4. Section 33 01 31 – Televising Sanitary Sewer Systems

16 **1.2 QUALITY ASSURANCE**

- 17 A. Referenced Standards:
- 18 1. ASTM International (ASTM):
 - 19 a. C109, Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-
 - 20 inch [50-mm] Cube Specimens)
 - 21 b. C190, Tensile Strength of Hydraulic Cement Mortars
 - 22 c. C191, Test Method for Time of Setting of Hydraulic Cement by Vicat Needle
 - 23 d. C882, Test Method for Bond Strength of Epoxy-Resin Systems Used With Concrete By
 - 24 Slant Shear
 - 25 e. C1244, Standard Test Method for Concrete Sewer Manholes by the Negative Air
 - 26 Pressure (Vacuum) Test Prior to Backfill
 - 27 f. D543, Test Method for Resistance of Plastics to Chemical Reagents
 - 28 g. D638, Test Methods for Tensile Properties of Plastic
 - 29 h. D695, Test Method for Compressive Strength of Plastic
 - 30 i. D790, Test Methods for Flexural Properties of Plastics
 - 31 j. D2240, Test Methods for Hardness
 - 32 k. D3567, Standard Practice for Determining Dimensions of “Fiberglass” (Glass-Fiber-
 - 33 Reinforced Thermosetting Resin) Pipe and Fittings
 - 34 l. D3753, Standard Specification for Glass-Fiber-Reinforced Polyester Manholes and
 - 35 Wetwells
 - 36 m. D4541, Standard Test Method for Pull-Off Strength of Coatings Using Portable
 - 37 Adhesion Testers
 - 38 n. D5813, Method for Chemical Resistance of Pipeline Coatings
 - 39 o. F1759, Standard Practice for Design of High-Density Polyethylene (HDPE) Manholes
 - 40 for Subsurface Applications
 - 41 2. Latest version of the Orange County Utilities Standards and Construction Specifications
 - 42 Manual

43 **1.3 PERFORMANCE REQUIREMENTS**

- 44 A. Perform work needed to make manholes structurally sound, improve flow, prevent entrance of
- 45 inflow or groundwater, prevent entrance of soil or debris, and provide protection against
- 46 hydrogen sulfide gas attack.

- 1 B. Manufacturer's Product Support
2 1. Wall sealing or lining systems shall submit for review and approval a detailed description of
3 the proposed rehabilitation process. Describe surface preparation, independent laboratory
4 test results, mix design procedures and method of controlling uniform thickness.
5 2. A representative employed by the manufacturer and having technical training in admixture
6 and concrete mix design shall be named and available for consultation by telephone during
7 business hours and on site upon 48 hours notice.
8 3. Manufacturer's representative on concrete lining systems shall provide technical assistance
9 to concrete batch plant operators to ensure proper usage of dispensing equipment and
10 accurate proportions of admixtures.

11 **1.4 SUBMITTALS**

- 12 A. See Section 01 33 00 for requirements for the mechanics and administration of the submittal
13 process.
- 14 B. Installer Qualifications. Installers of liners and wall repair systems shall submit qualifications to
15 Engineer at least 14 days prior to start of any material application. Submittal shall consist of:
16 1. Manufacturer's approved equipment list, by name and model number for application of
17 product and contractor's equipment list showing approved equipment available for use in
18 product application.
19 2. List of contractor's personnel who have satisfactorily completed manufacturer's training in
20 product application within previous two years. Include date of certification for each person.
21 3. Manufacturer's handling, storage, and installation instructions and procedures.
- 22 C. Submit manufacturer's specification containing instructions and quality control procedures meeting
23 the following requirements:
24 1. Before materials are delivered to the job site, the Contractor shall provide instructions written
25 and published by the coating/lining manufacturer for the purpose of giving complete
26 instruction on the use and application of the proposed coating for the conditions for which the
27 coating is specified herein.
28 2. The Contractor shall furnish Material Safety Data Sheets (MSDS) for all products used in the
29 coating/lining system.
30 3. For all coating/lining system components, the Contractor shall provide the manufacturer's
31 application instructions, which shall include the following:
32 a. Surface preparation (including repairs and resurfacing) recommendations
33 b. Cleaning chemicals including neutralization recommendations.
34 c. Crack/leak repair materials and methods.
35 d. Primer type, where required
36 e. Application of primer and final coating
37 f. Maximum dry and wet film thickness
38 g. Minimum and maximum curing time between coats, including atmospheric conditions for
39 each
40 h. Curing Methods
41 i. Curing time before submergence in liquid
42 j. Ventilation requirements
43 k. Minimum atmospheric conditions during which the coating/lining shall be applied
44 l. Allowable application methods
45 m. Maximum allowable moisture content
46 n. Maximum storage life
47 o. Special equipment
48 p. Testing procedures for dry film thickness, holiday testing, adhesion testing, and
49 acceptance test
50 q. Repair method(s)

- 1 4. Limitations, exceptions, precautions, and requirements that may adversely affect the
- 2 performance of the coating system shall be clearly and completely stated in the instructions. If
- 3 the manufacturer's requirements differ from these specifications, the instructions shall clearly
- 4 state where deviations are required. Temperature and humidity limitations for minimum and
- 5 maximum conditions are to be included.
- 6 5. Coating System Application Plan shall be prepared for approval by County that includes a
- 7 description of the following:
- 8 a. Quality Assurance Procedures
- 9 1) Detailed duties of the Coating Applicator's Quality Assurance Manager
- 10 2) Detailed duties of the Manufacturer's Representative
- 11 3) Correct storage and handling of coating materials, and the necessary safety
- 12 requirements
- 13 4) List of application and testing equipment to be used, including inspections
- 14 confirming satisfactory condition of equipment
- 15 b. Criteria for acceptance of the preparation of concrete and manhole surfaces
- 16 c. Plan for sewage diversion
- 17 d. Method and material for sealing active leaks
- 18 e. Detailed environmental provisions such as shading from the sun and other conditions that
- 19 adversely affect application of the coating.
- 20 6. Traffic control plan.

21 **PART 2 - PRODUCTS**

22 **2.1 GENERAL**

- 23 A. All materials furnished for this work shall be in accordance with the "Orange County
- 24 Utilities Appendix D, List of Approved Products" as appended to these specifications
- 25 unless otherwise noted. All products not listed in Appendix D shall be subject to the
- 26 County's approval.
- 27 B. Wall Cleaning Material
- 28 1. Cleaners: Detergent or muriatic acid capable of removing dirt, grease, oil and
- 29 other matter which would prevent a good bond of sealing material to wall.
- 30 Refer to sealing material manufacturer's recommendations.
- 31 C. Wall Repair Material
- 32 1. Patching
- 33 a. A premixed, nonshrink, cement-based patching material consisting of
- 34 hydraulic cement and graded silica aggregates, with special plasticizing
- 35 and accelerating agents. Material shall be suitable for vertical or
- 36 overhead use.
- 37 b. The premixed material shall not contain chlorides, gypsums, plasters,
- 38 iron particles, aluminum powder, or gas-forming agents. Material shall
- 39 not promote corrosion of steel.
- 40 c. Set time as per ASTM C191 shall be less than 30 minutes. One hour
- 41 compressive strength shall be a minimum of 2000 psi. The ultimate
- 42 strength as per ASTM C109 shall be a minimum of 5,000 psi. Bond
- 43 strengths as per ASTM C882, modified, shall be a minimum of 1,700
- 44 psi.
- 45 2. Spray Applied
- 46 a. This method consists of spray applying a cementitious mix to the
- 47 manhole walls and benches on the existing manholes resulting in a
- 48 monolithic liner having a minimum thickness of 1-inch. The mix(es)
- 49 shall be batches in accordance with manufacturer's recommendations.
- 50 Adding water to facilitate application at the nozzle will not be allowed.
- 51 b. Provide preapproved cementitious structural rehabilitation liner
- 52 material for use as a liner for manhole and to repair and reform

1 manhole benches and inverts. Use a pre-approved cementitious
2 structural manhole rehabilitation material which developed a minimum
3 compressive strength of 3000 psi at 14 days as, tested per the
4 provisions of ASTM C1140. Follow manufacturer's recommended
5 batching and mixing instructions.

6 D. Corrosion Resistant Manhole Materials

- 7 1. Manholes shall be applied with corrosion resistant liner only if stated on the
8 drawings. The materials shall be applied by an approved certified applicator and
9 must meet the manufacturer's recommendations.
10 2. See Orange County Utilities Standards and Construction Specifications Manual
11 *Section 3119* for description of approved liner systems.
12 3. The Contractor shall have manufacturer's representative present on site during
13 the installation of corrosion resistant barrier.

14 **PART 3 - EXECUTION**

15 **3.1 GENERAL**

- 16 A. Contractor to perform all work in strict accordance with all applicable OSHA, State, local, and
17 manufacturer's safety standards.
18 B. Traffic control per Florida Department of Transportation Manual on Traffic Control and Safe
19 Practices for Street and Highway Construction, Maintenance and Utility Operation, the Manual
20 of Uniform Traffic Control Devices (MUTCD), and *Section 3110: General Construction*
21 *Requirements* (3.03 Maintenance of Traffic and Closing of Streets) in Orange County Utilities
22 Standards and Construction Specifications Manual.
23 C. Temporary bypass pumping and flow control as specified in the current Orange County Utilities
24 Standards and Construction Specifications Manual *Section 3312: Collection System Bypass*.
25 D. Excavate in accordance with Section 31 21 33.
26 E. Install and operate necessary dewatering and surface water control measures in accordance with
27 Section 31 21 33.
28 F. Cleaning in accordance with Section 33 01 35 of these Specifications.

29 **3.2 MANHOLE WALL CLEANING**

- 30 A. The floor and interior walls of the manhole shall be thoroughly cleaned and made free of all
31 foreign materials including dirt, grit, roots, oils, grease, sludge, incompatible existing coatings,
32 waxes, form release, curing compounds, efflorescence, sealers, salts, or other contaminants
33 which may affect the performance and adhesion of the coating to the substrate.
34 1. High pressure water blasting with a minimum of 3500 psi shall be used to clean free all
35 foreign material within the manhole.
36 2. When grease and oil are present within the manhole, an approved detergent or muriatic acid
37 shall be used integrally with the high pressure cleaning water.
38 3. All materials resulting from the cleaning of the manhole shall be removed prior to
39 application of the cement based coating.
40 4. All loose or defective brick, grout, ledges, steps and protruding ledges shall be removed to
41 provide an even surface prior to application of coating.
42 B. Prevent any foreign material from entering the adjoining pipes. Remove droppings of foreign
43 and wall sealant materials before they harden on the bottom of the manhole.
44 C. No separate pay shall be made for this item. Include cost for sealing in the unit price for
45 manhole liner.
46 D. Manufacturer's representative shall be available at all times on site to answer questions and
47 approve manhole preparation work prior to lining.

1 **3.3 MANHOLE WALL SEALING**

- 2 A. Seal active leaks in the manhole structure by using a blend of cement powder or hydraulic
3 cement.
- 4 B. Remove loose or defective wall material. Wipe or brush surface clean prior to the application of
5 hydraulic cements.
- 6 C. Repair wide cracks, holes, or disintegrated mortar with quickset mortars. Follow manufacturer's
7 application procedures.
- 8 D. After all active leaks have been stopped, clean and prepare walls for application of selected liner
9 material.
- 10 E. Prevent any foreign material from entering the adjoining pipes. Remove droppings of foreign
11 and wall sealant materials before they harden on the bottom of the manhole.
- 12 F. Strictly follow product manufacturer's published technical specifications and recommendations
13 for surface preparation, application and proportioning.

14 **3.4 CEMENTITIOUS LINER**

- 15 A. Apply cementitious liner to a thickness of 1-inch using a steel trowel to provide a smooth, even
16 surface. Finish and cure concrete as specified in Section 03 09 00.
- 17 B. Cementitious liner material may be applied using spray application methods. Use steel trowel to
18 provide a smooth, even surface before final set.
- 19 C. No application shall be made to frozen surfaces or if freezing is expected to occur within the
20 manhole for 24 hours after application. If ambient temperatures are in excess of 95° F,
21 precautions shall be taken to keep the mix temperature at time of application below 90° F.
- 22 D. Follow manufacturer's recommended cure time before being subjected to active flow.

23 **3.5 CORROSION RESISTANT LINER**

- 24 A. The corrosion resistant barrier shall be spray applied as per the manufacturer's recommendation
25 and shall have an average minimum finished thickness of 80 mils if applied in conjunction with
26 cementitious liner.
- 27 B. Where corrosion resistant barrier is applied directly to manhole wall, upon cleaning and surface
28 preparation, the average minimum finished thickness shall be 125 mils ± 5 mils maximum at all
29 locations measured.
- 30 C. The Contractor shall have manufacturer's representative present on site at all times during the
31 installation of corrosion resistant barrier.
- 32 D. The Contractor shall make provisions in his unit price bid for each structure to create and
33 maintain dry conditions for the corrosion resistant liner application and subsequent curing as per
34 manufacturer's recommendations.

35 **3.6 MANHOLE BENCHES/INVERTS**

- 36 A. Remove obstructions and loose materials from benches prior to shaping the invert. Form a
37 smooth, U-shaped invert having a minimum depth of one-half pipe diameter and channel it
38 across the floor of the manhole using a quickset mortar. Control flow to allow sufficient setting
39 time for material used.
- 40 B. Make finished benches smooth and without defects which would allow for accumulation of
41 debris.

42 **3.7 INSPECTION**

- 43 A. After manhole wall sealing or manhole rehabilitation has been completed, visually inspect the
44 manhole in the presence of County. Check for cleanliness and elimination of active leaks.

- 1 B. At completion of manhole rehabilitation assist Engineer in verifying installation of minimum
2 coating thickness of concrete liner. Test several points on the manhole wall. Repair verification
3 points prior to final acceptance for payment.
- 4 C. During application of corrosion resistant liner, a wet film thickness gauge, meeting ASTM
5 D4414, shall be used to take at least one measurement per lineal foot of wall height.
6 Measurements shall be taken, documented and attested by the Contractor for submission to the
7 Owner.
- 8 D. See Orange County Utilities Standards and Construction Specifications Manual Section 3119
9 (PART 3) for additional information.

10 **3.8 ACCPETANCE**

- 11 A. Test all rehabilitated manholes using the vacuum test method, following manufacturer's
12 recommendations for proper and safe procedures.
- 13 B. If the manhole fails the vacuum test, the Contractor shall perform additional repairs and repeat
14 the test procedures until satisfactory results are obtained.
- 15 C. After the coating product(s) have set in accordance with manufacturer instructions, all surfaces
16 shall be inspected for holidays with high-voltage holiday detection equipment. Reference
17 NACE RPO 188-99 for performing holiday detection. All detected holidays shall be marked and
18 repaired by abrading the coating surface with grit disk paper or other hand tooling method.
19 After abrading and cleaning, additional coating can be hand applied to the repair area. All
20 touch-up/repair procedures shall follow the coating manufacturer's recommendations.
21 Documentation on areas tested, results and repairs made shall be provided to County by
22 Contractor.
- 23 D. Visual inspection shall be made by the Project Engineer and/or Owner. Any deficiencies in the
24 finished coating shall be marked and repaired according to the procedures submitted.

25 **3.9 WARRANTY**

- 26 A. The Contractor shall guarantee his work for a warranty period of one (1) year from the date of
27 acceptance. If, at anytime during the warranty period, any leakage, cracking, loss of bond, or
28 other discontinuity is identified, the Contractor shall make repairs at no additional cost to the
29 County.
- 30 B. Furnish an extended warranty for manhole rehabilitation materials from the Contractor and liner
31 manufacturer for a total of five (5) years from date of final completion.

32 **3.10 CLEAN UP**

- 33 A. Following inspection, the Contractor shall clean up the entire project area. All material and
34 debris, not incorporated into the permanent installation, shall be disposed off-site by the
35 Contractor.

36 **END OF SECTION**

1 **SECTION 33 01 98**
2 CURED-IN-PLACE PIPE (CIPP) LINING OF EXISTING PIPING

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

- 5 A. Section Includes:
- 6 1. Cured-in-place-pipe (CIPP) materials and properties
 - 7 2. Sewer rehabilitation by the inversion, pull-through, or other approved method of a
8 thermoset, resin-impregnated, felt/fabric, flexible tube into an existing sewer pipe and cured
9 into a rigid pipe using specifically designed and controlled hydrostatic pressure system.
 - 10 3. Re-establishment of existing service lateral connections along CIPP.
- 11 B. Related Sections include but are not necessarily limited to:
- 12 1. Division 1 - General Requirements.
 - 13 2. Section 31 21 33 – Trenching, Backfilling, and Compacting for Utilities
 - 14 3. Section 33 01 13 – Sanitary Sewer
 - 15 4. Section 33 01 31 – Televising of Sanitary Sewer Systems
 - 16 5. Section 33 01 99 – Cured-In-Place Pipe (CIPP) for Lateral Renewal

17 **1.2 QUALITY ASSURANCE**

- 18 A. Referenced Standards:
- 19 1. ASTM International (ASTM):
 - 20 a. C581, Standard Practice for Determining Chemical Resistance of Thermosetting Resins
21 Used in Glass-Fiber-Reinforced Structures Intended for Liquid Service
 - 22 b. C1107, Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
 - 23 c. D543, Standard Practices for Evaluating Resistance of Plastics to Chemical Reagents
 - 24 d. D638, Test Method for Tensile Properties of Plastics
 - 25 e. D790, Test Method for Flexural Properties of Un-reinforced and Reinforced Plastics
26 and Electrical Insulation Material
 - 27 f. D1222, Determining Dimensions of Thermoplastic Pipe and Fittings
 - 28 g. D2837, Obtaining Hydrostatic Design Basis for Thermo plastic Pipe Materials
 - 29 h. D5813, Standard Specification for Cured-in-Place Thermosetting Resin Sewer Piping
30 Systems
 - 31 i. F1216-98, Rehabilitation of Existing Pipelines and Conduits by Inversion and Curing of
32 a Resin Impregnated Tube
 - 33 j. F1743-96, Rehabilitation of Existing Pipelines and Conduits by Pulled-in-Place
34 Installation of Cured-in-Place Thermo Setting Resin Pipe
 - 35 k. F2990, Test Method for Tensile, Compressive and Flexural Creep and Creep-rupture of
36 Plastics
 - 37 2. Latest version of the Orange County Utilities Standards and Construction Specifications
38 Manual.

39 **1.3 SUBMITTALS**

- 40 A. Qualifications:
- 41 1. Manufacturer's Certificate of Compliance certifying compliance with the applicable
42 specifications and standards, a minimum of 500,000 linear feet of liner installed in U.S.
 - 43 2. Contractor's individual certification of actual documented installations of proposed material
44 liner of 500,000 linear feet in the U.S. including references.
- 45 B. Shop Drawings:
- 46 1. See Section 01 33 00 for requirements for the mechanics and administration of the submittal
47 process.
 - 48 2. Equipment from the list of approved manufacturers is not excluded from the shop drawing
49 submittal requirement.

- 1 3. Product technical data:
- 2 a. Acknowledgement that products submitted meet the requirements of the standards
- 3 referenced.
- 4 b. License or certificate verifying manufacturers/licensor approval of installer.
- 5 c. Resin curing process including cool-down and removal of the recirculation water,
- 6 calibration hose, or other materials or equipment used while curing the resin.
- 7 d. If wet-out is to be on site, provide drawings of how resin tanker will be located for each set
- 8 up and a plan for assuring no leakage or spillage of resin to the environment.
- 9 4. Product data and manufacturer's instructions for polyester resin and catalyst system. CIPP
- 10 System Data shall include at minimum the flexural modulus and strength, resin type,
- 11 material, and specifications.
- 12 5. Information on maximum allowable tensile stress for the tube versus the expected tensile
- 13 stress on the tube during the lining process.
- 14 6. Provide the minimum pressure required to hold the tube tight against the existing pipe and the
- 15 maximum allowable pressure so as not to damage the tube. Provide the expected pressure
- 16 range during lining operation.
- 17 7. Submit literature and material safety data sheet (MSDS) on any lubricants to be used to reduce
- 18 friction during inversion, including how the lubricant will be applied.
- 19 8. Provide manufacturer's recommended temperature of the water for curing the liner and their
- 20 recommended curing duration.
- 21 9. Manufacturer's Resin Data Test Results and Certification of Applicability of Resin
- 22 10. Resin Enhancer Manufacturer's Data and Bond Enhancer Manufacturer's Data.
- 23 11. Detail information on any needed excavations or modifications made to the sewer to allow
- 24 work to proceed. Provide details on sewer and road base and surface restoration.
- 25 12. Certification of the flow surface membrane coating compatibility with the felt and resin system
- 26 used.
- 27 13. Manufacturer's data on proposed waterstop material and installation procedure.
- 28 14. All test results.
- 29 C. **After award of contract, CONTRACTOR shall not order material until field verification of**
- 30 **all pipe sizes that are to be lined are performed and final design calculations are approved**
- 31 **by the ENGINEER/COUNTY.**
- 32 D. Contractor to submit procedures and materials for service renewal including time and duration of
- 33 service unavailability. Refer to Section 33 01 99.
- 34 E. Warranty
- 35 1. Furnish and extended warranty for liner material from the Contractor and liner manufacturer
- 36 for a total of five (5) years from date of Final Completion.
- 37 2. Furnish a one (1) year warranty for work done by Contractor from the date of acceptance. If
- 38 at anytime during this period any leakage, cracking, loss of bond, or other discontinuity is
- 39 identified the Contractor shall make repairs acceptable at no additional cost to the County.
- 40 F. Calculations
- 41 1. Data, measurements, assumptions and calculations for sizing liners shall be signed and
- 42 sealed by professional engineer registered in the state of Florida and certified by the
- 43 manufacturer as to the compliance of his materials to the values used in the calculations.
- 44 G. Video
- 45 1. Both a pre-lining and post-lining digital data video shall be submitted for review and
- 46 approval. The digital data video shall be clearly and properly labeled. A digital data video
- 47 and suitable log shall be prepared by the Contractor during the Work and provided for
- 48 review
- 49 H. Traffic control plan shall be submitted prior to beginning any work.
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1 **1.4 STORAGE AND DELIVERY**

- 2 A. The Contractor shall be responsible for the delivery, storage and handling of all materials for
3 CIPP, and end connection sealing material in accordance with the written requirements of the
4 manufacturer.
- 5 B. Contractor shall exercise adequate care during transportation, handling and installation to ensure
6 the CIPP material is not torn, cut, or otherwise damaged. If any part or parts of the CIPP
7 material becomes torn, cut or otherwise damaged before or during insertion, it shall be repaired
8 or replaced at the Contractor's expense in accordance with the manufacturer's recommendations
9 and approval by the County before proceeding further.

10 **1.5 DEFINITIONS**

- 11 A. CIPP segment: CIPP reach installed in a single operation between the CIPP tube insertion point
12 and the CIPP tube termination point.

13 **PART 2 - PRODUCTS**

14 **2.1 GENERAL**

- 15 A. All materials furnished for this work shall be in accordance with the "Orange County
16 Utilities Appendix D, List of Approved Products" as appended to these specifications
17 unless otherwise noted. All products not listed in Appendix D shall be subject to the
18 County's approval.
- 19 B. Cured-in-Place Pipe:
- 20 1. The Contractor shall be responsible for control of all material and process
21 variables to provide a finished CIPP possessing the minimum properties
22 specified in ASTM F1216 and required herein.
- 23 2. CIPP resin and fabric system meeting the requirements of ASTM F1216.
- 24 3. Connection liner must be compatible with the CIPP system used in the pipe. If
25 non-compatible liner is used, cured CIPP shall be brushed to remove top layer of
26 plastic to ensure bond with connection liner.
- 27 4. Component Properties:
- 28 a. Fabric Tubing:
- 29 1) The fabric tube shall be free from tears, holes, cuts, foreign
30 materials and other surface defects.
- 31 2) The fabric tube material shall be designed for use in gravity
32 sanitary sewers and shall be in strict conformance with all
33 applicable sections of ASTM F1216. The tube should be
34 fabricated to a size that, when installed, will tightly fit the
35 internal circumference and length of the original sewer pipe.
36 Allowance should be made for circumferential stretching
37 during the installation and shrinkage of resin.
- 38 b. Resins:
- 39 1) The resin used shall be compatible with the CIPP system used,
40 and designed for use in gravity sewers. The resin shall be a
41 general purpose, unsaturated polyester and catalyst system
42 compatible with the CIPP system that provides the cured
43 physical strengths and properties specified herein.
- 44 2) Resins shall be tinted for adequate visibility suitable for
45 internal inspection and provide positive indication of adequate
46 liner wet-out.
- 47 5. Chemical Resistance: The cured pipe shall be resistant to a variety of chemical
48 effluents as described in ASTM D543 and withstand internal exposure to
49 domestic sewage having a pH range of 5 to 11 and temperature up to 150° F.
- 50 6. Cured CIPP Properties: The physical properties of the cured CIPP shall have
51 minimum initial test values as defined in Table 1 of ASTM F1216 and

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supplemented below for polyester resin. Properties for the polyester or any other enhanced resins shall be substantiated with third party test data.

- a. Tensile strength: 4,000 psi per ASTM D638
- b. Flexural strength: 5,000 psi per ASTM D790
- c. Flexural modulus: 400,000 psi per ASTM D790
- d. 50-year flexural creep modulus: 150,000 psi per ASTM D2990

7. Dimensions:

- a. The Contractor shall make allowances in determining the felt tube length and circumference for stretch during installation and shrinkage during curing and aging. The minimum length shall be that which continuously spans the distance from the center of the inlet manhole to the center of the outlet manhole. The Contractor shall verify the lengths in the field before the liner tube is cut and impregnated. Individual installation runs may include one or more manhole-to-manhole sections as authorized by the Engineer or County.
- b. The actual diameter of the existing pipes may be larger than the approximate nominal inside diameter due to corrosion of the concrete. It is the Contractor's responsibility to determine the required diameter of the liner.
- c. The nominal CIPP thickness shall be at least the calculated design thickness, per ASTM F1216, except where fabric layers overlap, in which case it may be in excess of this value.
- d. The wall thickness of the felt tube shall be ordered to the next standard 1.5 mm incremental thickness above the minimum calculated design thickness.
- e. Unless otherwise specified to provide for excess resin migration, the gap thickness of the wetting out equipment shall be sized to allow an excess of 5 to 10 percent resin to pass during impregnation.

8. Design Criteria:

- a. The liner shall be designed in accordance with the procedures of ASTM F1216, as appropriate. All material properties used in design calculations shall be long-term (time-corrected) values.
- b. The Contractor shall calculate and submit to the Engineer for review the required minimum thickness for the CIPP to be installed in each pipe reach based on the pipeline information shown on the project Drawings, pre-construction internal inspection data, actual field conditions or assumptions, and the CIPP manufacturer's specifications.
- c. The following parameters shall be assumed for the liner design:
 - 1) Minimum service life of 50 years
 - 2) Fully deteriorated host pipe.
 - 3) Safety factor of 2.0.
 - 4) Maximum lining enhancement factor = 7
 - 5) Modulus of Soil Reaction, $E' = 1000$ psi.
 - 6) Unit weight of soil = 120 pcf
 - 7) Minimum ovality = 2%
 - 8) AASHTO H-20 live loading
 - 9) 50% long-term modulus reduction factor
 - 10) Hydrostatic load at 100% of depth to invert

9. CIPP End Seal: Use epoxy cement compatible with liner for end seal. Coat all concrete surfaces.

10. Gap Filler Materials: Type V, non-shrink, non-metallic grout conforming to ASTM C1107 as filler material for gaps between manhole liners and the CIPP, to be covered entirely by epoxy sealant or manhole liner. Ensure that the fluidity of the grout at the maximum water content is at least equal to a flowable mixture as defined in ASTM C827.

1 **PART 3 - EXECUTION**

2 **3.1 GENERAL**

- 3 A. Contractor to conduct operations in accordance with applicable OSHA, State, local, and
4 manufacturer's standards including those safety requirements involving work on an elevated
5 platform and entry into a confined space. Contractor to make suitable precautions to eliminate
6 hazards to personnel near construction activities when pressurized air is being used.
- 7 B. Prior to initiation any work it is the responsibility of the Contractor to notify all residents that
8 could be affected by the lining process. This notification shall consist of written information and
9 verbal communication that outlines the CIPP process and timing of the project. The written
10 information shall be delivered to each home or business at least 48 hours prior to start of
11 insertion, and at minimum shall describe the Work, schedule, how it affects the home/business,
12 and contact persons for any questions.
- 13 C. The Contractor shall provide water and sewer to affected property owners in the event of service
14 interruption, at no additional cost to the County.
- 15 D. Traffic control per Florida Department of Transportation Manual on Traffic Control and Safe
16 Practices for Street and Highway Construction, Maintenance and Utility Operation, the Manual
17 of Uniform Traffic Control Devices (MUTCD), and *Section 3110: General Construction*
18 *Requirements* (3.03 Maintenance of Traffic and Closing of Streets) in the current Orange County
19 Utilities Standards and Construction Specifications Manual.
- 20 E. Temporary bypass pumping and flow control as specified in the current Orange County Utilities
21 Standards and Construction Specifications Manual Section 3312: Collection System Bypass.
- 22 F. Preparation of existing sewers for installation and curing of CIPP. This includes:
23 1. Removal of all internal debris and cleaning the existing sewer line in accordance with the
24 recommendations of the liner manufacturer prior to installation.
25 2. Any modifications to the existing maintenance holes for access to existing sewers.
26 3. Repairing any necessary offset or dropped joints, crushed or collapsed pipe, protruding
27 service connections, or voids that will prevent or hinder CIPP installation.
28 4. Sealing all leaks and infiltration that will prevent the liner from curing properly.
- 29 G. See Section 33 01 35 for detailed cleaning of sewer pipelines
- 30 H. If an obstruction exists that cannot be removed by conventional sewer cleaning equipment the
31 County shall be notified immediately.
- 32 I. The County shall inspect the prepared pipe for cleanliness and smoothness before the Contractor
33 is authorized to proceed with pipe lining operations.
- 34 J. Prior to beginning insertion of the liner bag, the Contractor shall inspect the cleaned sewer line
35 by use of closed-circuit T.V. cameras, per Section 33 01 31, and shall confirm to his own
36 satisfaction that the lines are adequately cleaned. Insertion of the bag by the Contractor shall
37 serve as evidence of his acceptance of the condition of the piping and the suitability of the liner
38 insertion within the host pipe. Failure of the liner system due to inadequately cleaned host pipes
39 shall be repaired by the Contractor at no cost to the County.

40 **3.2 INSTALLATION**

- 41 A. General
42 1. Cured-in-place pipe (CIPP) shall be manufactured and installed in accordance with the CIPP
43 manufacturer's recommended procedures and one of the following: ASTM F1216 or
44 ASTM F1743. The CIPP liner shall be designed in accordance with ASTM F1216.
45 2. The liner shall be installed via an inversion process or other process that has been approved
46 by the County.
47 3. Prior to installation the Contractor shall provide the County with a Work plan that includes
48 but is not limited to:
49 a. Storage and handling of lining prior to installation

- 1 b. Liner preparation
- 2 c. Liner installation
- 3 d. Temperature and pressure requirements for inverting and setting the liner
- 4 e. Curing and cool down procedures
- 5 f. End seals and service connections
- 6 g. Methods to avoid liner stoppage due to conflict and friction at manhole and pipe
- 7 entrance
- 8 h. Methods to deal with liner stoppage due to snagging within pipe
- 9 i. Method for reconnecting sewer laterals

10 B. CIPP

- 11 1. Impregnate tube prior to installation. County shall be advised of time and location of
- 12 vacuum impregnation with resin (wet-out) and shall be allowed to witness the procedure.
- 13 On-site wet-out shall be permitted subject to the following requirements:
- 14 a. On-site wet-out shall be conducted within a suitable structure (large enough to house
- 15 the wet-out operation. If necessary, the structure shall have sidewalls and be heated or
- 16 cooled to maintain the temperature range required for this operation.
- 17 b. The structure shall be constructed of light-colored, opaque materials, to minimize heat
- 18 generation within the structure.
- 19 c. The on-site wet-out shall use the same type of equipment, procedures, and quality control
- 20 as required by ASTM and as normally conducted at the manufacturer's factory wet-out
- 21 facility.
- 22 d. Contractor shall develop and carry out a plan to assure no leakage or spillage of resin to the
- 23 environment.
- 24 2. Prior to installation of CIPP, the Contractor shall affix a pliable bentonite/plastic waterstop
- 25 system to the interior circumference of the existing sewer at the inlet and outlet of each
- 26 maintenance hole and as otherwise directed by the County. Install two rings of waterstop
- 27 material at both the inlet and outlet of each maintenance hole. The waterstop material shall
- 28 be attached to the interior wall of the sewer with the use of an adhesive supplied by the
- 29 waterstop manufacturer. The waterstop system shall provide a tight seal.
- 30 3. The Contractor shall provide suitable temperature gauges and monitors so that the resin curing
- 31 process can be monitored by the County.
- 32 4. Insert impregnated tube through maintenance hole by means of an inversion process or the pull-
- 33 through method. Use lubricant as necessary.
- 34 a. Calibration Hose Inversion System (F1743)
- 35 1) The wet-out tube shall be pulled into place using a power winch. The saturated
- 36 tube shall be pulled through an existing maintenance hole or other approved access
- 37 to fully extend it to the next designated maintenance hole or termination point.
- 38 2) The calibration hose shall be inserted into the vertical inversion standpipe and
- 39 attached at the lower end of the inversion standpipe so that a leak proof seal is
- 40 created. The resin-impregnated tube should also be attached to the standpipe so
- 41 that the calibration hose can invert into the center of the resin-impregnated tube.
- 42 Apply hydrostatic head sufficient to cause the calibration hose to invert through the
- 43 entire length of tube and hold the resin-impregnated tube tight to the pipe wall,
- 44 producing dimples at side connections and services. Care should be taken not to
- 45 overstress the felt fiber.
- 46 b. Wet-Out Tube Inversion System (F1216)
- 47 1) The impregnated tube shall be inserted into the vertical inversion standpipe and
- 48 attached to the lower end of the inversion standpipe so that a leak proof seal is
- 49 created. Apply hydrostatic head sufficient to cause the resin-impregnated tube to
- 50 invert to termination point and hold the tube tight to the pipe wall, producing
- 51 dimples at side connections and services. Care should be taken to not overstress the
- 52 felt fiber.

- 1 5. Provide a suitable heat source and water circulation equipment. Use specifically designed
2 and controlled hydrostatic pressures to cure impregnated tube into a rigid pipe. Determine
3 required temperature based on resin catalyst employed. Curing with pressurized steam
4 creates additional safety concerns with regard to high temperatures, quick burn times,
5 potential blow offs, etcetera. Contractors shall take additional precautions to ensure the
6 safety of everyone nearby curing mechanisms.
- 7 6. Monitor the temperature of ingoing and outgoing water supply with a gauge placed inside the
8 impregnated felt tube of the pipe invert level and the pipe invert of the remote maintenance
9 hole, and use to determine the temperatures during cure.
 - 10 a. Water temperature in the line shall be as recommended by the resin manufacturer.
 - 11 b. Initial cure shall be deemed completed when exposed portions of the pipe are hard and
12 sound and the remote temperature sensor indicates that the temperature is of a magnitude
13 to complete pipe curing.
 - 14 c. The cure period shall be of a duration recommended by the resin manufacturer during
15 which time the recirculation of the hot water and cycling of the heat exchanger to maintain
16 the temperature continues.
- 17 7. Cool the hardened pipe liner to a temperature below 100 degrees Fahrenheit before relieving
18 static head in the inversion stand pipe or calibration hose. Cool down may be accomplished
19 by the introduction of cool water into the inversion stand pipe to replace water drained from
20 a small hole in the downstream end of the CIPP. Release static head slowly to avoid
21 development of a vacuum that may damage newly installed CIPP.
- 22 8. Finished liner shall be continuous over the length of the inversion run and be free from visual
23 defects, including but not necessarily limited to foreign inclusions, dry spots, pinholes, and
24 delamination. Defects shall be corrected by the Contractor. Methods of repair shall be proposed
25 by the Contractor and submitted to the County for review and approval.
- 26 9. Wrinkles in the finished pipe, other than at pipe bends, which cause a deformity of 1/2-inch or
27 more and do not follow the surface of the cleaned pipe wall parallel to the pipe flow line are
28 unacceptable and shall be removed and repaired by the Contractor at the Contractor's expense.
29 Wrinkles in the finished liner pipe that reduce the structural stability of the pipe are
30 unacceptable. If a void between the wrinkle and the pipe exists, the Contractor shall repair and
31 replace the section of pipe at the Contractor's expense. Methods of repair shall be proposed by
32 the Contractor and submitted to the County for review and approval.
- 33 10. Each active service lateral connection shall be opened after the CIPP has cooled and cured,
34 using a recording television camera and robotic internal cutting device, or other method
35 approved by the County.
 - 36 a. The service laterals shall be reconnected to full capacity.
 - 37 b. If infiltration is observed at the service lateral connection and CIPP after it has been
38 fully reopened, the Contractor shall report the location of infiltration to the County.
- 39 11. A tight seal shall be achieved at the ends of the CIPP. Apply a seal consisting of a resin
40 mixture compatible with the CIPP.
- 41 12. Any existing maintenance hole or access structure removed or modified for CIPP installation
42 shall be reconstructed in conformance with County standards.
- 43 13. Equipment, techniques, and methods may vary with CIPP manufacturer. Contractor shall make
44 submittals providing information on installation methods and details, including information
45 regarding proposed methods that deviate from those indicated herein.
- 46 14. The final, in-place, CIPP shall be impermeable to water and wastewater, provide corrosion
47 resistance, and have an optimum friction factor for sewer flow.
- 48 15. Final cleanup and site restoration at each work site shall be completed within 30 days following
49 the CIPP installation.

50 3.3 QUALITY CONTROL TESTING

- 51 A. Conduct an internal CCTV inspection of completed work per Section 33 01 31 Televising Sanitary
52 Sewer Systems.

1 **3.4 SAMPLES**

- 2 A. A set of four (4) test samples shall be collected by the Contractor from each CIPP segment
3 selected by the County. The samples shall be taken in the presence of the County. Testing
4 sample set/testing frequency: minimum of one set of test samples per every 2,500 lineal feet per
5 CIPP diameter or as directed by the County. Should any test fail additional sets of test samples
6 will be collected and tested at the discretion of the County.
- 7 B. Thickness samples shall be cored coupons taken from within the pipe. Two additional thickness
8 samples shall be collected at each location where the CIPP thickness is scheduled to change within a
9 CIPP segment. Repair method for sample area shall be proposed by the Contractor and submitted to
10 the County for review and approval. Sample area shall be immediately repaired following sample
11 removal.
- 12 C. Flatplate and thickness samples for testing will be individually labeled and logged to record the
13 following:
14 1. Project number and title
15 2. Sample number
16 3. Segment number of line as noted on plans, and location (station and clock position)
17 4. Date and time sample taken
18 5. Name of contractor
19 6. Date, location, and by whom tested
20 7. Results of test
- 21 D. Samples shall be numbered as follows:
22 1. Sample #/A: Flat plate sample (2 samples per CIPP segment)
23 2. Sample #/B: Thickness test (2 cores per CIPP segment)
24 3. Additional samples will be lettered consecutively after "B".
25
- 26 E. Updated copies of the log shall be submitted to the County within 10 days after each section is
27 complete.

28 **3.5 TESTING**

- 29 A. Delamination testing (ASTM F1216 or F1743, and ASTM D903) shall be required for all types
30 of resin-impregnated CIPP, for each nonhomogeneous layer of representative field sample.
- 31 B. Physical Properties Tests
32 1. At the end of each segment to be lined, the CIPP shall be run between two release-agent
33 coated, smooth surface, aluminum plates of sufficient size to obtain two cured samples, each
34 6" x 16" in size.
35 a. The edges of the sample shall be sealed with polymer suitable for protecting the edges
36 from chemical intrusion. The CIPP material shall be sealed in a heavy duty plastic
37 envelope within the aluminum plate molds and cured with the CIPP which the samples
38 represent.
39 b. The two 6" x 16" samples shall be tested for modulus of elasticity and flexural strength
40 in accordance with ASTM D790. The test results shall meet or exceed the values used
41 for design.
- 42 C. Thickness Tests:
43 1. Two cores, each two inches in diameter, shall be taken for each CIPP segment. The
44 Contractor shall drill the cores from the lower half of the host pipe, below the springline.
45 The CIPP material shall be removed from the host pipe core sample and tested for thickness,
46 deducting any liner film thickness.
47 2. Three thickness measurements shall be taken from each sample. The resulting six
48 measurements will be averaged. The average thickness shall be equal to or greater than the
49 required design thickness as approved by the County.
- 50 D. Leakage Test: In accordance with ASTM F1216.

1 E. Failure to Meet Test Requirements:

- 2 1. A CIPP where test results do not meet the design requirements, exhibits delamination, or
3 fails leakage tests shall be brought into compliance by either removal and replacement of
4 the CIPP; addition of a second CIPP, after acceptable preparation of the in-place CIPP
5 interior surface; or by another method subject to approval by the County.
6 2. Alternatively, at the sole discretion of the County, the payment due to the Contractor for
7 furnishing and installing the CIPP which failed to meet test requirements shall be reduced in
8 proportion to (a) the deficiency in thickness and (b) the total installed length of CIPP in which
9 the deficiency occurs.

10 **3.6 ACCEPTANCE**

- 11 A. The finished lining shall be continuous over the entire length of the sewer line and be as free as
12 commercially practical from visual defects such as foreign inclusions, dry spots, pinholes, and
13 delamination. The lining shall be homogeneous, impervious, and free of any leakage from the
14 surrounding ground to the inside of the lined pipe. The CIPP shall not inhibit the post video
15 televising of the mainline or the service lateral pipes.
16 B. During the warranty period, any defects which will affect the integrity or strength of the liner,
17 collect solids, or reduce hydraulic flow capabilities of the product shall be repaired at the
18 Contractor's expense in a manner mutually agreed upon by the County and the Contractor.
19 C. The liner shall be continuous and free of all visual and material defects except those resulting
20 from pre-lined conditions (such conditions shall be brought to the attention of the County prior
21 to lining). There shall be no damage, deflection, holes, delaminating, uncured resin or other
22 visual defects in the liner. The liner surface shall be smooth and free of waviness throughout the
23 pipe. No visible leakage through the liner or at manhole or service lateral connections will be
24 allowed. Any defects located during the inspection shall be corrected by the Contractor to
25 conform to the requirements of the specifications and to the satisfaction of the County. The
26 Contractor shall not reactivate any section of lined sewer pipe until authorized to do so by the
27 County

28 **3.7 CLEAN UP**

- 29 A. After the installation work has been completed and all testing acceptable, the Contractor shall
30 cleanup the entire project area. The Contractor shall dispose of all excess material and debris
31 not incorporated into the permanent installation. The work area shall be left in a condition equal
32 to or better than prior condition.

33 **3.8 WARRANTY**

- 34 A. The Contractor shall guarantee his work for a warranty period of one (1) year from the date of
35 acceptance. If, at anytime during the warranty period, any leakage, cracking, loss of bond, or
36 other discontinuity is identified, the Contractor shall make repairs acceptable and at no
37 additional cost to the County.
38 B. The County shall conduct the warranty television inspection within one year after the date of
39 acceptance. Any defective sections of liner located during the inspection shall be promptly
40 repaired or replaced by the Contractor as directed by the County. In the event that a liner is
41 found to be leaking during the inspection, the Contractor shall be required to promptly replace it
42 with a new section of pipe or liner or, if approved by the County, to eliminate the leak(s) by
43 other means of repair.

44
45 **END OF SECTION**

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SECTION 33 01 99
CURED-IN-PLACE PIPE (CIPP) FOR LATERAL RENEWAL

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Renewal of existing sanitary sewer laterals by installation of a resin impregnated flexible felt tube into the existing lateral line utilizing a vertical inversion standpipe and hydrostatic head, pulled in place, or other approved method and curing by circulating hot water or other approved means to produce a hard, impermeable pipe.
- A. Related Sections include but are not necessarily limited to:
 - 1. Division 1 - General Requirements.
 - 2. Section 31 21 33 – Trenching, Backfilling, and Compacting for Utilities
 - 3. Section 33 01 13 – Sanitary Sewer
 - 4. Section 33 01 31 – Televising of Sanitary Sewer Systems
 - 5. Section 33 01 98 – Cured-In-Place Pipe (CIPP) for Existing Piping

1.02 REFERENCES

- A. Codes, Specifications, and Standards referred to by number or title shall form a part of this specification to the extent required by the references thereto. Latest revisions shall apply, unless otherwise shown or specified. Only County approved products shall be installed.
 - 1. ASTM F1216-98, Rehabilitation of Existing Pipelines and Conduits by Inversion and Curing of a Resin-impregnated Tube
 - 2. ASTM F1743-96, Rehabilitation of Existing Pipelines and Conduits by Pulled- in-Place Installation of Cured-in-Place Thermo Setting Resin Pipe
 - 3. ASTM D543, Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents
 - 4. ASTM D5813, Standard Specification for Cured-In-Place Thermosetting Resin Sewer Piping Systems

1.03 RESPONSIBILITY FOR OVERFLOWS AND SPILLS

- A. It shall be the responsibility of the Contractor to schedule and perform his work so as to result in no overflows or spills of sewage or combined sewage from the system. If sewage flows are such that they interfere with the Contractor's ability to perform work, the Contractor shall be responsible for scheduling his work during low flow periods or provide bypass pumping. Bypass pumping shall be provided only with the specific written approval of the designated Engineer.
- B. In the event of overflows caused by the Contractor's work activities, the Contractor shall immediately take appropriate action to contain and stop the overflow, clean up the spillage, disinfect the area affected by the spill, and notify County in a timely manner.
- C. Contractor will indemnify and hold harmless the County and Engineer for any fines or third-party claims for personal or property damage arising out of a spill or overflow that is fully or partially the responsibility of the Contractor. Should fines subsequently be imposed as a result of any overflow for which the Contractor is fully or partially responsible, the Contractor shall pay all such fines and all of the County's and Engineer's legal, engineering, and administrative costs in defending such fines and claims associated with the overflow.

1.04 SUBMITTALS

- A. Submit the following:
 - 1. Certified copies of test reports of factory tests required by the applicable standards and this Section.

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2. Manufacturer's installation instructions and procedures.
 3. Contractor's procedures and materials for service renewal including time and duration of sewer service unavailability for each service. Include all public outreach activities as well as copies of all printed material.
 4. Data, measurements, assumptions and calculations for sizing liners, signed and sealed by a professional engineer registered in the state of Florida and certified by the manufacturer as to the compliance of his materials to the values used in the calculations.
 5. Sampling procedures and locations for obtaining representative samples of the finished liner.
 6. Both a pre-lining and post-lining digital data video shall be submitted for review and approval. The digital data video shall be clearly and properly labeled. A digital data video and suitable log shall be prepared by the Contractor during the Work and provided for review.
- B. A final certificate of compliance with this specification shall be provided by the manufacturer for all lining material furnished. Tests for compliance by an independent laboratory shall be made according to the applicable ASTM specification and the manufacturer's quality control program.
- C. Furnish an extended warranty for liner materials from the Contractor and liner manufacturer for a total of five (5) years from date of Final Completion.
1. The Contractor shall guarantee his work for a warranty period of one (1) year from the date of acceptance. If, at anytime during the warranty period, any leakage, cracking, loss of bond, or other discontinuity is identified, the Contractor shall make repairs acceptable and at no additional cost to the County.
- D. As part of the design calculation submittal, the liner manufacturer shall submit a tabulation of time versus temperature. This tabulation shall show the lengths of time that exposed portions of the liner will endure without self-initiated cure or other deterioration beginning. This tabulation shall be at five degree Fahrenheit increments ranging from 70 to 100 degrees Fahrenheit. The manufacturer shall also submit his analysis of the progressive effects of such "pre-cure" on the insertion and cured properties of the liner. This information shall be submitted in a timely fashion prior to construction. The minimum liner thickness is for materials with characteristics as shown. Bidders with materials with other characteristics must supply complete information in their bids of the values as listed for ascertaining minimum thickness.
- E. Approval of New Products:
1. A product will be considered for approval if a minimum of 1,500 laterals of the proposed pipe liner has been installed in sewer collection pipes in the United States. An acceptable third party testing facility shall perform all tests. These tests shall be based on the following standards:
 - a. Materials tested shall be identical to those proposed for installation from samples of materials in final resting place after the trauma of installation and/or reforming of the product. Testing shall be in accordance with applicable ASTM standards. Laboratory samples will not be acceptable;
 - b. Short-term tests can be extrapolated using actual short-term test data and applicable ASTM standards for plastic pipe.
 - c. An independent third party qualified in these testing procedures shall validate all test data (whether theoretically extrapolated or actual).
 - d. The manufacturer shall submit all ASTM standards for installation and/or materials on their product. Foreign standards will not be accepted.
 - e. Manufacturer shall submit an engineering design guide and quality control procedures for product manufacturer and for product installation, including detailed inspection, testing of physical properties, retention of product samples, taking of and testing of field samples.
 - f. Manufacturer shall submit statements as to country of manufacturer of all major components used to produce the final installed product.
 - g. Manufacturer and installer shall submit evidence of installer training, testing and/or certification of being trained to install the product by the manufacturer.

- 1 h. Manufacturer shall provide detailed installation procedures, detailed procedures for
2 reconstruction of existing laterals and for new service connections. This shall include an
3 itemized list of the tasks to be performed and the estimated times for each task. Manufacturer
4 shall include the estimated number of excavations, if any, required for each line segment to be
5 installed.
- 6 i. Manufacturer shall submit detailed procedures of repairing its own product in the event of
7 failure.
- 8 j. In the event change in the product (material) occurred within the past three years, the
9 manufacturer shall disclose in writing, the date each change occurred, what change occurred,
10 the reason for the change, the number of lineal feet installed within each change period, the
11 last date since a change occurred, and the number of lineal feet installed since the last change.
12 The County reserves the right to require additional detailed information on the product
13 (material) in the event changes have occurred.

14 **1.05 DELIVERY, STORAGE, AND HANDLING**

- 15 A. The Contractor shall be responsible for the delivery, storage, and handling of products. No products
16 shall be shipped to the job site without the approval of the County.
- 17 B. Keep products safe from damage. Promptly remove damaged products from the job site. Replace
18 damaged products with undamaged products.

19 **PART 2 - PRODUCTS**

20 **2.01 GENERAL**

- 21 A. All materials furnished for this work shall be in accordance with the "Orange County Utilities
22 Appendix D, List of Approved Products" as appended to these specifications unless otherwise noted.
- 23 B. The system proposed (materials, methods, workmanship) must be proven through previous successful
24 installations to an extent and nature satisfactory to the County that is consistent with the size of the
25 project being proposed. Since CIPP is intended to have a minimum 50-year design life, only products
26 deemed to have this performance will be accepted.
- 27 C. The finished pipe liner in place shall be fabricated from materials which when complete are chemically
28 resistant to and will withstand internal exposure to domestic sewage having a pH range of 5 to 11 and
29 temperatures up to 150°F.
- 30 D. Unless specified otherwise, the liner shall be structurally designed for a minimum service life of 50
31 years; fully deteriorated host pipe/direct bury condition; prism loading; soil loading of 120 pcf; factor
32 of safety of 2.0; 2% ovality; maximum deflection of 5%; soil modulus of 1000 psi; lining enhancement
33 factor of 7 maximum; H-20 live loading; 50% long-term modulus reduction factor; and hydrostatic
34 load at 100% of depth to invert.
- 35 E. All CIPP lining products shall comply with the latest versions of ASTM D5813 and ASTM F1216 or
36 ASTM F1743, including appendices.

37 **2.02 STRUCTURAL REQUIREMENTS**

- 38 A. Each CIPP shall be designed to withstand internal and/or external loads as dictated by the site and pipe
39 conditions. When not specified by the County in the contract documents, the design thickness of the
40 CIPP shall be arrived at using standard engineering methodology as found in ASTM F1216. In no case
41 shall the finished thickness of the cured liner be less than three millimeters. The long-term modulus
42 shall not exceed 50 percent of the short-term value for the resin system and shall be verifiable through
43 testing. The thickness calculations, signed and sealed by a professional engineer registered in the State
44 of Florida, shall be submitted to the County prior to CIPP installation.

1
2 When multiple layers are present, the layers of the finished CIPP shall be uniformly bonded. It shall
3 not be possible to separate any two layers with a probe or point of a knife blade so that the layers
4 separate cleanly or such that the knife blade moves freely between the layers. If separation of the
5 layers occurs during testing of the field samples, new samples will be cut from the work. Any
6 reoccurrence may be cause for rejection of the work. The cured liner shall meet TABLE 02727 - 1
7 Minimum Physical Properties.
8
9
10

11 **TABLE 02727- 1**
12 **Minimum Physical Properties**

Property	ASTM Test Method	Minimum Value
Flexural Strength	D790	4,500 psi
Flexural Modulus (Initial)	D790	250,000 psi
Flexural Modulus (50-year)	D790	125,000 psi

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14
15 **2.03 MATERIALS**

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17 **A. Lateral Liner Tube**

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1. The tube shall consist of one or more layers of a flexible needled felt or an equivalent non-woven or woven material, or a combination of non-woven and woven materials, capable of carrying resin, withstanding installation pressures and curing temperatures. The tube should be compatible with the resin system to be used on this project. The material should be able to stretch to fit irregular pipe sections and negotiate bends. Projected changes in groundwater level; temperature and other loading factors shall cause no significant changes in the service characteristics or service life of the sewer pipe liner.
 2. The liner shall be polyester fiber felt tubing saturated with an epoxy vinyl ester or polyester resin prior to insertion which when cured, will be chemically resistant to reagents as defined in ASTM F1216, ASTM F1743, and ASTM D543.
 3. The tube should be fabricated under controlled conditions to a size that, when installed, will tightly fit the internal circumference and the length of the original conduit. Allowances should be made for the longitudinal and circumferential stretching that occurs during placement of the tube. Maximum stretching allowances shall be as defined in ASTM F1216 or ASTM F1743. The Contractor shall verify the lengths in the field before cutting the liner to length.
 4. The tube shall be uniform in thickness and when subjected to the installation pressures shall meet or exceed the designed wall thickness.
 5. Any plastic film applied to the tube on what will become the interior wall of the finished CIPP shall be compatible with the resin system used, translucent enough that the resin is clearly visible, and shall be firmly bonded to the felt material.
 6. At time of manufacture, each lot of liner shall be inspected and certified to be free of defects. The tube shall be marked for distance at regular intervals along its entire length, not to exceed five feet. Such markings shall also include the Manufacturer's name or identifying symbol.
 7. Liners may be made of single or multiple layer construction where any layer must not be less than 1.5 mm thick. A suitable mechanical strengthener membrane or strip may be placed in between layers where required to control longitudinal stretching.
 8. The sewer service lateral liner shall be a single piece liner that lines the lateral and be a contiguous part of the mainline.

1 B. Resin Components

- 2 1. The resin system shall be a corrosion resistant epoxy vinyl ester or polyester that when properly
3 cured within the tube composite meets the minimum requirements given herein or those that are to
4 be utilized in the design of the CIPP for this project. The catalyst system may be accelerated to
5 promote curing.
6 2. The resin used shall not contain non-strength enhancing fillers.
7 3. The Contractor shall submit the resin characteristics, including filler identification, to the County
8 and Engineer for approval prior to lining activities.
9

10 C. Interface Seal

- 11 1. The interface seal shall be a polyester impregnated, corrosion resistant fiberglass insert. The seal
12 shall be of one-piece construction and shall be designed such that when expanded shall tightly fit
13 both T and Y connections at the interface between the mainline and lateral sewer. The seal shall
14 extend into the mainline a minimum of four inches (4") and shall provide a minimum of a three-
15 inch (3") overlap inside the mainline pipe and be of equal thickness as the lateral liner at the
16 interface.
17 2. An epoxy sealant rated for piping applications shall be applied to the seal to ensure that any gap
18 between the interface of the mainline pipe and the CIPP lateral lining is air and watertight.
19

20 **PART 3 - EXECUTION**

21 **3.01 GENERAL**

- 22 A. It is the intent of this specification to provide for the renewal of sewer service laterals by the
23 installation of a resin-impregnated flexible tube and a mainline/lateral connection seal. The tube is
24 either inverted or pulled into the original service lateral through a newly installed cleanout and then
25 expanded to fit tightly against the lateral by the use of water or air pressure. The resin system shall
26 then be cured by elevating the temperature of the fluid (water/air) used for the inflation to a sufficient
27 enough level for the initiators in the resin to effect a reaction. The finished pipe shall be such that
28 when the thermosetting resin cures, the total wall thickness shall be a homogeneous and monolithic felt
29 and resin composite matrix that will be chemically resistant to withstand internal exposure to domestic
30 sewage.
31
32 B. Should it be determined after lateral lining that an interface seal is required or if directed by the
33 contract documents, the system shall then be provided with a seal at the mainline/lateral interface. The
34 finished seal shall be such that when the thermosetting resin cures, the seal bonds to the lateral liner
35 forming an airtight and watertight interface and will provide chemical resistance to domestic sewage.
36
37 C. The Contractor shall deliver the liner to the site and provide all equipment required to insert the liner
38 into the host pipe and cure it in place. The Contractor shall designate a location where the tube will be
39 vacuum impregnated prior to installation. If requested by the County, the Contractor shall notify the
40 County at least 72 hours prior to wet out to allow the County to observe the materials and wet out
41 procedure. All procedures to prepare the liner for installation will be in strict accordance with the
42 manufacturer's recommendations. Any material not properly prepared shall be rejected and replaced
43 with acceptable materials at the Contractor's expense.
44
45 D. The liner shall be impregnated with resin and stored according with manufacturer recommendations.
46
47
48

49 **3.02 PREPARATION**

- 50 A. The sewer mainline which the lateral is feeding shall have been accepted for use prior to
51 B. The Contractor shall notify all residents affected by this construction at least 24 hours prior to any
52 service disruption affecting their service connection. The mainline sewer shall be kept in operation
53 during the lateral lining operations. Customers shall be notified by the Contractor with door hanger
54 advising the customers of when the work will begin, expected date of completion, the type of work and
55 contact person for any questions.
56

- 1
2 C. The Contractor shall install a cleanout at the respective right-of-way line, property line or easement
3 line prior to or immediately after the lining procedure. Cleanouts shall be installed per the County's
4 requirements as shown on the drawings and specified herein.
5
6 D. The Contractor shall perform cleaning of the lateral and affected areas of the existing sewer line in
7 accordance with the liner manufacturer's recommendations, videotaping, and inspection prior to
8 installation of the CIPP lateral. The Contractor, when required, shall remove all internal debris out of
9 the pipeline that will interfere with the installation of the CIPP. The Contractor shall provide an
10 appropriate dumpster for all debris removed during the cleaning operations. Precautions shall be taken
11 by the Contractor to ensure that no damage or flooding of public or private property is caused by the
12 cleaning operation.
13
14 E. It shall be the responsibility of the Contractor to notify the County of line obstructions, offset joints, or
15 collapsed pipe that will prevent the insertion of the tube or significantly reduce the capacity of the
16 lateral. The County with input from the Contractor, shall determine the method of pipe repair required
17 and shall address these concerns on a case-by-case basis.
18
19 F. Protruding laterals or services shall be trimmed flush with the inside of the main sewer wall prior to
20 lining. Trimming shall not cause damage to the lateral or service beyond the inside face of the main
21 sewer.
22

23 **3.03 BYPASS PUMPING**

- 24
25 A. When the flow demand on the lateral dictates that bypass pumping is required, the Contractor shall
26 furnish all necessary pumping equipment, conduit, etc. to adequately and safely divert sewage flow
27 around the work in a manner approved by the County and as set forth in the Orange County Utilities
28 Standards and Construction Specifications Manual. No flow shall be discharged on the surface, into
29 storm sewers, in ditches, or in waterways.
30
31 B. During a bypass operation, the pump shall be manned continuously; the Contractor shall maintain the
32 pump and bypass equipment; and shall be responsible for any damages to public or private property
33 due to the malfunction of same
34

35 **3.04 TELEVISION INSPECTION**

- 36
37 A. The Contractor shall provide television equipment capable of properly documenting the conditions as
38 found within the lateral. The camera equipment shall be capable of launching into the full length of
39 each lateral and providing an accurate picture of the lateral to be lined. Lighting for the camera shall
40 illuminate the entire periphery of the lateral.
41
42 B. The Contractor shall launch into each lateral connection on both pre and post inspections.
43

44 **3.05 CIPP LINER INSTALLATION**

- 45 A. The following installation procedures shall be adhered to unless otherwise approved by the County.
46 1. The Contractor shall carry out his operations in strict accordance with all OSHA, State, local, and
47 manufacturer's safety requirements. Particular attention is drawn to those safety requirements
48 involving entering confined spaces. Curing with pressurized steam creates additional safety concerns
49 with regard to high temperatures, quick burn times, potential blow offs, etcetera. Contractors shall
50 take additional precautions to insure the safety of everyone nearby curing mechanisms.
51 2. It shall be the responsibility of the Contractor to remove all internal debris and clean the existing
52 sewer line and/or lateral in accordance with the recommendations of the liner manufacturer prior to
53 installation of the liner.

- 1 a. Preparation of the interior surface shall be accomplished by a thorough high pressure water-jet
2 cleaning. The pipe shall be left free of all loose sand, rock, or other deleterious materials. Any
3 roots in the pipe shall be either removed or cut off flush with the interior.
4 b. If conditions such as broken pipe and major blockages are found that will prevent proper
5 cleaning or where additional damage would result if cleaning is attempted or continued, the
6 Contractor shall notify the County immediately. The County will determine what course of
7 action will be taken to complete the project.
8 c. Precautions shall be taken by the Contractor to ensure that no damage or flooding of public or
9 private property is caused by the cleaning operation.
10 d. The County shall inspect the prepared pipe for cleanliness and smoothness before the Contractor
11 is authorized to proceed with pipe lining operations.
12
13 B. The CIPP shall be installed in accordance with the practices given in ASTM F1216 (for direct inversion
14 installations) or ASTM F1743 (for pulled-in-place installations). The quantity of resin used for the
15 tube's impregnation shall be sufficient to fill the volume of air voids in the tube with additional
16 allowances being made for polymerization shrinkage and the loss of any resin through cracks and
17 irregularities in the original pipe wall. A vacuum impregnation process shall be used in conjunction
18 with a roller system to achieve a uniform distribution of the resin throughout the tube.
19
20 C. The resin-impregnated tube shall be installed into the host pipe by methods approved by the
21 manufacturer and proven through previous successful installations. The insertion method shall not
22 cause abrasion or scuffing of the tube. Hydrostatic or air pressure shall be used to inflate the tube and
23 mold it against the walls of the host pipe. There will be no use of sewage in place of clean water for
24 insertion of the tube, or for the curing of the liner.
25
26 D. The tube is to be installed at a rate sufficient to cause controlled installation of the tube into the conduit.
27 The tube shall be installed in such a manner that no damage is done to the tube.
28
29 E. Should there be any difference between the referenced requirements, the more stringent shall govern.
30 Prior to construction, the Contractor shall submit to the County such written information which shall
31 include, but not be limited to, storage and handling of lateral liner before installation, preparing liner
32 for installation, installing the liner in the sewer lateral, temperature and pressure requirements for
33 inverting and setting the liner, curing and cool down procedures, end seals and service restore.
34
35 F. The Contractor shall have on hand at all times, for use by his personnel and the County, a digital
36 thermometer or other means of accurately and quickly checking the temperature of exposed portions of
37 the liner.
38

39 3.06 CURING

- 40
41 A. After inversion is completed the Contractor shall supply suitable heat source and recirculation
42 equipment. The equipment shall be capable of delivering heat throughout the section to uniformly raise
43 the temperature above the temperature required to affect a cure of the resin. This temperature shall be
44 determined by the resin/catalyst system employed.
45
46 B. The heat source shall be fitted with suitable monitors to gauge the temperature of the incoming and
47 outgoing heat supply. Thermocouples shall be placed between the tube and the host pipe to determine
48 the liner temperature during cure. The water or air temperature in the pipe during the cure period shall
49 be as recommended by the resin manufacturer.
50
51 C. Initial cure shall be deemed to be completed when inspection of the exposed portions of cured pipe
52 appear to be hard and sound and the remote temperature sensor indicates that the temperature is of a
53 magnitude to realize an exotherm. The cure period shall be of a duration recommended by the resin
54 manufacturer, as modified for the installation process, during which time the recirculation and cycling
55 of the heat exchanger to maintain the temperature continues. The heat source shall be shut down
56 during the post cure.

- 1
2 D. Temperatures shall be monitored and recorded throughout the installation process to ensure that each
3 phase of the process is achieved at the manufacturer's recommended temperature levels. Copies of
4 these records shall be given to the County at the completion of each installation.
5

6 **3.07 COOL DOWN**
7

- 8 A. Cool down may be accomplished by the introduction of cool water or air into the installation standpipe
9 to replace the initial heating agent. The Contractor shall cool the hardened pipe to a temperature below
10 100° F before relieving the pressure in the pressure apparatus. A minimum period of post-cure shall be
11 maintained under a static head to provide a minimum hoop tension on the tube felt. Care shall be taken
12 in the release of the static head so that a vacuum will not be developed.
13

14 **3.08 FINISH**
15

- 16 A. The finished lining shall be continuous over the entire length of the lateral and be as free as
17 commercially practical from visual defects such as foreign inclusions, dry spots, pinholes, and
18 delamination. The lining shall be homogeneous, impervious, and free of any leakage from the
19 surrounding ground to the inside of the lined pipe. The lateral CIPP shall not inhibit the post video
20 televising of the mainline or the service lateral pipes.
21
22 B. During the warranty period, any defects which will affect the integrity or strength of the liner, collect
23 solids, or reduce hydraulic flow capabilities of the product shall be repaired at the Contractor's expense
24 in a manner mutually agreed upon by the County and the Contractor.
25
26 C. The liner shall be continuous and free of all visual and material defects except those resulting from pre-
27 lined conditions (such conditions shall be brought to the attention of the County prior to lining). There
28 shall be no damage, deflection, holes, delaminating, uncured resin or other visual defects in the liner.
29 The liner surface shall be smooth and free of waviness throughout the pipe. No visible leakage
30 through the liner or at manhole or service lateral connections will be allowed. Any defects located
31 during the inspection shall be corrected by the Contractor to conform to the requirements of the
32 specifications and to the satisfaction of the County. The Contractor shall not reactivate any section of
33 lined sewer pipe until authorized to do so by the County.
34

35 **3.09 INTERFACE SEAL INSTALLATION**
36

- 37 A. The interface seal between the mainline and the lateral shall be installed by remote device from inside
38 of the sewer main. The seal shall be properly expanded with air pressure to tightly fit the lateral
39 interface.
40
41 B. Seal installation shall be installed in strict accordance with the manufacturer's written specifications,
42 recommendations and these specifications.
43
44 C. The finished seal shall be continuous over the entire interface and be as free as commercially practical
45 from visual defects such as foreign inclusions, dry spots and pinholes. The seal shall be homogeneous,
46 impervious, and free of any leakage from the surrounding ground to the inside of the lined pipe. The
47 interface seal shall not inhibit the post video televising of the mainline or the service lateral pipes.
48
49 D. During the warranty period, any defects which will affect the integrity or strength of the seal, collect
50 solids, or reduce hydraulic flow capabilities of the product shall be repaired at the Contractor's expense
51 in a manner mutually agreed upon by the County and the Contractor.
52

53 **3.10 CLEANUP**
54

- 55 A. After the installation work has been completed and all testing acceptable, the Contractor shall cleanup
56 the entire project area. The Contractor shall dispose of all excess material and debris not incorporated

1 into the permanent installation. The work area shall be left in a condition equal to or better than prior
2 condition.
3

4 **3.11 WARRANTY INSPECTION**
5

6 A. The County shall conduct a warranty television inspection within one year after the date of acceptance.
7 Any defective sections of liner located during the inspection shall be promptly repaired or replaced by
8 the Contractor as directed by the County. In the event that a lateral liner or interface seal is found to be
9 leaking during the inspection, the Contractor shall be required to promptly replace it with a new section
10 of pipe or liner or, if approved by the County, to eliminate the leak(s) by other means of repair.
11

12 **END OF SECTION**

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1 **SECTION 33 05 01**
2 **UTILITY PIPE AND FITTINGS**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

- 5 A. Section Includes:
6 1. Utility piping systems.
- 7 B. Related Sections include but are not necessarily limited to:
8 1. Division 1 – General Requirements
9 2. Section 31 21 33 - Trenching, Backfilling, and Compaction for Utilities.
10 3. Section 09 91 00 - Painting for Utilities.
11 4. Section 40 05 23 - Valves: Basic Requirements.

12 **1.2 QUALITY ASSURANCE**

- 13 A. Referenced Standards:
14 1. American Association of State Highway and Transportation Officials (AASHTO):
15 2. American Iron and Steel Institute (AISI).
16 3. American Society of Mechanical Engineers (ASME):
17 a. B16.3, Malleable Iron Threaded Fittings.
18 b. B16.5, Pipe Flanges and Flanged Fittings.
19 c. B16.9, Factory-Made Wrought Steel Butt-Welding Fittings.
20 d. B36.19, Stainless Steel Pipe.
21 e. B40.100, Pressure Gauges and Gauge Attachments.
22 4. ASTM International (ASTM):
23 a. A536, Standard Specification for Ductile Iron Castings.
24 b. A774, Standard Specification for As-Welded Wrought Austenitic Stainless Steel
25 Fittings for General Corrosive Service at Low and Moderate Temperatures.
26 c. A778, Standard Specification for Welded, Unannealed Austenitic Stainless Steel
27 Tubular Products.
28 d. C14, Standard Specification for Concrete Sewer, Storm Drain, and Culvert Pipe.
29 e. C76, Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer
30 Pipe.
31 f. C478, Standard Specification for Precast Reinforced Concrete Manhole Sections.
32 5. American Water Works Association (AWWA):
33 a. C606, Standard for Grooved and Shouldered Joints.
34 b. C651, Standard for Disinfecting Water Mains.
35 c. C800, Standard for Underground Service Line Valves and Fittings.
36 6. American Water Works Association/American National Standards Institute
37 (AWWA/ANSI):
38 a. C105/A21.5, Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems.
39 b. C110/A21.10, Standard for Ductile-Iron and Gray-Iron Fittings for Water.
40 c. C111/A21.11, Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and
41 Fittings.
42 d. C115/A21.15, Standard for Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron
43 Threaded Flanges.
44 e. C151/A21.51, Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water.
45 f. C153/A21.53, Standard for Ductile-Iron Compact Fittings for Water Service.
46 7. Latest version of the Orange County Utilities Standards and Construction Specifications
47 Manual.
- 48 B. Coordinate flange dimensions and drillings between piping, valves, and equipment.

1 **1.3 SUBMITTALS**

- 2 A. Shop Drawings:
- 3 1. See Section 01 33 00 for requirements for the mechanics and administration of the submittal
- 4 process.
- 5 2. Layout drawings:
- 6 a. Schedule of interconnections to existing piping and method of connection.
- 7 3. Product technical data including:
- 8 a. Acknowledgement that products submitted meet requirements of standards referenced.
- 9 b. Copies of manufacturer's written directions regarding material handling, delivery,
- 10 storage and installation.
- 11 c. Technical product data on gaskets, pipe, fittings, and other components. Indicate
- 12 maximum rated working pressure and test pressure for each item
- 13 B. Miscellaneous Submittals:
- 14 1. Pipeline Cleaning Plan identifying all steps required to clean the installed pipe.
- 15 2. Disinfection Plan for water lines
- 16 a. No disinfectant residual
- 17 b. Include method of disposal of all flush and highly chlorinated water and identify
- 18 neutralizing agent, if needed.
- 19 c. Disinfection plan that identifies the segments to be tested with isolation methods.
- 20 3. Qualifications of lab performing disinfection analysis on water systems.
- 21 4. Test reports:
- 22 a. Copies of pressure test results on all piping systems.
- 23 b. Disinfection test reports.
- 24 c. Notification of time and date of piping pressure tests.
- 25 5. CCTV Contractor.
- 26 6. As-built drawing(s) of all piping section(s) that Contractor requests for clearance must be
- 27 submitted and approved prior to submission of clearance request to local agency and/or
- 28 FDEP
- 29 C. Operation and Maintenance Manuals:
- 30 1. See Section 01 33 00 for requirements for:
- 31 a. The mechanics and administration of the submittal process
- 32 b. The content of Operation and Maintenance Manuals

33 **1.4 DELIVERY, STORAGE, AND HANDLING**

- 34 A. Protect pipe coating during handling using methods recommended by manufacturer.
- 35 1. Use of bare cables, chains, hooks, metal bars or narrow skids in contact with coated pipe is
- 36 not permitted.
- 37 B. Prevent damage to pipe during transit.
- 38 1. Pipe, specials, and fittings received at Project Site in damaged condition will not be
- 39 accepted.
- 40 C. Store rubber gaskets in cool, well ventilated place, and do not expose to direct rays of sun. Do
- 41 not allow contact with oils, fuels, petroleum, or solvents.
- 42 D. Store and support pipe securely to prevent accidental rolling and to avoid contact with mud,
- 43 water, or other deleterious materials.
- 44 E. Pipe shall be handled with proper equipment in a manner to prevent distortion or damage. Use of
- 45 hooks, chains, wire ropes, or clamps that could damage pipe, damage coating or lining, or kink
- 46 and bend pipe ends is not permitted.
- 47 F. Use heavy canvas, or nylon slings of suitable strength for lifting and supporting materials.

- 1 G. Lifting pipe during unloading or lifting into trench shall be done using two slings placed at
2 quarter point of pipe section. Pipe may be lifted using one sling near center of pipe, provided
3 pipe is guided to prevent uncontrolled swinging and no damage will result to pipe or harm to
4 workers. Slings shall bear uniformly against pipe.
- 5 H. Pipe and fittings shall not be stored on rocks or gravel, or other hard material that might damage
6 pipe. This includes storage area and along pipe trench.

7 **PART 2 - PRODUCTS**

8 **2.1 ACCEPTABLE MANUFACTURERS**

- 9 A. All materials furnished and/or specialty subcontractor(s) used for this work shall be in
10 accordance with the "Orange County Utilities Appendix D, List of Approved Products" as
11 appended to these specifications unless otherwise noted. All products not listed in Appendix D
12 shall be subject to the County's approval.
- 13 B. Submit request for substitution in accordance with Specification Section 01 25 13.
- 14 C. For water improvements, the acceptable piping materials are PVC, HDPE and DIP.
- 15 D. For wastewater improvements, the acceptable piping material is PVC.

16 **2.2 COMPONENTS AND ACCESSORIES**

- 17 A. Flanges, Flange Gaskets, and Bolting Material.
- 18 1. Flanges, bolting materials, and flange gaskets for steel flanges shall conform to
19 AWWA C207.
- 20 2. Flanges, bolting materials, and flange gaskets for ductile iron flanges shall conform to
21 AWWA C110 and AWWA C115.
- 22 3. Stainless steel bolting material shall conform to ASTM F593, Type 304 stainless steel,
23 Group 1, Condition SH1, 2, 3 or 4.
- 24 4. If the flanges are coated, provide two washers for each bolt on each side of the flange to
25 minimize damage to the coating as the nuts are tightened. Provide bolts of the proper length
26 to accommodate the washers.
- 27 B. Protective Coating and Lining:
- 28 1. Include pipe, fittings, and appurtenances where coatings, linings, paint, tests and other items
29 are specified.
- 30 2. Field paint pipe in accordance with Section 09 91 00.
- 31 C. Underground Warning Tape:
- 32 1. See Section 10 14 00.
- 33 D. Valves:
- 34 1. See Section 40 05 23.
- 35 E. Polyethylene encasement tape:
- 36 1. Chase (Chasekote 750).
- 37 2. Kendall (Polyken 900).
- 38 3. 3 M (Scotchrap 50).
- 39 4. Or approved equal.
- 40 F. Tapping Sleeve
- 41 1. Split body with test plug
- 42 a. Ductile iron body
- 43 b. Carbon steel per ASTM A283 with fusion bonded epoxy coating (12 mil average DFT)
- 44 1) Meets AWWA C-223
- 45 2. Outlet flange dimensions in accordance with ANSI B16.1, class 125/150

- 1 3. Gasket to conform to main line pipe, Nitrile (Buna-N), and NSF rated for contact with
- 2 potable water
- 3 4. All appurtenances to be Type 304 stainless steel with anti-galling coating
- 4 5. Provide joint restraint for all joints

5 **2.3 CCTV EQUIPMENT**

- 6 A. Provide the necessary CCTV equipment for inspecting the installed or rehabilitated gravity
- 7 mains in accordance with the "Orange County Utilities Appendix D, List of Approved Products"
- 8 as appended to these specifications unless otherwise noted.
- 9 1. All products not listed in Appendix D shall be subject to the County's approval.

10 **PART 3 - EXECUTION**

11 **3.1 GENERAL**

- 12 A. Notify Engineer at least 2 weeks prior to field fabrication of pipe or fittings.
- 13 B. Furnish feeler gauges of proper size, type, and shape for use during installation for each type of
- 14 pipe furnished.
- 15 C. Distributing Materials: Place materials along trench only as will be used each day, unless
- 16 otherwise approved by the County. Placement of materials shall not be hazardous to traffic or to
- 17 general public, obstruct access to adjacent property, or obstruct others working in area.
- 18 D. Water mains shall be staked at a minimum of 100 FT intervals with depths of cuts monitored.

19 **3.2 EXAMINATION**

- 20 A. Verify size, material, joint types, elevation, and horizontal location of existing pipeline to be
- 21 connected to new pipeline or new equipment.
- 22 B. Inspect size and location of structure penetrations to verify adequacy of wall pipes, sleeves, and
- 23 other openings.
- 24 C. Damaged Coatings and Linings: Repair using coating and lining materials in accordance with
- 25 manufacturer's instructions.

26 **3.3 PREPARATION OF TRENCH**

- 27 A. Prepare trench as specified in Section 31 21 33 Trenching, Backfilling, and Compaction for
- 28 Utilities.
- 29 B. Unless otherwise permitted by Engineer, maximum length of open trench shall not exceed 50
- 30 feet.

31 **3.4 EXTERIOR BURIED PIPING INSTALLATION**

- 32 A. Unless otherwise shown on the Drawings, provide a minimum of 3 FT earth cover over exterior
- 33 buried piping systems and appurtenances.
- 34 B. Install expansion devices as necessary to allow expansion and contraction movement.
- 35 C. Install individual pipe lengths in accordance with approved lay diagram. Misplaced pipe shall be
- 36 removed and replaced.
- 37 D. Inspect pipe and fittings before installation, clean ends thoroughly, remove foreign matter and
- 38 dirt from inside.
- 39 E. Laying Pipe in Trench:
 - 40 1. Excavate and backfill trench in accordance with Section 31 21 33.
 - 41 2. Keep trench dry until pipe laying, joining backfilling and compaction is completed.
 - 42 3. Exercise care when lowering pipe into trench to prevent twisting or damage to pipe.

- 1 4. Measure for grade at pipe invert, not at top of pipe.
- 2 5. Clean each pipe length thoroughly and inspect for compliance to Specifications.
- 3 6. Grade trench bottom and excavate for pipe bell and lay pipe on trench bottom.
- 4 7. Install gasket or joint material according to manufacturer's directions after joints have been
- 5 thoroughly cleaned and examined.
- 6 8. Prevent foreign material from entering pipe during placement.
- 7 9. Close and block open end of last laid pipe section when placement operations are not in
- 8 progress and at close of day's work.
- 9 10. In general, lay pipe upgrade with bell ends pointing in direction of laying.
- 10 11. With the exception of PVC, deflect pipe at joints for pipelines laid on a curve using
- 11 unsymmetrical closure of spigot into bell. If joint deflection of standard pipe lengths will not
- 12 accommodate horizontal or vertical curves in alignment, provide:
- 13 a. Shorter pipe lengths
- 14 b. Special mitered joints
- 15 c. Standard or special fabricated bends
- 16 12. Check gasket position with feeler gauge to assure proper seating.
- 17 13. After joint has been made, check pipe alignment and grade.
- 18 14. Place sufficient pipe zone material to secure pipe from movement before next joint is
- 19 installed.
- 20 15. Prevent uplift and floating of pipe prior to backfilling.
- 21 16. Except for first two (2) joints, before making final connections of joints, install two (2) full
- 22 sections of pipe with earth tamped along side of pipe or final with bedding material placed.
- 23 17. Lay pipe in only suitable weather with good trench conditions.
- 24 a. Never lay pipe in water except where approved by Engineer.
- 25 18. Seal open end of line with watertight plug if pipe laying stopped.
- 26 19. Remove water in trench before removal of plug.
- 27 20. Tolerances:
- 28 a. Deflection From Horizontal Line: Maximum 2 inches.
- 29 b. Deflection From Vertical Line: Maximum 1 inch.
- 30 c. Joint Deflection: Maximum of 75 percent of manufacturer's recommendation.
- 31 d. Horizontal position of pipe centerline on alignment around curves maximum variation
- 32 of 1 foot from position shown.
- 33 e. No joint deflection or pipe bending is allowed in PVC pipe. The maximum allowable
- 34 tolerance in the joint due to variances in installation is 0.75 degrees (3-inches per joint
- 35 per 20 ft stick of pipe). No bending tolerance in the pipe barrel shall be acceptable.
- 36 Alignment change shall be made only with sleeves or fittings.
- 37 21. Cover Over Top of Pipe: Minimum 3 feet, unless otherwise shown.
- 38 F. Lining Up Push-On Joint Piping:
- 39 1. Lay piping on route lines shown on Drawings.
- 40 2. Deflect from straight alignments or grades by vertical or horizontal curves or offsets.
- 41 3. Observe maximum allowable deflection values stated in manufacturer's written literature.
- 42 4. Provide special bends when specified or where required alignment exceeds allowable
- 43 deflections stipulated.
- 44 5. Install shorter lengths of pipe in such length and number that angular deflection of any joint,
- 45 as represented by specified maximum deflection, is not exceeded.
- 46 G. Flanged Joints:
- 47 1. Install perpendicular to pipe centerline.
- 48 2. Bolt Holes: Straddle vertical centerline, aligned with connecting equipment flanges or as
- 49 shown on Drawings.
- 50 3. Use torque-limiting wrenches to provide uniform bearing and proper bolt tightness.
- 51 a. Confirm with bolt manufacturers max torque that can be applied prior to reaching yield
- 52 strength of the bolt material.
- 53 b. Match the above with the max torque that can be applied to chosen gasket to determine
- 54 limiting applicable torque.

- 1 4. Flange Type: Use flat-faced flange when joining with flat-faced ductile or cast iron flange.
- 2 H. Couplings:
- 3 1. Install in accordance with manufacturer's written instructions.
- 4 2. Before coupling, clean pipe holdback area of oil, scale, rust, and dirt.
- 5 3. Do not remove pipe coating. If damaged, repair before joint is made.
- 6 4. Clean gaskets before installation.
- 7 5. If necessary, lubricate with gasket lubricant for installation on pipe ends.
- 8 6. Tighten coupling bolts progressively; drawing up bolts on opposite sides gradually until
- 9 bolts have uniform tightness.
- 10 I. Thrust Restrain:
- 11 1. Provide thrust restraints for preventing movement of piping caused by forces in or on buried
- 12 piping tees, wye branches, plugs, or bends.
- 13 2. Use restrained joint fittings as specified in individual piping specifications.
- 14 3. Thrust blocking is not allowed.
- 15 J. Install insulating components where dissimilar metals are joined together.

16 **3.5 CONNECTIONS WITH EXISTING PIPING**

- 17 A. Where connection between new work and existing work is made, use suitable and proper fittings
- 18 to suit conditions encountered.
- 19 B. Perform connections with existing piping at time and under conditions which will least interfere
- 20 with service to customers affected by such operation. Coordinate with County.
- 21 C. Undertake connections in fashion which will disturb system as little as possible.
- 22 D. Provide suitable equipment and facilities to dewater, drain, and dispose of liquid removed
- 23 without damage to adjacent property.
- 24 E. Where connections to existing systems necessitate employment of past installation methods not
- 25 currently part of trade practice, utilize necessary special piping components.
- 26 F. Where connection involves potable water systems, provide disinfection methods as described in
- 27 these Specifications.
- 28 G. Once tie-in to each existing system is initiated, continue work continuously until tie-in is made
- 29 and tested.

30 **3.6 LOCATION OF PUBLIC WATER SYSTEM MAINS**

- 31 A. Horizontal Minimum Separation:
- 32 1. New or relocated, underground water mains shall be laid to provide a horizontal distance of:
- 33 a. At least three feet between the outside of the water main and the outside of any existing
- 34 or proposed storm sewer, stormwater force main, or pipeline conveying reclaimed
- 35 water regulated under Part III of Chapter 62-610 F.A.C.
- 36 b. At least three feet, and preferably ten feet, between the outside of the water main and
- 37 the outside of any existing or proposed vacuum-type sanitary sewer.
- 38 c. At least six feet, and preferably ten feet, between the outside of the water main and the
- 39 outside of any existing or proposed gravity or pressure-type sanitary sewer, wastewater
- 40 force main, or pipeline conveying reclaimed water not regulated under Part III of
- 41 Chapter 62-610 F.A.C. The minimum horizontal distance between water mains and
- 42 gravity-type sanitary sewers shall be reduced to three feet where the bottom of the
- 43 water main is laid at least six inches above the top of the sewer.
- 44 d. At least ten feet between the outside of the water main and all parts of any existing or
- 45 proposed "on-site sewage treatment and disposal system".
- 46 B. Vertical Minimum Separation:
- 47 1. New or relocated, underground water mains crossing any existing or proposed:

- 1 a. Gravity or vacuum-type sanitary sewer or storm sewer shall be laid so the outside of the
2 water main is at least six inches, and preferably 12 inches, above or at least 12 inches
3 below the outside of the other pipeline. However, it is preferably to lay the water main
4 above the other pipeline.
- 5 b. Pressure-type sanitary sewer, wastewater or stormwater force main, or pipeline
6 conveying reclaimed water shall be laid so the outside of the water main is at least 12
7 inches above or below the outside of the other pipeline. However, it is preferable to lay
8 the water main above the other pipeline.
- 9 2. At the utility crossings, one full length of water main pipe shall be centered above or below
10 the other pipeline so the water main joints be as far as possible from the other pipeline.
11 Alternatively, at such crossings, the pipes shall be arranged so that all water main joints are
12 at least three feet from all joints in vacuum type sanitary sewers, storm sewers, stormwater
13 force mains, or pipelines conveying reclaimed water regulated under Part III of Chapter 62-
14 610 F.A.C., and at least six feet from all joints in gravity or pressure-type sanitary sewers,
15 wastewater force mains, or pipelines conveying reclaimed water not regulated under Part III
16 of Chapter 62-610 F.A.C.
- 17 C. Separation between Water Mains and Sanitary or Storm Sewer Manholes:
- 18 1. No water main shall pass through, or come into contact with, any part of a sanitary sewer
19 manhole.
- 20 2. Water mains shall not be constructed or altered to pass through, or come into contact with,
21 any part of a storm sewer manhole or inlet structure.

22 **3.7 CORROSION PROTECTION**

- 23 A. Buried Pipe: As specified in the individual specifications following this Section.
- 24 B. Notify Engineer at least 3 days prior to start of surface preparation, coating application, and
25 corrosion protection work.

26 **3.8 PLACEMENT OF PIPE LOCATING TAPE**

- 27 A. Place pipe locating tape in accordance with Section 10 14 00, Identification Devices.

28 **3.9 PLACEMENT OF ELECTRONIC MARKER BALLS**

- 29 A. Place electronic marker balls in accordance with Section 10 14 00, Identification Devices.

30 **3.10 PLACEMENT OF TRACER WIRE**

- 31 A. Place tracer wire in accordance with Section 10 14 00, Identification Devices.

32 **3.11 PIPE BEDDING AND ZONE MATERIAL**

- 33 A. Place pipe bedding and pipe zone material in accordance with Section 31 21 33, Trenching,
34 Backfilling, and Compaction for Utilities.

35 **3.12 FIELD QUALITY CONTROL**

- 36 A. Pipe Testing - General:
- 37 1. Isolate equipment which may be damaged by the specified pressure test conditions.
- 38 2. Perform pressure test using calibrated pressure gages and calibrated volumetric measuring
39 equipment to determine leakage rates.
- 40 a. Select each gage so that the specified test pressure falls within the upper half of the
41 gage's range.
- 42 b. Notify the Engineer/Owner 24 HRS prior to each test. Engineer/Owner shall be present
43 during pipe testing.
- 44 3. Completely assemble and test new piping systems prior to connection to existing pipe
45 systems.
- 46 4. Acknowledge satisfactory performance of tests and inspections in writing to Engineer prior
47 to final acceptance.

- 1 5. Bear the cost of all testing and inspecting, locating and remedying of leaks and any
2 necessary retesting and re-examination.

3 B. Pressure Testing: As specified.

4 **3.13 CLEANING AND DISINFECTION FOR WATER LINES**

5 A. General:

- 6 1. Conform to AWWA C651 for water pipes and pipelines, except as modified in these
7 Specifications.
8 2. Disinfect the water facilities installed or modified under this Project intended to hold,
9 transport, or otherwise contact potable water:
10 a. Pipelines: Disinfect new pipelines including new services to new meter boxes that
11 connect to existing pipelines up to point of connection.
12 b. Disinfect surfaces of materials that will connect to existing pipelines up to point of
13 connection.
14 c. Disinfect surfaces of materials that will contact finished water, both during and
15 following construction, using one of the methods described in AWWA C651. Disinfect
16 prior to contact with finished water. Take care to avoid recontamination following
17 disinfection.
18 3. Prior to application of disinfectants, clean pipelines of loose and suspended material
19 4. Allow fresh water and disinfectant solution to flow into pipe at a measured rate so chlorine-
20 water solution is at specified strength. Do not place concentrated liquid commercial
21 disinfectant in pipeline to be disinfected before it is filled with water.
22 5. The water facilities are to remain out of service until Owner receives clearance from local
23 regulatory agency and/or FDEP.
24 a. As-built drawing(s) of all section(s) requested must be submitted and approved prior to
25 submission of clearance request to local agency and/or FDEP.
26 b. Partial clearance may be obtained for sections of the project.

27 B. Cleaning of Water Piping:

- 28 1. Water from the existing distribution system used for filling, flushing and testing shall be
29 provided through a jumper connection, meter, and PRZ assembly.
30 a. Contractor shall provide all fittings and connections required for a complete assembly.
31 b. Contractor will also be required to remove the assembly when all testing and acceptable
32 bac-T tests are completed. Provide all fittings and plugs as required for the removal of
33 the assembly.
34 2. Fill pipeline and remove all air prior to flushing or disinfecting.
35 a. Slow fill the line(s) to allow for the removal of all air.
36 b. Pipe shall sit for at least 24 hours after fill is complete.
37 3. Before disinfecting clean all foreign matter from pipe in accordance with AWWA C651.
38 a. Flush at a velocity of at least 2.5 fps to remove all construction debris in pipeline(s).
39 1) Contractor responsible for metering all water used.
40 2) Contractor responsible for disposal of all flush water including, if necessary,
41 neutralizing any remaining residual disinfectant(s).
42 b. Pipeline(s) can be cleaned by use of a pipe swab specifically designed for cleaning.
43 1) Swab shall be of polypropylene material sized and designed to remove dirt, sand
44 and debris from the installed mains.
45 a) Minimum density is 2 pounds per cubic foot.
46 b) Provide with rear polyurethane drive seal.
47 2) Observe the material removed by the swab on each pass. Repeat the process until
48 the pipe has been cleaned to the satisfaction of the Owner/Engineer.
49 3) If swabbing access and egress points are not provided in the drawings, the
50 Contractor will be responsible for providing temporary access and egress points as
51 required.

- 1 4) Passage of the cleaning swabs through the pipelines shall be constantly monitored,
- 2 controlled and all swabs entered into the shall be individually marked and
- 3 identified so that each swab used can be accounted for at the end of the cleaning
- 4 process.
- 5 5) Locate and open all in-line valves for the piping to be cleaned.
- 6 6) At the exit point, Contactor shall be responsible for handling the debris removed
- 7 from the line, the water pushing the swab and collecting the swab. Contractor is
- 8 also responsible for disposal of all debris and water.
- 9 7) Only Owner's personnel shall operate the supply valve from the existing
- 10 distribution system.
- 11 8) Flushing shall continue until the swab is retrieved and the water runs clear for 5
- 12 minutes.
- 13 9) Contractor shall be responsible for supplying additional swabs of varying
- 14 diameters and/or densities as required to proper clean the newly installed pipelines.
- 15 10) Swabbing speed shall be between 2 and 5 feet per second.

16 C. Disinfection of Water Piping

- 17 1. Initial chlorine residual shall not be less than 25 mg/L free chlorine and not less than 10
- 18 mg/L free chlorine after allowing the chlorinated water to stand in the pipe for 24 hours.
- 19 a. Contractor shall be responsible for monitoring and documenting the residual.
- 20 2. If the continuous feed method of the slug method of disinfection, as described in AWWA
- 21 C651 is used, flush pipelines with potable water until clear of suspended solids and color.
- 22 Provide hoses, temporary pipes, ditches, and other conduits as needed to dispose of flushing
- 23 water without damage to adjacent properties.
- 24 3. Flush service connections and hydrants. Flush distribution lines prior to flushing hydrants
- 25 and service connections. Operate valves during flushing process at least twice during each
- 26 flush.
- 27 4. Disinfecting procedure: In accordance with AWWA C651, unless herein modified.

28 D. Disposal of Heavily Chlorinated Water:

- 29 1. Flush all heavily chlorinated water from the piping until the disinfectant residual is equal to
- 30 the surrounding area.
- 31 2. Do not allow flow into a waterway without neutralizing disinfectant residual.
- 32 3. See the appendix of AWWA C651 for acceptable neutralization methods.

33 E. Bacteriological Testing for Water Piping

- 34 1. Collection of bacteriological samples shall not be taken until all heavily chlorinated water
- 35 has been flushed from piping. The remaining residual shall be equal to that normally found
- 36 in the surrounding water system.
- 37 a. Coordinate activities to allow samples to be taken in accordance with this Specification.
- 38 b. Provide valves at sampling points at locations as shown on the Drawings or as directed
- 39 by County.
- 40 c. Provide access to sampling points.
- 41 2. After pipelines have been cleaned, disinfected, and refilled with potable water, Contractor
- 42 will take water samples and have them analyzed for conformance to bacterial limitations for
- 43 public drinking water supplied.
- 44 3. For acceptance, bacteriological tests for two consecutive days must be taken, tested, and
- 45 satisfactory results obtained.
- 46 4. Owner is responsible for performing bacteriological tests. If Contractor wishes to use a
- 47 private lab, the lab must be approved by the Owner and the Contractor is responsible for all
- 48 costs associated with using a third party laboratory.
- 49 5. Proper chain of custody procedures are to be followed and samples collected by certified
- 50 laboratory personnel only in the presence of the Owner.
- 51 6. If any samples required are bacterially positive, disinfecting procedures and bacteriological
- 52 testing shall be repeated until bacterial limits are met.

1 **3.14 WATER PIPE TESTING – PRESSURE LINES**

- 2 A. Hydrostatic tests shall be performed on all water mains and all services installed. Once the
- 3 hydrostatic test has been completed successfully, then a leakage test shall be performed.
- 4 B. The Contractor shall schedule each test with the County/Engineer. Each test shall be performed
- 5 on the day mutually agreed upon and in the presence of the County/Engineer.
- 6 C. The Contractor shall furnish all equipment, temporary piping, pumps, fittings, gauges, and
- 7 operating personnel necessary to conduct the tests. Water for testing may be obtained from the
- 8 County; however, the Contractor shall pay for all metered water used.
- 9 D. Mains may be tested in sections between valves when intermediary valves are present in the
- 10 main to be tested. Each section to be tested shall be complete, and thrust blocks/joint restraints
- 11 shall have been in place for not less than 10 days prior to performance of the tests. All restrained
- 12 joint pipe and fittings shall be completely backfilled to produce the required restraint prior to
- 13 performance of the tests.
- 14 E. Before applying the specified test pressure, all air shall be expelled from the pipe. If blow-offs
- 15 are not available, the Contractor shall make the necessary taps at points of highest elevation
- 16 before the test is made and plug the taps after the test has been completed.
- 17 F. Any exposed pipe, fittings, valves, and joints shall be carefully examined during the test. All
- 18 joints showing visible leaks shall be repaired. Any cracked or defective pipe, fittings, or valves
- 19 discovered as a result of the pressure test shall be removed and replaced by the Contractor with
- 20 sound material, and the test shall be repeated until satisfactory results are attained.
- 21 G. Testing shall be performed to current AWWA C-600 standard and the following requirements:
- 22 pressure tests on mains shall be conducted at a static pressure of one hundred fifty pounds per
- 23 square inch (150 psi) over a period of not less than two (2) hours. Test pressure shall not vary
- 24 by more than ±5 psi for the duration of the test for the test to be considered successful.
- 25 H. Allowable Leakage:
- 26 1. Leakage test to be performed after an acceptable pressure test.
- 27 2. Water: leakage may not exceed that amount determined by the following equation:

$$L = \frac{SD\sqrt{P}}{133,200}$$

- 28
- 29
- 30 Where: L = the allowable leakage in gallons/hour
- 31 S = the length of pipe tested in feet
- 32 D = the nominal pipe diameter in inches
- 33 P = the average test pressure in psi
- 34

- 35 3. Test Failure:
- 36 a. If the actual leakage exceeds the allowable, locate the leak and correct the work and
- 37 repeat the test.
- 38 b. If the integrity of the system is in question, the test may be extended to 6 hours.

39 **3.15 TESTING OF OTHER APPURTENANCES – WATER**

- 40 A. Test all other appurtenances after the connecting pipe lines have been accepted.
- 41 B. Tracer Wire
- 42 1. The locating wire shall be tested for continuous continuity along the entire length.
- 43 2. All visible locations will be check for conformity with the Contract Documents.
- 44 C. Fire Hydrants
- 45 1. Test for smooth operation.
- 46 2. During operation, inspect for leakage from any ports, joints or fittings in the assembly.
- 47 3. Determine that the hydrant has been painted in accordance with Owner’s requirements.

- 1 D. Valves and Valve Boxes
- 2 1. Valves shall be operated to verify smooth operation.
- 3 2. Valves shall be operated to verify correct opening and closing direction.
- 4 3. Valve boxes shall be inspected to ensure that all debris has been cleared, the operating nut is
- 5 centered, and installed with a collar.
- 6 4. The depth of the operating nut will be measured to confirm that a riser has been installed as
- 7 required.
- 8 E. Service Lines
- 9 1. Verify that all service lines have been installed properly, identified and free from all
- 10 conflicts.
- 11 2. The number, location and size shall be shown on the As-Built Drawings.
- 12 F. Blow-Off Valve Assemblies
- 13 1. Valves shall be operated to verify smooth operation and correct opening.
- 14 2. Verify that the installation is free of all obstructions.
- 15 G. Air Release Valves
- 16 1. Test to verify correct operation.
- 17 2. Verify that the installation is free of all obstructions.
- 18 3. Locate on As-Built Drawings.

19 **3.16 INSPECTION OF GRAVITY MAINS**

- 20 A. All gravity mains shall be inspected with CCTV for alignment, grade variation, separated pipe,
- 21 leaks, deflections, cracked, broken or defective pipe.
- 22 B. All mains shall be cleaned to remove debris and stains from the pipe prior to televising.
- 23 1. Flushing water or debris will not be allowed to enter downstream pump station wet wells.
- 24 2. Water is to be pumped from the sewer system during flushing to an acceptable discharge
- 25 location.
- 26 3. A visual inspection shall be made to determine that all obstructions are removed.
- 27 4. After inspecting, if any pipes are found to be dirty and/or stained shall be re-flushed and
- 28 clean before CCTV inspection. If necessary, swabbing may be required.
- 29 5. After cleaning is acceptable, the Contractor shall pass a mandrel through the pipe to confirm
- 30 ring deflection is less than five percent (5%). The base inside diameter shall be used to
- 31 determine mandrel size per ASTM D-3034.
- 32 6. The piping shall be backfilled in accordance with the Contract Documents to the subgrade
- 33 prior to CCTV inspection.
- 34 C. The procedures, data requirements and QA/QC procedures will be in accordance with County
- 35 Specifications Contract Manual Section 4310.

36 **3.17 TESTING OF GRAVITY MAINS**

- 37 A. All gravity mains shall be tested for leakage.
- 38 B. The Contractor shall be responsible for furnishing all necessary labor and equipment required to
- 39 conduct the required pressure testing.
- 40 C. Leakage test will be performed with low pressure air.
- 41 1. The section to be tested shall not exceed 400 lineal feet between adjacent manholes.
- 42 2. Leakage test shall be conducted in accordance with "Recommended Practice for Low
- 43 Pressure Air Testing of Installed Sewer Pipe" as published by the Uni-Bell PVC Pipe
- 44 Association.
- 45 3. The piping shall meet the latest UNI-B-6 Uni-Bell standard for gravity sewers with no
- 46 evidence of leaks in the pipe or connections.

47 **3.18 ACCEPTANCE OF GRAVITY MAINS**

- 48 A. The gravity main must pass both the inspection and leakage test prior to acceptance.

- 1 B. If any portion of the gravity main(s) fails, the Contractor shall present a repair and/or
2 replacement plan for acceptance prior to beginning any work.
- 3 1. Pressure grouting of the pipe or manhole is not an acceptable repair method.
- 4 C. The gravity mains are to remain out of service until Owner receives clearance from local
5 regulatory agency and/or FDEP.
- 6 1. As-built drawing(s) of all section(s) requested must be submitted and approved prior to
7 submission of clearance request to local agency and/or FDEP.
- 8 2. Partial clearance may be obtained for sections of the project.
- 9 D. Lateral work may not begin until the gravity mains are accepted and in service.

10 **3.19 TESTING OF OTHER APPURTENANCES – WASTEWATER**

- 11 A. Manholes
- 12 1. Leakage Test – There shall be no visible leakage through the walls or pipe connection(s).
- 13 2. Vacuum Test
- 14 a. All manholes shall meet the requirements of the vacuum test per the current “Standard
15 Test Method for Concrete Sewer Manholes by the Negative Air Pressure “Vacuum”
16 Test,” ASTM C1244 prior to acceptance.
- 17 b. Any manhole that fails the vacuum test or develops a leak during the one year warranty
18 period shall be rejected, removed and replaced with new manhole at no cost to the
19 Owner. No field repair is acceptable.
- 20 3. Inspection
- 21 a. All parts of the manhole, including the manufacturing, are subject to inspection and
22 approval by the Owner.
- 23 b. The inspections may be made at the manufacturing plant and/or at the site after
24 delivery.
- 25 c. All rejected materials shall be removed from the project site immediately.
- 26 d. If already installed, the rejected materials shall be removed immediately and replaced
27 with all new materials.
- 28 e. The sections shall be examined for compliance with ASTM C-478 and the approved
29 manufacturer’s drawings.
- 30 f. The installed manholes shall be inspected for proper filling and coating of the lifting
31 holes and proper installation of any liner, coating or shrink-wrap.

32 **3.20 LOCATION OF BURIED OBSTACLES**

- 33 A. Furnish exact location and description of buried utilities encountered.
- 34 B. Reference items to definitive reference point locations such as found property corners, entrances
35 to buildings, existing structure lines, fire hydrants and related fixed structures.
- 36 C. Include such information as location, elevation, coverage, supports and additional pertinent
37 information.
- 38 D. Incorporate information on Record Drawings. Refer to Section 01 77 00.

39 **END OF SECTION**

1 **SECTION 33 05 01.02**
2 **DUCTILE IRON PIPE AND FITTINGS**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

- 5 A. Section Includes:
6 1. Ductile iron piping, fittings, and appurtenances.
7 B. Related Sections include but are not necessarily limited to:
8 1. Division 1 - General Requirements.
9 2. Section 33 11 13 – Water Main Construction.

10 **1.2 QUALITY ASSURANCE**

- 11 A. Referenced Standards:
12 1. American Society of Mechanical Engineers (ASME):
13 a. B1.1, Unified Inch Screw Threads (UN and UNR Thread Form).
14 b. B16.1, Cast Iron Pipe Flanges and Flanged Fittings - Classes 25, 125 and 250.
15 2. ASTM International (ASTM):
16 a. B695, Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and
17 Steel.
18 3. American Water Works Association (AWWA):
19 a. C203, Standard for Coal-Tar Protective Coatings and Linings for Steel Water Pipelines
20 - Enamel and Tape - Hot Applied.
21 b. C606, Standard for Grooved and Shouldered Joints.
22 4. American Water Works Association/American National Standards Institute
23 (AWWA/ANSI):
24 a. C105/A21.5, Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems.
25 b. C110/A21.10, Standard for Ductile-Iron and Gray-Iron Fittings for Water.
26 c. C111/A21.11, Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and
27 Fittings.
28 d. C115/A21.15, Standard for Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron
29 Threaded Flanges.
30 e. C150/A21.50, Standard for Thickness Design of Ductile-Iron Pipe.
31 f. C151/A21.51, Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water.
32 g. C153/A21.53, Standard for Ductile-Iron Compact Fittings for Water Service.
33 5. Latest version of the Orange County Utilities Standards and Construction Specifications
34 Manual.

35 **1.3 SUBMITTALS**

- 36 A. Shop Drawings:
37 1. See Section 01 33 00 for requirements for the mechanics and administration of the submittal
38 process.
39 2. See Section 33 11 13.
40 3. Certification of factory hydrostatic testing.
41 4. If mechanical coupling system is used, submit piping, fittings, and appurtenant items which
42 will be utilized to meet system requirements.

1 **PART 2 - PRODUCTS**

2 **2.1 ACCEPTABLE MANUFACTURERS**

- 3 A. All materials furnished for this work shall be in accordance with the “Orange County Utilities
4 Appendix D, List of Approved Products” as appended to these specifications unless otherwise
5 noted. All products not listed in Appendix D shall be subject to the County’s approval.
- 6 B. Submit request for substitution in accordance with Specification Section 01 25 13.

7 **2.2 MATERIALS**

- 8 A. Ductile Iron Pipe:
- 9 1. Centrifugally cast, grade 60-42-10 iron.
 - 10 2. AWWA/ANSI C115/A21.15.
 - 11 3. AWWA/ANSI C150/A21.50.
 - 12 4. AWWA/ANSI C151/A21.51.
 - 13 5. AWWA/ANSI C153/A21.53.
 - 14 6. Lined and coated as specified.
 - 15 7. Thickness class of pipe from 6 IN to 12 IN diameter shall be Class 350.
 - 16 8. Pipe shall be new and recently manufactured. Refurbished pipe shall not be provided.
- 17 B. Identification:
- 18 1. All ductile iron water mains shall be marked with a continuous stripe located within the top
19 90 degrees of the pipe. Said stripe shall be a minimum 2-inches in width and shall be oil-
20 based paint, blue in color. Backfill shall not be placed for 30 minutes following paint
21 application.
- 22 C. Joints:
- 23 1. Push-On Joint: Rated at a minimum working pressure equal to pipe material design.
 - 24 2. Restrained Joint: Manufactured joint that mechanically restrains to adjoining pipe.
 - 25 a. Mechanical joint wedge-action restraining gland, epoxy coated.
 - 26 b. For bell joint restraints – split serrated on bell and spigot ends.
 - 27 c. Restraint gaskets and locking bell – stainless steel wedges built into the gasket rubber.
 - 28 1) Gasket shall prevent joint separation, but allow joint deflection.
 - 29 2) Bell shall be painted red to identify restrained gasket.
 - 30 d. Provide joint restraint as shown on the drawings at all bends, tees, valves and other
31 locations that may require it to accommodate thrust forces.
 - 32 3. Flanged Joint: Threaded 250 psi working pressure ductile iron flanges conforming to
33 AWWA C115.
- 34 D. Fittings:
- 35 1. AWWA/ANSI C110/A21.10.
 - 36 2. AWWA/ANSI C111/A21.11.
 - 37 3. AWWA/ANSI C115/A21.15.
 - 38 4. AWWA/ANSI C153/A21.53.
 - 39 5. Mechanical Joint Fittings: In accordance with AWWA C111
 - 40 6. Fittings shall be new and recently manufactured. Refurbished pipe shall not be provided.
- 41 E. Nuts and Bolts:
- 42 1. Buried: High strength low alloy steel for buried application.
 - 43 2. Heads and dimensions per ASME B1.1.
 - 44 3. Threaded per ASME B1.1.
 - 45 4. Project ends 1/4 to 1/2 IN beyond nuts.
- 46 F. Gaskets:
- 47 1. Gaskets for flat faced 150 and 250 psi working pressure flanges shall be 1/8-IN thick, red
48 rubber (SBR), hardness 80 (Shore A), rated to 200° F, conforming to ASME
49 B16.21.AWWA C207, and ASTM D1330, Grades 1 and 2.

1 2. Gaskets for grooved end joints shall be Halogenated butyl, conforming to ASTM D2000
2 and AWWA C606.

3 G. If mechanical coupling system is used, utilize pipe thickness and grade in accordance with
4 AWWA C606.

5 H. Polyethylene Encasement: Standard thickness. See AWWA/ANSI C105/A21.5.

6 **2.3 LININGS AND COATINGS**

7 A. For Water, cement mortar lined standard thickness with bitumastic coating.

8 B. Corrosion resistant lining/coating as specified in Section 09 91 00, Painting for Utilities.

9 **PART 3 - EXECUTION**

10 **3.1 INSTALLATION**

11 A. Joining Method - Push-On Mechanical (Gland-Type) Joints:
12 1. Install in accordance with AWWA/ANSI C111/A21.11.
13 2. Assemble mechanical joints carefully according to manufacturer's recommendations.
14 3. If effective sealing is not obtained, disassemble, thoroughly clean, and reassemble the joint.
15 4. Do not overstress bolts.
16 5. Where piping utilizes mechanical joints with tie rods, align joint holes to permit installation
17 of harness bolts.

18 B. Joining Method - Push-On Joints:
19 1. Install in accordance with AWWA/ANSI C151/A21.51.
20 2. Assemble push-on joints in accordance with manufacturer's directions.
21 3. Bevel and lubricate spigot end of pipe to facilitate assembly without damage to gasket.
22 a. Use lubricant that is non-toxic, does not support the growth of bacteria, has no
23 deteriorating effects on the gasket material, and imparts no taste or odor to water in
24 pipe.
25 4. Assure the gasket groove is thoroughly clean.
26 5. For cold weather installation, warm gasket prior to placement in bell.
27 6. Taper of bevel shall be approximately 30° F with centerline of pipe and approximately 1/4
28 IN back.

29 C. Joining Method - Mechanical Coupling Joint:
30 1. Arrange piping so that pipe ends are in full contact.
31 2. Groove and shoulder ends of piping in accordance with manufacturer's recommendations.
32 3. Provide coupling and grooving technique assuring a connection which passes pressure
33 testing requirements.

34 D. Cutting:
35 1. Do not damage interior lining material during cutting.
36 2. Use abrasive wheel cutters or saws.
37 3. Make square cuts.
38 4. Bevel and free cut ends of sharp edges after cutting.
39 5. Recoat cut edge.

40 E. Install buried piping in accordance with Section 33 11 13.

41 F. Install restrained joint systems where specified herein and in Section 33 11 13.

42 G. Provide polyethylene encasement where ductile iron piping crosses or is near power easements,
43 gas line easements or any location where induced currents may be found.

44 H. Provide polyethylene encasement where ductile iron piping is in areas shown to have aggressive
45 soils. Refer to Geotechnical Report in **Appendix B** of these Specifications.

1 **SECTION 33 05 01.09**
2 **POLYVINYL CHLORIDE PIPE AND FITTINGS**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

5 A. Section Includes:

- 6 1. PVC pipe.

7 B. Related Sections include but are not necessarily limited to:

- 8 1. Division 1 - General Requirements.
9 2. Section 33 05 01 – Utility Pipe and Fittings

10 **1.2 QUALITY ASSURANCE**

11 A. See Section 33 05 01.

12 B. Referenced Standards:

13 1. ASTM International (ASTM):

14 a. PVC (polyvinyl chloride) materials:

- 15 1) D1784, Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds
16 and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.
17 2) D3034, Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer
18 Pipe and Fittings.
19 3) D3139, Standard Specification for Joints for Plastic Pressure Pipes Using Flexible
20 Elastomeric Seals.
21 4) D3212, Standard Specification for Joints for Drain and Sewer Plastic Pipes Using
22 Flexible Elastomeric Seals.
23 5) F477, Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic
24 Pipe.
25 6) F593, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
26 7) F679, Standard Specification for Poly (Vinyl Chloride) (PVC) Large-Diameter
27 Plastic Gravity Sewer Pipe and Fittings.
28 8) F794, Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Gravity
29 Sewer Pipe and Fittings Based on Controlled Inside Diameter.

30 b. Installation:

- 31 1) D2321, Standard Practice for Underground Installation of Thermosplastic Pipe for
32 Sewers and Other Gravity-Flow Applications.

33 2. American Water Works Association (AWWA):

34 a. PVC (polyvinyl chloride) materials:

- 35 1) C900, Standard for Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated
36 Fittings, 4 IN Through 12 IN, for Water Distribution.
37 2) C905, Standard for Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated
38 Fittings, 14 IN through 48 IN, for Water Transmission and Distribution.

39 b. Polyethylene (PE) materials:

- 40 1) C901, Standard for Polyethylene (PE) Pressure Pipe and Tubing, 1/2 IN through
41 3 IN, for Water Service.

42 3. Uni-Bell:

- 43 a. UNI-PUB 6, Installation Guide for PVC Solid-Wall Sewer Pipe (4–15 IN)
44

45 **1.3 SUBMITTALS**

46 A. See Section 01 33 00 for requirements for the mechanics and administration of the submittal
47 process.

1 B. See Section 33 05 01.

2 **PART 2 - PRODUCTS**

3 **2.1 UNDERGROUND PRESSURE PIPING**

- 4 A. Materials: Furnish materials in full compliance with following requirements:
- 5 1. 4-12 IN: AWWA C900 PVC with Pressure Class of 150 psi per Table 2, AWWA C900,
6 DR-18.
- 7 2. HDPE, AWWA C-901 or C-906, DR 11, PE3408/3608/4710 manufactured in accordance
8 with ASTM F-714. Polyethylene pipe shall be ductile iron pipe size,
- 9 3. Joints for polyethylene pipe shall be fusion type in accordance with AWWA C901.
- 10 4. Joints for PVC pipe shall be the rubber-gasket type with a pressure rating not less than pipe
11 pressure rating meeting performance requirements of ASTM D1869.
- 12 5. Fittings for PVC pipe shall be ductile iron, conforming to AWWA C153 or AWWA C110.
- 13 6. Provide joint restraint for PVC as shown on the drawings at all bends, tees, valves and other
14 locations that may require it to accommodate thrust forces.
- 15 a. Where joint restraint is required for standard pipe, use split serrated on bell and spigot
16 ends.
- 17 b. Where joint restrain is required at mechanical joints, use wedge action restraining
18 gland, epoxy coated.
- 19 B. Installation:
- 20 1. Field threading of PVC pipe will not be permitted.
- 21 2. Pipe restraint, where indicated on Drawings, shall be provided by system using wedges or
22 gripping teeth. System shall be specifically recommended for use on PVC pipe. Systems
23 with set screws shall not be used. Minimum pressure rating shall be 150 psi.
- 24 3. Perform installation procedures, handling, connections, and other appurtenant operations in
25 full compliance to the manufacturer's printed recommendations and in full observance to
26 plan details when more stringent.
- 27 4. See Section 33 05 01 for additional installation information.
- 28 C. Color Coding
- 29 1. All pipes, including fittings shall be color coded or marked according to the following:
- 30 a. Potable Water – Blue
- 31 b. Force Main – Green
- 32 D. Acceptable Manufacturers
- 33 1. All materials furnished for this work shall be in accordance with the “Orange County
34 Utilities Appendix D, List of Approved Products” as appended to these specifications unless
35 otherwise noted. All products not listed in Appendix D shall be subject to the County’s
36 approval.

37 **2.2 UNDERGROUND GRAVITY SEWER PIPE**

- 38 A. Materials: Furnish materials in full compliance with following:
- 39 1. 6-15 IN: ASTM D3034, SDR-35 maximum
- 40 2. 18-30 IN: ASTM F679, SDR-35 maximum
- 41 3. Joints shall be integral bell elastomeric gasket joints manufactures in accordance with
42 ASTM D3212 and ASTM F477.
- 43 4. Fittings, ASTM D3034, shall be same as pipe material.
- 44 a. Wyes shall be provided for all service lateral connections and have 6 IN inside diameter
45 for the lateral.
- 46 5. PVC pipe shall bear the NSF-DW seal. Minimum standard length of pipe shall be 13 FT.
- 47 B. Color Coding
- 48 1. Gravity Main – Green

1 **PART 3 - EXECUTION**

2 **3.1 IDENTIFICATION**

- 3 A. Identify each length of pipe clearly at intervals of 5 FT or less.
- 4 1. Include manufacturer's name and trademark.
- 5 2. Nominal size of pipe, appurtenant information regarding polymer cell classification and
- 6 critical identifications regarding performance specifications and NSF approvals when
- 7 applicable.
- 8

9 **3.2 PIPING (UNDERGROUND)**

- 10 A. Installation:
- 11 1. Pressure Piping: In accordance with AWWA C605.
- 12 2. Gravity Sewer Piping: In accordance with UNI-PUB 6
- 13 3. Rubber gasketed joints in accordance with manufacturer's written instructions.
- 14 4. Pipe Bending for Horizontal or Vertical Curves.
- 15 a. See Section 33 05 01.
- 16 5. Cleaning and Disinfection, See Section 33 05 01.

17 **3.3 HYDROSTATIC PRESSURE TESTING METHODOLOGY:**

- 18 A. General:
- 19 1. Notify Engineer in writing at least 5 days in advance of testing. Perform testing in presence
- 20 of Engineer.
- 21 2. Using water as test medium, all newly installed pipelines shall successfully pass hydrostatic
- 22 leakage test prior to acceptance.
- 23 3. Conduct field hydrostatic test on buried piping after trench has been completely backfilled.
- 24 Testing may, as approved by Engineer, be done prior to placement of asphaltic concrete or
- 25 roadway structural section.
- 26 4. Contractor may, if field conditions permit and as approved by Engineer, partially backfill
- 27 trench and leave joints open for inspection and conduct initial service leak test. Final field
- 28 hydrostatic test shall not, however, be conducted until backfilling has been completed as
- 29 specified above.
- 30 5. Supply of Temporary Water: Contractor shall furnish all water required for flushing and
- 31 testing. Water shall be from a potable water source satisfactory to County.
- 32 6. Install temporary restraints as necessary to prevent movement of pipe and protect adjacent
- 33 piping or equipment. Thrust blocks shall not be used. Make necessary taps in piping prior to
- 34 testing.
- 35 7. Prior to test, remove or suitably isolate appurtenant instruments or devices that could be
- 36 damaged by pressure testing.
- 37 8. New Piping Connected to Existing Piping: Isolate new piping with grooved-end pipe caps,
- 38 blind flanges, or other means as acceptable to Engineer.
- 39 B. Pipeline Inspection and Hydrostatic Testing:
- 40 1. Hydrostatic tests shall be performed on all water mains and all services installed. The
- 41 Contractor shall schedule each test with the County. Each test shall be performed on the
- 42 day mutually agreed upon and in the presence of the County and Engineer.
- 43 2. The Contractor shall furnish all equipment, temporary piping, pumps, fittings, gauges, and
- 44 operating personnel necessary to conduct the tests. Water for testing may be obtained from
- 45 the County; however, the Contractor shall pay for all metered water used.
- 46 3. Mains may be tested in sections between valves when intermediary valves are present in the
- 47 main to be tested. Each section to be tested shall be complete, and thrust collars shall have
- 48 been in place for not less than 5 days prior to performance of the tests. All restrained joint
- 49 pipe and fittings shall be completely backfilled to produce the required restraint prior to
- 50 performance of the tests.

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- 4. Before applying the specified test pressure, all air shall be expelled from the pipe. If blow-offs are not available, the Contractor shall make the necessary taps at points of highest elevation before the test is made and plug the taps after the test has been completed.
- 5. Any exposed pipe, fittings, valves, and joints shall be carefully examined during the test. All joints showing visible leaks shall be repaired. Any cracked or defective pipe, fittings, or valves discovered as a result of the pressure test shall be removed and replaced by the Contractor with sound material, and the test shall be repeated until satisfactory results are attained.
- 6. Testing shall be performed to current AWWA C-605 standard and the following requirements: pressure tests on mains shall be conducted at a static pressure of one hundred fifty pounds per square inch (150 psi) over a period of not less than two (2) hours. Test pressure shall not vary by more than ± 5 psi for the duration of the test for the test to be considered successful.
- 7. Allowable Leakage:
 - a. Water: leakage may not exceed that amount determined by the following equation:

$$Q = \frac{LD\sqrt{P}}{148,000}$$

Where: Q = the allowable leakage in gallons/hour
 D = the nominal pipe diameter in inches
 P = the average pressure during the hydrostatic test in psi
 L = the length of the pipe section being tested in ft

- b. Test Failure:

If the actual leakage exceeds the allowable, locate the leak and correct the work and repeat the test.

END OF SECTION

1 **SECTION 33 05 01.10**

2 **HIGH DENSITY POLYETHYLENE (HDPE) PIPE & FITTINGS**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

5 A. Section Includes:

- 6 1. Polyethylene pipe.

7 B. Related Specification Sections include but are not necessarily limited to:

- 8 1. Division 1 - General Requirements.

9 **1.2 QUALITY ASSURANCE**

10 A. Referenced Standards:

11 1. ASTM International (ASTM):

- 12 a. A53, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated,
13 Welded and Seamless.
- 14 b. A197, Standard Specification for Cupola Malleable Iron.
- 15 c. D638, Standard Test Method for Tensile Properties of Plastics.
- 16 d. D1248, Standard Specification for Polyethylene Plastics Extrusion Materials for Wire
17 and Cable.
- 18 e. D1693, Standard Test Method for Environmental Stress-Cracking of Ethylene Plastics.
- 19 f. D2240, Standard Test Method for Rubber Property-Durometer Hardness.
- 20 g. D2513, Standard Specification for Thermoplastic Gas Pressure Pipe, Tubing, and
21 Fittings.
- 22 h. D2683, Standard Specification for Socket-Type Polyethylene Fittings for Outside
23 Diameter-Controlled Polyethylene Pipe and Tubing.
- 24 i. D3261, Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings
25 for Polyethylene (PE) Plastic Pipe and Tubing.
- 26 j. D3350, Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.
- 27 2. American Water Works Association:
- 28 a. C-901 - Polyethylene Pressure Pipe and Tubing, ½ IN. through 3 IN for Water Service
- 29 b. C-906 – Polyethylene Pressure Pipe and Fittings, 4 IN through 63 IN for Water
30 Distribution and Transmission
- 31 c. Manual of Water Supply Practices M55: PE Pipe – Design and Installation
- 32 3. National Science Foundation
- 33 a. NSF/ANSI 61 – Drinking Water System Components – Health Effects
- 34 4. Plastic Pipe Institute

35 **1.3 DEFINITIONS**

36 A. SDR: Standard Dimension Ratio.

37 B. IPS: Iron Pipe Size.

38 C. CTS: Copper Tube Size.

39 D. ESCR: Environmental Stress Crack Resistance.

40 **1.4 SUBMITTALS**

41 A. Shop Drawings:

- 42 1. See Specification Section 01 33 00 for requirements for the mechanics and administration of
43 the submittal process.
- 44 2. See Specification Section 33 11 13.

- 1 3. Certifications:
- 2 a. Installer certification.
- 3 4. Field quality control documents.

4 **PART 2 - PRODUCTS**

5 **2.1 ACCEPTABLE MANUFACTURERS**

- 6 A. Subject to compliance with the Contract Documents, the following manufacturers of PE pipe are
- 7 acceptable :
- 8 1. Phillips Driscopipe.
- 9 2. Plexco.
- 10 3. Polypipe.
- 11 B. Submit request for substitution in accordance with Specification Section 01 25 13.

12 **2.2 PE 3408 PIPING**

- 13 A. General:
 - 14 1. Provide PE 3408 piping with fittings and appurtenances to locations shown on Drawings.
 - 15 2. Furnish materials in {accordance with ASTM D2513} and full compliance to the following
 - 16 material specifications:
 - 17 a. Material description: ASTM D1248, Type III, Class C, Category 5, Grade P34.
 - 18 b. Cell classification: ASTM D3350, PE 345434C.
 - 19 c. ESCR: ASTM D1693, condition C, F_o>5,000 HRS.
 - 20 3. Modulus of elasticity: ASTM D638, 130,000 psi.
 - 21 4. Hardness: ASTM D2240, 65 Shore D.
 - 22 5. SDR: 11.0.
 - 23 6. IPS for line size greater than 1 IN.
- 24 B. Fittings:
 - 25 1. ASTM D2513.
 - 26 2. SDR: 11.0.
 - 27 3. 1/2 to 3 IN: ASTM D2683.
 - 28 4. 4 to 10 IN: ASTM D3261.
 - 29 5. End connections:
 - 30 a. Socket fused ends for fittings 1 IN and under.
 - 31 b. Butt-fused ends for fitting 1-1/2 IN and greater.
 - 32 6. Use IPS reducers on the service mains.
 - 33 7. Use tapping tees or straight outlet service saddles to join service lines to the main.
 - 34 8. Mitered or field fabricated fittings are not allowed.
- 35 C. Installation: Install pipe and fittings in accordance with ASTM, AWWA, and as recommended
- 36 by the manufacturer.
 - 37 1. Provide for a maximum deflection of not more than 3 percent.
 - 38 2. PE 3408 shall not be field threaded.
- 39 D. Deflection:
 - 40 1. After backfilling, each section of pipe shall be checked for deflection by pulling a mandrel
 - 41 through the pipe.
 - 42 2. Pipe with deflection exceeding 5 percent of the inside diameter shall have backfill removed
 - 43 and replaced to provide a deflection of less than 5 percent.
 - 44 3. Any repaired pipe shall be retested.
- 45 E. PE 3408 to Other Pipe Materials Transition Fittings:
 - 46 1. When connecting plastic to other piping materials use either Universal Maxi-Grip Coupling
 - 47 or weld-in transition fitting.
 - 48 2. Universal Maxi-Grip Coupling:

- a. Match coupling size with pipe size.
- b. For 1-1/4 IN IPS and 2 IN IPS Maxi-Grip provide sheer sleeve protector.
3. Install according to Maxi-Grip Fitting Installation Procedures.

PART 3 - EXECUTION

3.1 IDENTIFICATION

- A. Identify each length of pipe clearly at intervals of 5 FT or less.
 1. Include manufacturer's name and trademark.
 2. Nominal size of pipe, appurtenant information regarding polymer cell classification and critical identifications regarding performance specifications, and "NSF" approvals when applicable.

3.2 INSTALLATION

- A. See Specification Section 33 11 13.
- B. General:
 1. Install buried pipe as indicated on Drawings.
 2. Contractor shall insure that kinking or excessive bend diameters of the pipe do not occur during the installation process.
 3. Contractor shall insure that the pipe installed in the trench is firmly supported.
 4. Contractor shall cap all open pipe ends at the end of the work day.
 5. All installed valves shall be tested in the presence of the Engineer.
 - a. All repairs deemed necessary by the Engineer shall be made by the Contractor.
 6. Contractor shall remove any cave-in portions of the trench prior to placing sand bagging around the pipe.
 7. HDPE pipe and fittings shall be by the same manufacturer.
 - a. The minimum strength of the fittings shall not be less than that of the pipe.
 8. Service taps shall be installed as shown on the Drawings.
 9. Changes in direction of PE Pipe:
 - a. Pipe may be cold-bent to minimum radius of 20 times the pipe diameter as it is installed.
 - b. If fittings or fusions are present in the bend, the minimum recommended cold bending radius is 125 times the outside diameter of the pipe.
 10. Remove cutting and threading burrs.
- C. Joining Procedures:
 1. HDPE pipe joints shall be fused on the surface prior to installation into the trench.
 - a. Alternative methods of fusing shall be approved by the Engineer.
 - b. PE pipe 1 IN and under shall be socket fused.
 - c. PE pipe joints 1-1/2 IN and over shall be butt-fused.
 2. Fusion joiner must be qualified by type of fusion (i.e., butt fusion, socket fusion or sidewall fusion) and fuse pipe only as qualified.
 3. Each joint must be visually inspected inside and outside for damage, dirt, moisture, or any other abnormalities prior to fusing.
 4. All joint fusion shall be performed in strict accordance with the manufacturer's specifications.
 5. All fusion equipment must be approved by the manufacturer and operated by qualified and certified operators.
 - a. Cost for testing and certifying personnel shall be born by the Contractor.
- D. See Specification Section 33 05 01.09 Polyvinyl Chloride Pipe and Fittings for Hydrostatic Testing and Leakage Testing for Pressure Piping.

END OF SECTION

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1 **PART 2 - PRODUCTS**

2 **2.1 GENERAL**

- 3 A. All materials furnished for this work shall be in accordance with the “Orange County Utilities
4 Appendix D, List of Approved Products” as appended to these specifications unless otherwise
5 noted. All products not listed in Appendix D shall be subject to the County’s approval.

6 **2.2 SANITARY SEWER MANHOLE STRUCTURE COMPONENTS**

7 A. Manhole Components:

- 8 1. Reinforcement: ASTM C478.
9 2. Minimum wall thickness: 5 IN.
10 3. Minimum base thickness: 8 IN.
11 4. Provide the following components for each manhole structure:
12 a. Base (precast) with integral bottom section.
13 b. Precast bottom section(s).
14 c. Precast barrel section(s).
15 d. Precast concentric transition section.
16 1) Eccentric cone can be used for conflict resolution with approval
17 e. Precast adjuster ring(s).
18 f. Precast concrete transition section.
19 g. Precast flat top with manhole.
20 5. Unless dimensioned or specifically noted on Drawings, provide manhole section with
21 minimum 48 IN inside dimensions

22 B. Non-pressure Type Frames and Cover:

- 23 1. Cast iron frame and covers: ASTM A48, Class 30B
24 2. Use only cast iron of best quality, free from imperfections and blow holes.
25 3. All manhole frames and covers shall be traffic bearing to meet AASHTO H-20 loadings..
26 4. Machine all horizontal surfaces.
27 5. Furnish unit with solid non-ventilated lid with two (2) non-penetrating pick holes.
28 a. See Figure A304 in Construction Drawings for details on manhole cover.
29 6. Ensure minimum clear opening of 24 IN DIA
30 7. Provide lettering on cover.

31 C. Brick:

- 32 1. Brick for manhole construction shall be dense, hard burned, shale, or clay brick conforming
33 to ASTM Designation C 32, Grade MM or C 62, Grade MW, except that brick absorption
34 shall be between five and twenty-five grams of water absorbed in one minute by dried brick,
35 set flat face down, in 1/8-inch of water.

36 D. Cement Mortar:

- 37 1. Cement mortar for manhole construction shall comply with ASTM Designation C 270, Type
38 M, except that the cement shall be Portland Type II only. No mortars that have stood for
39 more than one hour shall be used.

40 E. Joint Sealer:

- 41 1. Joint sealer material for precast manhole structures shall be pre-formed flexible plastic
42 conforming to Federal Specification SS-S-00210 (GSA-FSS). Seal all exterior joints with
43 Portland Type II cement after setting of joint sealer and placement of manhole section to
44 form a watertight joint.

45 F. Non-Shrink Mortar:

- 46 1. Non-shrink mortar shall be used for filling annular spaces and holes in precast manholes and
47 wet wells.

48 G. Manhole Encapsulation:

- 49 1. Manhole cones, riser rings, iron frame, cover, and all joints shall be encapsulated with a heat
50 shrink-wrap with a minimum thickness of 98 mils (2.5 mm).

- 1 a. Wrap shall have a cross-linked polyolefin backing coated with a protective heat
- 2 activated adhesive. The wrap shall effectively bond to the substrate via primer provided
- 3 by the manufacturer. The wrap shall be applied with a high intensity propane torch.
- 4 b. Heat shrink wrap for all barrel section joints of manholes shall be a minimum 9-inch
- 5 width. Corbel section, riser rings, and ring and cover shall have a minimum 12-inch
- 6 width wrap.
- 7 c. Adhesive tap materials shall not be allowed.

8 H. Sanitary Sewer Manhole Concrete:

- 9 1. Provide all sanitary manholes constructed with Portland ASTM C150, Type I modified or II
- 10 cement, 4000 psi at 28 days.
- 11 2. Crystalline Waterproofing Materials:
- 12 a. Xypex Admix C-1000R (with red dye) or approved concrete waterproofing admix shall
- 13 be added to the concrete during the batching operation.
- 14 1) 3.5% of the required weight of Portland Cement shall be added as Xypex.
- 15 2) The amount of cement shall remain the same and not be reduced.
- 16 3) A colorant shall be added to verify the ADMIX was added to the concrete.
- 17 Colorant shall be added at the ADMIX manufacturing facility, not at the concrete
- 18 batch plant.
- 19 4) ADMIX must be added to the concrete at the time of batching. It is recommended
- 20 that the ADMIX powder be added first to the rock and sand and blended
- 21 thoroughly before adding cement and water.
- 22 b. Approved Products
- 23 1) Xypex Admix C-1000R (with red dye) @ 3.5% by weight of Portland Cement.
- 24 2) Kryton – Krystol Internal Membrane (KIM) with color or UV tracer
- 25 3) Penetron Admix with tracer.
- 26 c. Dosage Rate.
- 27 1) The Crystalline Waterproofing Additive shall be added to the concrete mix per the
- 28 manufacturer's specifications.
- 29 d. Application, Batching and Mixing
- 30 1) Comply with manufacturer's product data regarding installation, including
- 31 technical bulletins, product catalogue, installation instructions and product
- 32 packaging labels.

33 I. Liners and Coatings

- 34 1. Coal Tar Epoxy:
- 35 a. Exterior of all manhole surfaces shall have a protective coating of coal tar epoxy with a
- 36 minimum dry film thickness of 9 mils. Coating shall be applied by the manhole
- 37 manufacturer in two (2) coats to attain the specified dry film thickness.
- 38 2. Special Interior Lining (existing structure):
- 39 a. Interior surfaces of manholes shall be coated or lined with a polyethylene or PVC
- 40 system to resist corrosion. Coatings or liners shall be applied in accordance with the
- 41 manufacturer's recommendations. Surface preparation (cleaning, sandblasting, or acid
- 42 etching), material application, and curing shall be performed in accordance with the
- 43 manufacturer's recommendations.
- 44 b. Interior of existing manholes shall be coated or lined with the appropriate material as
- 45 specified in Orange County Utilities Standards and Construction Specifications Manual
- 46 Section 3119 Coatings and Linings. Approved manufacturers can be found in
- 47 Appendix D of the Orange County Utilities Standards and Construction Specifications
- 48 Manual appended to these specifications.
- 49 3. Special Interior Lining (new structure):
- 50 a. Interior surfaces of manholes shall contain a crystalline waterproofing concrete admix.
- 51 Crystalline waterproofing concrete admix shall be added to the concrete during the
- 52 batching operation. Admixture concentration shall be added based upon manufacturer's
- 53 design percent concentration of admixture to the required weight of cement. The
- 54 amount of cement shall remain the same and not be reduced. A colorant shall be added

1 to verify the admixture was added to the concrete. Colorant shall be added and
2 provided at the admixture manufacturing facility, not at the concrete batch plant. It is
3 recommended that the admixture be added first to the rock and sand and blended
4 thoroughly before adding cement and water or per the manufacturer's
5 recommendations. Concrete structures without crystalline waterproofing admixture or
6 admixture without colorant for field verification shall be rejected. Contractor shall
7 provide certification from the pre-caster that the admixture was added in accordance
8 with the manufacturer's recommendations.

9 b. Approved manufacturers can be found in Appendix D of the Orange County Utilities
10 Standards and Construction Specifications Manual appended to these specifications.

11 4. Coatings or liners shall be applied in strict accordance with the manufacturer's
12 recommendations.

13 J. See Orange County Utilities Standards and Construction Specifications Manual Section 3311
14 Wastewater Manholes for additional product specifications.

15 **PART 3 - EXECUTION**

16 **3.1 GENERAL**

17 **A. General:**

- 18 1. Make inverts with a semi-circular bottom conforming to the inside contour of the adjacent
19 sewer sections. The invert channels shall be smooth and accurately shaped to a semicircular
20 bottom conforming to the inside of the adjacent sewer section using 2500 psi concrete.
21 Steep slopes outside the invert channels shall be avoided. Changes in size and grade shall be
22 made gradually and evenly. Changes in the direction of the sewer or entering branch shall
23 be a smooth curve with radius as long as practicable. Invert channels shall also be formed
24 for pipe stub-outs.
- 25 2. Precast manhole tops shall terminate at such elevations to permit laying brick courses under
26 the manhole frame to make allowance for future street grade adjustments.
- 27 3. The first pipe joint outside the manhole shall be located a minimum distance of 24-inches
28 from the outside surface of the manhole.
- 29 4. Outside drop connections shall be made in accordance with the details shown on the
30 Drawings.
- 31 5. Drop connection base slab extensions on precast manholes shall be manufactured
32 monolithically with the manhole elements at the casting yard. The manufacturer shall
33 submit for approval the method of drop manhole construction.
- 34 6. Where additional pipe connections or modifications of existing factory made openings are
35 required on new or existing precast concrete manholes or wet wells, all cutting relative
36 thereto shall be performed only by a power driven abrasive wheel or saw. It is specifically
37 noted that such connections to existing manholes or wet wells shall be installed in
38 accordance with the details for new units shown on the Drawings, and shall be caulked
39 water tight with non-shrink grout.
- 40 7. The exterior surfaces of all precast manholes shall be factory coated with coal tar epoxy,
41 nine mils DFT applied in two coats. The interior of precast manholes shall receive the
42 specified protective lining in the factory as specified in the Materials portion of this section.
- 43 8. Connection of the pipe entering the manhole shall be made by using a flexible boot type
44 manhole coupling adapter. At the entry into the manhole, no part of the horizontal pipe shall
45 rest against the concrete.
- 46 9. On all straight runs, lay pipe through manhole and cut out top half of pipe.
 - 47 a. See detail on Drawings.
 - 48 b. If pipes deflect at manhole, shape as specified .
- 49 10. Shape inverts accurately with steel trowel finish.
 - 50 a. For changes in direction of the sewer and entering branches into the manhole, make a
51 circular curve in the manhole invert using as large a radius as manhole inside diameter
52 will permit.

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1 **SECTION 33 05 20**

2 **PLASTIC PIPE FOR INSTALLATION BY HORIZONTAL DIRECTIONAL DRILL (HDD)**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

5 A. Section Includes:

- 6 1. Covers the work necessary to furnish and install C900 PVC pipe by the method of
7 horizontal directional drilling.

8 B. Related Sections include but are not necessarily limited to:

- 9 1. Division 1 - General Requirements.

10 **1.2 QUALITY ASSURANCE**

11 A. Referenced Standards:

- 12 1. American Water Works Association/American National Standards Institute
13 (AWWA/ANSI):
14 a. C110/A21.10, Standard for Ductile-Iron and Gray-Iron Fittings for Water.
15 b. C111/A21.11, Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and
16 Fittings.
17 c. C153/A21.53, Standard for Ductile-iron Compact Fittings for Water Service.
18 2. American Water Works Association (AWWA):
19 a. C605, Standard for Underground Installation of Polyvinyl Chloride (PVC) Pressure
20 Pipe and Fittings for Water
21 b. C651, Standard for Disinfecting Water Mains
22 c. C900, Standard for Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4
23 IN Through 12 IN, for Water Distribution.
24 d. C905, Standard for Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14
25 IN through 48 IN, for Water Transmission and Distribution.
26 e. C-906 – Polyethylene Pressure Pipe and Fittings, 4 IN through 63 IN for Water
27 Distribution and Transmission.
28 f. M23, AWWA Manual of Supply Practices PVC Pipe – Design and Installation, Second
29 Edition
30 g. M28, AWWA Manual – Rehabilitation of Water Mains
31 h. M55, AWWA Manual of Water Supply Practices PE Pipe – Design and Installation
32 3. American Society for Testing and Materials (ASTM) Standards
33 a. A53, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated,
34 Welded and Seamless.
35 b. C495, Standard Test Method for Compressive Strength of Lightweight Insulating
36 Concrete
37 c. D638, Tensile Properties of Plastics
38 d. D1238, Flow Rates of Thermoplastics by Extrusion Plastomer
39 e. D1505, Standard Test Method for the Density of Plastics by the Density-Gradient
40 Technique
41 f. D1693, Standard Test Method for Environmental Stress-Cracking of Ethylene Plastics.
42 g. D1784, Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and
43 Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.
44 h. D1785, Standard Specification for Poly(Vinyl Chloride) PVC Plastic Pipe, Schedules
45 40, 80 and 120.
46 i. D2122, Determining Dimensions of Thermoplastic Pipe and Fittings
47 j. D2152, Test Method for Degree of Fusion of Extruded Polyvinyl Chloride (PVC) Pipe
48 and Molded Fittings by Acetone Immersion
49 k. D2240, Standard Test Method for Rubber Property-Durometer Hardness.
50 l. D2241, Polyvinyl Chloride (PVC) Plastic Pipe (SDR-PR)

- 1 m. D2665, Polyvinyl Chloride (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings
- 2 n. D2683, Standard Specification for Socket-Type Polyethylene Fittings for Outside
- 3 Diameter-Controlled Polyethylene Pipe and Tubing.
- 4 o. D2837, Standard Test Method for Obtaining Hydrostatic Design Basis for
- 5 Thermoplastic
- 6 p. D3139, Standard Specification for Joints for Plastic Pipes Using Flexible Elastomeric
- 7 Seals
- 8 q. D3261, Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings
- 9 for Polyethylene (PE) Plastic Pipe and Tubing.
- 10 r. D3350, Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.
- 11 s. F477, Elastomeric Seals (Gaskets) for Joining Plastic Pipe
- 12 t. F1057, Standard Practice for Estimating the Quality of Extruded Polyvinyl Chloride
- 13 (PVC) Pipe by the Heat Reversion Technique
- 14 u. F1417, Standard Test Method for Installation Acceptance of Plastic Gravity Sewer
- 15 Lines Using Low-Pressure Air
- 16 4. Uni-Bell OVC Pipe Association Standards
- 17 a. UNI-PUB-8, Recommended Practice for the Direct Tapping of Polyvinyl Chloride
- 18 (PVC) Pressure Water Pipe (Nominal Diameters 6-12 Inch)
- 19 5. National Sanitation Foundation Standards
- 20 a. NSF-14, Plastics Piping System Components and Related Materials
- 21 b. NSF-61, Drinking Water System Components--Health Effects
- 22 6. Plastic Pipe Institute Standards
- 23 a. PPI TR-2/2006, PVC Range Composition Listing of Qualified Ingredients
- 24 7. Latest version of the Orange County Utilities Standards and Construction Specifications
- 25 Manual.
- 26 B. Miscellaneous:
- 27 1. Should conflicts arise between standard specifications of government agencies mentioned
- 28 herein and Contract Documents, Contract Documents shall govern.

29 1.3 SUBMITTALS

- 30 A. See Section 01 33 00 for requirements for the mechanics and administration of the submittal
- 31 process.
- 32 B. Submit the following:
- 33 1. Manufacturer's Certificate of Compliance certifying compliance with the applicable
- 34 specifications and standards. Manufacturer shall submit the following:
- 35 a. Name of the pipe manufacturer and a list of the piping and quantities to be provided by
- 36 manufacturer.
- 37 b. Product data and pipe supplier data indicating conformance with this Specification and
- 38 applicable standards, including written documentation regarding any intended variance
- 39 from this Specification and applicable standards. This will include experience of pipe
- 40 supplier by years and number of projects; warranty information; and independent
- 41 laboratory testing certification.
- 42 c. If applicable, fusion joint data and fusion technician data indicating conformance with
- 43 this Specification and applicable standards. This will include fusion joint warranty
- 44 information and recommended project specific fusion parameters, including criteria
- 45 logged and recorded by data logger.
- 46 2. Certified copies of test reports of factory tests required by the applicable standards and this
- 47 Section. Report shall include at minimum include following information:
- 48 a. Dimensional Checks
- 49 b. Pipe Burst
- 50 c. Flattening
- 51 d. Extrusion Quality (Acetone Immersion)
- 52 3. Shop drawings showing all specials and fittings, joint restraint systems, adapters, and
- 53 couplings.

- 1 4. Testing procedures and testing laboratory for factory testing specified in this Section.
- 2 5. The following product data and information is required from the Contractor and/or
- 3 horizontal directional drilling Contractor:
- 4 a. Equipment:
- 5 1) Contractor shall submit specifications on directional drilling equipment to be used
- 6 to ensure that the equipment will be adequate to complete the project. Submittal
- 7 shall demonstrate that pullback forces are sufficient to complete the entire project
- 8 without imposing excessive forces on the PVC or HDPE pipe. Include calculations
- 9 prepared by Florida registered engineer demonstrating acceptable forces for this
- 10 installation / material combination.
- 11 b. Drilling Plan:
- 12 1) Provide a layout indicating location of the entry, exit pits, and fluid storage pits,
- 13 location of fused pipe before pulling (not to block private property), location and
- 14 type of fusion equipment, storage of waste fluid, and fluid recycling plan (if used).
- 15 2) Provide a detail of the planned bore path and the method of monitoring and
- 16 controlling the speed, line, grade, and rate of fluids delivery.
- 17 a) Include the sequence, size and description of each reamer and the capabilities
- 18 of each through the type of soils encountered in the project area.
- 19 3) The Contractor shall maintain the alignment and minimum radii as detailed on the
- 20 plan sheets and as specified herein.
- 21 4) The drill plan should include a final swabbing of the bore path prior to pipe
- 22 pullback.
- 23 5) Contractor shall not proceed with work until drilling plan is approved by Engineer
- 24 and Owner.
- 25 c. Estimated Pullback Thrust:
- 26 1) The Contractor shall submit to the Engineer an estimate of the anticipated pullback
- 27 loads that will be required to install the pipe.
- 28 2) Contractor shall include the calculated buoyant force or buoyant weight of the pipe
- 29 and any proposed method for counter-weighting the pipe during pullback.
- 30 a) Calculation shall be based on density of the drilling fluid(s) to be used.
- 31 b) Any counter-weight placed inside the pipe shall be free from any dirt, grease,
- 32 oil, or other contaminants that may prevent proper disinfection.
- 33 d. Drilling Fluids Management:
- 34 1) A fluids management plan shall be submitted to the Engineer for review, including:
- 35 a) Proposed mix design for each specific geological strata or formation
- 36 anticipated during drilling of the bore path,
- 37 b) Estimate of quantities,
- 38 c) Delivery volume and pressure for each and the proposed method for
- 39 monitoring,
- 40 d) Details of the drilling fluid/soil slurry solids separation, recycling or disposal
- 41 plan that will describe the equipment and capacities for separation and
- 42 recirculation.
- 43 (1) If direct vacuum excavation of the slurry is selected the disposal site shall
- 44 be identified and copies of all required permits shall be presented to the
- 45 Engineer.
- 46 (2) The Contractor shall submit a written plan that details the estimated
- 47 quantity of slurry to be vacuum excavated and provide substantiation that
- 48 there is sufficient equipment to adequately pump or shuttle the slurry to
- 49 and from the disposal site(s) as required to maintain a near continuous
- 50 drilling and pipe pull-back.

- e. The Contractor shall submit to the Engineer a plan for a quick response team to address inadvertent fluid discharges to the surface (frac-outs). In the event that a drilling fluid fracture, inadvertent returns or returns loss occurs during pilot hole drilling operations, Contractor shall cease drilling, wait at least 30 minutes, inject a quantity of drilling fluid with a viscosity exceeding 120 seconds as measured by a Marsh funnel and then wait another 30 minutes. If mud fracture or returns loss continues, Contractor will cease operations and notify Engineer. Engineer and Contractor will discuss additional options and work will then proceed accordingly. Repair of damages associated with frac-outs will be resolved in a timely fashion as directed by the County at the Contractor's expense.
- f. Safety Plan:
 - 1) The Contractor shall be responsible for securing a safe worksite that meets all Federal, State, and Local government codes. A project safety and contingency plan which shall include but shall not be limited to drilling fluid containment and cleanup procedures, equipment and plan for compromised utility installations including electrical and power lines, water, wastewater and any other subsurface utility.
- g. Directional drilling operator certification and references, project scope and owners' contact information for the experience commensurate with the size and scope of the project.
- h. At least two weeks prior to the start of work, the Contractor shall submit his HDD schedule identifying daily work hours and working dates for each installation.

1.4 QUALITY ASSURANCE

A. Requirements

- 1. Contractor shall have a minimum of three years experience doing work of a similar nature required for this project. Contractor shall provide a structurally sound, leak-proof, polyvinyl chloride pipe or monolithic HDPE pipe for all piping identified for installation by horizontal directional drilling. Individual pipe lengths shall be assembled by spline lock joints for PVC pipe and butt-fused HDPE pipe unless otherwise specified. Connecting fittings shall be mechanically joined and restrained to the piping as specified. Contractor shall also be responsible for all installation processes included drilling, back-reaming, management and disposal of all drilling fluid, dewatering flow around his work, and leak testing the polyvinyl chloride or HDPE pipe and fittings in accordance with these Specifications.

B. Pipe Description

- 1. PVC
 - a. Supplier shall furnish AWWA C900 (DR 18) polyvinyl chloride pipe conforming to all applicable standards and procedures, and meeting all applicable testing and material properties as described by those standards or within this Specification
 - b. As defined in AWWA C900, pipe and couplings shall be homogeneous throughout and free from voids, cracks, inclusions, and other defects, and shall be as uniform as commercially practicable in color, density, and other physical characteristics.
- 2. HDPE
 - a. Supplier shall furnish HDPE (DR 11) pipe conforming to all applicable standards and procedures, and meeting all applicable testing and material properties as described by those standards or within this Specification
 - b. As defined in AWWA C906, pipe and couplings shall be homogeneous throughout and free from voids, cracks, inclusions, and other defects, and shall be as uniform as commercially practicable in color, density, and other physical characteristics.

C. Manufacturer Requirements

- 1. PVC

- 1 a. Polyvinyl chloride pipe shall be tested at the extrusion facility for properties required to
- 2 meet all applicable parameters as outlined in AWWA C900, AWWA C905, and
- 3 applicable sections of ASTM D2241. Testing priority shall be in conformance with
- 4 AWWA C900 and AWWA C905.
- 5 2. HDPE
- 6 a. HDPE pipe shall be tested at the extrusion facility for properties required to meet all
- 7 applicable parameters as outlined in AWWA C906 and other applicable standards.
- 8 Testing priority shall be in conformance with AWWA C906.
- 9 D. Warranty
- 10 1. A two-year warranty for the pipe shall be included, and shall cover the cost of replacement
- 11 pipe and freight to project site, should the pipe have any defects in material or
- 12 workmanship.
- 13 2. In addition to the standard pipe warranty, the fusing contractor shall provide in writing a
- 14 warranty for a period of two years for all the fusion joints, including formation, installation,
- 15 and pressure testing.
- 16 3. Warranty periods shall begin on the date of installation and product acceptance after all
- 17 applicable testing.
- 18 E. All pipe and fitting sizes and all references to pipe diameter on the Drawings or in the
- 19 Specifications are intended to be nominal size or diameter, and shall be interpreted as such.
- 20 Nominal outside diameters and wall thicknesses of pipe shall conform to the requirements of
- 21 their applicable AWWA and ASTM standards.

22 **1.5 DELIVERY, STORAGE, AND HANDLING**

- 23 A. The Contractor shall be responsible for the delivery, storage, and handling of products. No
- 24 products shall be shipped to the job site without the approval of the Owner's representative.
- 25 B. All pipes shall be bundled or packaged in such a manner as to provide adequate protection of the
- 26 ends during transportation to the site. Any pipe damaged in shipment shall be replaced as
- 27 directed by the Owner or Engineer.
- 28 C. Each pipe shipment should be inspected prior to unloading to see if the load has shifted or
- 29 otherwise been damaged. Notify Owner or Engineer immediately if more than immaterial
- 30 damage is found.
- 31 D. Each pipe shipment should be checked for quantity and proper pipe size, color and type.
- 32 E. Pipe should be loaded, off-loaded, and otherwise handled in accordance with AWWA M23.
- 33 F. If left bundled in units, unloading can be done with a single forklift so long as it is of sufficient
- 34 capacity to handle the load. If sag exceeds recommendation (see the table below as to allowable
- 35 sag), then each piece of pipe should be unloaded individually. When unloading individual
- 36 pieces of pipe, the pipe should be supported at approximately the 1/3 point measured from each
- 37 end of the pipe. Sag is the measurement of the pipe ends relative to the pipe center.

38 Sag in Pipe Lengths during Unloading and Moving:

<u>Nominal Pipe Size</u> (DIPS-inches)	<u>Segment Height (Sag)</u>	
	<u>30' Length</u> (inches)	<u>40' Length</u> (inches)
4	13	23-1/2
6	9	16-1/2
8	7	12-1/2
10	5-1/2	10
12	4	7-1/2

50

- 1 G. Off-loading devices such as chains, wire rope, chokers, or other pipe handling implements that
2 may scratch, nick, cut, or gouge the pipe are strictly prohibited.
- 3 H. Any length of pipe showing a crack or which has received a blow that may have caused an
4 incident fracture, even though no such fracture can be seen, shall be marked as rejected and
5 removed at once from the work. Damaged areas, or possible areas of damage may be removed
6 by cutting out and removing the suspected incident fracture area. Limits of the acceptable length
7 of pipe shall be determined by the Owner or Engineer.
- 8 I. Any scratch or gouge greater than 10% of the wall thickness will be considered significant and
9 can be rejected unless determined acceptable by the Owner or Engineer.
- 10 J. Pipe should be stored at the job site in the unit packaging provided by the manufacturer. Caution
11 shall be exercised to avoid compression, damage, or deformation to the ends of the pipe. The
12 interior of the pipe, as well as all end surfaces, should be kept free from dirt and foreign matter.
- 13 K. Pipe shall be handled and supported with the use of woven fiber pipe slings or approved equal.
14 Use of hooks, chains, wire rope or any other handling device which creates the opportunity to
15 damage the surface of the pipe is strictly prohibited.
- 16 L. After delivery to the project site, polyvinyl chloride pipe shall be stored at ambient temperature
17 and protected from ultraviolet light degradation.

18 **PART 2 - PRODUCTS**

19 **2.1 RESTRAINED JOINT COUPLINGS**

- 20 A. All PVC joints of directionally drilled pipe shall be a spline lock system conforming to ASTM
21 D2241 and ASTM D1784 Class 12454-B, or other restrained joint PVC pipe conforming to
22 these specifications and capable of withstanding the stresses of the installation process.
- 23 B. Joints shall meet the requirements of ASTM D3139.
- 24 C. O-rings shall meet the requirements of ASTM F477.
- 25 D. Pipe shall have a minimum DR of 18.

26 **2.2 FITTINGS**

- 27 A. PVC Pipe
 - 28 1. See Specification Sections 33 05 01 Utility Pipe and Fittings and 33 05 01.09 Polyvinyl
29 Chloride Pipe and Fittings regarding product and manufacturer information.
- 30 B. HDPE
 - 31 1. See Specifications Section 33 05 01.10 High Density Polyethylene Pipe and Fittings
32 regarding product and manufacturer information.

33 **2.3 SLEEVE-TYPE COUPLINGS**

- 34 A. Sleeve-type mechanical couplings shall be manufactured for use with PVC pipe, and shall be
35 restrained.

36 **2.4 EXPANSION AND FLEXIBLE COUPLINGS**

- 37 A. Expansion-type mechanical couplings shall be manufactured for use with PVC pipe, and shall be
38 restrained.

39 **2.5 CONNECTION HARDWARE**

- 40 A. Bolts and nuts for buried service shall be made of non-corrosive, high-strength, low-alloy steel
41 having the characteristics specified in ANSI/AWWA C111/A21.11, regardless of any other
42 protective coating.

43

1 **2.6 DRILLING SYSTEM EQUIPMENT**

2 A. General

3 The directional drilling equipment shall consist of a directional drilling rig of sufficient capacity
4 to perform the bore(s) and pullback of the pipe(s), a drilling fluid mixing and delivery system of
5 sufficient capacity to successfully complete the crossing, a guidance system to accurately guide
6 boring operations, a vacuum truck of sufficient capacity to handle the drilling fluid volume, and
7 trained and competent personnel to operate the system. All equipment shall be in good, safe
8 operating condition with sufficient supplies, materials and spare parts on hand to maintain the
9 system in good working order for the duration of this project. All required equipment shall be
10 included per the emergency and contingency plan as submitted per these Specifications.

11 B. Drilling Rig

- 12 1. The directional drilling machine shall consist of a hydraulically powered system to rotate,
13 push and pull drill pipe while delivering a pressurized fluid mixture to a steerable drill head.
14 The machine shall be anchored to withstand the pulling, pushing and rotating forces
15 required to complete the project.
- 16 2. The drilling rig hydraulic system shall be self-contained with sufficient pressure and volume
17 to power drilling operations. Hydraulic system shall be free of leaks.
- 18 3. The drilling rig shall have a system to monitor and record maximum pull-back hydraulic
19 pressure during pull-back operations.

20 C. Drill Head

- 21 1. The horizontal directional drilling equipment shall produce a stable fluid lined tunnel with
22 the use of a steerable drill head.
- 23 2. The system must be able to control the depth and direction of the pipe.
- 24 3. Drill head shall contain all necessary cutters and fluid jets for the operation, and shall be of
25 the appropriate design for the medium being drilled.

26 D. Drill Pipe

27 Drill pipe shall be constructed of high quality 4130 seamless tubing, grade D or better, with
28 threaded box and pins. Tool joints should be hardened to 32-36 RC.

29 E. Drilling Fluid System

- 30 1. Drilling Fluid (Mud)
 - 31 a. Drilling fluid shall be composed of clean water and the appropriate additive(s) for the
32 fluid to be used. Water shall be from a clean source and shall meet the mixing
33 requirements of the manufacturer.
 - 34 b. The water and additives shall be mixed thoroughly to assure the absence of any clumps
35 or clods. No hazardous additives may be used.
 - 36 c. Drilling fluid shall be maintained at a viscosity sufficient to suspend cuttings and
37 maintain the integrity of bore wall(s).
 - 38 d. Drilling fluid shall be disposed of off-site in accordance with local, state and federal
39 requirements and/or permit conditions.
 - 40 e. No additional chemicals or polymer surfactants shall be allowed to be added to the
41 drilling fluid as submitted for this project without written consent of the Owner and/or
42 Engineer.
- 43 2. Mixing System
 - 44 a. A self-contained, closed, drilling fluid mixing system shall be of sufficient size to mix
45 and deliver drilling fluid for the project.
 - 46 b. The drilling fluid reservoir tank shall be minimum of 1,000 gallons.
 - 47 c. The mixing system shall be able to ensure thorough mixing of the drilling fluid. The
48 drilling fluid reservoir tank shall be sized for adequate storage of the fluid.
 - 49 d. The mixing system shall continually agitate the drilling fluid during drilling operations.
- 50 3. Drilling Fluid Delivery and Recovery System
 - 51 a. The mud pumping system shall have a minimum capacity of 35-500 GPM and the
52 capability of delivering the drilling fluid at a constant minimum pressure of 1200 psi.

- b. The delivery system shall have filters or other appropriate in-line equipment to prevent solids from being pumped into the drill pipe.
- c. Used drilling fluid and drilling fluid spilled during drilling operations shall be contained and properly disposed of. The use of spill containment measures shall be maintained around drill rigs, drilling fluid mixing system, entry and exit pits and drilling fluid recycling system (if used) to prevent spills into the surrounding environment. Pumps, vacuum truck(s), and/or storage of sufficient size shall be in place to contain excess drilling fluid.
- d. A closed-loop drilling fluid system and a drilling fluid cleaning system should be used to whatever extent practical, depending upon project size and conditions. Under no circumstances shall drilling fluid that has escaped containment be reused in the drilling system.

13 F. Pipe Pull Heads

- 14 1. Pipe pulls heads shall be utilized that employ a positive through-bolt design assuring a
- 15 smooth wall against the pipe cross-section at all times.
- 16 2. Pipe pull heads shall be specifically designed for use with polyvinyl chloride pipe, and shall
- 17 be as recommended by the pipe supplier.

18 G. Drilling Control System

- 19 1. Calibration of the electronic detection and control system shall be verified prior to the start
- 20 of the bore.
- 21 2. The drilling head shall be remotely steerable by means of an electronic or magnetic
- 22 detection system. The drilling head location shall be monitored in three dimensions:
- 23 a. Offset from the baseline,
- 24 b. Distance along the baseline, and
- 25 c. Depth of cover.
- 26 3. The guidance shall be capable of tracking at all depths up to fifty feet and in any soil
- 27 condition, including hard rock. It shall enable the driller to guide the drill head by providing
- 28 immediate information on the tool face, azimuth (horizontal direction), and inclination
- 29 (vertical direction). The guidance system shall be accurate and calibrated to manufacturer's
- 30 specifications of the vertical depth of the borehole at sensing position at depths up to fifty
- 31 feet and accurate to 2-feet horizontally.
- 32 4. Point of rotation of the head shall also be monitored.
- 33 5. For gravity application and on-grade drilling, sonde/beacon or approved equipment
- 34 applicable for grade increments of 1/10th of one percent shall be used.

35 H. Pipe Rollers

- 36 1. Pipe rollers shall be used for pipe assembly during final product pull back.
- 37 2. Pipe rollers shall be of a size, quantity and spacing that meet the manufacturer's guidelines.

38 **PART 3 - EXECUTION**

39 **3.1 INSTALLATION**

40 A. General:

- 41 1. Install undercrossing to meet requirements of authority or agency having jurisdiction over
- 42 undercrossing.
- 43 2. Observe work requirements stipulated in any permit condition.
- 44 3. Consult Contract Drawings for limitation of construction right-of-way.

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1 **3.2 DRILLING OPERATIONS**

2 A. General

- 3 1. Grades and alignment of the proposed HDD installation are presented in the drawings for
4 reference and intended bore path. Proper alignment and elevation of the bore hole shall be
5 consistently maintained throughout the directional drilling operation. The path of the bore
6 may be modified based on field and equipment conditions. Entry and exit locations and
7 control-point elevations shall be maintained as shown on the drawings and specified, unless
8 otherwise approved by the Owner or Engineer.
9 2. Minimum Bend Radius shall not exceed 75% of that recommended by the pipe
10 manufacturer.
11 3. Maximum Pull-in Force shall not exceed those recommended by the manufacturer.
12 4. The entire drill path shall be accurately surveyed with entry and exit stakes placed in the
13 appropriate locations within the areas indicated on drawings.

14 B. Location and Protection of Underground Utilities

- 15 1. Correct location of all underground utilities that may impact the HDD installation is the
16 responsibility of the Contractor, regardless of any locations shown on the drawings or
17 previous survey completed by the Engineer and/or Owner.
18 2. Utility location and notification services shall be contacted by the Contractor prior to the
19 start of construction.
20 3. All existing lines and underground utilities shall be positively identified, including exposing
21 those facilities that are located within an envelope of possible impact of HDD installation as
22 determined for the project specific site conditions. It is the Contractor and HDD system
23 operator's responsibility to determine this envelope of safe offset from existing utilities.
24 This will include, but is not limited to, soil conditions and layering, utility proximity and
25 material, HDD system and equipment, and foreign subsurface material.

26 C. Site Location Preparation

- 27 1. Work site as indicated on drawings shall be graded or filled to provide a level working area.
28 No alterations beyond what is required for operations are to be made
29 2. Contractor shall confine all activities to designated work areas.
30 3. Contractor shall place slit fence between all drilling operations and any drainage, waterways
31 or other areas designated for such protection necessary by documents, state, federal and
32 local regulations.

33 D. Drilling Layout and Tolerances

- 34 1. The drill path shall be accurately surveyed with entry and exit areas placed in the
35 appropriate locations within the areas indicated on drawings. If using a magnetic guidance
36 system, drill path will be surveyed for any surface geomagnetic variations or anomalies.
37 2. Readings shall be recorded after advancement of each successive drill pipe (no more than 10
38 ft.) and the readings plotted on a scaled drawing of 1 in. = 2 ft., vertical and 1 in. = 20 ft.
39 horizontal.
40 3. Instrumentation shall be provided and maintained at all times that accurately locates the
41 pilot hole, measures drill-string axial and torsional loads and measures drilling fluid
42 discharge rate and pressure.
43 4. Entry and exit areas shall be drilled so as not to exceed the bending limitations of the pipe as
44 recommended by the manufacturer.

45 E. Pilot Hole Bore

- 46 1. Pilot hole shall be drilled along bore path. In the event that the pilot bore does deviate from
47 the bore path, Contractor shall notify Owner and Engineer and the Owner and/or Engineer
48 may require contractor to pull-back and re-drill from the location along bore path before the
49 deviation.
50 2. The pilot hole shall be drilled on bore path with no deviations greater than 1% of depth over
51 a length of 100-feet. In the event that pilot does deviate from the bore path more than 1-foot
52 of depth in 100-feet, Contractor will notify Engineer and Engineer may require Contractor
53 to pull-back and re-drill from the location along bore path before the deviation.

3. The Contractor shall limit curvature in any direction to reduce force on the pipe during pullback. Ideally, the directional bore should lie in a vertical plane. The pilot hole radius shall not exceed 75% of the minimum bending radius as recommended by the pipe manufacturer.
4. In the event that a drilling fluid fracture, inadvertent returns or returns loss occurs during pilot hole drilling operations, Contractor shall cease drilling and contact the Owner and Engineer.
5. Owner and/or Engineer shall approve the pilot hole bore alignment prior to back reaming phase and pipe installation.
6. Upon completion of pilot hole phase of the operation, a complete set of as-built records shall be submitted in duplicate to the Owner.

F. Reaming

1. After successfully completing the pilot hole, the bore hole shall be reamed to a diameter which meets all local jurisdictional standards and the following table as a minimum:

<u>Nominal Pipe Diameter</u>	<u>Bore Hole Diameter</u>
< 8 inches	Pipe Diameter or Coupling + 4 inches
8 inches to 24 inches	Pipe Diameter or Coupling times 1.5
> 24 inches	Pipe Diameter or Coupling + 12 inches

2. Multiple reaming passes shall be used at the discretion of the Contractor and shall conform to these Specifications.
3. A swivel shall be used between the reaming head and the polyvinyl chloride pipe to minimize torsion stress on the assembly.
4. In the event of a drilling fluid fracture, returns loss or other loss of drilling fluid, the Contractor shall be responsible for restoring any damaged property to original condition and cleaning up the area in the vicinity of the damage or loss. Contractor shall immediately inform the Owner and Engineer.

3.3 PIPE PULL-BACK AND INSERTION

- A. The C900 PVC pipe shall be joined together according to manufacturer's specifications. The gaskets and the ends of pipe must be inspected and cleaned with a wet cloth prior to each joint assembly so they are free of any dirt or sand.
- B. The HDPE pipe shall be heat fused and pressure tested as per manufacturer's guidelines before installation in the borehole. During assembly and prior to pullback, pipe must be laid out in such a way as to minimize interference to pedestrian and vehicular traffic. Pipe shall be welded/fused together in one length, if space permits. Pipe will be placed on pipe rollers before pulling into bore hole with rollers spaced close enough to prevent excessive sagging of pipe. The minimum bending radius for the HDPE pipe shall be 25% greater than the manufacturer's recommended minimum bending radius.
- C. Contractor shall handle the pipe in a manner that will not over-stress the pipe prior to insertion. Vertical and horizontal curves shall be limited so that the pipe does not over-deflect, buckle, or otherwise become damaged. Damaged portions of the pipe shall be removed and replaced.
- D. The pipe entry area shall be graded as needed to provide support for the pipe and to allow free movement into the bore hole.
 1. The pipe shall be guided into the bore hole to avoid deformation of, or damage to, the pipe.
 2. The pipe will be elevated to the approximate angle of entry and supported by means of a sideboom with roller arm, or similar equipment, to allow for the stress free situation as the pipe is pulled into the exit hole toward the drill rig.
 3. The pipe may be continuously or partially supported on rollers or other Owner and Engineer approved friction decreasing implement during joining and insertion, as long as the pipe is not over-stressed or critically abraded prior to, or during installation.

- 1 E. Buoyancy modification shall be at the sole discretion of the Contractor, and shall not exceed the
2 pipe supplier's recommendations. Damage caused by buoyancy modifications shall be the
3 responsibility of the Contractor.
- 4 F. Once pullback operations have commenced, the operation shall continue without interruption
5 until the pipe is completely pulled through the bore hole. Except for drill rod removal, pull-back
6 operation shall not cease until the pipe has been completely installed to final position. During the
7 pull-back operations, excessive pullback force shall be reported to Owner and Engineer.
- 8 G. The pipe shall be installed in a manner that does not cause upheaval, settlement, cracking, or
9 movement and distortion of surface features. Any damages caused by the Contractor's
10 operations shall be corrected by the Contractor at no cost to the Owner.

11 **3.4 INSTALLATION ACCEPTANCE AND CLEANUP**

- 12 A. If the final grade of the finished installation is not satisfactory to the Owner, Engineer or other
13 jurisdictional entity, the pipe shall be abandoned, full pressure grouted in place in accordance
14 with the jurisdictional authority, and an alternate installation shall be made. The abandoned pipe
15 shall be properly shown on as-recorded drawings to be submitted following conclusion of the
16 construction work.
- 17 B. The Engineer shall inspect the installed pipe ends for roundness and/or damage. Evidence of
18 significant surface scratching shall be brought to the attention of the Engineer. Gouges or
19 excessive surface damage of more than 10 percent of the wall thickness may be grounds to
20 abandon the bore and have the Contractor re-drill another line at no additional cost to the Owner.
- 21 C. Following the installation, the project site shall be returned to a condition equal to or better than
22 the pre-construction condition of the site. All excavations will be backfilled and compacted to
23 95% maximum density. Compaction Testing shall be performed as per specification 31 21 33
24 Trenching, Backfilling, and Compaction for Utilities. All pavement and hardscape shall be
25 repaired per applicable jurisdictional standards, excess materials shall be removed from the site,
26 and disturbed areas shall be re-landscaped. All drilling fluid shall be properly disposed of per
27 these Specifications and all applicable jurisdictional laws.

28 **3.5 TESTING**

- 29 A. Testing shall comply with all local building codes, statutes, standards, local jurisdiction, and
30 laws.
- 31 B. Cleaning and flushing of the PVC or HDPE water main shall be completed by the Contractor.
- 32 C. See Specification Section 33 05 01.09 Polyvinyl Chloride Pipe and Fittings for Hydrostatic
33 Testing and Leakage Testing for Pressure Piping.
- 34 D. See Specification Section 31 21 33 Trenching, Backfilling, and Compaction for Utilities.

35 **3.6 PREPARATION PRIOR TO MAKING CONNECTIONS INTO EXISTING PIPING**
36 **SYSTEMS**

- 37 A. Approximate locations for existing piping systems are shown on the drawings. Prior to making
38 connections into existing piping systems, the Contractor shall:
 - 39 1. Field verify location, size, piping material and piping system of the existing pipe.
 - 40 2. Obtain all required existing piping manufacturer(s) approved fittings (i.e., saddles, sleeve
41 type couplings, flanges, tees, etc., as shown).
 - 42 3. Have installed all temporary pumps and/or pipes in accordance with established connection
43 plans.
 - 44 4. Have on hand necessary pipe stoppers, pancake flanges or other items which may be
45 necessary should an existing valve or appurtenance fail to seal properly.
 - 46 5. Verify compliance of any applicable permitting before making connections and placing
47 system in service.

1 B. Unless otherwise approved by the Engineer, new piping systems shall be completely assembled
2 and successfully tested prior to making connections into existing pipe systems.

3 **3.7 PIPING SYSTEM CONNECTIONS**

4 A. Piping system connections shall be installed per applicable standards and regulations, as well as
5 per the manufacturer's recommendations and as indicated on the drawings. Pipe connections to
6 structures shall be installed per applicable standards and regulations, as well as per the
7 connection manufacturer's recommendations.

8 **3.8 TRACER WIRE**

9 A. See Section 10 14 00, Identification Devices.

10 B. Upon completion of the directional bore, the Contractor shall demonstrate that the wire is
11 continuous and unbroken through the entire run of the pipe.

12 1. Demonstration shall include full signal conductivity (including splices) when energizing for
13 the entire run in the presence of the Owner or Engineer.

14 2. If the wire is broken, the Contractor shall repair or replace it. Pipeline installation will not
15 be accepted until the wire passes a continuity test

16 **3.9 RECORD KEEPING**

17 A. Contractor shall maintain a daily project log of drilling operations and a guidance system log
18 with a copy given to Engineer at completion of project. Contractor shall certify as-built
19 drawings as to accuracy.

20

END OF SECTION

1 **SECTION 33 11 13**
2 **WATER MAIN CONSTRUCTION**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

5 A. Section Includes:

- 6 1. Utility piping systems.

7 B. Related Sections include but are not necessarily limited to:

- 8 1. Section 31 21 33 - Trenching, Backfilling, and Compaction for Utilities.
9 2. Section 09 91 00 - Painting for Utilities.
10 3. Section 40 05 23 - Valves: Basic Requirements.

11 **1.2 QUALITY ASSURANCE**

12 A. Referenced Standards:

- 13 1. American Association of State Highway and Transportation Officials (AASHTO):
14 2. American Iron and Steel Institute (AISI).
15 3. American Society of Mechanical Engineers (ASME):
16 a. B16.3, Malleable Iron Threaded Fittings.
17 b. B16.5, Pipe Flanges and Flanged Fittings.
18 c. B16.9, Factory-Made Wrought Steel Butt-Welding Fittings.
19 d. B36.19, Stainless Steel Pipe.
20 e. B40.100, Pressure Gauges and Gauge Attachments.
21 4. ASTM International (ASTM):
22 a. A536, Standard Specification for Ductile Iron Castings.
23 b. A774, Standard Specification for As-Welded Wrought Austenitic Stainless Steel
24 Fittings for General Corrosive Service at Low and Moderate Temperatures.
25 c. A778, Standard Specification for Welded, Unannealed Austenitic Stainless Steel
26 Tubular Products.
27 5. American Water Works Association (AWWA):
28 a. C606, Standard for Grooved and Shouldered Joints.
29 b. C651, Standard for Disinfecting Water Mains.
30 c. C800, Standard for Underground Service Line Valves and Fittings.
31 6. American Water Works Association/American National Standards Institute
32 (AWWA/ANSI):
33 a. C105/A21.5, Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems.
34 b. C110/A21.10, Standard for Ductile-Iron and Gray-Iron Fittings for Water.
35 c. C111/A21.11, Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and
36 Fittings.
37 d. C115/A21.15, Standard for Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron
38 Threaded Flanges.
39 e. C151/A21.51, Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water.
40 f. C153/A21.53, Standard for Ductile-Iron Compact Fittings for Water Service.
41 7. Latest version of the Orange County Utilities Standards and Construction Specifications
42 Manual.

43 B. Pipe Inspection:

- 44 1. The Contractor shall obtain a certificate of inspection from the pipe manufacturer stating
45 that the pipe and fittings supplied for this Contract have been inspected at the plant and that
46 they meet the requirements of these specifications.

- 1 2. The entire product of any plant may be rejected when, in the opinion of the County, the
- 2 methods of manufacture fail to secure uniform results, or where the materials used are such
- 3 as to produce inferior pipe or fittings.
- 4 3. All pipe and fittings shall be subjected to a visual inspection at the time of delivery and
- 5 before being lowered into the trench. Joints or fittings that do not conform to these
- 6 specifications will be rejected and must be removed immediately by the Contractor.
- 7 4. The County reserves the right to sample and test any pipe or fitting after delivery and to
- 8 reject all pipe and fittings represented by any sample which fails to comply with the
- 9 specified requirements.
- 10 C. Prevention of electrolysis is required in accordance with AWWA C105 and when crossing, or
- 11 adjacent to, a power easement, gas easements, any location where induced currents may be
- 12 present, in areas where aggressive soils exist, and where shown on Drawings. Electrolytic action
- 13 through the contact of dissimilar metals shall be prevented by either.
- 14 1. The separation of one material from the other by means of an insulating or dielectric
- 15 coupling (polyethylene wrap), or
- 16 2. The use of alternative materials, as directed by the County.

17 **1.3 SUBMITTALS**

- 18 A. Shop Drawings:
 - 19 1. See Section 01 33 00 for requirements for the mechanics and administration of the submittal
 - 20 process.
 - 21 2. Layout drawings:
 - 22 a. Detailed laying schedule for pipe.
 - 23 b. Schedule of interconnections to existing piping and method of connection.
 - 24 3. Product technical data including:
 - 25 a. Acknowledgement that products submitted meet requirements of standards referenced.
 - 26 b. Copies of manufacturer's written directions regarding material handling, delivery,
 - 27 storage and installation.
 - 28 c. Technical product data on gaskets, pipe, fittings, valves, pipe restrained joints, and
 - 29 other components. Indicate maximum rated working pressure and test pressure for each
 - 30 item
- 31 B. Miscellaneous Submittals:
 - 32 1. Pipeline Cleaning Plan identifying all steps required to clean the installed pipe.
 - 33 2. Disinfection Plan for water lines
 - 34 a. No disinfectant residual
 - 35 b. Include method of disposal of all flush and highly chlorinated water and identify
 - 36 neutralizing agent, if needed.
 - 37 c. Disinfection plan that identifies the segments to be tested with isolation methods.
 - 38 3. Qualifications of lab performing disinfection analysis on water systems.
 - 39 4. Test reports:
 - 40 a. Copies of pressure test results on all piping systems.
 - 41 b. Disinfection test reports.
 - 42 c. Notification of time and date of piping pressure tests.
 - 43 5. As-built drawing(s) of all piping section(s) that Contractor requests for clearance must be
 - 44 submitted and approved prior to submission of clearance request to local agency and/or
 - 45 FDEP
- 46 C. Operation and Maintenance Manuals:
 - 47 1. See Section 01 33 00 for requirements for:
 - 48 a. The mechanics and administration of the submittal process
 - 49 b. The content of Operation and Maintenance Manuals

50 **1.4 DELIVERY, STORAGE, AND HANDLING**

- 51 A. Protect pipe coating during handling using methods recommended by manufacturer.

- 1 1. Use of bare cables, chains, hooks, metal bars or narrow skids in contact with coated pipe is
2 not permitted.
- 3 B. Prevent damage to pipe during transit.
 - 4 1. Pipe, specials, and fittings received at Project Site in damaged condition will not be
5 accepted.
- 6 C. Store rubber gaskets in cool, well ventilated place, and do not expose to direct rays of sun. Do
7 not allow contact with oils, fuels, petroleum, or solvents.
- 8 D. Store and support pipe securely to prevent accidental rolling and to avoid contact with mud,
9 water, or other deleterious materials.
- 10 E. Pipe shall be handled with proper equipment in a manner to prevent distortion or damage. Use of
11 hooks, chains, wire ropes, or clamps that could damage pipe, damage coating or lining, or kink
12 and bend pipe ends is not permitted.
- 13 F. Use heavy canvas, or nylon slings of suitable strength for lifting and supporting materials.
- 14 G. Lifting pipe during unloading or lifting into trench shall be done using two slings placed at
15 quarter point of pipe section. Pipe may be lifted using one sling near center of pipe, provided
16 pipe is guided to prevent uncontrolled swinging and no damage will result to pipe or harm to
17 workers. Slings shall bear uniformly against pipe.
- 18 H. Pipe and fittings shall not be stored on rocks or gravel, or other hard material that might damage
19 pipe. This includes storage area and along pipe trench.

20 **1.5 JOB CONDITIONS**

- 21 A. Water in Excavation:
 - 22 1. Water shall not be allowed in the trenches while the pipes are being laid and/or tested. The
23 Contractor shall not open more trench than the available pumping facilities are able to
24 dewater to the satisfaction of the County. The Contractor shall assume responsibility for
25 disposing of all water so as not to injure or interfere with the normal drainage of the territory
26 in which he is working.
 - 27 2. In no case shall the pipelines being installed be used as drains. The ends of the pipe shall be
28 kept properly and adequately blocked during construction by the use of approved stoppers
29 and not by improvised equipment.
 - 30 3. All necessary precautions shall be taken to prevent the entrance of mud, sand, or other
31 obstructing matter into the pipelines. If on completion of the Work any such material has
32 entered the pipelines, it must be cleaned as directed by the County so that the entire system
33 will be left clean and unobstructed.

34 **PART 2 - PRODUCTS**

35 **2.1 ACCEPTABLE MANUFACTURERS**

- 36 A. All materials furnished and/or specialty subcontractor(s) used for this work shall be in
37 accordance with the "Orange County Utilities Appendix D, List of Approved Products" as
38 appended to these specifications unless otherwise noted. All products not listed in Appendix D
39 shall be subject to the County's approval.
- 40 B. Submit request for substitution in accordance with Specification Section 01 25 13.
- 41 C. For water improvements, the acceptable piping materials are PVC, HDPE and DIP.

42 **2.2 COMPONENTS AND ACCESSORIES**

- 43 A. Flanges, Flange Gaskets, and Bolting Material.
 - 44 1. Flanges, bolting materials, and flange gaskets for steel flanges shall conform to
45 AWWA C207.

- 1 2. Flanges, bolting materials, and flange gaskets for ductile iron flanges shall conform to
- 2 AWWA C110 and AWWA C115.
- 3 3. Stainless steel bolting material shall conform to ASTM F593, Type 304 stainless steel,
- 4 Group 1, Condition SH1, 2, 3 or 4.
- 5 4. If the flanges are coated, provide two washers for each bolt on each side of the flange to
- 6 minimize damage to the coating as the nuts are tightened. Provide bolts of the proper length
- 7 to accommodate the washers.

- 8 B. Protective Coating and Lining:
- 9 1. Include pipe, fittings, and appurtenances where coatings, linings, paint, tests and other items
- 10 are specified.
- 11 2. Field paint pipe in accordance with Section 09 91 00.

- 12 C. Underground Warning Tape:
- 13 1. See Section 10 14 00.

- 14 D. Fire Hydrants:
- 15 1. See Section 33 12 19.

- 16 E. Water Services
- 17 1. See Section 33 12 13.

- 18 F. Valves:
- 19 1. See Section 40 05 23.

- 20 G. Polyethylene encasement tape:
- 21 1. Chase (Chasekote 750).
- 22 2. Kendall (Polyken 900).
- 23 3. 3 M (Scotchrap 50).
- 24 4. Or approved equal.

- 25 H. Tapping Sleeve
- 26 1. Split body with test plug
- 27 a. Ductile iron body
- 28 b. Carbon steel per ASTM A283 with fusion bonded epoxy coating (12 mil average DFT)
- 29 1) Meets AWWA C-223
- 30 2. Outlet flange dimensions in accordance with ANSI B16.1, class 125/150
- 31 3. Gasket to conform to main line pipe, Nitrile (Buna-N), and NSF rated for contact with
- 32 potable water
- 33 4. All appurtenances to be Type 304 stainless steel with anti-galling coating
- 34 5. Provide joint restraint for all joints

35 **PART 3 - EXECUTION**

36 **3.1 GENERAL**

- 37 A. Notify Engineer at least 2 weeks prior to field fabrication of pipe or fittings.
- 38 B. Furnish feeler gauges of proper size, type, and shape for use during installation for each type of
- 39 pipe furnished.
- 40 C. Distributing Materials: Place materials along trench only as will be used each day, unless
- 41 otherwise approved by the County. Placement of materials shall not be hazardous to traffic or to
- 42 general public, obstruct access to adjacent property, or obstruct others working in area.
- 43 D. Contractor shall install four inch diameter schedule 80 PVC utility pipe line markers over the
- 44 pipe alignment at 1000 feet intervals, at all valves, and at all locations where fittings deflect the
- 45 pipe alignment in the horizontal plane. Utility pipe line markers shall include a decal and shall
- 46 be colored blue for water service.

- 1 E. All mains (PVC, HDPE, and DI) shall be installed with a continuous, insulated 10-gauge copper
2 wire installed directly above the pipe for location purposes. Locate wire shall terminate in a test
3 station box and be capable of extending 18-inches above the top of the box. Directionally drilled
4 pipe shall be installed with two insulated 10-gauge copper wires.

5 **3.2 EXAMINATION**

- 6 A. Verify size, material, joint types, elevation, and horizontal location of existing pipeline to be
7 connected to new pipeline or new equipment.
- 8 B. Inspect size and location of structure penetrations to verify adequacy of wall pipes, sleeves, and
9 other openings.
- 10 C. Damaged Coatings and Linings: Repair using coating and lining materials in accordance with
11 manufacturer's instructions.

12 **3.3 PREPARATION OF TRENCH**

- 13 A. Prepare trench as specified in Section 31 21 33 Trenching, Backfilling, and Compaction for
14 Utilities.
- 15 B. Unless otherwise permitted by Engineer, maximum length of open trench shall not exceed 50
16 feet.

17 **3.4 EXTERIOR BURIED PIPING INSTALLATION**

- 18 A. Piping shall be laid with a minimum cover of 36-inches below finished grade, unless located
19 within 300 feet of a major intersection where a minimum cover of 48-inches is required.
- 20 B. Install expansion devices as necessary to allow expansion and contraction movement.
- 21 C. Install individual pipe lengths in accordance with approved lay diagram. Misplaced pipe shall be
22 removed and replaced.
- 23 D. Inspect pipe and fittings before installation, clean ends thoroughly, remove foreign matter and
24 dirt from inside.
- 25 E. Laying Pipe in Trench:
- 26 1. Excavate and backfill trench in accordance with Section 31 21 33.
- 27 2. Keep trench dry until pipe laying, joining backfilling and compaction is completed.
- 28 3. Exercise care when lowering pipe into trench to prevent twisting or damage to pipe.
- 29 4. Measure for grade at pipe invert, not at top of pipe.
- 30 5. Clean each pipe length thoroughly and inspect for compliance to Specifications.
- 31 6. Grade trench bottom and excavate for pipe bell and lay pipe on trench bottom.
- 32 7. Install gasket or joint material according to manufacturer's directions after joints have been
33 thoroughly cleaned and examined.
- 34 8. Prevent foreign material from entering pipe during placement.
- 35 9. Close and block open end of last laid pipe section when placement operations are not in
36 progress and at close of day's work.
- 37 10. In general, lay pipe upgrade with bell ends pointing in direction of laying.
- 38 11. Deflect pipe at joints for pipelines laid on a curve using unsymmetrical closure of spigot
39 into bell. If joint deflection of standard pipe lengths will not accommodate horizontal or
40 vertical curves in alignment, provide:
- 41 a. Shorter pipe lengths
- 42 b. Special mitered joints
- 43 c. Standard or special fabricated bends
- 44 12. Check gasket position with feeler gauge to assure proper seating.
- 45 13. After joint has been made, check pipe alignment and grade.
- 46 14. Place sufficient pipe zone material to secure pipe from movement before next joint is
47 installed.
- 48 15. Prevent uplift and floating of pipe prior to backfilling.

- 1 16. Except for first two (2) joints, before making final connections of joints, install two (2) full
- 2 sections of pipe with earth tamped along side of pipe or final with bedding material placed.
- 3 17. Lay pipe in only suitable weather with good trench conditions.
- 4 a. Never lay pipe in water except where approved by Engineer.
- 5 18. Seal open end of line with watertight plug if pipe laying stopped.
- 6 19. Remove water in trench before removal of plug.
- 7 20. Tolerances:
- 8 a. Deflection From Horizontal Line: Maximum 2 inches.
- 9 b. Deflection From Vertical Line: Maximum 1 inch.
- 10 c. Joint Deflection:
- 11 1) Ductile Iron Pipe: Whenever it is desirable to deflect pipe, the amount of deflection
- 12 shall not exceed 75% of the maximum limits as shown in AWWA Standard C600
- 13 for ductile iron pipe.
- 14 2) PVC Pipe: Joint deflection or pipe bending shall not be permitted. The maximum
- 15 allowable tolerance in the joint due to variances in installation is 0.75 degrees (3-
- 16 inches per joint per 20 foot stick of pipe). No bending tolerance in the pipe barrel
- 17 shall be acceptable. Alignment change shall be made only with sleeves and fittings.
- 18 d. Horizontal position of pipe centerline on alignment around curves maximum variation
- 19 of 1 foot from position shown.
- 20 21. Cover Over Top of Pipe: Minimum 3 feet, unless otherwise shown.
- 21 F. Lining Up Push-On Joint Piping:
- 22 1. Lay piping on route lines shown on Drawings.
- 23 2. Deflect from straight alignments or grades by vertical or horizontal curves or offsets.
- 24 3. Observe maximum allowable deflection values stated in manufacturer's written literature.
- 25 4. Provide special bends when specified or where required alignment exceeds allowable
- 26 deflections stipulated.
- 27 5. Install shorter lengths of pipe in such length and number that angular deflection of any joint,
- 28 as represented by specified maximum deflection, is not exceeded.
- 29 G. Flanged Joints:
- 30 1. Install perpendicular to pipe centerline.
- 31 2. Bolt Holes: Straddle vertical centerline, aligned with connecting equipment flanges or as
- 32 shown on Drawings.
- 33 3. Use torque-limiting wrenches to provide uniform bearing and proper bolt tightness.
- 34 a. Confirm with bolt manufacturers max torque that can be applied prior to reaching yield
- 35 strength of the bolt material.
- 36 b. Match the above with the max torque that can be applied to chosen gasket to determine
- 37 limiting applicable torque.
- 38 4. Flange Type: Use flat-faced flange when joining with flat-faced ductile or cast iron flange.
- 39 H. Couplings:
- 40 1. Install in accordance with manufacturer's written instructions.
- 41 2. Before coupling, clean pipe holdback area of oil, scale, rust, and dirt.
- 42 3. Do not remove pipe coating. If damaged, repair before joint is made.
- 43 4. Clean gaskets before installation.
- 44 5. If necessary, lubricate with gasket lubricant for installation on pipe ends.
- 45 6. Tighten coupling bolts progressively; drawing up bolts on opposite sides gradually until
- 46 bolts have uniform tightness.
- 47 I. Thrust Restrain:
- 48 1. Provide thrust restraints for preventing movement of piping caused by forces in or on buried
- 49 piping tees, wye branches, caps, or bends.
- 50 2. Thrust restraints shall be accomplished by the use of mechanical restraining devices unless
- 51 specifically identified otherwise on the Drawings or herein.
- 52 3. Thrust blocking is not allowed.
- 53 J. Install insulating components where dissimilar metals are joined together.

1 **3.5 CONNECTIONS WITH EXISTING SYSTEM**

- 2 A. All connections to existing mains shall be made after complete disinfection of the proposed
3 system and shall be made under the direction of the County. Valves separating the mains being
4 installed from existing mains shall be operated by or under the direction of the County. The cost
5 of the Work in making the connections shall be paid for by the Contractor.
- 6 B. In the event the proposed main is to be connected to a main which has one or more active
7 services between the point of connection and the first existing line valve, a temporary plug or
8 cap shall be installed on the new main until the pressure tests and disinfecting are completed.
9 Upon satisfactory completion, the cap or plug shall be removed from both mains and the
10 connection made with pipe which has been swabbed out with a solution of chlorine and water.
11 The connection shall be made as swiftly as possible and any water in the ditch shall be kept
12 below the level of the pipe. The pipeline shall then be placed in service by the County's
13 personnel.
- 14 C. In the event any existing users will be without water while a connection is being made, the
15 Contractor shall notify the County 72 hours prior to disconnection. The County shall notify the
16 affected user(s) when the water will be turned off and when the service is estimated to be
17 resumed. In some instances, these connections may have to be made at night. No user shall be
18 without water service for more than three hours.

19 **3.6 LOCATION OF PUBLIC WATER SYSTEM MAINS**

- 20 A. Horizontal Minimum Separation:
- 21 1. New or relocated, underground water mains shall be laid to provide a horizontal distance of:
- 22 a. At least three feet between the outside of the water main and the outside of any existing
23 or proposed storm sewer, stormwater force main, or pipeline conveying reclaimed
24 water regulated under Part III of Chapter 62-610 F.A.C.
- 25 b. At least three feet, and preferably ten feet, between the outside of the water main and
26 the outside of any existing or proposed vacuum-type sanitary sewer.
- 27 c. At least six feet, and preferably ten feet, between the outside of the water main and the
28 outside of any existing or proposed gravity or pressure-type sanitary sewer, wastewater
29 force main, or pipeline conveying reclaimed water not regulated under Part III of
30 Chapter 62-610 F.A.C. The minimum horizontal distance between water mains and
31 gravity-type sanitary sewers shall be reduced to three feet where the bottom of the
32 water main is laid at least six inches above the top of the sewer.
- 33 d. At least ten feet between the outside of the water main and all parts of any existing or
34 proposed "on-site sewage treatment and disposal system".
- 35 B. Vertical Minimum Separation:
- 36 1. New or relocated, underground water mains crossing any existing or proposed:
- 37 a. Gravity or vacuum-type sanitary sewer or storm sewer shall be laid so the outside of the
38 water main is at least six inches, and preferably 12 inches, above or at least 12 inches
39 below the outside of the other pipeline. However, it is preferably to lay the water main
40 above the other pipeline.
- 41 b. Pressure-type sanitary sewer, wastewater or stormwater force main, or pipeline
42 conveying reclaimed water shall be laid so the outside of the water main is at least 12
43 inches above or below the outside of the other pipeline. However, it is preferable to lay
44 the water main above the other pipeline.
- 45 2. At the utility crossings, one full length of water main pipe shall be centered above or below
46 the other pipeline so the water main joints be as far as possible from the other pipeline.
47 Alternatively, at such crossings, the pipes shall be arranged so that all water main joints are
48 at least three feet from all joints in vacuum type sanitary sewers, storm sewers, stormwater
49 force mains, or pipelines conveying reclaimed water regulated under Part III of Chapter 62-
50 610 F.A.C., and at least six feet from all joints in gravity or pressure-type sanitary sewers,
51 wastewater force mains, or pipelines conveying reclaimed water not regulated under Part III
52 of Chapter 62-610 F.A.C.

- 1 C. Separation between Water Mains and Sanitary or Storm Sewer Manholes:
2 1. No water main shall pass through, or come into contact with, any part of a sanitary sewer
3 manhole.
4 2. Water mains shall not be constructed or altered to pass through, or come into contact with,
5 any part of a storm sewer manhole or inlet structure.

6 **3.7 CORROSION PROTECTION**

- 7 A. Buried Pipe: As specified in the individual specifications following this Section.
8 B. Notify Engineer at least 3 days prior to start of surface preparation, coating application, and
9 corrosion protection work.

10 **3.8 PLACEMENT OF PIPE LOCATING TAPE**

- 11 A. Place pipe locating tape in accordance with Section 10 14 00, Identification Devices.

12 **3.9 PLACEMENT OF ELECTRONIC MARKER BALLS**

- 13 A. Place electronic marker balls in accordance with Section 10 14 00, Identification Devices.

14 **3.10 PLACEMENT OF TRACER WIRE**

- 15 A. Place tracer wire in accordance with Section 10 14 00, Identification Devices.

16 **3.11 PIPE BEDDING AND ZONE MATERIAL**

- 17 A. Place pipe bedding and pipe zone material in accordance with Section 31 21 33, Trenching,
18 Backfilling, and Compaction for Utilities.

19 **3.12 FIELD QUALITY CONTROL**

- 20 A. Pipe Testing - General:
21 1. Isolate equipment which may be damaged by the specified pressure test conditions.
22 2. Perform pressure test using calibrated pressure gages and calibrated volumetric measuring
23 equipment to determine leakage rates.
24 a. Select each gage so that the specified test pressure falls within the upper half of the
25 gage's range.
26 b. Notify the Engineer/Owner 24 HRS prior to each test. Engineer/Owner shall be present
27 during pipe testing.
28 3. Completely assemble and test new piping systems prior to connection to existing pipe
29 systems.
30 4. Acknowledge satisfactory performance of tests and inspections in writing to Engineer prior
31 to final acceptance.
32 5. Bear the cost of all testing and inspecting, locating and remedying of leaks and any
33 necessary retesting and re-examination.
34 B. Pressure Testing: As specified.
35 C. Supplier's Field Service:
36 1. The Contractor shall, at no additional cost to the County, arrange for a pipe supplier's field
37 representative to be on-site to provide instruction to each crew working on the installation
38 for a minimum of four push-on joints (PVC, DIP). The supplier's field representative shall
39 certify that the installations observed were satisfactorily completed and all pipe installation
40 crews were familiar with the proper methods and procedures for the pipeline installations.

41 **3.13 CLEANING AND DISINFECTION FOR WATER LINES**

- 42 A. General:
43 1. Conform to AWWA C651 for water pipes and pipelines, except as modified in these
44 Specifications.

- 1 2. Disinfect the water facilities installed or modified under this Project intended to hold,
- 2 transport, or otherwise contact potable water:
- 3 a. Pipelines: Disinfect new pipelines including new services to new meter boxes that
- 4 connect to existing pipelines up to point of connection.
- 5 b. Disinfect surfaces of materials that will connect to existing pipelines up to point of
- 6 connection.
- 7 c. Disinfect surfaces of materials that will contact finished water, both during and
- 8 following construction, using one of the methods described in AWWA C651. Disinfect
- 9 prior to contact with finished water. Take care to avoid recontamination following
- 10 disinfection.
- 11 3. Prior to application of disinfectants, clean pipelines of loose and suspended material
- 12 4. Allow fresh water and disinfectant solution to flow into pipe at a measured rate so chlorine-
- 13 water solution is at specified strength. Do not place concentrated liquid commercial
- 14 disinfectant in pipeline to be disinfected before it is filled with water.
- 15 5. The water facilities are to remain out of service until Owner receives clearance from local
- 16 regulatory agency and/or FDEP.
- 17 a. As-built drawing(s) of all section(s) requested must be submitted and approved prior to
- 18 submission of clearance request to local agency and/or FDEP.
- 19 b. Partial clearance may be obtained for sections of the project.
- 20 B. Cleaning of Water Piping:
- 21 1. Water from the existing distribution system used for filling, flushing and testing shall be
- 22 provided through a jumper connection, meter, and PRZ assembly.
- 23 a. Contractor shall provide all fittings and connections required for a complete assembly.
- 24 b. Contractor will also be required to remove the assembly when all testing and acceptable
- 25 bac-T tests are completed. Provide all fittings and plugs as required for the removal of
- 26 the assembly.
- 27 2. Fill pipeline and remove all air prior to flushing or disinfecting.
- 28 a. Slow fill the line(s) to allow for the removal of all air.
- 29 b. Pipe shall sit for at least 24 hours after fill is complete.
- 30 3. Before disinfecting clean all foreign matter from pipe in accordance with AWWA C651.
- 31 a. Flush at a velocity of at least 2.5 fps to remove all construction debris in pipeline(s).
- 32 1) Contractor responsible for metering all water used.
- 33 2) Contractor responsible for disposal of all flush water including, if necessary,
- 34 neutralizing any remaining residual disinfectant(s).
- 35 b. Pipeline(s) can be cleaned by use of a pipe swab specifically designed for cleaning.
- 36 1) Swab shall be of polypropylene material sized and designed to remove dirt, sand
- 37 and debris from the installed mains.
- 38 a) Minimum density is 2 pounds per cubic foot.
- 39 b) Provide with rear polyurethane drive seal.
- 40 2) Observe the material removed by the swab on each pass. Repeat the process until
- 41 the pipe has been cleaned to the satisfaction of the Owner/Engineer.
- 42 3) If swabbing access and egress points are not provided in the drawings, the
- 43 Contractor will be responsible for providing temporary access and egress points as
- 44 required.
- 45 4) Passage of the cleaning swabs through the pipelines shall be constantly monitored,
- 46 controlled and all swabs entered into the shall be individually marked and identified
- 47 so that each swab used can be accounted for at the end of the cleaning process.
- 48 5) Locate and open all in-line valves for the piping to be cleaned.
- 49 6) At the exit point, Contractor shall be responsible for handling the debris removed
- 50 from the line, the water pushing the swab and collecting the swab. Contractor is also
- 51 responsible for disposal of all debris and water.
- 52 7) Only Owner's personnel shall operate the supply valve from the existing
- 53 distribution system.
- 54 8) Flushing shall continue until the swab is retrieved and the water runs clear for 5
- 55 minutes.

- 1 9) Contractor shall be responsible for supplying additional swabs of varying
- 2 diameters and/or densities as required to proper clean the newly installed pipelines.
- 3 10) Swabbing speed shall be between 2 and 5 feet per second.

4 C. Disinfection of Water Piping

- 5 1. Initial chlorine residual shall not be less than 25 mg/L free chlorine and not less than 10
- 6 mg/L free chlorine after allowing the chlorinated water to stand in the pipe for 24 hours.
- 7 a. Contractor shall be responsible for monitoring and documenting the residual.
- 8 2. If the continuous feed method of the slug method of disinfection, as described in AWWA
- 9 C651 is used, flush pipelines with potable water until clear of suspended solids and color.
- 10 Provide hoses, temporary pipes, ditches, and other conduits as needed to dispose of flushing
- 11 water without damage to adjacent properties.
- 12 3. Flush service connections and hydrants. Flush distribution lines prior to flushing hydrants
- 13 and service connections. Operate valves during flushing process at least twice during each
- 14 flush.
- 15 4. Disinfecting procedure: In accordance with AWWA C651, unless herein modified.
- 16 5. Sampling and analysis shall be done by the County.

17 D. Disposal of Heavily Chlorinated Water:

- 18 1. Flush all heavily chlorinated water from the piping until the disinfectant residual is equal to
- 19 the surrounding area.
- 20 2. Do not allow flow into a waterway without neutralizing disinfectant residual.
- 21 3. See the appendix of AWWA C651 for acceptable neutralization methods.

22 E. Bacteriological Testing for Water Piping

- 23 1. Collection of bacteriological samples shall not be taken until all heavily chlorinated water
- 24 has been flushed from piping. The remaining residual shall be equal to that normally found
- 25 in the surrounding water system.
- 26 a. Coordinate activities to allow samples to be taken in accordance with this Specification.
- 27 b. Provide valves at sampling points at locations as shown on the Drawings or as directed
- 28 by County.
- 29 c. Provide access to sampling points.
- 30 2. After pipelines have been cleaned, disinfected, and refilled with potable water, Owner will
- 31 take water samples and have them analyzed for conformance to bacterial limitations for
- 32 public drinking water supplied.
- 33 3. For acceptance, bacteriological tests for two consecutive days must be taken, tested, and
- 34 satisfactory results obtained.
- 35 4. Owner is responsible for performing bacteriological tests. If Contractor wishes to use a
- 36 private lab, the lab must be approved by the Owner and the Contractor is responsible for all
- 37 costs associated with using a third party laboratory.
- 38 5. If any samples required are bacterially positive, disinfecting procedures and bacteriological
- 39 testing shall be repeated until bacterial limits are met.

40 **3.14 WATER PIPE TESTING – PRESSURE LINES**

- 41 A. See Specification Section 33 05 01.09 for testing of PVC pressure lines.
- 42 B. Hydrostatic tests shall be performed on all water mains and all services installed. Once the
- 43 hydrostatic test has been completed successfully, then a leakage test shall be performed.
- 44 C. The Contractor shall schedule each test with the County/Engineer. Each test shall be performed
- 45 on the day mutually agreed upon and in the presence of the County/Engineer.
- 46 D. The Contractor shall furnish all equipment, temporary piping, pumps, fittings, gauges, and
- 47 operating personnel necessary to conduct the tests. Water for testing may be obtained from the
- 48 County; however, the Contractor shall pay for all metered water used.

- 1 E. Mains may be tested in sections between valves when intermediary valves are present in the
- 2 main to be tested. Each section to be tested shall be complete, and thrust blocks/joint restraints
- 3 shall have been in place for not less than 10 days prior to performance of the tests. All restrained
- 4 joint pipe and fittings shall be completely backfilled to produce the required restraint prior to
- 5 performance of the tests.
- 6 F. Before applying the specified test pressure, all air shall be expelled from the pipe. If blow-offs
- 7 are not available, the Contractor shall make the necessary taps at points of highest elevation
- 8 before the test is made and plug the taps after the test has been completed.
- 9 G. Any exposed pipe, fittings, valves, and joints shall be carefully examined during the test. All
- 10 joints showing visible leaks shall be repaired. Any cracked or defective pipe, fittings, or valves
- 11 discovered as a result of the pressure test shall be removed and replaced by the Contractor with
- 12 sound material, and the test shall be repeated until satisfactory results are attained.
- 13 H. Testing shall be performed to current AWWA C-600 standard and the following requirements:
- 14 pressure tests on mains shall be conducted at a static pressure of one hundred fifty pounds per
- 15 square inch (150 psi) over a period of not less than two (2) hours. Test pressure shall not vary
- 16 by more than ± 5 psi for the duration of the test for the test to be considered successful.
- 17 I. Allowable Leakage:
- 18 1. Leakage test to be performed after an acceptable pressure test.
- 19 2. Water: leakage may not exceed that amount determined by the following equation:

$$L = \frac{SD\sqrt{P}}{133,200}$$

- 21
- 22 Where: L = the allowable leakage in gallons/hour
- 23 S = the length of pipe tested in feet
- 24 D = the nominal pipe diameter in inches
- 25 P = the average test pressure in psi
- 26

- 27 3. Test Failure:
- 28 a. If the actual leakage exceeds the allowable, locate the leak and correct the work and
- 29 repeat the test.
- 30 b. If the integrity of the system is in question, the test may be extended to 6 hours.

31 **3.15 TESTING OF OTHER APPURTENANCES – WATER**

- 32 A. Test all other appurtenances after the connecting pipe lines have been accepted.
- 33 B. Tracer Wire
- 34 1. The locating wire shall be tested for continuous continuity along the entire length.
- 35 2. All visible locations will be check for conformity with the Contract Documents.
- 36 C. Fire Hydrants
- 37 1. Test for smooth operation.
- 38 2. During operation, inspect for leakage from any ports, joints or fittings in the assembly.
- 39 3. Determine that the hydrant has been painted in accordance with Owner’s requirements.
- 40 D. Valves and Valve Boxes
- 41 1. Valves shall be operated to verify smooth operation.
- 42 2. Valves shall be operated to verify correct opening and closing direction.
- 43 3. Valve boxes shall be inspected to ensure that all debris has been cleared, the operating nut is
- 44 centered, and installed with a collar.
- 45 4. The depth of the operating nut will be measured to confirm that a riser has been installed as
- 46 required.
- 47 E. Service Lines

- 1 1. Verify that all service lines have been installed properly, identified and free from all
2 conflicts.
3 2. The number, location and size shall be shown on the As-Built Drawings.
4 3. No service shall terminate under a driveway.
- 5 F. Blow-Off Valve Assemblies
6 1. Valves shall be operated to verify smooth operation and correct opening.
7 2. Verify that the installation is free of all obstructions.
- 8 G. Air Release Valves
9 1. Test to verify correct operation.
10 2. Verify that the installation is free of all obstructions.
11 3. Locate on As-Built Drawings.
- 12 **3.16 LOCATION OF BURIED OBSTACLES**
- 13 A. Furnish exact location and description of buried utilities encountered.
14 B. Reference items to definitive reference point locations such as found property corners, entrances
15 to buildings, existing structure lines, fire hydrants and related fixed structures.
16 C. Include such information as location, elevation, coverage, supports and additional pertinent
17 information.
18 D. Incorporate information on Record Drawings. Refer to Section 01 77 00.

19

END OF SECTION

1 **SECTION 33 12 13**
2 **WATER SERVICE CONNECTIONS**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

- 5 A. Section Includes:
6 1. Plumbing fixtures, trim, and equipment.
7 B. Related Sections include but are not necessarily limited to:
8 1. Section 33 05 01 – Utility Pipe and Fittings.

9 **1.2 QUALITY ASSURANCE**

- 10 A. Referenced Standards:
11 1. American Society of Mechanical Engineer (ASME):
12 a. A112.19.3M, Stainless Steel Plumbing Fixtures (Designed for Residential Use).
13 2. American Society of Sanitation Engineers (ASSE):
14 a. 1011, Performance Requirements for Hose Connection Vacuum Breaker.
15 3. Canadian Standards Association (CSA).
16 4. National Sanitation Foundation International (NSF).
17 5. Underwriters Laboratories, Inc. (UL).
18 6. Latest version of the Orange County Utilities Standards and Construction Specifications
19 Manual.

20 **1.3 SUBMITTALS**

- 21 A. Shop Drawings:
22 1. See Section 01 33 00 for requirements for the mechanics and administration of the submittal
23 process.
24 2. Components and equipment from the list of approved manufacturers included in the
25 Specification Sections are not excluded from the shop drawing submittal requirement.
26 3. See Section 33 05 01.
27 4. Fabrication and/or layout drawings:
28 5. Product technical data including:
29 a. Acknowledgement that products submitted meet requirements of standards referenced.
30 b. Manufacturer's installation instructions.
31 B. Operation and Maintenance Manuals:
32 1. See Section 01 33 00 for requirements for:
33 a. The mechanics and administration of the submittal process.
34 b. The content of Operation and Maintenance Manuals.

35 **PART 2 - PRODUCTS**

36 **2.1 ACCEPTABLE MANUFACTURERS**

- 37 A. All materials furnished for this work shall be in accordance with the “Orange County Utilities
38 Appendix D, List of Approved Products” as appended to these specifications unless otherwise
39 noted. All products not listed in Appendix D shall be subject to the County’s approval.
40 B. Submit request for substitutions in accordance with Specification Sections 01 25 13.

41

1 **2.2 SERVICE PIPE, STOPS, FITTINGS, AND SERVICE SADDLES**

2 A. Refer to *Section 3210: Water Pipes, Valves, and Appurtenances* in the 2011 Orange County
3 Utilities Standards and Construction Specifications Manual

4 **2.3 METER BOXES AND METERS**

5 A. Meter box to be installed by the Contractor per OCU Detail Figure A118.

6 B. Meter to be installed by County per OCU Detail Figure A118.

7 **2.4 GALVANIZED PIPE AND FITTINGS**

8 A. Design Requirements:

- 9 1. Size: 1 IN and 2 IN only.
- 10 2. Standard weight with screwed ends and couplings.
- 11 3. Rated for working pressure of service.
- 12 4. Conforming to ASTM A53/A53M.
- 13 5. Fittings:
 - 14 a. 150-LB malleable iron screwed fittings.
 - 15 b. Use with ferrous pipe having American Standard pipe threads.
- 16 6. Meet lead free requirements of NSF 61 Certification.

17 **2.5 COPPER TUBING**

18 A. Design Requirements:

- 19 1. Size: 1 IN and 2 IN only.
- 20 2. Type K, soft, seamless.
- 21 3. Conform to ASTM B88.
22 Commercially pure wrought copper solder joint fittings.
- 23 4. Joints:
 - 24 a. 95-5 coreless wire solder.
 - 25 b. Conform to ASTM B32, Grade 95 TA.

26 **2.6 POLYETHYLENE TUBING, POTABLE WATER**

27 A. Design Requirements:

- 28 1. Design Requirements:
 - 29 a. Size: 1 IN and 2 IN only.
 - 30 b. Manufactured from ultra-high molecular weight, high density polyethylene.
 - 31 c. Conforming to PE 3408/PE 4710 and AWWA C901, with copper tube outside diameter
32 per ASTM D2737.
 - 33 d. Cell Classification: 345444E (exterior) and 345444D (interior).
 - 34 e. Color: Blue with UV protection
 - 35 f. Working Pressure: 200 psi.
 - 36 g. Standard dimension ratio (SDR) of 9.

37 **PART 3 - EXECUTION**

38 **3.1 GENERAL**

39 A. Install service connections, where applicable, during or after construction of the main.

40 B. Water meters:

- 41 1. Single-Family Residential Meters: To be installed by County.

42 C. See Orange County Standard Details A118 (HDR revised) and A119 for location of residential
43 water services.

1 **3.2 INSTALLATION**

2 A. Cross Connection:

- 3 1. Do not install any plumbing components that will provide a cross connection between
4 potable and non-potable water or drainage systems.

5 B. Connection to Water Main:

- 6 1. Clean exterior of main of dirt and other foreign matter that may impair the quality of the
7 completed connection.
8 2. Place service clamp at desired location.
9 3. Clamp by tightening alternate nuts progressively.
10 4. Do not place service clamp within 1 FT of pipe joint, or another clamp.
11 5. Make taps with adapters for the size main being tapped.

12 C. Undercrossing of Hard Surface Roads:

- 13 1. Directional bore undercrossings.
14 2. Do not open-cut asphalt or concrete roads, unless shown on Drawings and approved by
15 Orange County Public Works.

16 D. Galvanized Pipe:

- 17 1. Cut threads with sharp tools.
18 2. Ream pipes after cutting.
19 3. Join pipe and coupling with an application of a non-toxic pipe compound.

20 E. Copper Tubing:

- 21 1. Cut square ends, ream clean, and flare and make up tightly.
22 2. Prevent the tube from kinking or buckling on short radius bends. If tube should kink or
23 buckle, cut out kinked or buckled sections and splice with brass fitting.

24 F. Polyethylene Tubing:

- 25 1. Install in conformance with manufacturer's recommendations.

26 G. Meter Boxes:

- 27 1. Construct enclosures plumb, and flush with existing ground surface unless shown otherwise.
28 2. Use standard extension sections to adjust to grade.
29 3. Place lightly compacted earth backfill inside meter box to depth shown.
30 4. Backfill around meter vaults as specified in Section 31 21 33, Trenching, Backfilling and
31 Compaction.
32 5. Corporation Stops: OPEN position.
33 6. Angle Stops: CLOSED position.

34 H. Marking:

- 35 1. Water services will be marked with a 2 IN diameter by 5 FT length minimum PVC pipe
36 placed vertically in ground with the top 2 FT painted blue located behind the meter box and
37 a minimum marker burial depth of 2 FT. Additionally, 3 IN wide by 6 IN wide letters will
38 be etched or cut in the concrete curb and painted blue. Use the letter "W" for water services,
39 "V" for valves, and "B.O" for blow-offs.

40 I. Testing:

- 41 1. Test Service connection and piping at the main test pressure after main has been connected
42 and pressure tested as specified in the individual sections.
43 2. Inspect service connections for leakage under normal system pressure. Joints shall be
44 watertight before acceptance.
45 3. Test Duration: At least 15 minutes.
46 4. Inspect for leaks and repair before backfilling.

47 J. Disinfection of Service Connections:

- 48 1. Make connection to the main, which has been pressure tested as specified in the individual
49 Sections, and disinfected as specified in Section 33 11 13.

1 **SECTION 33 12 19**
2 **FIRE HYDRANT**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

- 5 A. Section Includes:
6 1. Dry-barrel fire hydrant.
7 B. Related Sections include but are not necessarily limited to:
8 1. Section 09 91 00 - Painting for Utilities.
9 2. Section 33 05 01 – Utility Pipe and Fittings.

10 **1.2 QUALITY ASSURANCE**

- 11 A. Referenced Standards:
12 1. American Water Works Association (AWWA):
13 a. C502, Standard for Dry-Barrel Fire Hydrants.
14 b. M17, Installation, Operation and Maintenance of Fire Hydrants.
15 2. Specifications outlined in the latest version of the Orange County Subdivision Regulations
16 and applicable County fire codes shall be followed at a minimum.
17 3. Latest version of the Orange County Utilities Standards and Construction Specifications
18 Manual.

19 **1.3 SUBMITTALS**

- 20 A. Informational Submittal:
21 1. Fire Hydrant flow test results, name plate data, and GPS coordinates for each hydrant
22 installed or reset.
23 B. Shop Drawings:
24 1. See Section 01 33 00 for requirements for the mechanics and administration of the
25 submittal process.
26 2. Product technical data:
27 a. Acknowledgement that products submitted meet the requirements of the standards
28 referenced.
29 b. Manufacturer's installation instructions.
30 c. Acknowledge and verify dimensions and provide list of integral parts and materials.

31 **PART 2 - PRODUCTS**

32 **2.1 ACCEPTABLE MANUFACTURERS**

- 33 A. All materials furnished for this work shall be in accordance with the “Orange County Utilities
34 Appendix D, List of Approved Products” as appended to these specifications unless otherwise
35 noted. All products not listed in Appendix D shall be subject to the County’s approval.
36 B. Submit request for substitutions in accordance with Specification Section 01 25 13.

37 **2.2 FIRE HYDRANT**

- 38 A. Design and Fabrication:
39 1. Conform to AWWA C502.
40 2. Provide with either compression or gate design.

- 1 3. Provide with a minimum 5-1/4 IN main valve opening with 6 IN bottom connection; nozzle
- 2 section consisting of two (2) 2-1/2 IN hose nozzles and one (1) 4-1/2 IN pumper nozzle.
- 3 4. Operating Nuts: 1-1/2 IN National Standard pentagon nut.
- 4 5. Provide with water passages to permit full flow of water to minimize friction loss.
- 5 6. Furnish with multiple weep holes for positive draining to allow water to escape readily
- 6 from standpipe when hydrant valve is closed.
- 7 7. Designed to throttle flow when partially opened.
- 8 8. Designed to allow removal of valve and valve stem without digging up hydrant.
- 9 9. Valve opens on counterclockwise rotation
- 10 10. Main Valve:
- 11 a. Depth of bury: 3 FT minimum.
- 12 b. Equip with O-ring seals.
- 13 11. Hydrant Leads:
- 14 a. The hydrant lead shall be a minimum of six inches in diameter. Auxiliary isolation
- 15 valve(s) shall be installed in all hydrant leads. Restrain all joints.
- 16 12. Furnish with restrained mechanical (gland type) joint inlet connections.
- 17 13. Design to break off at ground line when struck by a vehicle.
- 18 14. Furnish with O-ring packing only.
- 19 15. Furnish hose and steamer nozzles with threads conforming to standard threads used by local
- 20 Fire Department.
- 21 16. Furnish with direction of opening as required by local Fire Department with direction of
- 22 opening cast on dome.

23 2.3 BLOW-OFF ASSEMBLY (FLUSHING HYDRANT)

- 24 A. Design and Fabrication:
- 25 1. Self-draining, non-freezing, compression type hydrant.
- 26 2. Main valve opening 2-3/16".
- 27 3. Inlet connection: 2" FIP and 2" NPT nozzle.
- 28 4. Designed to fit in standard 5 1/4" adjustable valve box.
- 29 5. Principal interior parts shall be brass and removable from the hydrant for servicing without
- 30 excavating.
- 31 6. Lead to be at least 2" with all joints restrained.

32 PART 3 - EXECUTION

33 3.1 INSTALLATION

- 34 A. Install hydrants at locations indicated in accordance with AWWA M17 and the following:
- 35 1. Remove foreign material from barrel of hydrant before placement.
- 36 2. Install plumb and at same elevation as connecting pipe and main.
- 37 3. Place each hydrant on a slab of concrete 8 IN thick and 16 IN SQ base. Compressive
- 38 strength of concrete shall be 3,000 psi at 28 days.
- 39 4. Place washed 3/4 IN drainage gravel around base of hydrant in accordance with Section 3.7
- 40 of AWWA C600 and as shown in the Drawings. Gravel shall be free of organic matter,
- 41 sand, loam, clay, and other small particles that will restrict flow through gravel.
- 42 5. Firmly tamp carefully compacted backfill around hydrant to surface of ground and to a
- 43 distance of 5 FT in front of hydrant.
- 44 6. Thrust ties:
- 45 a. All hydrants shall be provided with anchor coupling or joints designed to prevent
- 46 movement.
- 47 b. Install two tie rods between main valve and hydrant.
- 48 c. Install mechanical joint glands with lugs in joints between hydrant and main valve.
- 49 7. See Construction Detail Figure A203 in the Drawings for additional requirements.
- 50 8. Provide locating tape and wire on the lead to the hydrant.

- 1 B. Installation Blow-off Assembly (Flushing Hydrant):
2 1. Blow-offs shall be set in 4 CUFT of crushed stone to allow for proper drainage of the blow-
3 off.
4 2. Installation requirements in Article 3.1A of this Specification Section shall be met.
5 3. See Construction Detail Figure A122-1 in the Drawings for additional requirements.
6 4. Provide locating tape and wire on the lead to the hydrant.

7 **3.2 LOCATION OF FIRE HYDRANTS**

- 8 A. Hydrants shall be placed on the same side as the water mains.
9 B. For single-family residential hydrants shall be placed at no more than 1000 FT intervals.
10 C. New or relocated fire hydrants with underground drains shall be located so the drains are:
11 1. At least 3 FT from any existing or proposed storm sewer, stormwater force main, or
12 pipeline conveying reclaimed water regulated under Part III of Chapter 62-610 F.A.C.
13 2. At least 3 FT and preferably 10 FT from any existing or proposed vacuum-type sanitary
14 sewer.
15 3. At least 6 FT, and preferably 10 FT from any existing or proposed gravity or pressure-type
16 sanitary sewer, wastewater force main, or pipeline conveying reclaimed water not regulated
17 under Part III of Chapter 62-610 F.A.C.
18 4. At least 10 FT from any existing or proposed “on-site sewage treatment and disposal
19 system”.

20 **3.3 COATINGS AND FINISHES**

- 21 A. Above-ground
22 1. Non-brass parts inside and outside of hydrant to be painted in accordance with AWWA
23 C502.
24 2. Coating in accordance with Section 3119: *Coatings and Linings* of the Orange County
25 Utilities Standards and Construction Specifications Manual and applicable standards of the
26 National Association of Corrosion Engineers.
27 3. Paint products shall be in accordance with Appendix D of the Orange County Utilities
28 Standards and Construction Specifications Manual and applicable standards of the National
29 Association of Corrosion Engineers.
30 B. Below-ground
31 1. Shoe:
32 a. Fusion bonded epoxy coating
33 2. Barrel:
34 a. Coated with mastic material by the manufacturer.
35 b. Contractor shall check the coating before installing and recoat all coating damage with
36 same material.

37 **END OF SECTION**

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1 **SECTION 40 05 23**
2 **VALVES: BASIC REQUIREMENTS**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

- 5 A. Section Includes:
6 1. Valving, actuators, and valving appurtenances.
7
8 B. Related Sections include but are not necessarily limited to:
9 1. Division 1 - General Requirements.
10 2. Section 09 91 00 – Painting for Utilities.
11 3. Section 33 05 01 – Utility Pipe and Fittings.

12 **1.2 QUALITY ASSURANCE**

- 13 A. Referenced Standards:
14 1. American Society of Mechanical Engineers (ASME):
15 a. B1.20.1, Pipe Threads, General Purpose.
16 b. B16.1, Cast Iron Pipe Flanges and Flanged Fittings.
17 c. B16.5, Pipe Flanges and Flanged Fittings - NPS 1/2 Through NPS 24.
18 d. B16.18, Cast Copper Alloy Solder Joint Pressure Fittings.
19 2. ASTM International (ASTM):
20 a. A48, Standard Specification for Gray Iron Castings.
21 b. A126, Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe
22 Fittings.
23 c. A276, Standard Specification for Stainless Steel Bars and Shapes.
24 d. A395, Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for
25 Use at Elevated Temperatures.
26 e. A436, Standard Specification for Austenitic Gray Iron Castings.
27 f. A536, Standard Specification for Ductile Iron Castings.
28 g. B148, Standard Specification for Aluminum-Bronze Sand Castings.
29 h. D256, Standard Test Methods for Determining the Izod Pendulum Impact Resistance of
30 Plastics.
31 i. D638, Standard Test Method for Tensile Properties of Plastics.
32 j. D648, Standard Test Method for Deflection Temperature of Plastics Under Flexural
33 Load in the Edgewise Position.
34 k. D695, Standard Test Method for Compressive Properties of Rigid Plastics.
35 l. D2240, Standard Test Method for Rubber Property-Durometer Hardness.
36 3. American Water Works Association (AWWA):
37 a. C207, Standard for Steel Pipe Flanges for Waterworks Service - Sizes 4 IN through
38 144 IN.
39 b. C500, Standard for Metal-Seated Gate Valves for Water and Supply Service.
40 c. C504, Standard for Rubber-Seated Butterfly Valves.
41 d. C509, Standard for Resilient-Seated Gate Valves for Water Supply Service.
42 e. C515, Standards for Reduced-Wall, Resilient-Seated Gate Valves for Water Supply
43 Systems
44 f. C540, Standard for Power-Actuating Devices for Valves and Slide Gates.
45 g. C550, Standard for Protective Interior Coatings for Valves and Hydrants.
46 h. C606, Standard for Grooved and Shouldered Joints.
47 4. American Water Works Association/American National Standards Institute
48 (AWWA/ANSI):
a. C111/A21.11, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

5. Manufacturers Standardization Society of the Valve and Fittings Industry Inc. (MSS):
 - a. SP-9, Spot Facing for Bronze, Iron and Steel Flanges.
 - b. SP-67, Butterfly Valves.
 - c. SP-70, Cast Iron Gate Valves, Flanged and Threaded Ends.
6. Latest version of the Orange County Utilities Standards and Construction Specifications Manual.

1.3 SUBMITTALS

- A. Shop Drawings:
 1. See Section 01 33 00 for requirements for the mechanics and administration of the submittal process.
 2. Product technical data including:
 - a. Acknowledgement that products submitted meet requirements of standards referenced.
 - b. Manufacturer's installation instructions.
 - c. Valve pressure and temperature rating.
 - d. Valve material of construction.
 - e. Special linings.
 - f. Valve dimensions and weight.
 - g. Valve flow coefficient.
 3. For valves 8 IN and larger, furnish "Affidavit of Compliance" with AWWA C504.
 4. Test reports.
- B. Operation and Maintenance Manuals:
 1. See Section 01 33 00 for requirements for:
 - a. The mechanics and administration of the submittal process.
 - b. The content of Operation and Maintenance Manuals.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Valves to include operator, actuator, handwheel, chain wheel, extension stem, floor stand, operating nut, chain, wrench, and accessories to allow a complete operation from the intended operating level.
- B. Valve to be suitable for intended service. Renewable parts are not to be of lower quality than specified.
- C. Valve same size as adjoining pipe, unless otherwise called out on Drawings.
- D. Valve ends to suit adjacent piping.
- E. Resilient seated valves shall have no leakage (drop-tight) in either direction at valve rated design pressure. All other valves shall have no leakage (drop-tight) in either direction at valve rated design pressure, unless otherwise allowed for in this section or in stated valve standard.
- F. Size operators and actuators to operate valve for the full range of pressures and velocities.
- G. Valve to open by turning counterclockwise.
- H. Factory mount operator, actuator, and accessories.

2.2 ACCEPTABLE MANUFACTURERS

- A. All materials furnished for this work shall be in accordance with the "Orange County Utilities Appendix D, List of Approved Products" as appended to these specifications unless otherwise noted. All products not listed in Appendix D shall be subject to the County's approval.
- B. Submit request for substitution in accordance with Specification Section 01 25 13.

1 **2.3 GATE VALVES: WATER (12 IN AND SMALLER)**

2 A. Conform to requirements of Specification Section 40 50 05 of these Contract Documents.

3 **2.4 TAPPING VALVES**

4 A. Tapping valves shall conform in all respects to the requirements of valves in this Section, except
5 inlet joints shall be designed for the sleeve provided, outlet ends shall be restrained mechanical
6 joint, and seat rings shall be sized to allow passage of the tapping machine cutters.

7 **2.5 TAPPING SLEEVES**

8 A. Mechanical Joint Tapping Sleeves:

- 9 1. ANSI D 16.1, Class 125.
10 2. Ductile iron with ductile iron glands.
11 3. Working pressure of 250 psi.
12 4. Vulcanized natural synthetic rubber gaskets.
13 5. Bolts and nuts in compliance with AWWA C111.
14 6. Provide bituminous coating with polyethylene wrap.

15 B. Steel Tapping Sleeve (Epoxy Coated W/S.S. Bolts and Nuts):

- 16 1. AWWA C-207, Class 150.
17 2. Carbon steel, 3/8 inch, ASTM A285, Grade C.
18 3. Working pressure of 250 psi.
19 4. Vulcanized natural or synthetic rubber gaskets.
20 5. Bolts and nuts in compliance with AWWA C111.

21 C. Stainless Steel Tapping Sleeves, Potable/Non-potable:

- 22 1. Sleeve shell and lugs, 18-8 Type 304 stainless steel.
23 2. Flange, ductile iron or stainless steel in compliance with ASTM 536, Grade 65-45-12.
24 3. Working pressure of 250 psi.
25 4. Virgin SER compounded gaskets in compliance with ASTM D2000 MAA 410z-90, 45
26 durometer.
27 5. Bolts, washers, and nuts shall be 5/8-inch Type 304 stainless steel, NC thread, heavy hex
28 bolts. Bolt threads shall be Teflon coated.
29 6. Washers shall be plastic lubricating.

30 **2.6 ISOLATION VALVES**

31 A. Corporation Stop:

- 32 1. Size: 1 inch and 2 inches.
33 2. Characteristics: Ball type with AWWA/CC Taper thread.

34 B. Curb Stop:

- 35 1. Straight Valve, Ball Type, Compression.
36 2. Size: 1 inch and 2 inches.
37 3. Characteristics: 5/8-inch by 3/4-inch and 3/4-inch meter size outlet with female iron pipe
38 threads and padlock wing.

39 **2.7 VALVE ACTUATORS**

40 A. Valve Actuators - General:

- 41 1. Provide actuators as shown on Drawings or specified.
42 2. Counter clockwise opening as viewed from the top.
43 3. Direction of opening and the word OPEN to be cast in handwheel or valve bonnet.
44 4. Size actuator to produce required torque with a maximum pull of 80 LB at the maximum
45 pressure rating of the valve provided and withstand without damage a pull of 200 LB on
46 handwheel or chainwheel or 300 foot-pounds torque on the operating nut.
47 5. Unless otherwise specified, actuators for valves to be buried shall be sealed to withstand at
48 least 20 FT of submergence.

6. Extension Stem:
 - a. Install where shown or specified.
 - b. Solid steel with actuator key and nut, diameter not less than stem of valve actuator shaft.
 - c. Pin all stem connections.
 - d. Center in valve box or grating opening band with guide bushing.

B. Buried Valve Actuators:

1. Provide screw type adjustable cast iron valve box, 5 IN minimum diameter, 3/16 IN minimum thickness, and identifying cast iron cover.
2. Box base to enclose buried valve gear box or bonnet.
3. Provide 2 IN standard actuator nuts complying with Section 3.16 of AWWA C500.
4. Provide at least two (2) teehandle keys for actuator nuts, with 5 FT extension between key and handle.
5. Extension Stem:
 - a. Provide for buried valves greater than 3 FT below finish grade.
 - b. Extend to within 6 IN of finish grade.
6. Provide concrete pad encasement of valve box as shown for all buried valves unless shown otherwise.

2.8 ACCESSORIES

A. T-Handled Operating Wrench:

1. One each galvanized operating wrenches, 4 feet long, for every 5 valves installed.
2. One each galvanized operating keys for cross handled valves.

B. Extension Bonnet for Valve Operator: Complete with enclosed stem, extension, support brackets, and accessories for valve and operator.

C. Cast-Iron Valve Box: Designed for traffic loads, sliding type, with minimum of 5-1/4-inch ID shaft.

1. Box: Cast iron with minimum depth of 9 inches.
2. Lid: Cast iron, minimum depth 3 inches, nonlocking type, marked WATER, SEWER, or RECLAIM.
3. Extensions: Cast iron.
4. Two-piece box and lid for valves 4 inches through 12 inches, three-piece box and lid for valves larger than 12 inches with base sized for valve

2.9 FABRICATION

A. End Connections:

1. Refer to individual valve sections for specifications.
2. Comply with the following standards:
 - a. Threaded: ASME B1.20.1.
 - b. Flanged: ASME B16.1 Class 125 unless otherwise noted or AWWA C207.
 - c. Bell and spigot or mechanical (gland) type: AWWA/ANSI C111/A21.11.
 - d. Soldered: ASME B16.18.
 - e. Grooved: Rigid joints per Table 5 of AWWA C606.

B. Nuts, Bolts, and Washers:

1. Wetted or internal to be bronze or stainless steel.
 - a. Exposed to be zinc or cadmium plated.

C. Epoxy Interior Coating:

1. Provide epoxy interior coating for all ferrous surfaces in accordance with AWWA C550.
2. Either two-part liquid material or heat-activated (fusion) material except only heat-activated material if specified as “fusion” or “fusion bonded” epoxy.
3. Minimum 7-mil dry film thickness except where limited by valve operating tolerances

1 **PART 3 - EXECUTION**

2 **3.1 INSTALLATION**

3 A. General

- 4 1. Install products in accordance with manufacturer's instructions.
- 5 2. Valves shall be carefully inspected, fully opened, and then tightly closed and the various
- 6 nuts and bolts shall be tested for tightness. Any valve that does not operate correctly shall be
- 7 removed and replaced.
- 8 3. See Construction Detail A112 in the Drawings for valve box pad requirements.
- 9 4. Painting Requirements:
- 10 a. Comply with Section 09 91 00 for painting and protective coatings.
- 11 5. Setting Buried Valves:
- 12 a. Locate valves installed in pipe trenches where buried pipe indicated on Drawings.
- 13 b. Set valves and valve boxes plumb.
- 14 c. Place valve boxes directly over valves with top of box being brought to surface of
- 15 finished grade.
- 16 d. Install in closed position.
- 17 e. Place valve on firm footing in trench to prevent settling and excessive strain on
- 18 connection to pipe.
- 19 f. After installation, backfill up to top of box for a minimum distance of 4 FT on each side
- 20 of box.
- 21 6. Support exposed valves and piping adjacent to valves independently to eliminate pipe loads
- 22 being transferred to valve and valve loads being transferred to the piping.
- 23 7. For grooved coupling valves, install rigid type couplings or provide separate support to
- 24 prevent rotation of valve from installed position.
- 25 8. Install all cylinder actuators above or horizontally adjacent to valve and gear box to
- 26 optimize access to controls and external handwheel.
- 27 9. For threaded valves, provide union on one side within 2 FT of valve to allow valve removal.
- 28 10. Install valves accessible for operation, inspection, and maintenance.

29 B. Valve Boxes:

- 30 1. Valve boxes shall be carefully centered over the operating nuts of the valves so as to permit
- 31 a valve key to be fitted easily to the operating nut. In unpaved areas, valve boxes shall be set
- 32 to conform to the level of the finished surface and held in position by a concrete collar
- 33 placed under the support flange as shown on the Drawings. The letter "V" shall be etched in
- 34 the curb at each valve location. The valve box shall not transmit surface loads to the pipe or
- 35 valve but be supported by bedding rock as shown on the Drawings. Extensions or risers for
- 36 valve boxes shall be an integral part of the box. No cut sections of D.I. or PVC pipe shall be
- 37 used in extending the box to its proper height. Care shall be taken to prevent earth and other
- 38 material from entering the valve box. Any valve box which is out of alignment or whose top
- 39 does not conform to the finished ground surface shall be dug out and reset. Before final
- 40 acceptance of the Work all valve boxes shall be adjusted to finish grade.

41 C. Concrete Collar:

- 42 1. Each valve installed in an unimproved area (outside of pavement, driveways or sidewalks)
- 43 shall require a 24" x 24" x 6" concrete pad or collar as shown in the Drawings.

44 D. Identification Disc:

- 45 1. Each 16-inch or larger valve (unless otherwise shown on the Drawings) installed shall be
- 46 identified by a 3-inch diameter bronze disc anchored in the concrete pad or collar in
- 47 unimproved areas and/or anchored on a 4-inch x 4-inch x 18-inch long concrete post set
- 48 flush with the pavement surface in improved areas. The disc shall be stamped with the
- 49 following information as shown on the Drawings:
- 50 a. Size of the valve.
- 51 b. Type of valve.
- 52 c. Service.
- 53 d. Direction and number of turns to open.

- 1 E. Gate Valves:
2 1. Install operating stem vertical when valve is installed in horizontal runs of pipe having
3 centerline elevations 4 FT 6 IN or less above finished floor, unless otherwise shown.
4 2. Install operating stem horizontal in horizontal runs of pipe having centerline elevations
5 greater than 4 FT 6 IN above finish floor, unless otherwise shown.
6 3. See Construction Detail A107 in the Drawings for additional requirements.

7 **3.2 TESTS AND INSPECTION**

- 8 A. Valve may be either tested while testing pipelines, or as a separate step.
9 B. Test that valves open and close smoothly under operating pressure conditions. Test that two-way
10 valves open and close smoothly under operating pressure conditions from both directions.
11 C. Count and record number of turns to open and close valve; account for any discrepancies with
12 manufacturer's data.
13 D. Set, verify, and record set pressures for relief and regulating valves.

14 **END OF SECTION**

1 **SECTION 40 50 05**
2 **GATE VALVES**

3 **PART 1 - GENERAL**

4 **1.1 SUMMARY**

- 5 A. Section Includes:
6 1. Gate valves.
7 B. Related Specification Sections include but are not necessarily limited to:
8 1. Section 40 05 23 - Valves: Basic Requirements.

9 **1.2 QUALITY ASSURANCE**

- 10 A. Referenced Standards:
11 1. ASTM International (ASTM):
12 a. A126, Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe
13 Fittings.
14 2. American Water Works Association (AWWA):
15 a. C500, Standard for Metal-Seated Gate Valves for Water Supply Service.
16 b. C504, Standard for Rubber-Seated Butterfly Valves.
17 c. C509, Standard for Resilient-Seated Gate Valves for Water Supply Service.
18 d. C515, Standards for Reduced-Wall, Resilient-Seated Gate Valves for Water Supply
19 Systems.
20 e. C550, Standard for Protective Epoxy Interior Coatings for Valves and Hydrants.
21 3. Manufacturers Standardization Society of the Valve and Fittings Industry Inc. (MSS):
22 a. SP-9, Spot Facing for Bronze, Iron and Steel Flanges.
23 b. SP-70, Cast Iron Gate Valves, Flanged and Threaded Ends.
24 c. SP-80, Bronze Gate, Globe, Angle and Check Valves.
25 4. Latest version of the Orange County Utilities Standards and Construction Specifications
26 Manual.

27 **1.3 DEFINITIONS**

- 28 A. OS&Y: Outside Screw and Yoke.
29 B. NRS: Non-rising Stem.
30 C. RS: Rising Stem.

31 **1.4 SUBMITTALS**

- 32 A. Shop Drawings:
33 1. See Specification Section 01 33 00 for requirements for the mechanics and administration of
34 the submittal process.
35 2. See Specification Section 40 05 23.
36 B. Operation and Maintenance Manuals:
37 1. See Specification Section 01 33 00 for requirements for:
38 a. The mechanics and administration of the submittal process.
39 b. The content of Operation and Maintenance Manuals.

1 **PART 2 - PRODUCTS**

2 **2.1 ACCEPTABLE MANUFACTURERS**

- 3 A. All materials furnished for this work shall be in accordance with the “Orange County Utilities
4 Appendix D, List of Approved Products” as appended to these specifications unless otherwise
5 noted. All products not listed in Appendix D shall be subject to County’s approval.

6 **2.2 VALVES: WATER (12 IN DIA AND SMALLER)**

- 7 A. Resilient Seat Gate Valves:
8 1. Comply with AWWA C509 & AWWA C515.
9 2. Materials:
10 a. Stem and stem nut: Bronze.
11 1) Wetted bronze parts in low zinc bronze.
12 2) Aluminum bronze components: Heat treated per AWWA C504.
13 b. Body, gate: Ductile iron.
14 c. Resilient seat: Styrene Butadiene Rubber (SBR).
15 3. Design requirements:
16 a. Minimum 200 psig working pressure.
17 b. Buried: NRS O-ring stem seal.
18 c. Exposed: NRS, O-ring, stem seal, handwheel.
19 d. Counter clockwise open rotation.
20 4. Fusion bonded epoxy coating interior and exterior except stainless steel and bearing
21 surfaces.
22 a. Comply with AWWA C550. NSF 61 certified.
23 b. Wetted bronze parts in low zinc bronze.
24 c. Aluminum bronze components: Heat treated per AWWA C504.

25 **2.3 ACCESSORIES**

- 26 A. Refer to Drawings for type of actuators.
27 1. Furnish actuator integral with valve.
28 2. All buried valves to be furnished with 2 IN operating nut with extension and valve box. Nut
29 to be located 6 IN from finished grade.
30 B. Refer to Specification Section 40 05 23 for actuator requirements.

31 **2.4 FABRICATION**

- 32 A. General:
33 1. Provide valves with clear waterways the full diameter of the valve.
34 B. Spot valves in accordance with MSS SP-9.

35 **PART 3 - EXECUTION**

36 **3.1 INSTALLATION**

- 37 A. See Specification Section 40 05 23.
38 B. Where larger buried valves utilize smaller bypass valves, provide a second valve box installed
39 over the bypass valve operating nut.
40 C. Do not install gate valves inverted or with the stems sloped more than 45 degrees from the
41 upright unless the valve was ordered and manufactured specifically for this orientation.

42 **END OF SECTION**

APPENDIX A

**License Agreement to Enter Upon Lands to Connect Residential and Commercial Buildings
to Public Utility Systems**

**LICENSE AGREEMENT FOR CONTRACTOR TO ENTER UPON LANDS TO
CONNECT RESIDENTIAL AND COMMERCIAL BUILDINGS TO PUBLIC UTILILITY SYSTEMS**

_____, (Licensor/Property Owner) hereby grants to _____, (Contractor/Contractor's Plumbing Subcontractor), a licensed contractor (herein called Contractor), the license and privilege to enter on the property described below, for the purposes of disconnecting and abandoning the existing sewer lateral and potable water service connections (rear lot) and reconnecting the residential or commercial unit to the public water and wastewater systems being installed by the Orange County Utilities Department (County) in public rights-of-way (front of lot) pursuant to the Park Manor Estates Water and Wastewater Systems Improvements (Project), restoring all disturbed property and inspecting the work to determine compliance with the Contract Documents.

- A. Licensor grants said License to Plumbing Contractor in consideration of the sum of \$1.00, the sufficiency of which is hereby acknowledged. Licensor and Plumbing Contractor acknowledge and agree that Plumbing Contractor may utilize the services of a subcontractor to connect the residence to the public water and wastewater system authorized and permitted by this License Agreement.
- B. The purpose of this License Agreement is to allow Plumbing Contractor its officers, employees, agents, and assigns as well as the officers, employees, agents, and assigns for the General Contractor of the Project, Orange County Utility (utility owner) and HDR Engineering Inc. (engineer of record) to enter upon the described property for the purposes set forth in the first paragraph.
- C. This license shall be a term of three hundred and sixty-five (365) days from the date hereof. Licensor, and Plumbing Contractor agree that this License Agreement may be renewed one time for up to an additional sixty (60) days upon further written notice to Licensor from Plumbing Contractor at least fifteen (15) days prior to the expiration of the initial terms of this License Agreement. Notice to Licensor shall be sent to:

Property Owners Name: _____
Mailing Address: _____
City/State/Zip: _____
Phone: _____
Facsimile: _____
Site Address: _____
Site Parcel ID: _____
Site Legal: _____

- D. The person executing this License Agreement as Licensor represents that he has the authority to grant the License and that he/she is the _____ (owner, partner, corporate officer, trustee of the owner).
- E. The Property Owner granting this License acknowledges and agrees that the services of the Plumbing Contractor will be paid for by the County.
- F. The Property Owner granting this License acknowledges and agrees that the services of the Contractor will include installation of new gravity sewer and water service piping from a connection to the house to a point of connection with the County defined as the sewer lateral connection with a clean out and water service connection located in the right of way.
- G. The Property Owner granting the License acknowledges that the utilities constructed by the Contractor on private property beyond the County point of connection at or near the right-of-way line are owned and shall be maintained by the Property Owner.
- H. Utilities constructed by the Contractor and owned by the Property Owner will have a warranty period of three hundred sixty-five days (365) from the date of Project final completion.

DONE AND EXECUTED AND EFFECTIVE this _____ day of _____, 2012.

WITNESSES:

LICENSOR:

By: _____
Print Name: _____
Title: _____

By: _____
Print Name: _____

By: _____
Print Name: _____

AS TO LICENSOR:

STATE OF _____
COUNTY OF _____

The foregoing instrument was acknowledged before me this _____ (date)
by _____ (name)
as _____ (owner, partner, corporate officer, trustee).
He/she is personally known to me [] or has produced _____ as identification.

Signature - Notary Public-State of

Type or Print Name

APPENDIX B

Geotechnical Report for Park Manor Estates Water and Wastewater System Improvements

By

Nodarse & Associates, Inc. (Terracon Consultants Inc.)
September 4, 2012

Report of Subsurface Exploration and Geotechnical Engineering Evaluation

Park Manor Estates
Water and Wastewater System Improvements
Orange County, Florida
September 4, 2012
Project No. H1115484

Prepared for:
HDR Engineering, Inc.
Orlando, Florida

Prepared by:
Nodarse & Associates
A Terracon Company
Winter Park, Florida

Offices Nationwide
Employee-Owned
nodarse.com
terracon.com





September 4, 2012

HDR Engineering, Inc.
315 East Robinson Street, Suite 400
Orlando, Florida 32801

Attn: Mr. Roger Noack, P.E.
P: [407] 420-4208
C: [512] 924-0463
E: roger.noack@hdrinc.com

Re: Report of Subsurface Exploration and Geotechnical Engineering Evaluation
Park Manor Estates
Water and Wastewater System Improvements
Orange County, Florida
Project No. H1115484

Dear Mr. Noack:

Nodarse & Associates, a Terracon Company (Nodarse/Terracon) is pleased to present this report of our subsurface exploration and geotechnical engineering evaluation for the referenced project. The purposes of this study were to explore subsurface conditions along the proposed utility alignments and to use the data obtained to provide geotechnical engineering recommendations to assist in the design and construction of the utilities for the above-referenced project. This report describes our exploration procedures, exhibits the data obtained and presents our geotechnical engineering recommendations for the installation of the proposed utilities.

PROJECT DESCRIPTION

The project consists of installation of utility pipes (water and wastewater mains and associated manhole structures) throughout the Park Manor Estates residential development, located south of State Road 50, east of Dean Road, west of Rouse Road, in Orange County, Florida. The proposed pipes consist of 6-inch and 8-inch water and wastewater mains, and are anticipated to be installed to maximum depths of about 4 to 13 feet.



Nodarse & Associates, A Terracon Company 1675 Lee Road Winter Park, Florida 32789
P [407] 740 6110 F [407] 740 6112 terracon.com

Geotechnical



Environmental



Construction Materials



Facilities

SITE CONDITIONS

Review of the USGS “Oviedo SW, Florida” Quadrangle Map, excerpted in **Exhibit A-1** in the **Appendix**, for the project area, shows that natural ground surface elevations at the project site range from about +70 to +80 feet NGVD.

Review of the United States Department of Agriculture (USDA)/Soil Conservation Service (SCS) Map of Orange County, Florida, excerpted in **Exhibit A-2** in the **Appendix**, for the vicinity of the proposed water main pipes indicates that the near surface soil types present along the alignments consist of:

Soil Type	Description	Depth Below Natural Grade to Seasonal High Groundwater Table Under Natural Conditions
1	Arents, Nearly Level	24 to 36 inches
3	Basinger Fine Sand, Depressional	Ponded
15	Felda Fine Sand, Frequently Flooded	Within 10 inches
27	Ona-Urban Land Complex	Within 10 inches
34	Pomello Fine Sand, 0 to 5 Percent Slopes	24 to 40 inches
35	Pomello-Urban Land Complex, 0 to 5 Percent Slopes	24 to 40 inches
42	Sanibel Muck	Ponded
44	Smyrna Fine Sand	Within 10 inches
45	Smyrna-Urban Land Complex	Within 10 inches
54	Zolfo Fine Sand	24 to 40 inches
55	Zolfo-Urban Land Complex	24 to 40 inches

It should be noted that although the majority soil types within the project area indicate a seasonal high groundwater table either typically within 10 inches or at depths of 24 to 40 inches below natural grade; this is based on natural conditions. Groundwater levels will likely vary from these estimates due to development that includes use of fill material, construction of man-made drainage, etc.

Based on review of the St. John's River Water Management District (SJRWMD) potentiometric maps of the upper Floridan Aquifer for this project area, the estimated elevation of the artesian head is near approximately +35 feet, NGVD for the project site. Based on these maps and the results of the soil borings, artesian conditions are not anticipated to be a concern for this project.

SUBSURFACE EXPLORATION

The general subsurface soil conditions within the project site was explored and evaluated from the following:

- Twenty-nine (29) auger borings (A-1 through A-29) performed to depths of about 9 and 15 feet below existing grade throughout the project site.
- Eight (8) pavement cores performed throughout the project site.
- Visual classification of recovered soil samples with soil classification.
- Selective laboratory testing of recovered soil samples for soil classification as well as corrosion series testing.

Borings and pavement cores were located in the field by referencing existing site features and measuring from selected features. The boring locations should be considered approximate and are presented on **Exhibits A-3 and A-4** in the **Appendix**.

The machine auger borings were performed by hydraulically turning a 4-inch diameter continuous flight auger into the ground in 5-foot increments. Additional flights were added until the desired termination depth was achieved. The auger was then extracted without further rotation and representative soil samples were retrieved from the auger. Samples were visually classified in the field and were then packaged and returned to our soils laboratory for further classification and testing.

Pavement coring was performed using a 6-inch diameter core barrel. The core barrel was advanced through the pavement and the base course. The core locations were located in the field by referencing prominent site features and measuring from these features. Therefore, the core locations indicated on **Exhibit A-3 and A-4** in the **Appendix** should be considered approximate.

SOIL AND GROUNDWATER CONDITIONS

Subsurface conditions encountered in the borings are described below and are shown on **Exhibits A-5 and A-6** in the **Appendix**. Descriptions of the soils encountered in the borings are accompanied by the Unified Soil Classification symbol (SP, SC, etc.) based on visual examination and limited laboratory testing. Stratification boundaries between soil types should be considered approximate as the actual transition between soil types may be gradual and soils are stratified with regard to their anticipated engineering characteristics. For details at individuals boring locations, refer to the individual boring profiles on **Exhibits A-5 and A-6** in the **Appendix**.

In general, the soil stratification, based on visual examination and laboratory testing, is as follows:

Stratum No.	Description	USCS Classification
1	Light gray to dark brown fine sand to fine sand with silt, with occasional trace roots or shell	SP, SP-SM
2	Orangish-brown and light gray to dark brown fine sand with silt to silty fine sand with trace to some clay	SP-SM, SM
3	Light gray to dark brown silty fine sand	SM
4	Light gray to brown and orangish-brown silty to clayey fine sand	SM-SC
5	Brown to dark brown cemented silty fine sand (hardpan)	SM

A majority of the borings along the project alignment encountered Strata 1, 2 and 3 soils from the existing ground surface to the boring termination depths. Several borings encountered Stratum 4 soils intermittently at various depths and thicknesses ranging between the existing ground surface to the boring termination depths. Stratum 5 (hardpan) was encountered within Boring A-20 at a depth of about 3.5 to 4 feet below existing grade.

The above subsurface conditions are only general descriptions. For details at individual boring locations, refer to the boring profiles in the **Appendix**.

Groundwater Tables: In general, groundwater was observed at depths ranging from about 3 to 9 feet below existing grade in the open boreholes at the time of drilling (June 2012). Groundwater levels regularly fluctuate throughout the year, and therefore, may be different at other times. Groundwater levels at the site will also vary due to fluctuations in the amount of local rainfall.

For purposes of design and construction, the normal seasonal high groundwater levels are estimated to range from depths of about 0.5 to 5.0 feet below the existing ground surface at the boring locations. Estimated normal seasonal high groundwater levels are shown adjacent to the individual boring profiles on **Exhibits A-5 and A-6** in the **Appendix**.

It should be understood that these estimated normal seasonal high groundwater levels are based on the review of available published historical data. It does not imply or guarantee that under certain circumstances of high rainfall conditions or alterations to this or adjoining sites or significant changes in the operating characteristics of adjoining drainage features, that groundwater levels can not be higher than the estimate given above.

LABORATORY TESTING

Laboratory testing included eight (8) single sieve (-200) analyses and four (4) Atterberg Limits tests. The purpose of this testing was to assist in classification of soil samples. Test results are presented adjacent to the boring profiles on **Exhibits A-5 and A-6** in the **Appendix**.

Corrosion Series Testing: A series of six (6) corrosion tests were performed on soil samples obtained from near surface soils for the proposed water and wastewater main lines. These results indicate that the substructure environment generally classifies as slightly aggressive for use in selection of an appropriate class of concrete; and generally classifies as moderately aggressive for use in selection of an appropriate class of steel in accordance with the Florida Department of Transportation (FDOT) Standards. The environmental classifications are based on the Structures Design Guidelines. The corrosion series test results are summarized in **Table 1** in the **Appendix**.

PAVEMENT CORING

Pavement coring was conducted at eight (8) locations throughout the project site. Approximate pavement core locations are presented on **Exhibits A-3 and A-4** in the **Appendix**.

Pavement cores and samples of the underlying base were taken to the lab for inspection by the Geotechnical Engineer. The general locations and frequency of the pavement coring was provided by HDR Engineering, Inc. It should be noted that the pavement and/or base type at each performed pavement core location, as presented in the table below, may vary away from these locations.

A summary of the results is presented in the following table:

Core No.	Pavement Layer (in.)	Base Thickness and Type	Subgrade Soil and Depth to Water Table
	Structural (S)		
P-1	3.9	8" Soil Cement	See Boring A-4 in Appendix
P-2	2.7	7" Soil Cement	See Boring A-5 in Appendix
P-3	3.6	8.5" Soil Cement	See Boring A-8 in Appendix
P-4	2.7	4" Soil Cement	See Boring A-14 in Appendix
P-5	4.3	7.8" Soil Cement	See Boring A-18 in Appendix
P-6	2.6	7.4" Soil Cement	See Boring A-21 in Appendix
P-7	2.7	9.8" Limerock	See Boring A-25 in Appendix
P-8	3.4	5" Limerock	See Boring A-29 in Appendix

A picture of each pavement core is presented in the **Appendix**.

CONCLUSIONS AND RECOMMENDATIONS

The following conclusions and recommendations are based on the project characteristics previously described, the data obtained in our field exploration and our experience with similar subsurface conditions and construction types. If the proposed utility alignments or installation depths are significantly different from those described in this report, or if subsurface conditions different from those disclosed by the borings are encountered during construction, we should be notified immediately so that we might review and modify, if necessary, the following recommendations in regards to such changes. The general guidelines included in this report are not intended to supersede any more stringent requirements mandated by City or County specifications.

General Site Preparation: It is our understanding that the bottom of the utility pipes are proposed to be at about 4 to 13 feet below existing grade. Also, it is our understanding that the majority of the pipelines are proposed to be installed using open-trench construction techniques; and directional drilling will be utilized for pipeline installation in some areas.

The following general procedures are recommended for site preparation:

- All excavations required for pipe construction and installation should be performed in accordance with appropriate Occupational Safety and Health Administration (OSHA) standards. These standards typically include side slopes for temporary excavations not steeper than 1.5 Horizontal to 1 Vertical (1.5H: 1V) to provide for adequate worker safety.
- If these side slopes cannot be maintained or are not desired due to other considerations, a properly designed braced excavation, trench shield or sheet piling would be required to stabilize installation trenches. All shields, shoring and bracing systems or sheet piling should be designed and reviewed by an experienced Professional Engineer registered in the State of Florida. Adjacent traffic loads and induced vibrations among other factors should be included in the design of these stabilization systems.
- Difficult excavation may be encountered in areas of the proposed pipe locations. The Contractor should be made aware that a dense soil layer (hardpan) was encountered in Boring A-20 during our field exploration and may be encountered in other locations along the proposed alignments. Special equipment may be required to penetrate the dense soil materials encountered.

Pipe Subgrade: Based on our understanding of the construction depths for the proposed pipelines, we offer the following recommendations:

- The soils encountered in the majority of the borings appear suitable to support the proposed water mains. The silty fine sand soils (Strata 2 and 3) may retain excess moisture and may be difficult to dry and compact.
- Borings A-7 to A-11, A-16, A-21, and A-25 encountered clayey soils (SM-SC)(Stratum 4) at various depths and thicknesses below existing grade. This material should be treated as unsuitable. The Contractor should anticipate encountering this type of material in the area of the above-referenced borings.
- Boring A-20 encountered hardpan material (Stratum 5) from about 3.5 to 4 feet below existing grade. This material should be treated as unsuitable. The Contractor should anticipate encountering this type of material in the area of Boring A-20.
- If unsuitable soils (soft clays, organics, hardpan, Strata 4 and 5, etc.) are encountered during construction, they should be removed to a depth of 1 foot below the pipe bottom and to the horizontal extent of the bedding, replaced with well-draining granular sands with a fines content of 10% or less passing the No. 200 U.S. Standard sieve by weight and compacted to at least 95% of the soils' modified Proctor maximum dry density (ASTM D-1557).

- In-place density testing of the pipe subgrade soils should be performed at a frequency of at least one test per 300 lineal feet of pipe alignment to verify this compaction is achieved.
- The bedding soil beneath the pipe should be properly shaped to completely support the pipe section and areas should be excavated to accommodate any bells or other raised portions of the pipe to help avoid point loading conditions.
- A minimum separation of 2 feet between the bottom of the compacted subgrade level and the groundwater level is recommended during construction and backfilling operations. A properly designed dewatering system will be required to maintain this minimum separation.
- After the subgrade soils have been prepared as recommended above, the pipe may be installed.

Pipe Backfill Soils: Regarding the pipe backfill soils, we offer the following recommendations:

- Compaction of backfilled soils around the pipe should be accomplished in loose lift thicknesses no thicker than 12 inches.
- The majority of soils encountered in the borings performed during the exploration should be suitable for use as pipe backfill. The silty fine sand soils (Strata 2 and 3) may retain excess moisture and may be difficult to dry and compact. Clayey soils (Stratum 4) are not suitable for use as pipe backfill. Hardpan soils (Stratum 5) will need to be pulverized prior to use as fill.
- From one (1) foot above the pipe to the finished grade elevation, compaction can be accomplished with a small plate or hand-guided drum-type vibratory compactor. Fill should be placed on both sides of the pipe to avoid pipe displacement or unequal pressure on the pipe. Extreme caution should be exercised when operating vibratory equipment near existing structures. Smaller hand compactors should be utilized in all restricted areas, such as beneath pipe haunches and to one (1) foot above the pipe to help provide uniform compaction around the pipe.
- At least one (1) density test per 300 lineal feet of pipe length per lift should be performed to verify that the soil has been compacted to at least 95% of its Modified Proctor maximum dry density (ASTM D-1557).
- Care should be taken to also test the haunch area and to 1 foot above the pipe on this same frequency of one (1) test per 300 lineal feet of pipe installed.
- If compaction difficulties arise during construction, the Geotechnical Engineer should be consulted to provide further recommendations.

Directional Drilling: As stated previously, borings to depths of 9 and 15 feet were performed along the proposed pipeline alignments. Results of these borings are shown on **Exhibits A-5 and A-6** in the **Appendix**.

Based on encountered soil and groundwater conditions, the site appears feasible for directional drilling operations. However, due to the presence of dense soils (hardpan), the Contractor shall anticipate the need for special equipment and/or procedures to facilitate penetration along the alignment. The section *Difficult Drilling/Excavation*, below, should be reviewed for additional information.

Difficult Drilling/Excavation: As previously mentioned, the Contractor should be made aware that a dense soil layer (hardpan) was encountered in Boring A-20 during our field exploration and may be encountered in other locations along the proposed alignments. Dense soils encountered in pipe bedding locations should be undercut and backfilled to avoid uneven loading (point loads) of pipes and fittings.

The Contractor should be made aware that dense soils are present along the water line alignments and should take the appropriate steps to handle it during construction. The Contractor shall anticipate the need for special equipment and/or procedures to facilitate excavations, dewatering, and penetration along the alignment.

Pavements: It is our understanding that in portions of the project, installation of the proposed pipelines will be within areas of existing pavement. In these areas, pavement repair should consist of a pavement section that matches the existing pavement, or should be in accordance with County specifications.

Temporary Dewatering: Groundwater was observed at depths ranging from about 3 to 9 feet in the open boreholes at the time of drilling. Normal seasonal high groundwater levels are estimated to be about 0.5 to 5 feet below the existing ground surface at the boring locations. Based on this information and the proposed embedment depths of the pipes, dewatering will be required to facilitate construction, backfill and compaction in the dry.

Regarding dewatering, we offer the following recommendations:

- Dewatering operations at this site for pipe installation should be accomplished with a properly designed dewatering system operating outside the excavation limits.
- The dewatering system should be adequate to lower groundwater levels to at least 2 feet below the lowest compaction surface and keep it there during backfilling to facilitate excavations in the dry and proper compaction of bedding and backfill soils.
- The Contractor should review the boring profiles prior to implementing the dewatering system to be aware of anticipated soils.

- Special dewatering considerations should be anticipated in areas where very dense soil/hardpan layers are encountered. The Contractor should review the boring profiles prior to implementing the dewatering system to be aware of the encountered locations of very dense/hardpan soils. Very dense/hardpan soils may also be encountered in other locations along the alignments. These soils may cause difficulty for the installation of well points, and specialized equipment may be necessary to penetrate these soils. Additionally, these soils may act as a relatively impermeable confining layer, requiring well point screening both above and below these layers.

REPORT LIMITATIONS


This report is based on the results of a limited number of borings and may not accurately reflect conditions between or away from boring locations. Variations of the subsoil conditions between or away from the borings may occur. If conditions not discussed in this report are observed, we request the opportunity to review our recommendations.

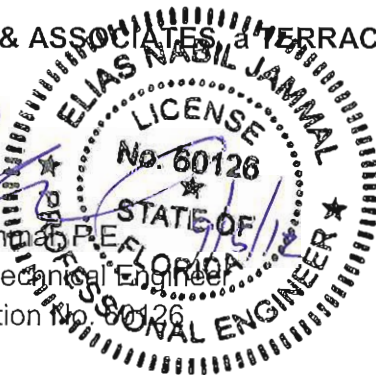
CLOSURE

Nodarse/Terracon appreciates the opportunity to be of service to you on this project. If you should have questions concerning the contents of this report, or if we may be of further assistance, please do not hesitate to contact us.

Sincerely,

NODARSE & ASSOCIATES, A TERRACON COMPANY


Elias N. Jammal, P.E.
Senior Geotechnical Engineer
FL Registration No. 60126




Richard G. Acree, P.E.
Principal, Regional Manager
FL Registration No. 53962



Attachment: Appendix

APPENDIX

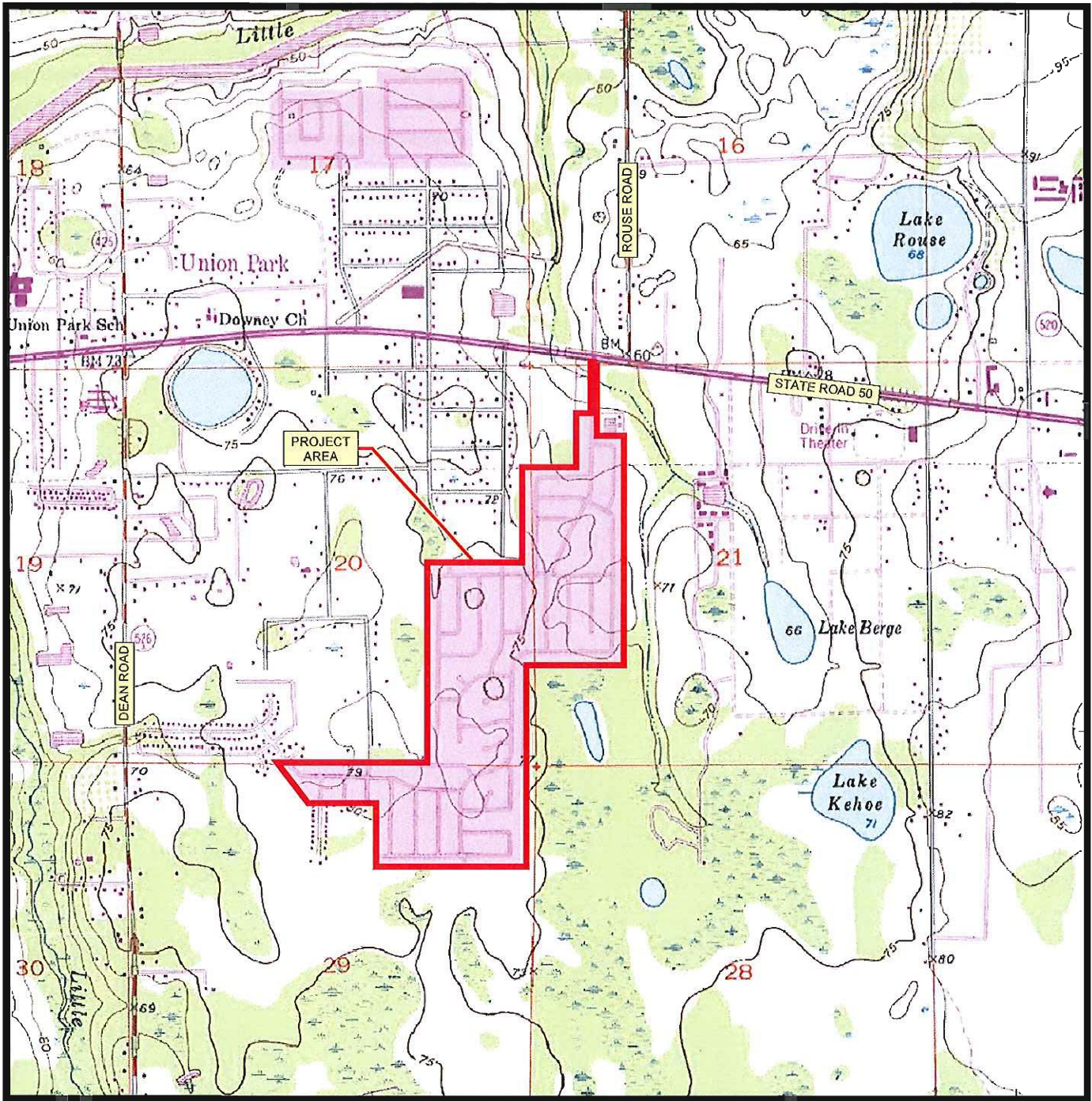
TABLE

**TABLE 1
SUMMARY OF CORROSION SERIES TESTING
PARK MANOR ESTATES
WATER AND WASTEWATER SYSTEM IMPROVEMENTS
ORANGE COUNTY, FLORIDA
PROJECT NO. H1115484**

Boring Number	Sample Depth (feet)	pH	Minimum Resistivity (ohm-cm)	Chlorides (ppm)	Sulfates (ppm)	Substructural Environmental Classification	
						Concrete	Steel
A-1	1.5	7.1	21,000	60	<5	Slightly Aggressive	Slightly Aggressive
A-6	1.5	7.1	33,000	60	<5	Slightly Aggressive	Slightly Aggressive
A-8	3.0	6.5	25,000	60	<5	Slightly Aggressive	Moderately Aggressive
A-14	2.5	6.3	15,000	60	9.9	Slightly Aggressive	Moderately Aggressive
A-23	3.5	5.5	34,000	60	<5	Moderately Aggressive	Extremely Aggressive
A-29	1.5	6.1	4,600	60	<5	Slightly Aggressive	Moderately Aggressive

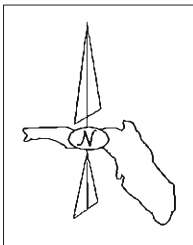
EXHIBITS

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 SECTIONS: 20, 21 and 29
 TOWNSHIP: 22 SOUTH
 RANGE: 31 EAST
 SCALE: 1" = 2000'

ISSUED: 1953 REVISED: 1980



U.S.G.S. QUADRANGLE MAP
 PARK MANOR ESTATES
 WATER AND WASTEWATER SYSTEM IMPROVEMENTS
 ORANGE COUNTY, FLORIDA

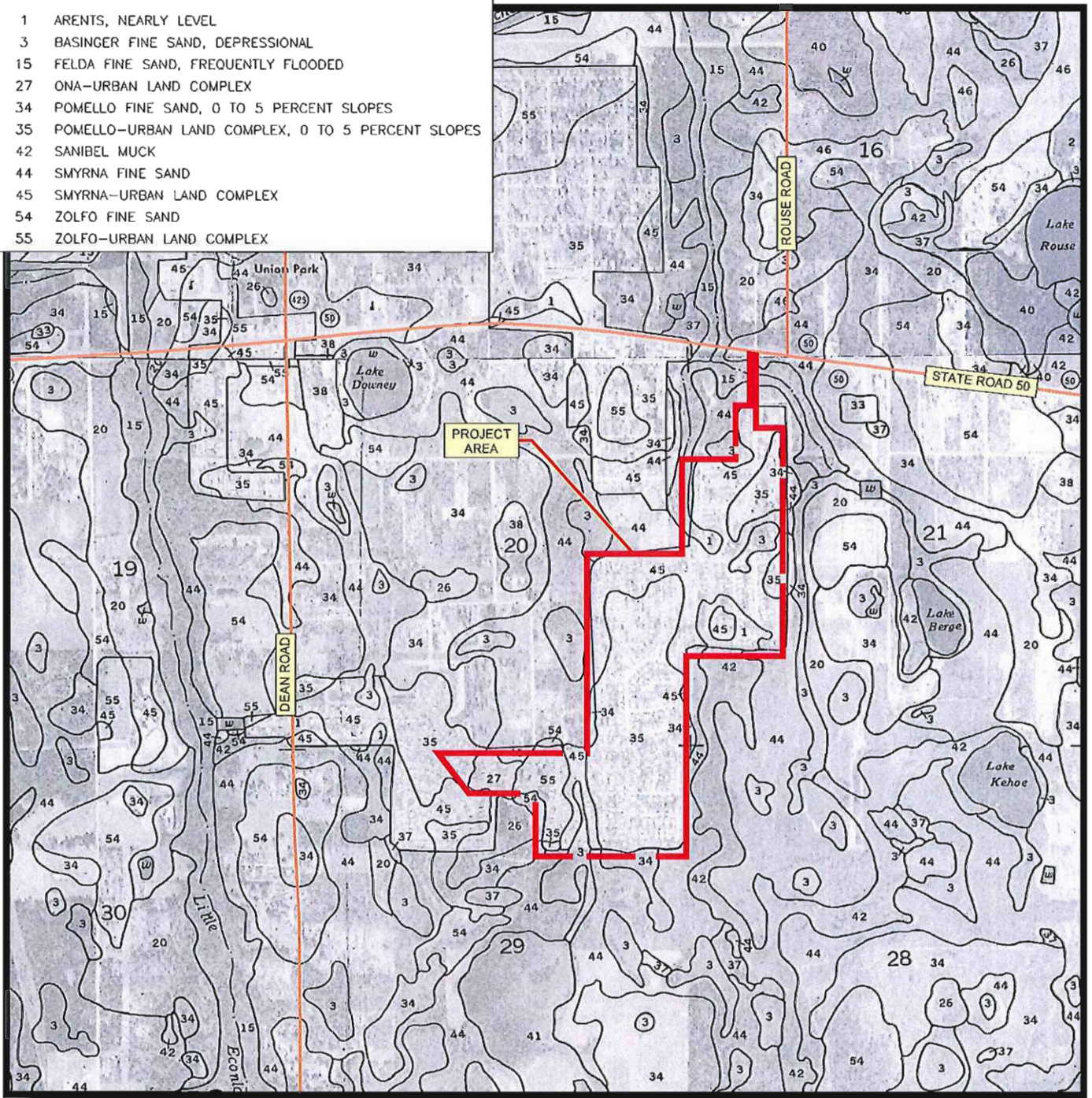
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 CHKD: EJ
 SCALE: 1"=2000'
 DATE: 6-26-12



PROJ. NO: H1115484 EXHIBIT: A-1

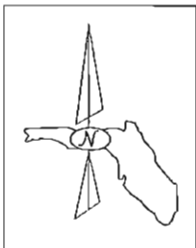
SOIL LEGEND

- 1 ARENTS, NEARLY LEVEL
- 3 BASINGER FINE SAND, DEPRESSIONAL
- 15 FELDA FINE SAND, FREQUENTLY FLOODED
- 27 ONA-URBAN LAND COMPLEX
- 34 POMELLO FINE SAND, 0 TO 5 PERCENT SLOPES
- 35 POMELLO-URBAN LAND COMPLEX, 0 TO 5 PERCENT SLOPES
- 42 SANIBEL MUCK
- 44 SMYRNA FINE SAND
- 45 SMYRNA-URBAN LAND COMPLEX
- 54 ZOLFO FINE SAND
- 55 ZOLFO-URBAN LAND COMPLEX



REFERENCE: U.S.D.A. ORANGE COUNTY, FLORIDA SOIL SURVEY
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 TOWNSHIP: 22 SOUTH
 RANGE: 31 EAST
 SCALE: 1" = 2000'

ISSUED: 1953



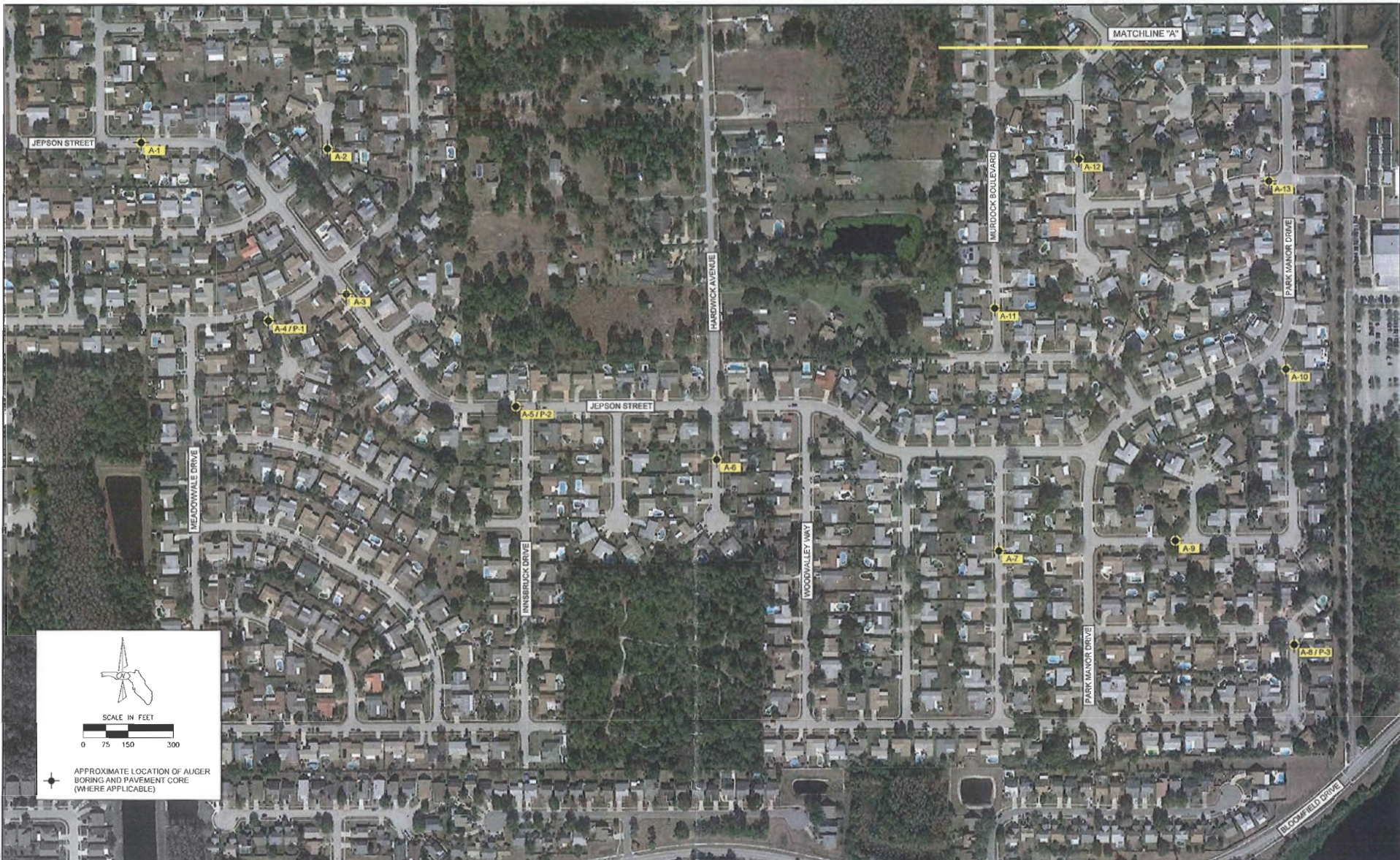
SOILS MAP
 PARK MANOR ESTATES
 WATER AND WASTEWATER SYSTEM IMPROVEMENTS
 ORANGE COUNTY, FLORIDA

DRAWN: MG
 CHKD: EJ
 SCALE: 1"=2000'
 DATE: 6-26-12




PROJ. NO: H1115484
 EXHIBIT: A-2

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04/27, 2013 - R.350m

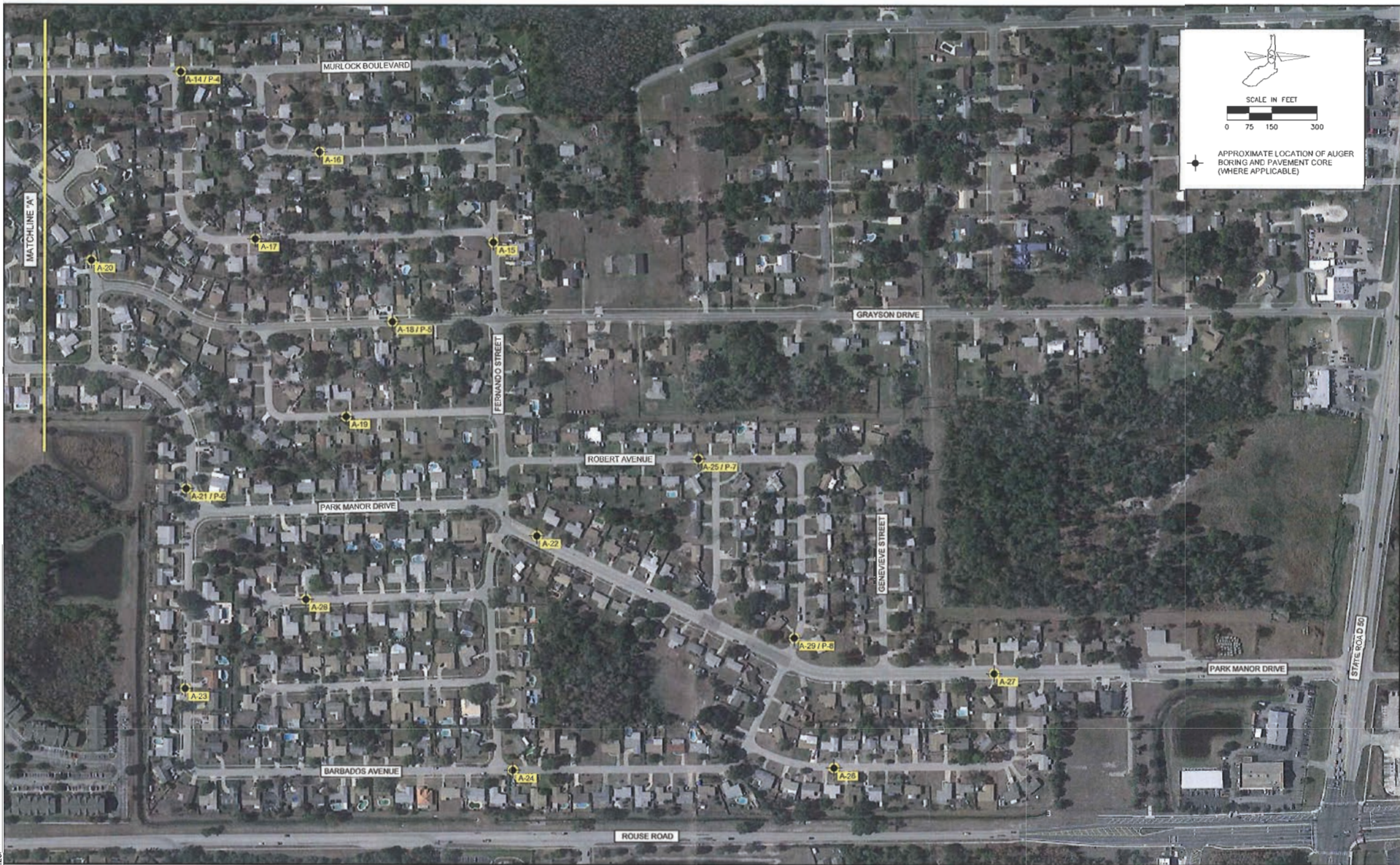
REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION


NODARSE
 A Terracon Company

ENGINEER IN CHARGE, P.E.
 P.E. LICENSE NUMBER 60126
 NODARSE A TERRACON COMPANY
 1075 LEE ROAD
 WINTER PARK, FLORIDA 32789
 CERTIFICATE OF AUTHORIZATION No. 8830

DRAWN BY: JM 6-26-12 CHECKED BY: EJ 6-26-12 DESIGNED BY: CHECKED BY:	ORANGE COUNTY UTILITIES ROAD NO. COUNTY FINANCIAL PROJECT ID - ORANGE -
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SHEET TITLE: REPORT OF AUGER BORINGS PROJECT NAME: PARK MANOR ESTATES WATER AND WASTEWATER SYSTEM IMPROVEMENTS	REF. DWG. NO. SHEET NO.
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Jun 28, 2012 - 10:26am

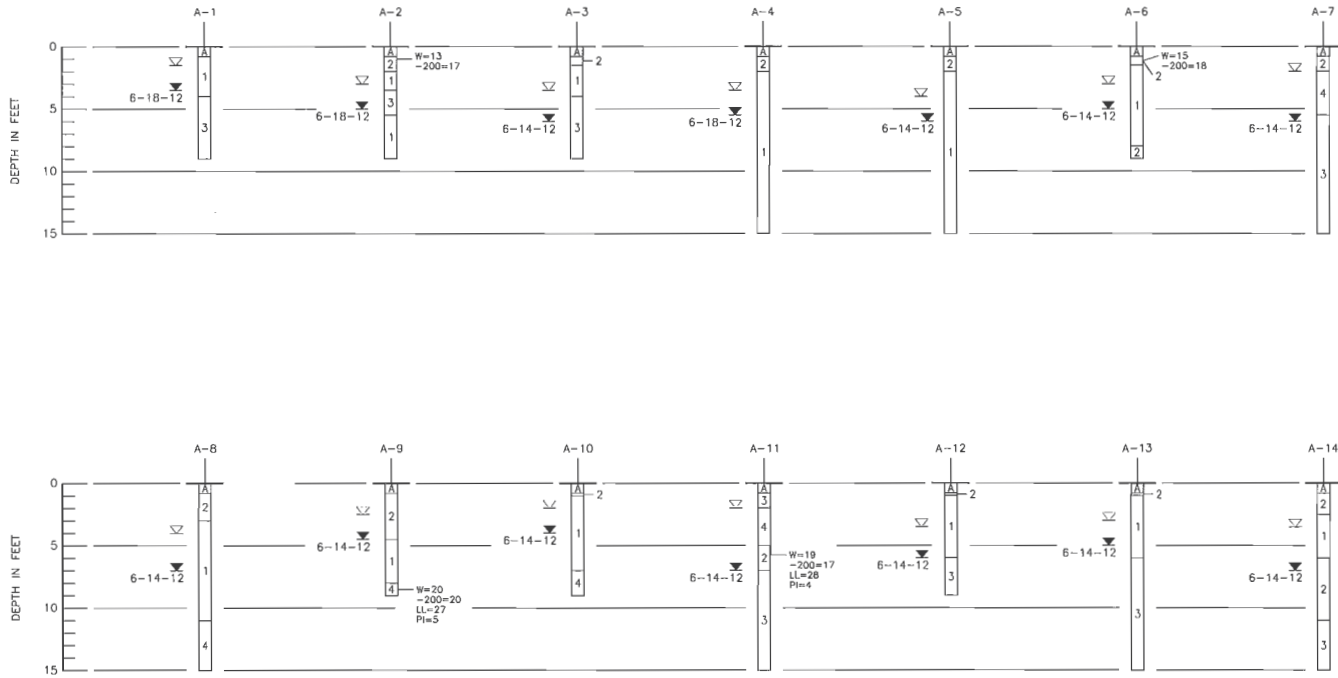
REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

NODARSE
A Terracon COMPANY

ELIAS N. JAMALI, P.E.
P.E. LICENSE NUMBER 60126
NODARSE A TERRACON COMPANY
1675 LEE ROAD
WINTER PARK, FLORIDA 32789
CERTIFICATE OF AUTHORIZATION No. 8830

DRAWN BY: MG 6-26-12	ORANGE COUNTY UTILITIES		SHEET TITLE: REPORT OF AUGER BORINGS
CHECKED BY: EJ 6-26-12			
DESIGNED BY:	ROAD NO.:	COUNTY:	FINANCIAL PROJECT ID:
CHECKED BY:	-	ORANGE	-

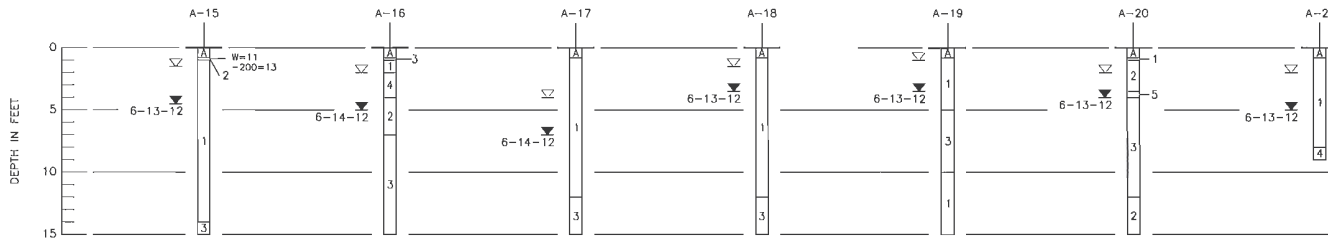
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NODARSE A TERRACON COMPANY No. H1115484	SHEET NO.:
EXHIBIT: A-4	-



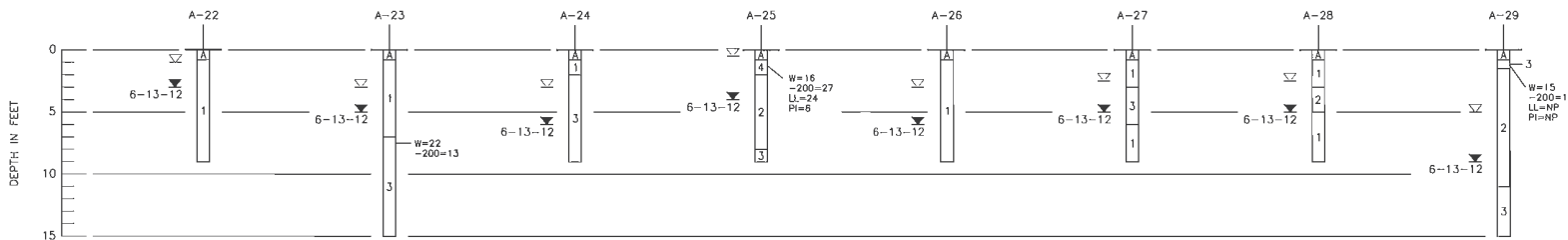
- LEGEND**
- A ASPHALT/ BASE
 - 1 LIGHT GRAY TO DARK BROWN FINE SAND TO FINE SAND WITH SILT WITH OCCASIONAL TRACE ROOTS OR SHELL (SP)(SP-SM)
 - 2 ORANGISH-BROWN AND LIGHT GRAY TO DARK BROWN FINE SAND WITH SILT TO SILTY FINE SAND WITH TRACE TO SOME CLAY (SP-SM)(SM)
 - 3 LIGHT GRAY TO DARK BROWN SILTY FINE SAND (SM)
 - 4 LIGHT GRAY TO BROWN AND ORANGISH-BROWN SILTY TO CLAYEY FINE SAND (SM-SC)
 - 5 BROWN TO DARK BROWN CEMENTED SILTY FINE SAND (HARDPAN) (SM)
 - (SP) UNIFIED SOIL CLASSIFICATION GROUP SYMBOL AS DETERMINED BY VISUAL EXAMINATION
 - ▼ OBSERVED GROUNDWATER LEVEL WITH DATE OF READING
 - 6-13-12
 - ▽ ESTIMATED NORMAL SEASONAL HIGH GROUNDWATER TABLE
 - W NATURAL MOISTURE CONTENT (%)
 - 200 FINES PASSING No. 200 SIEVE (%)
 - LL LIQUID LIMIT (%)
 - PI PLASTICITY INDEX
 - NP NON-PLASTIC

Jun28, 2012 11:46am

REVISIONS				 <small>ELIAS M. JAWHAR, P.E. P.E. LICENSE NUMBER 60126 NODARSE A TERRACON COMPANY 1675 LEE ROAD WINTER PARK, FLORIDA 32789 CERTIFICATE OF AUTHORIZATION No. 8830</small>	ORANGE COUNTY UTILITIES			SHEET TITLE:	REF. DWG. NO.	
DATE	BY	DESCRIPTION	DATE		BY	DESCRIPTION	ROAD NO.	COUNTY	FINANCIAL PROJECT ID	PROJECT NAME:
						-	ORANGE	-	REPORT OF AUGER BORINGS PARK MANOR ESTATES WATER AND WASTEWATER SYSTEM IMPROVEMENTS	-




- LEGEND**
- A ASPHALT/ BASE
 - 1 LIGHT GRAY TO DARK BROWN FINE SAND TO FINE SAND WITH SILT WITH OCCASIONAL TRACE ROOTS OR SHELL (SP)(SP-SM)
 - 2 ORANGISH-BROWN AND LIGHT GRAY TO DARK BROWN FINE SAND WITH SILT TO SILTY FINE SAND WITH TRACE TO SOME CLAY (SP-SM)(SM)
 - 3 LIGHT GRAY TO DARK BROWN SILTY FINE SAND (SM)
 - 4 LIGHT GRAY TO BROWN AND ORANGISH-BROWN SILTY TO CLAYEY FINE SAND (SM-SC)
 - 5 BROWN TO DARK BROWN CEMENTED SILTY FINE SAND (HARDPAN) (SM)
 - (SP) UNIFIED SOIL CLASSIFICATION GROUP SYMBOL AS DETERMINED BY VISUAL EXAMINATION
 - 6-13-12 OBSERVED GROUNDWATER LEVEL WITH DATE OF READING
 - Σ ESTIMATED NORMAL SEASONAL HIGH GROUNDWATER TABLE
 - W NATURAL MOISTURE CONTENT (%)
 - 200 FINES PASSING No. 200 SIEVE (%)
 - LL LIQUID LIMIT (%)
 - PI PLASTICITY INDEX
 - NP NON-PLASTIC



Jun09, 2012-8:11am

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION


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DRAWN BY: MG 8-28-12 CHECKED BY: EJ 6-26-12 DESIGNED BY: CHECKED BY:	ORANGE COUNTY UTILITIES ROAD NO. COUNTY FINANCIAL PROJECT ID - ORANGE -
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SHEET TITLE: REPORT OF AUGER BORINGS PROJECT NAME: PARK MANOR ESTATES WATER AND WASTEWATER SYSTEM IMPROVEMENTS	REF. DNG. NO. SHEET NO. -
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PAVEMENT CORE PICTURES

PAVEMENT CORE

P-1



PAVEMENT CORE

P-2



PAVEMENT CORE

P-3



PAVEMENT CORE

P-4



PAVEMENT CORE

P-5



PAVEMENT CORE

P-6



PAVEMENT CORE

P-7



PAVEMENT CORE

P-8



APPENDIX C

**ORANGE COUNTY UTILITIES 2011 STANDARDS AND CONSTRUCTION
SPECIFICATIONS MANUAL APPENDIX D “LIST OF APPROVED PRODUCTS AND
APPROVAL PROCESS”**

APPENDIX D

LIST OF APPROVED PRODUCTS - TRANSMISSION SYSTEMS

FEBRUARY 11, 2011

Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater	
			Model #	Comments	Model #	Comments	Model #	Comments
Air Release	ARV Enclosure	All ARV above ground enclosures shall be vented with tamper proof locking device						
		Water Plus Polyethylene Enclosure	131632 H30-B	Blue 44" Tall	131632 H30-P	Pantone 44"	131632 H30-G	Green 44" Tall
			171730 H40-B	Blue 30" Tall	171730 H40-P	Pantone 30"	171730 H40-G	Green 30" Tall
		Hot Box Vent Guard Fiberglass Enclosure	AVG2036 Encl	Blue 36" Tall	AVG2036 Encl	Pantone 36" Tall	AVG2036 Encl	Green 36" Tall
			GP3232 Base		GP3232 Base		GP3232 Base	
			AVG2041 Encl	Blue 41" Tall	AVG2041 Encl	Pantone 41" Tall	AVG2041 Encl	Green 41" Tall
		GP3232 Base		GP3232 Base		GP3232 Base		
	Safety-Guard/Hydro Guard	15100 Encl	Blue 34" Tall	15100 Encl	Pantone 34" Tall	15100 Encl	Green 34" Tall	
	Air Release Valves	Air Release Valves shall be Combination Type, 316 SS						
		ARI	D-040SS	Combination	D-040SS	Combination	D-020 (SS)	Combination
H-TEC		NA	NA	NA	NA	986 (316SS)	Combination	
Vent-O-Mat		Series RBX DN50	2"	Series RBX DN50	2"	RGX series		
ARV Vault	Air Release Valve Frame and Cover							
	US Foundry	NA	NA	NA	NA	USF 7665-HH-HJ		
Blow Off	Auto Blow Off	Automatic Blow Off Valve						
		Hydro Guard	HG-1 Standard Unit	Automatic	NA	NA	NA	NA
	Blow Off Valve	Blow Off Valve - Fits standard 5-1/4 inch Valve Box						
		Kupferle Foundry Co	Truflo Series TF #550		Truflo Series TF #550		NA	NA
	Water Plus Corp	The Hydrant Plus Series VB 2000B		The Hydrant Plus Series VB 2000B		NA	NA	
Casing Seals / Spacers	Casing End Seals	Casing End Seals. Annular space between pipe and steel casing shall be brick and mortar with end seals to secure ends.						
		Advance Products	Model AC and AW		Model AC and AW		Model AC and AW	
		BWM Company	Model WR and PO		Model WR and PO		Model WR and PO	
		Cascade Water Works	Model CCES		Model CCES		Model CCES	
		CCI Pipeline	Model ESW and ESC		Model ESW and ESC		Model ESW and ESC	
		Pipeline Seal & Insulator, Inc (PSI)	Model C and W		Model C and W		Model C and W	
		Power Seal	Model 4810ES		Model 4810ES		Model 4810ES	

Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater	
			Model #	Comments	Model #	Comments	Model #	Comments
Casing Seals / Spacers	Casing spacer	Casing spacers shall be a min. 8-inches wide for pipe 12" Dia or less or min. 12-inches wide for pipe 16 or greater , shall have a minimum 14 gauge 304 stainless steel shell/band, minimum 10 gauge 304 reinforced risers; minimum thickness of 0.090 EPDM or PVC interior liners, glass reinforces polymer or ultra high molecular weight polyethylene and 304 stainless bolts, nuts and washers.						
		Advance Products	SSI8 / SSI12		SSI8 / SSI12		SSI8 / SSI12	
		BWM Company	BWM-SS-8 / SS-12		BWM-SS-8 / SS-12		BWM-SS-8 / SS-12	
		Cascade Water Works	Series CCS 8" / 12"		Series CCS 8" / 12"		Series CCS 8" / 12"	
		CCI Pipeline	Model CCS8 / CSS12		Model CCS8 / CSS12		Model CCS8 / CSS12	
		Pipeline Seal & Insulator, Inc (PSI)	Series S8G-2 / S12G-2		Series S8G-2 / S12G-2		Series S8G-2 / S12G-2	
Coatings	Exterior Coatings for Exposed Metal Assets	Coatings: Aerial pipe, hydrants, above ground piping, fittings, valves and Appurtenances - System 1 Zinc / Urethane / Fluoropolymer application and color code per Section 3119 Coatings & Linings. Coating shall not be in contact with Potable water unless NSF 61 approved.						
		Carboline	Carbozinc 621	3.0 - 8.0 mils	Carbozinc 621	3.0 - 8.0 mils	Carbozinc 621	3.0 - 8.0 mils
			Carbothane 133 HB	3.0 -5.0 mils	Carbothane 133 HB	3.0 -5.0 mils	Carbothane 133 HB	3.0 -5.0 mils
			Carboxane 950	2.0 - 3.0 mils	Carboxane 950	2.0 - 3.0 mils	Carboxane 950	2.0 - 3.0 mils
		Tnemec	Zinc Series 90-97	2.5 - 3.5 mils	Zinc Series 90-97	2.5 - 3.5 mils	Zinc Series 90-97	2.5 - 3.5 mils
			Typoxy Series 27WB	4.0 -14.0 mils	Typoxy Series 27WB	4.0 -14.0 mils	Typoxy Series 27WB	4.0 -14.0 mils
			EnduraShield Series73	2.0 - 3.0 mils	EnduraShield Series73	2.0 - 3.0 mils	EnduraShield Series73	2.0 - 3.0 mils
	Hydroflon Series 700		2.0 - 3.0 mils	Hydroflon Series 700	2.0 - 3.0 mils	Hydroflon Series 700	2.0 - 3.0 mils	
	Exterior Coatings for Exposed Metal Assets	Coatings: Aerial pipe, hydrants, above ground piping, fittings, valves and Appurtenances - System 2 Zinc / Epoxy / Urethane application and color code per Section 3119 Coatings & Linings. Coating shall not be in contact with Potable water unless NSF 61 approved.						
		Carboline	Carbozinc 621	3.0 - 8.0 mils	Carbozinc 621	3.0 - 8.0 mils	Carbozinc 621	3.0 - 8.0 mils
			Carboguard 60	4.0 -6.0 mils	Carboguard 60	4.0 -6.0 mils	Carboguard 60	4.0 -6.0 mils
			Carboxane 950	2.0 - 3.0 mils	Carboxane 950	2.0 - 3.0 mils	Carboxane 950	2.0 - 3.0 mils
		Tnemec	Zinc Series 90-97	2.5 - 3.5 mils	Zinc Series 90-97	2.5 - 3.5 mils	Zinc Series 90-97	2.5 - 3.5 mils
			Typoxy Series 27WB	4.0 -14.0 mils	Typoxy Series 27WB	4.0 -14.0 mils	Typoxy Series 27WB	4.0 -14.0 mils
Hi-Build Epoxoline II			4.0 - 10.0 mils	Hi-Build Epoxoline II	4.0 - 10.0 mils	Hi-Build Epoxoline II	4.0 - 10.0 mils	
Series N69			Series N69		Series N69			
PPG / Ameron	EnduraShield Series73	2.0 - 3.0 mils	EnduraShield Series73	2.0 - 3.0 mils	EnduraShield Series73	2.0 - 3.0 mils		
	Amercoat 68HS	Min 3.0 mils	Amercoat 68HS	Min 3.0 mils	Amercoat 68HS	Min 3.0 mils		
	Amercoat 385	4.0 - 6.0 mils	Amercoat 385	4.0 - 6.0 mils	Amercoat 385	4.0 - 6.0 mils		
	Amercoat 450H	2.0 - 3.0 mils	Amercoat 450H	2.0 - 3.0 mils	Amercoat 450H	2.0 - 3.0 mils		

APPENDIX D

LIST OF APPROVED PRODUCTS - TRANSMISSION SYSTEMS

FEBRUARY 11, 2011

Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater	
			Model #	Comments	Model #	Comments	Model #	Comments
Fittings	Fittings	Ductile Iron Fittings C153 SSB / C110 FLG: (Water & Reclaimed Water fittings shall cement lined or holiday free fusion bonded epoxy lined) (Wastewater fittings interior shall be Protecto 401 and holiday free)						
		American	30" & up	FBE / Cement	30" & up	FBE / Cement	30" & up	Protecto 401
		Sigma		FBE / Cement		FBE / Cement		Protecto 401
		Star		FBE / Cement		FBE / Cement		Protecto 401
		Tyler Union & Clow		FBE / Cement		FBE / Cement		Protecto 401
Flow Meter	Flow Meter	Flow Meters With Replaceable Sensors						
		EMCO	NA	NA	NA	NA	Unimag 4411E	
Hydrants	Hydrants	Hydrants Shall open left, 1-1/2 Pentagon operating nut, NST hose & pumper thread, rotate 360 degrees, closed drains, epoxy on shoe in & out and 304 SS nuts & bolts below ground.						
		American Flow Control	B-84-B (6 inch)		NA	NA	NA	NA
		Clow	Medallion 2545		NA	NA	NA	NA
		Mueller	Super Centurion 250		NA	NA	NA	NA
Joint Restraints	Ductile iron pipe MJ Restraints	Mechanical Joint Wedge-action Restraining Gland, Epoxy Coated Restrain ductile iron pipe to mechanical joint fittings, pipe and appurtenances.						
		EBAA Iron Inc	Megalug Series 1100		Megalug Series 1100		Megalug Series 1100	
		Ford / Uni-Flange	UFR-1400		UFR-1400		UFR-1400	
		Sigma	OneLok Series SLD/SLDE		OneLok Series SLD/SLDE		OneLok Series SLD/SLDE	
		Smith Blair	Cam Lok Series 111		Cam Lok Series 111		Cam Lok Series 111	
		Star	Star Grip Series 3000		Star Grip Series 3000		Star Grip Series 3000	
		Tyler Union	TufGrip Series TLD		TufGrip Series TLD		TufGrip Series TLD	
	DIP Bell Joint Restraints (4" - 12") (New & Existing)	Bell Joint Restraints for Ductile Iron Pipe (4"-12") (New & Existing) - All restraints split serrated on bell and spigot ends. Pipe 16" and greater shall have restraint gaskets or locking bells. (Wastewater only for restraint of existing DIP FM)						
		EBAA Iron Inc	Tru-Dual Series 1500TD		Tru-Dual Series 1500TD		Tru-Dual Series 1500TD	
		Ford / Uni-Flange	Uni-Flange Series 1390C		Uni-Flange Series 1390C		Uni-Flange Series 1390C	
		Sigma	PV-Lok Series PWP-C		PV-Lok Series PWP-C		PV-Lok Series PWP-C	
		Smith Blair	Bell-Lock Series 165		Bell-Lock Series 165		Bell-Lock Series 165	
		Star	StarGrip Series 3100S		StarGrip Series 3100S		StarGrip Series 3100S	
DIP Bell Joint Restraints (16" & Greater)	Ductile Iron Pipe Bell Joint Restraints for Ductile Iron Pipe (16" & Greater) - All restraints shall have a split back-up ring for the bell and a serrated or wedge action gland for the spigot end. New installation for water & reclaimed water piping 16" and greater shall have restraint gaskets or locking bells.							
	EBAA Iron Inc	Series 1100HD	Existing Only	Series 1100HD	Existing Only	Series 1100HD	Existing Only	
	Sigma	Series SSLDH	Existing Only	Series SSLDH	Existing Only	Series SSLDH	Existing Only	
	Star	Series 3100S	Existing Only	Series 3100S	Existing Only	Series 3100S	Existing Only	

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Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater	
			Model #	Comments	Model #	Comments	Model #	Comments
Joint Restraints	Ductile iron pipe Bell Joint Restraint Gaskets and Locking Bell (4" & Above)	Bell Joint Restraint Gaskets and Locking Bell (4" & Above) Stainless Steel locking wedges built into the gasket-rubber. ANSI/AWWA C111/A21.11 Standard for Rubber-Gasket Joints for Ductile Iron Pressure Pipe. Ductile Iron Bell Joint Restraint for Push-On Pipe- Locking bell joint system that prevents joint separation and allows for joint deflection. Bells shall be painted red to verify restrained gasket.						
		American	Fast Grip Gasket	Gasket	Fast Grip Gasket	Gasket	NA	NA
			Flex-Ring Joint	Bell Lock	Flex-Ring Joint	Bell Lock	NA	NA
			Lok-Ring Joint	Bell Lock	Lok-Ring Joint	Bell Lock	NA	NA
		Griffin	Talon RJ Gasket	Gasket	Talon RJ Gasket	Gasket	NA	NA
			Snap-Lok	Bell Lock	Snap-Lok	Bell Lock	NA	NA
			McWane Inc. DI Pipe Group	Sure Stop 350 Gasket	Gasket	Sure Stop 350 Gasket	Gasket	NA
		Thrust-Lock		Bell Lock	Thrust-Lock	Bell Lock	NA	NA
		TR-Flex		Bell Lock	TR-Flex	Bell Lock	NA	NA
		Super-Lock		Bell Lock	Super-Lock	Bell Lock	NA	NA
		US Pipe	Field Lok 350 Gasket	Gasket	Field Lok 350 Gasket	Gasket	NA	NA
			Field Lok Gasket	Gasket	Field Lok Gasket	Gasket	NA	NA
			TR-Flex	Bell Lock	TR-Flex	Bell Lock	NA	NA
			HP Lok Restraint Joint	Bell Lock	HP Lok Restraint Joint	Bell Lock	NA	NA
	SS to DIP Transition Restraint	SS to DIP Transition Restraint -Flanged stainless steel pipe from Wetwell to Valve box restrained joint transition (epoxy coated, SS hardware) Flg x PE RJ.						
		EBAA Iron Inc	NA	NA	NA	NA	Megaflange 2100	
		Sigma	NA	NA	NA	NA	SigmaFlange with One Lock SLDE	
		Smith Blair	NA	NA	NA	NA	911 Flange - Lock Restrained FCA	
	PVC Pipe MJ Restraints	Mechanical Joint Wedge-action Restraining Gland, Epoxy Coated Restrain PVC pipe to mechanical joint fittings, and appurtenances.						
		EBAA Iron Inc	Mega-lug Series 2000PV		Mega-lug Series 2000PV		Mega-lug Series 2000PV	
			NA	NA	NA	NA	Megalug Series 2200 (42"-48")	
		Ford / Uni-Flange	UFR 1500 Series		UFR 1500 Series		UFR 1500 Series	
		Sigma	One Lok Series SLC/SLCE		One Lok Series SLC/SLCE		One Lok Series SLC/SLCE	
		Smith Blair	Cam Lok Series 120		Cam Lok Series 120		Cam Lok Series 120	
		Star	Star Grip Series 4000		Star Grip Series 4000		Star Grip Series 4000	
	Tyler Union	TufGrip Series TLP		TufGrip Series TLP		TufGrip Series TLP		
	PVC Bell Joint Restraints (4" - 12") (New & Existing)	PVC Bell Joint Restraints: PVC pipe Split Serrated on Bell End and Spigot End. (4" - 12") (New & Existing)						
		EBAA Iron Inc	Tru-Dual Series 1500TD		Tru-Dual Series 1500TD		Tru-Dual Series 1500TD	
Ford / Uni-Flange		Uni-Flange Series 1390		Uni-Flange Series 1390		Uni-Flange Series 1390		
Sigma		PV-Lok Series PWP		PV-Lok Series PWP		PV-Lok Series PWP		
Smith Blair		Bell-Lock Series 165		Bell-Lock Series 165		Bell-Lock Series 165		
Star		Series 1100C		Series 1100C		Series 1100C		
Tyler Union		TufGrip 300C		TufGrip 300C		TufGrip 300C		

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Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater	
			Model #	Comments	Model #	Comments	Model #	Comments
Joint Restraints	PVC Bell Joint Restraints (16" & Greater)	PVC Bell Joint Restraints: (16" & Greater) PVC pipe Split Serrated on Bell End and Spigot End. Water & Reclaimed Water Existing pipe only. Wastewater shall be new and existing pipe.						
		Ford / Uni-Flange	Series 1390	Existing Only	Series 1390	Existing Only	Series 1390	
		JCM	Sur-Grip Series 621	Existing Only	Sur-Grip Series 621	Existing Only	Sur-Grip Series 621	
		Sigma	PV-Lok PWP	Existing Only	PV-Lok PWP	Existing Only	PV-Lok PWP	
		Smith Blair	Bell-Lock Series 165	Existing Only	Bell-Lock Series 165	Existing Only	Bell-Lock Series 165	
		Star	Series 1100C	Existing Only	Series 1100C	Existing Only	Series 1100C	
Pipe	PVC C900 DR 18 Bell & Spigot (4" - 12")	C900 Bell & Spigot PVC Pipe: 4 to 12-inch - AWWA C-900, Minimum DR18 for Water, Reclaimed and Wastewater. DR14 for Fire Lines. Manufacturers shall be members in good standing with Uni-Bell to maintain approval status.						
		Certaanteed 4" to 12"	Certa-Lok C900/RJ	Blue	Certa-Lok C900/RJ	Pantone Purple	Certa-Lok C900/RJ	Green
		Diamond Plastics Corp	C-900	Blue	C-900	Pantone Purple	Diamond C900	Green
		Ipex Inc	C-900 Blue Brute	Blue	C-900	Pantone Purple	C900 Blue Brute	Green
		JM Eagle	C-900	Blue	C-900	Pantone Purple	C-900	Green
		National Pipe & Plastics Inc	C-900 Dura- Blue	Blue	C-900	Pantone Purple	C-900 Pipe	Green
		North American Pipe Corp (NAPCO)	C-900	Blue	C-900	Pantone Purple	C-900	Green
		Sanderson Pipe Corp	C-900	Blue	C-900	Pantone Purple	C-900	Green
	PVC C905 DR 18 Bell & Spigot 16" and Larger	C905 Bell & Spigot PVC Pipe 16" and Larger: AWWA C-905, Minimum DR18 for all Force Mains up to 24". Minimum DR21/DR25 for 30" and greater. Manufacturers shall be members in good standing with Uni-Bell to maintain approval status.						
		Certaanteed 16"	NA	NA	NA	NA	Certa-Lok C905/RJ	NA
		Diamond Plastics Corp	NA	NA	NA	NA	Trans-21 DR18	Green
		Ipex Inc	NA	NA	NA	NA	IPEX Centurion	Green
		JM Eagle	NA	NA	NA	NA	C905 Big Blue	Green
National Pipe & Plastics Inc		NA	NA	NA	NA	C905	Green	
HDPE C906 DR11	HDPE Pipe DR11 AWWA C906 shall be Ductile Iron Pipe Size, PE 3408/3608/4710 DIPS manufactured in accordance with ASTM F-714 and listed with NSF. Pipe shall be marked in accordance with either AWWA C901,AWWA C906. Compression type connections are not acceptable in new installations. Pipe joints shall be butt fusion or electro-fusion with flange or adapter. All HDPE shall be color coded to the Utility. Color identifications are in accordance with the APWA/ULCC Uniform Color Code. Manufacturers shall be members in good standing with PPI to maintain approval status.							
	JM Eagle	HDPE	DR11 Blue	HDPE	DR11 Pantone	HDPE	DR11Green	
	Performance Pipe(Chevron)	Driscoplex 4000	DR11 Blue	Driscoplex 4000	DR11 Pantone	Driscoplex 4300	DR11 Green	
	PolyPipe, Inc.	EHMW Poly Pipe	DR11 Blue	EHMW	DR11 Pantone	EHMW	DR11Green	

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Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater	
			Model #	Comments	Model #	Comments	Model #	Comments
Pipe	Ductile Iron Pipe	Ductile iron/Cast iron: (4" to 12" = Class 350, 16" to 24" - Class 250, 30" to 64" = Class 200). Water and Reclaimed water shall be cement lined. Wastewater Piping shall be Protecto 401 and Holiday Free. Exterior coatings as specified. Wastewater DIP piping shall be for pump station piping only. Manufacturers shall be members in good standing with DIPRA to maintain approval status.						
		American	Cement Lined	Blue	Cement Lined	Pantone Purple	Protecto 401	Pump Station
		Griffin	Cement Lined	Blue	Cement Lined	Pantone Purple	Protecto 401	Pump Station
		McWane Inc. DI Pipe Group	Cement Lined	Blue	Cement Lined	Pantone Purple	Protecto 401	Pump Station
		US Pipe	Cement Lined	Blue	Cement Lined	Pantone Purple	Protecto 401	Pump Station
Sample	Sample Station	Sample Stations - Bacteriological Sample Station with built in flush system, all internal piping to be 2", brass and includes lockable green enclosures.						
		Safety-Guard	SG-BSS-05 pedestal #77	green enclosure	NA	NA	NA	NA
		Water Plus Corp	Model 5000	green	NA	NA	NA	NA
Services	Brass Service Saddles	Brass Service Saddles for 1" & 2" water & reclaimed water services on 4" through 12" Mains - Service saddles can be hinge or bolt controlled OD saddles to be used on C-900 and existing IPS OD PVC pipe.						
		Ford	Series S-70, S-90	4"-12"	Series S-70, S-90	4"-12"	NA	NA
		AY McDonald	Model 3891 / 3895,3801 / 3805	4"-12"	Model 3891 / 3895,3801 / 3805	4"-12"	NA	NA
		Mueller	Series S-13000/H-13000	4"-12"	Series S-13000/H-13000	4"-12"	NA	NA
	Services	Service Saddles	Service Saddles for 1" (CC) & 2" (Iron pipe threads) Water & Reclaimed Water services on mains greater than 12". Service saddles for 2" taps (iron pipe threads) on 4" mains and greater for Waste Water. : Epoxy or nylon coated stainless steel 18-8-type 304 double straps, controlled O.D. saddles to be used on C-900 / C905 or DI for all 1-in and -2in taps on pipes over 12in.					
Ford			Series FC202	16" & greater	Series FC202	16" & greater	Series FC202	4" & greater
JCM			Series 406	16" & greater	Series 406	16" & greater	Series 406	4" & greater
Mueller			DR2S	16" & greater	DR2S	16" & greater	DR2S	4" & greater
Romac			Series 202NS	16" & greater	Series 202NS	16" & greater	Series 202NS	4" & greater
Smith Blair			Series 317	16" & greater	Series 317	16" & greater	Series 317	4" & greater
Services	Service Saddles for HDPE	Service Saddles for 1" (CC) & 2" (Iron Pipe threads) Water and Reclaimed Water Services: Epoxy or nylon coated stainless steel 18-8-type 304 double straps, controlled O.D. saddles to be used on HDPE for all 1-in and -2in taps. Taps to HDPE pipe shall be approved on a case by case basis.						
		Ford	Series FCP202		Series FCP202		Series FCP202	
		Romac	Series 202N-H		Series 202N-H		Series 202N-H	
		Smith Blair	Series 317-1 for HDPE		Series 317-1 for HDPE		Series 317-1 for HDPE	
Corporation	Stops Ball Type	Corporation Stops Ball Type (1-inch with AWWA taper C threads only/pack joint outlet for CTS) 2" Corporation Stop Ball Type shall be 2" MIP X FIP threads.						
		Ford	FB1000, FB1700-7		FB1000, FB1700-7		FB1700-7	2" ARV
		AY McDonald	4701B-22, 3149B2		4701B-22, 3149B2		3149B2	2" ARV
		Mueller	P25008, B-20046		P25008, B-20046		B-20046	2" ARV

Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater		
			Model #	Comments	Model #	Comments	Model #	Comments	
Services	Curb Stops	Curb Stops - Straight Valves: Ball type compression 2" cts O.D. tubing by 2" FIP							
		Ford	B41-777W		B41-777W		NA	NA	
		AY McDonald	6102W-22		6102W-22		NA	NA	
		Mueller	P25172		P25172		NA	NA	
	Curb Stops	Curb Stops - Straight Valves: ball type compression x compression							
		Ford	B44-444W		B44-444W		NA	NA	
		AY McDonald	6100W-22		6100W-22		NA	NA	
		Mueller	P25146		P25146		NA	NA	
	PE tubing	Polyethylene tubing: AWWA C901. UV protection (SDR-9) 1-inch and 2-inch only. PE 3408 / PE 4710							
		Charter Plastics	Blue Ice		Lav Ice		NA	NA	
		Endot	Endopure Blue		Endocore Lavender		NA	NA	
		JM Eagle	Pure-Core		NA	NA	NA	NA	
Line Stops	Line Stops								
	JCM								
	Romac								
	Smith Blair								
Tapping Sleeves and Valves	Tapping Sleeves	Tapping Sleeves: (Mechanical joint for taps on cast iron, ductile iron, PVC & AC pipe, including size on size) with stainless steel nuts and bolts.							
		American Flow Control	Series 2800		Series 2800		Series 2800		
			Series 1004		Series 1004		Series 1004		
		Clow	Series F-5205	DIP/PVC	Series F-5205	DIP/PVC	Series F-5205	DIP/PVC	
			Series F-5207	A/C Pipe	Series F-5207	A/C Pipe	Series F-5207	A/C Pipe	
		JCM	Series 414	FBE	Series 414	FBE	Series 414	FBE	
		Mueller	Series H-615	DIP/PVC	Series H-615	DIP/PVC	Series H-615	DIP/PVC	
			Series H-619	A/C Pipe	Series H-619	A/C Pipe	Series H-619	A/C Pipe	
Smith Blair	Style 623	FBE	Style 623	FBE	Style 623	FBE			
Tapping Valves: 12" and smaller	Tapping Valves: 12" and smaller - Tapping Valves shall be furnished with an alignment lip and installed in the vertical position for Water and Reclaim Water. Wastewater shall be installed horizontally and abandoned in the open position. Tapping valves shall be resilient seated only and meet the requirements of AWWA C509 or C515								
	American Flow Control	Series 2500	Alignment Lip	Series 2500	Alignment Lip	Series 2500	Alignment Lip		
	Clow	Series F-6114	Alignment Lip	Series F-6114	Alignment Lip	Series F-6114	Alignment Lip		
	Mueller	Series T2360 (4"-12")	Alignment Lip	Series T2360 (4"-12")	Alignment Lip	Series T2360 (4"-12")	Alignment Lip		

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Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater	
			Model #	Comments	Model #	Comments	Model #	Comments
Tapping Sleeves and Valves	Tapping Valves: 16" and Larger	Tapping Valves: 16" and Larger - Tapping valves shall be furnished with an alignment lip and be installed in the vertical position for Water and Reclaimed Water. No tapping valve shall be installed horizontally for Water and Reclaim Water unless approved by the engineer. Tapping Valves 16" and larger AWWA C515 resilient seated only (16" and 24" no gearing required) above 24" shall be installed vertically with a spur gear actuator unless noted by the engineer. All tapping valves above 24" shall be furnished with NPT pipe plugs for flushing the tracks when valves are installed horizontally. Tapping valves for Wastewater shall be installed horizontally and abandoned in open position.						
		American Flow Control	Series 2500	Alignment Lip & flushing port	Series 2500	Alignment Lip & flushing port	Series 2500	Alignment Lip & flushing port
		Clow	Series F-6114	Alignment Lip & flushing port	Series F-6114	Alignment Lip & flushing port	Series F-6114	Alignment Lip & flushing port
		Mueller	Series T2361 (14"&up)	Alignment Lip & flushing port	Series T2361 (14"&up)	Alignment Lip & flushing port	Series T2361 (14"&up)	Alignment Lip & flushing port
Valves	Butterfly Valve 42" and Above	Butterfly Valves 42"and above. AWWA C504. Actuators input torques based on 150 psi valve pressure and 16 fps velocity with a maximum input of 80 ft-lb on 2" nuts and shall withstand 250 ft-lbs. Valve seats shall be leak-tight in both directions at 150 psi.						
		Clow	Style #1450		Style #1450		NA	NA
		Dezurik	BAW		BAW		NA	NA
		Mueller / Pratt	LINSEAL III / Groundhog		LINSEAL III / Groundhog		NA	NA
	Check Valves	Valves (Check) 4-inch and Larger (8 mil epoxy lined)						
American Flow Control		NA		NA		Series 600 or 50 line		
Clow / M&H / Kennedy		NA		NA		106		
Gate Valves 4" - 12"	Gate Valves 12" and smaller - resilient seated only AWWA C509 or C515. Valve seat shall be leak-tight in both directions at 150 psi.							
	American Flow Control	Series 2500		Series 2500		NA	NA	
	Clow	Series F-6100		Series F-6100		NA	NA	
	Mueller	Series A-2360		Series A-2360		NA	NA	
Gate Valves (Vertical) 16" and Up	Gate Valves 16" and larger (Vertical Installation) AWWA C515 resilient seated only (16" and 24" no gearing required) above 24" shall be installed vertically with a gear actuator unless noted by the engineer. Valve seat shall be leak-tight in both directions at 150 psi.							
	American Flow Control	Series 2500		Series 2500		NA	NA	
	Clow	Series F-6100		Series F-6100				
	Mueller	Series A-2361		Series A-2361		NA	NA	

Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater			
			Model #	Comments	Model #	Comments	Model #	Comments		
Valves	Plug Valves	Plug Valves - Bi-directional, MJ & Flanged (min. 8mil fusion bonded epoxy with stainless steel bolts), gear operator to be sized for rated pressure of the valve. Valves 4"-20" shall be 80% Full Port and valves 24" and greater shall be minimum of 70% full port. Valve shall be factory tested to minimum 100 PSI in both directions.								
		Clow	NA	NA	NA	NA	F-5412 FLG	4" & up		
			NA	NA	NA	NA	F-5413 MJ	4" & up		
		Dezurik	NA	NA	NA	NA	Series PEF or PEC	4" & up		
		Millikan / Pratt	NA	NA	NA	NA	Eccentric / Ballcentric	4" & up		
		Val-Matic	NA	NA	NA	NA	5600 or 5800 (FLG)	4" & up		
NA	NA		NA	NA	5700 or 5900 (MJ)	4" & up				
Valve Boxes	Valve Boxes with Locking Lids (Cast Iron)	Two piece standard screw type Heavy Duty Valve Boxes with Locking Lids (Cast Iron) and type of service cast in heavy duty traffic lid (H2O loading) ASTM A48								
		Bingham/Taylor	Series 4905	Box	NA	NA	Series 4905	Box		
			4905-X	Extension	NA	NA	4905-X	Extension		
			4904-L	Blue Water Locking Lid	NA	NA	4904-L	Green Sewer locking Lid		
		Sigma	Series VB 261X-267X	Box	VB-25031LK-VB-2612	Box	Series VB 261X-267X	Box		
			VB 6302	Extension	VB-6302	Extension	VB 6302	Extension		
			VB 4650W	Blue Water Locking Lid	VB2503LK	Purple Square Locking Lid	VB 4650S	Green Sewer locking Lid		
		Star	Series VB-0002	Box	NA	NA	Series VB-0002	Box		
			VBEX 12-24S	Extension	NA	NA	VBEX 12-24S	Extension		
			VBLIDLOCK	Blue Water Locking Lid	NA	NA	VBLIDLOCK	Green Sewer locking Lid		
		Tyler Union	Series 6850	Box	NA	NA	Series 6850	Box		
			58, 59, 60	Extension	NA	NA	58, 59, 60	Extension		
			Locking Lid	Blue Water Locking Lid	NA	NA	Locking Lid	Green Sewer locking Lid		
		Valve Box	Valve Box	For mains equal to, or greater than, 16" diameter or equal to greater than 6' feet deep						
				American Flow Control	# 2A - 9A Retrofit Valve Box Insert	Fit inside std valve boxes	NA		2A - 9A Retrofit Valve Box Insert	Green Sewer locking Lid
Mueller Company	MVB050C thru MVB130C with Extension Stem			Blue Water Locking Lid	MVB050CR thru MVB130CR with Extension Stem	Purple Square Locking Reclaim Lid	MVB050C thru MVB130C with Extension Stem	Green Sewer locking Lid		
		MVB875 Guide Plate		MVB875 Guide Plate		MVB875 Guide Plate				

APPENDIX D

LIST OF APPROVED PRODUCTS - GRAVITY SYSTEMS

FEBRUARY 11, 2011

Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater	
			Model #	Comments	Model #	Comments	Model #	Comments
Coatings	Anti-Graffiti Paint	Block Walls-Anti-Graffiti Paint per Section 3119 Coatings & Linings						
		American Building Restoration Products	NA	NA	NA	NA	Polyshield Graffiti Preventer for Unpainted Masonry Type B	Super Bio Strip or Strip it all
		Tnemec / Chemprobe	NA	NA	NA	NA	626 DUR A PEL	680 Mark A Way
		Professional Products of Kansas, Inc	NA	NA	NA	NA	Professional Water Seal & Anti-Graffiti (PWS-15 Super Strength)	Professional Phase II Cleaner
	Coatings for Existing Manholes	Rehabilitation corrosion protection system per Section 3119 Coatings & Linings. Interior coating for force main connections to existing concrete manholes only. New precast structures and existing pump stations shall be lined.						
		CCI Spectrum, Inc	NA	NA	NA	NA	Spectrashield	min of 500 mils
		Kerneos Aluminate Technologies	NA	NA	NA	NA	Sewpercoat	1" (1000mil)
		Raven Lining System	NA	NA	NA	NA	Raven 155 Primer Raven 405	min 8 mils min 125 mils
		Sauereisen	NA	NA	NA	NA	210 Series Topcoat Glaze 210G	min 125 mils min 20 mils
		Tnemec	NA	NA	NA	NA	Series 434 Topcoat Glaze 435	min 125 mils 15-20 mils
PVC Pipe and fittings	Pipe SDR 35 Gravity Mains	PVC Pipe for Gravity SDR26/SDR 35 (Green in color) ASTM-D034. Manufacturers shall be members in good standing with Uni-Bell to maintain approval status.						
		Certainteed	NA	NA	NA	NA	Gravity Sewer Pipe	
		Diamond Plastics Corp	NA	NA	NA	NA	Sani-21 SDR-35	
		JM Eagle	NA	NA	NA	NA	Gravity Sewer	
		National Pipe & Plastics, Inc.	NA	NA	NA	NA	Ever-Green Sewer Pipe	
		North American Pipe Corp (NAPCO)	NA	NA	NA	NA	Gravity Sewer	
		Sanderson Pipe Corp	NA	NA	NA	NA	Gravity Sewer	
	Locate Balls	Locating Marker Systems - Wastewater Locator balls placed at all sanitary sewer cleanouts						
		3M	NA	NA	NA	NA	3M™ EMS 4" Extended Range 5' Ball Marker 1404-XR	
	Fittings SDR 35	Fittings, Adapters and Plugs - Gravity PVC ASTM-D3034, Min SDR26/ SDR 35						
		GPK Products, Inc.	NA	NA	NA	NA	SDR26/SDR35 Gasketed sewer fittings	
		Harrington Corporation (HARCO)	NA	NA	NA	NA	SDR26/SDR35 Gasketed sewer fittings	
		Multi Fittings Corp.	NA	NA	NA	NA	SDR26/SDR 35 Trench Tough Sewer Fittings	
JM Eagle		NA	NA	NA	NA	SDR26/SDR35 Gasketed sewer fittings		
Plastic Trends Inc		NA	NA	NA	NA	SDR26/SDR35 Gasketed sewer fittings		
TIGRE USA, Inc.		NA	NA	NA	NA	SDR26/SDR35 Gasketed sewer fittings		

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LIST OF APPROVED PRODUCTS - GRAVITY SYSTEMS

FEBRUARY 11, 2011

Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater	
			Model #	Comments	Model #	Comments	Model #	Comments
PVC Pipe a	Flexible Pipe Connectors	Flexible Pipe Connectors and Transitions						
		Fernco	NA	NA	NA	NA	1002, 1051, 1056 Series	
		Indiana Seal	NA	NA	NA	NA	102, 151, 156 Series	
		Mission Rubber	NA	NA	NA	NA	MR02, MR51, MR 56 Series	
Precast Concrete Structures	MH Lids	Frame and Cover						
		USF Fabrication Inc.	NA	NA	NA	NA	USF 225-AS	
	Adj Ring	Top Adjusting Rings - HDPE with heavy duty loading (H-20)						
		Ladtech, Inc	NA	NA	NA	NA	24R, 24S with Rope Sealant CS2455	
	Hatches	Wet Well and Valve Vault Access Frames and Covers (Include the term "Confined Space" etched or cast into the cover with recessed lock & hasp. Frames and covers per manufacturers specifications.						
		Halliday Products	NA	NA	NA	NA	S1R or S2R Series	
		USF Fabrication Inc.	NA	NA	NA	NA	APS or APD Series	
	Precast Concrete Structures	Precast Manhole and Wetwell Structures ASTM C478. Precast concrete shall be batched with concrete dyed crystalline waterproofing admixture with corrosion protection. Concrete without admixture or without color tint /tracer shall be rejected.						
		Allied Precast	NA	NA	NA	NA	Dyed Admix	
		Atlantic Concrete Products, Inc.	NA	NA	NA	NA	Dyed Admix	
		Delzotto Products, Inc.	NA	NA	NA	NA	Dyed Admix	
		Dura Stress Underground Inc.	NA	NA	NA	NA	Dyed Admix	
		Hanson Pipe & Product	NA	NA	NA	NA	Dyed Admix	
		Mack Concrete	NA	NA	NA	NA	Dyed Admix	
		Oldcastle Precast	NA	NA	NA	NA	Dyed Admix	
Standard Precast Inc.	NA	NA	NA	NA	Dyed Admix			
Concrete Admix	Crystalline Waterproofing Concrete Admix with color dye shall be added to all concrete structures (precast and cast-in-place) to provide waterproofing and corrosion resistance. Concrete without admixture or without color tint / tracer shall be rejected. % concentration of admix with colored dye added to the mix shall be based on weight of cement.							
	Kryton International	NA	NA	NA	NA	KIM K-301R (with red dye)	2%	
	Xypex Chemical Corp	NA	NA	NA	NA	Xypex Admix C-1000Red (with red dye)	3.0 - 3.5%	
Liners	Interior Liner for New or existing Precast Manhole and Precast Wetwell Structures per Section 3119 Coatings & Linings							
	AFE	NA	NA	NA	NA	Fiberglass Liner		
	AGRU Liner	NA	NA	NA	NA	HDPE Liner (Min 2 mm for Manhole / Min 5 mm for Pump Station)		
	Containment Solutions Inc. (Flowtite)	NA	NA	NA	NA	Fiberglass Liner		
	GSE Studliner	NA	NA	NA	NA	HDPE Liner (Min 2 mm for Manhole / Min 5 mm for Pump Station)		
	GU Liner	NA	NA	NA	NA	Reinforced Plastic Liner		
		L & F Manufacturing	NA	NA	NA	NA	Fiberglass Liner	

APPENDIX D

LIST OF APPROVED PRODUCTS - GRAVITY SYSTEMS

FEBRUARY 11, 2011

Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater		
			Model #	Comments	Model #	Comments	Model #	Comments	
Precast Concrete Structures	Heat Shrink Seal	Heat Shrink Seal - Precast structures shall be primed with manufacturer approved primer prior to application of heat shrunk encapsulation.							
		Canusa-CPS	NA	NA	NA	NA	Wrapid Seal with WrapidSeal Primer (Canusa G Primer)		
		Pipeline Seal & Insulator, Inc (PSI)	NA	NA	NA	NA	Riser Wrap with Polyken 1027 or 1039 primer		
	Joining Material	Joining Material Min. 2" width for all products to ensure squeeze out with manufacturer approved primer.							
		Henry Company	NA	NA	NA	NA	Ram-Nek	with Primer	
		Martin Asphalt Company	NA	NA	NA	NA	Evergrip 990	with Primer	
		Trelleborg Pipe Seals	NA	NA	NA	NA	NPC – Bidco C-56	with Primer	
	Pipe Seals Gravity	Resilient Connector Pipe Seals, Manhole - Gravity less than 12-inch and less than 15-ft deep							
		Atlantic Concrete	NA	NA	NA	NA	A-Lok (cast-in-place)		
		Hail Mary Rubber	NA	NA	NA	NA	Star Seal (cast-in-place)		
		IPS	NA	NA	NA	NA	Wedge Style		
		NPC	NA	NA	NA	NA	Kor-N-Seal Model WS		
		Press seal gasket	NA	NA	NA	NA	PSX Direct Drive		
	Pipe Seals Gravity	Cast in Place Pipe Seals, Manhole - Gravity Greater Than or Equal to 12-inch and all pipe sizes greater than 15-ft deep							
		Atlantic Concrete	NA	NA	NA	NA	A-Lok	cast in place	
		Hail Mary Rubber	NA	NA	NA	NA	Star Seal	cast in place	
	FM Pipe Seals	Modular Pipe Seals for Wet Well and Valve Box penetrations and all forcemain connections to existing and new precast concrete structures. EPDM Rubber with 316 SS Hardware							
		CCI Pipeline Systems	NA	NA	NA	NA	Wrap-It Link WL-SS Series		
		Pipeline Seal & Insulator, Inc / Link Seal	NA	NA	NA	NA	Link-Seal S-316 Modular Seal		
		Proco Products, Inc	NA	NA	NA	NA	PenSeal ES-PS Series		

APPENDIX D

LIST OF APPROVED PRODUCTS - PUMP STATION SYSTEMS

FEBRUARY 11, 2011

Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater	
			Model #	Comments	Model #	Comments	Model #	Comments
Generator	Gen	Generator Systems, Fixed Shall be UL 2200 Certified.						
		Caterpillar	NA	NA	NA	NA	CAT Diesel Generator Set	
		Cummins Power Generation	NA	NA	NA	NA	Diesel Generator Set	
	Fuel Tanks	Generator Fuel Tanks. Shall be UL2085 certified.						
		Convault	NA	NA	NA	NA	CVT-3SF or CVT-3FF	
		Phoenix	NA	NA	NA	NA	Envirovault	
	GR	Generator Receptacle (GR)						
		Cooper Crouse-Hinds	NA	NA	NA	NA	AR2042 (230V, 200A, 3P, 4W) With AJA1 Angle Adaptor	
		Cooper Crouse-Hinds	NA	NA	NA	NA	AR2042-S22 (460V, 200A, 3P, 4W) With AJA1 Angle Adaptor	
		Pyle National	NA	NA	NA	NA	JRE-4100 (230V, 100A, 3P, 4W)	
ATS	Generator Transfer Switch							
	Russelectric	NA	NA	NA	NA	RMTD Series with model 2000 controller	NEMA 12/3R 316SS Enclosure	
Odor Control Units	Biotrickling Filters	Biotrickling filters						
		BioAir	NA	NA	NA	NA		
		Bioem	NA	NA	NA	NA	Biosorbens BTF	
		Envirogen	NA	NA	NA	NA	BTF	
		Siemens	NA	NA	NA	NA	Zabocs BTF	
	Carbon Adsorption Units	Carbon Adsorption Units						
		Calgon	NA	NA	NA	NA		
		Pure Air Filtration	NA	NA	NA	NA		
		Siemens	NA	NA	NA	NA		
	Pressure Gauges	Pressure Gauges shall have Diaphragm Seals. Oil filled.						
Ashcroft		NA	NA	NA	NA	10 1008SL 02L 60#	Gauge Diaphragm Seal	
		25 200SS 02T XYTSE						
Terice		NA	NA	NA	NA	D83LFSS4002LA100 - Gauge		
						M51001SSSS - Diaphragm Seal		
Winter Gauges	NA	NA	NA	NA	D99100 Fill and Mount Charge			
Pumps	Submersible Pumps							
	ABS	NA	NA	NA	NA			
	Flygt	NA	NA	NA	NA	PFQ770 0-60 PSI D70950 top D70954 Bottom		

APPENDIX D

LIST OF APPROVED PRODUCTS - PUMP STATION SYSTEMS

FEBRUARY 11, 2011

Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater	
			Model #	Comments	Model #	Comments	Model #	Comments
Pumps	Floats	Float Regulator (FR) - Duplex and Triplex Pump Stations						
		Atlantic Scientific	NA	NA	NA	NA	Roto-Float	
	Radar	Radar - Pulse Burst Radar Transmitter. Input 24 VDC and Output 4-20 mA						
		Magnetrol	NA	NA	NA	NA	R82-520A-011	
Pump Station Main Ser	Main Srvce Disconnect	Main Service Disconnect Breaker						
		Square D	NA	NA	NA	NA	H or J Frame 3 Pole 600 Volt (HGL or JGL determined by amperage)	
	Surge Protector Device	Surge Protector - UL 1449, 3rd Edition listed and labeled, minimum 10 year warranty, NEMA LS-1 and IEEE C62, 41/45 tested with NEMA 4X enclosure, internal fusing, voltage and phase to match service. Rated 80,000 amps per mode for Duplex & Triplex stations and 150,000 Amperes per mode for Master Stations. All devices shall be provided with a NEMA 4X Plastic enclosure which is approved in lieu of stainless steel.						
		Current Technology (Power & Systems)	NA	NA	NA	NA	XN-80, TG-150 or CurrentGuard 150 Plus Series	
		Joslyn AKA (Total Protection Solutions)	NA	NA	NA	NA	TSS-ST 160 Series, ST 300 Series or JSP-300 Series	
		Surge Suppressors, Inc	NA	NA	NA	NA	LSE Series or SHL Series	
Sub Panel	Sub Panel	Sub-Panel Enclosure - NEMA 12/3R Enclosure 316SS, white polyester Powder coated finish inside and out, With 3 Point Pad lockable Handle, and Door Stop						
		Hoffman	NA	NA	NA	NA		
		Schaefer	NA	NA	NA	NA		
		Universal enclosure systems	NA	NA	NA	NA		
Pump Station Control Panel	Control Panel	Control Panel Supplier						
		ECS	NA	NA	NA	NA		
		Sta-Con Inc	NA	NA	NA	NA		
	Enclosure	Enclosure - NEMA 12/3R Enclosure 316SS, white polyester Powder coated finish inside and out, With 3 Point Pad lockable Handle, and Door Stop						
		Hoffman	NA	NA	NA	NA		
		Schaefer	NA	NA	NA	NA		
		Universal enclosure systems	NA	NA	NA	NA		
	Mnts	Mounting Channel for Enclosures						
		Unistrut Stainless Steel	NA	NA	NA	NA	1" 5/8 x 1" 5/8 316 SS	
	Seal-off	Explosion-Proof Sealoff						
	Cooper Crouse-Hinds	NA	NA	NA	NA	EYSR - 2 Inch Min.		
FL	Flasher (FL)							
		MPE	NA	NA	NA	NA	025-120-105	
		SSAC	NA	NA	NA	NA	FS-126	

APPENDIX D

LIST OF APPROVED PRODUCTS - PUMP STATION SYSTEMS

FEBRUARY 11, 2011

Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater		
			Model #	Comments	Model #	Comments	Model #	Comments	
Pump Station Control Panel	AL	Alarm Light / With Base and Globe (AL)							
	American Electric	NA	NA	NA	NA	F32552			
	Red Dot Globe	NA	NA	NA	NA	VGLR-01			
	Red Dot Base					VA-01			
	AH	Alarm Horn (AH)							
	Wheelock	NA	NA	NA	NA	3IT-115-R			
	Fuse	Fuses (F)							
	Bussmann	NA	NA	NA	NA	FNQ-R or KTK-R			
	HOA	Hand-Auto-Off Selector (HOA)							
	Square D	NA	NA	NA	NA	9001-SKS43B			
	HSS	Horn Silence Button (HSS)							
	Square D	NA	NA	NA	NA	9001-SKR1RH5			
	Inter-lock	Mechanical Interlock							
	Square D	NA	NA	NA	NA	S29354			
	Breakers	Control Panel Main Circuit Breaker (MCB) With S29450 Circuit Breaker Auxiliary Switch							
		Square D	NA	NA	NA	NA	H or J Frame 3 Pole 600 Volt (HGL or JGL determined by amperage)		
		Emergency Circuit Breaker (ECB) With S29450 Circuit Breaker Auxiliary Switch							
		Square D	NA	NA	NA	NA	H or J Frame 3 Pole 600 Volt (HGL or JGL determined by amperage)		
		Motor Circuit Breaker (MB)							
	Square D	NA	NA	NA	NA	H or J Frame 3 Pole 600 Volt (HGL or JGL determined by amperage)			
	Control Circuit Breaker/ GFCI Receptacle Breaker/ SCADA Breaker								
	Square D	NA	NA	NA	NA	QOU120			
	MS	Motor Starter (MS)							
Square D	NA	NA	NA	NA	Type S Class 8536				
OL	Overload Heater(OL)								
Square D	NA	NA	NA	NA	Part number will vary with size needed				
OR	Overload Reset								
Square D	NA	NA	NA	NA	9066-RA1				
Transformer	Control Circuit Transformer (XMFR)								
	Square D	NA	NA	NA	NA	9070TF75D23	120/24 Volt .075 KVA		
	Main Circuit Transformer (MCT)								
Square D	NA	NA	NA	NA	9070T2000D1	480/120 2KVA			
SPB	Supplemental Protector Breaker - 3 pole, 1-amp for Phase Monitor								
Square D	NA	NA	NA	NA	MG24532				

APPENDIX D

LIST OF APPROVED PRODUCTS - PUMP STATION SYSTEMS

FEBRUARY 11, 2011

Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater	
			Model #	Comments	Model #	Comments	Model #	Comments
Pump Station Control Panel	PM	Phase Monitor (PM)						
		MPE 240 V.	NA	NA	NA	NA	001-230-118-OVG5	
		MPE 480 V.	NA	NA	NA	NA	002-480-123-OVG5	
	Pump Alternator	Pump Automatic Alternator (PAA)						
		Diversified Duplex	NA	NA	NA	NA	ARA-120-ACA	
		Diversified Triplex	NA	NA	NA	NA	ARA-120-AME	
		MPE Duplex	NA	NA	NA	NA	008-120-13SP	
		MPE Triplex	NA	NA	NA	NA	009-120-23P	
	MPE Triplex Socket	NA	NA	NA	NA	SD-12-PC		
	Alt. Test Switch	Alt. Test Switch						
		Carling Technologies	NA	NA	NA	NA	6GG5E-78	
		Honeywell	NA	NA	NA	NA	2TL1-50	
	Relay	Relay						
		Potter Brumfield 24 Volt	NA	NA	NA	NA	KRPA-11AN-24	
		Potter Brumfield 120 Volt	NA	NA	NA	NA	KRPA-11AN-120	
		Square D 24 Volt	NA	NA	NA	NA	8501KP12P14V14	
	Square D 120Volt	NA	NA	NA	NA	8501KP12P14V20		
	Relay Base	Relay Base						
		IEDC 8 Pin Relay Base 600 Volt	NA	NA	NA	NA	SR2P-06	
	Duplex Receptacle / GFCI	Duplex Receptacle/GFCI (DR) Upgraded to 20 Amp						
		Hubbell	NA	NA	NA	NA	GFTR20BK	
		Pass & Seymour	NA	NA	NA	NA	2095TRBK	
	ETM	Elapse Time Meter (ETM)						
		Reddington	NA	NA	NA	NA	711-0160	
	Grounding	Grounding System						
		Marathon	NA	NA	NA	NA	Neutral Isolation Block 1421570	
		Panduit	NA	NA	NA	NA	Ground Lug LAM2A 1/0 - 014 -6Y	
	Square D	NA	NA	NA	NA	Ground Buss PK7GTA		
TS	Terminal Strip (TS)							
	Marathon	NA	NA	NA	NA	Series 200		
	Square D	NA	NA	NA	NA	9080GR6		
TS	Terminal Strip End Blocks and End Clamps							
	Square D	NA	NA	NA	NA	9080GM6B & 9080GH10		

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LIST OF APPROVED PRODUCTS - PUMP STATION SYSTEMS

FEBRUARY 11, 2011

Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater	
			Model #	Comments	Model #	Comments	Model #	Comments
Pump Station Control Pane	PL	Pilot Light (PL) 24 Volt with 1819 Bulb						
		Dialight	NA	NA	NA	NA	803-1710	
		Lighting Components & Design	NA	NA	NA	NA	Littlelight 930507X	
	RL	Run Indicator Light (RL) 120 Volt						
		Dialight	NA	NA	NA	NA	803-1710	
		Lighting Components & Design	NA	NA	NA	NA	Littlelites 930507X With 120MB Bulb	
	MT	Moisture and Temperature Failure Light (MT) 120 Volt with 120MB Bulb						
		Dialight	NA	NA	NA	NA	803-1710	
		Lighting Components & Design	NA	NA	NA	NA	Littlelites 930507X	
Sluice Gate	Sluice Gate for Wet Well with Motorized Operator							
	BNW	NA	NA	NA	NA	Model 77 - 316 SS		
	Fontaine	NA	NA	NA	NA	Model 20 - 316 SS		
VFD	Variable Frequency Drives							
	Square D	NA	NA	NA	NA			

APPENDIX D

**Florida Department of Environmental Protection (FDEP) Permit for Constructing a
Domestic Wastewater Collection/Transmission System. Issued 10/08/2012**



Florida Department of Environmental Protection

Central District
3319 Maguire Boulevard, Suite 232
Orlando, Florida 32803-3767

Rick Scott
Governor

Jennifer Carroll
Lt. Governor

Herschel T. Vinyard Jr.
Secretary

NOTICE OF PERMIT ISSUANCE

In the Matter of an
Application for Permit by:

ORANGE COUNTY UTILITIES
9150 CURRY FORD ROAD
ORLANDO FL 32825

ATTENTION JAMES N BROOME PE
CHIEF ENGINEER

Orange County - CS
Park Manor Estates Water & WW System Improvements
Connected to: OCUD/Eastern WRF - FL0038849

Dear Mr. Broome:

Enclosed is Permit Number CS48-0025660-002 to construct a sewage collection/transmission system, issued pursuant to 403.087(1), Florida Statutes.

The Department's proposed agency action shall become final unless a timely petition for an administrative hearing is filed under Sections 120.569 and 120.57, Florida Statutes, within fourteen days of receipt of notice. The procedures for petitioning for a hearing are set forth below.

A person whose substantial interests are affected by the Department's proposed permitting decision may petition for an administrative proceeding (hearing) under Sections 120.569 and 120.57, Florida Statutes. The petition must contain the information set forth below and must be filed (received by the clerk) in the Office of General Counsel of the Department at 3900 Commonwealth Boulevard, Mail Station 35, Tallahassee, Florida 32399-3000.

Petitions by the applicant or any of the persons listed below must be filed within fourteen days of receipt of this written notice. Petitions filed by any persons other than those entitled to written notice under Section 120.60(3), Florida Statutes, must be filed within fourteen days of publication of the notice or within fourteen days of receipt of the written notice, whichever occurs first. Under Section 120.60(3), Florida Statutes, however, any person who has asked the Department for notice of agency action may file a petition within fourteen days of receipt of such notice, regardless of the date of publication.

The petitioner shall mail a copy of the petition to the applicant at the address indicated above at the time of filing. The failure of any person to file a petition within fourteen days of receipt of notice shall constitute a waiver of that person's right to request an administrative determination (hearing) under Sections 120.569 and 120.57, Florida Statutes. Any subsequent intervention (in a proceeding initiated by another party) will be only at the discretion of the presiding officer upon the filing of a motion in compliance with Rule 28-106.205, Florida Administrative Code.

A petition that disputes the material facts on which the Department's action is based must contain the following information:

- (a) The name, address, and telephone number of each petitioner; the name, address, and telephone number of the petitioner's representative, if any; the Department permit identification number and the county in which the subject matter or activity is located;
- (b) A statement of how and when each petitioner received notice of the Department action;
- (c) A statement of how each petitioner's substantial interests are affected by the Department action;
- (d) A statement of all disputed issues of material fact. If there are none, the petition must so indicate;
- (e) A statement of facts that the petitioner contends warrant reversal or modification of the Department action;
- (f) A concise statement of the ultimate facts alleged, as well as the rules and statutes which entitle the petitioner to relief; and
- (g) A statement of the relief sought by the petitioner, stating precisely the action that the petitioner wants the Department to take.

Because the administrative hearing process is designed to formulate final agency action, the filing of a petition means that the Department's final action may be different from the position taken by it in this notice. Persons whose substantial interests will be affected by any such final decision of the Department have the right to petition to become a party to the proceeding, in accordance with the requirements set forth above.

Mediation under Section 120.573, Florida Statutes, is not available for this proceeding.

This permit action is final and effective on the date filed with the clerk of the Department unless a petition is filed in accordance with the above. Upon the timely filing of a petition this permit will not be effective until further order of the Department.

Any party to the permit has the right to seek judicial review of the permit action under Section 120.68, Florida Statutes, by the filing of a notice of appeal under Rules 9.110 and 9.190, Florida Rules of Appellate Procedure, with the clerk of the Department in the Office of General Counsel, Mail Station 35, 3900 Commonwealth Boulevard, Tallahassee, Florida, 32399-3000; and by filing a copy of the notice of appeal accompanied by the applicable filing fees with the appropriate district court of appeal. The notice of appeal must be filed within 30 days from the date when this permit action is filed with the clerk of the Department.



Florida Department of Environmental Protection

Central District
3319 Maguire Boulevard, Suite 232
Orlando, Florida 32803-3767

Rick Scott
Governor

Jennifer Carroll
Lt. Governor

Herschel T. Vinyard Jr.
Secretary

STATE OF FLORIDA DOMESTIC WASTEWATER COLLECTION/TRANSMISSION INDIVIDUAL PERMIT

Permittee:

Orange County Utilities
9150 Curry Ford Road
Orlando FL 32825

Attention: James N Broome, PE
Chief Engineer

Permit Number: CS48-0025660-002

Date of Issue: October 8, 2012

Expiration Date: October 7, 2017

County: Orange

Project: Park Manor Estates Water & WW
System Improvements

Connected to: OCUD/Eastern WRF -
FL0038849

This permit is issued under the provisions of Chapter 403, Florida Statutes (F.S.), and Chapters 62-4 and 62-604, Florida Administrative Code (F.A.C.).

The above named permittee is hereby authorized to construct the facilities shown on the application and other documents on file with the Department and made a part hereof and specifically described as follows:

DESCRIPTION OF PROJECT:

Construction of a sewage collection/transmission system for the Park Manor Estates Water & WW System Improvements project will relocate and replace gravity sewer mains. No new flow is generated.

The sewage collection/transmission system shall consist of: (A) 12,925 LF of 8 inch PVC gravity sewer mains, and (B) associated manholes and appurtenances.

LOCATION OF PROJECT: Within Park Manor Estates Subdivision, Orlando, Orange County, Florida.

IN ACCORDANCE WITH: The limitations, requirements and other conditions set forth in pages 1 through 3 of this permit.

Permittee:
Orange County Utilities

Permit Number: CS48-0025660-002
Expiration Date: October 7, 2017

Attention: James N Broome, PE
Chief Engineer

PERMIT CONDITIONS:

1. This permit is subject to the general conditions of Rule 62-4.160, F.A.C., as applicable. This rule is available at the Department's Internet site at:
<http://www.dep.state.fl.us/water/wastewater/rules.htm#domestic> [62-4.160]
2. Upon completion of construction of the collection/transmission system project, and before placing the facilities into operation for any purpose other than testing for leaks or testing equipment operation, the permittee shall submit to the Department's Central District Office Form 62-604.300(8)(b), Request for Approval to Place a Domestic Wastewater Collection/Transmission System into Operation. This form is available at the Department's Internet site at:
<http://www.dep.state.fl.us/water/wastewater/forms.htm> [62-604.700(2), 11-6-03]
3. The new or modified collection/transmission facilities shall not be placed into service until the Department clears the project for use. [62-604.700(3), 11-6-03]
4. Permit revisions shall only be made in accordance with Rule 62-4.050(4)(s), F.A.C. Request for revisions shall be made to the Department in writing and shall include the appropriate fee. Revisions not covered under Rule 62-4.050(4)(s), F.A.C., shall require a new permit. [62-604.600(8), 11-6-03]
5. Abnormal events shall be reported to the Department's Central District office in accordance with Rule 62-604.550, F.A.C. For unauthorized spills of wastewater in excess of 1000 gallons per incident, or where information indicates that public health or the environment may be endangered, oral reports shall be provided to the STATE WARNING POINT TOLL FREE NUMBER, (800) 320-0519, as soon as practical, but no later than 24 hours from the time the permittee or other designee becomes aware of the circumstances. Unauthorized releases or spills less than 1000 gallons per incident are to be reported orally to the Department's Central District office within 24 hours from the time the permittee, or other designee becomes aware of the circumstances. [62-604.550, 11-6-03]

APPENDIX E

**Florida Department of Environmental Protection (FDEP) Notice of Intent to Use the
General Permit for Construction of Water Main Extensions for PWSs. Issued 10/02/2012**



Florida Department of Environmental Protection

Central District
3319 Maguire Boulevard, Suite 232
Orlando, Florida 32803-3767

Rick Scott
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Secretary

Notification of Use of General Permit

Sent by E-Mail

Permittee: James N. Broome, P.E., OCUD Eastern
Utility: James N. Broome, P.E., OCUD Eastern
Engineer: Chandler R. Wilson, P.E., HDR Engineering

Permit Number: 0080780-955DSGP

Project Name: Park Manor Estates

PWS No. 3484132

Location: Park Manor Estates Subdivision in east-central Orange County, bounded by SR 50, Rouse Road, SR 408 and Dean Road.

Project Description: Construction of 6 inch and 8 inch water mains to replace aging existing asbestos cement pipe.

To the Permittee: James N. Broome, P.E., Chief Engineer

In response to your request, this document is to advise you that the Department has received your notice of intent to use a general permit as provided in Chapter 62-555, Florida Administrative Code (F.A.C.), to construct a water distribution system extension. At this time, the Department is not objecting to your use of such a general permit. Be advised that you are required to abide by all conditions in F.A.C. Chapters 62-4, 62-550, 62-555, the general requirements for general permits, and Rule 62-555.405, *F.A.C.* Also note that the permittee must promptly notify the Department upon sale or legal transfer of the permitted facility. This permit is transferable only upon Department approval. The new owner must apply, by letter, for a transfer of permit within 30 days.

A Letter of Clearance must be issued by the Department prior to placement of this project into service. Failure to do so may result in the taking of appropriate enforcement action against the permittee.

To obtain the clearance letter, the engineer-of-record must submit a "Request for Letter of Release to Place Water Supply System into Service" [DEP Form 62-555.900 (9), *F.A.C.*], a copy of this letter, and satisfactory bacteriological test results (with chlorine residuals indicated), taken on two consecutive days, from the locations to be designated by the engineer of record.

The engineer shall submit a sampling plan covering the mains to be cleared with each certification of completion. The plan shall include locations on the proposed piping at all points of connection to the existing main, at all terminal ends, on straight runs of pipes between each two isolation valves and at the beginning and end of lines for each segment to be partial completed. The maximum interval between two sampling locations shall be 1,000 feet. Per AWWA C651, samples shall not be taken from fire hydrants.

If this project involves work on an existing asbestos cement (AC) pipes the permittee shall do so in accordance with the applicable rules of Federal Asbestos Regulation and Florida DEP requirements. Please contact Allen Rainey with the Air Resources Management Program at the DEP Central District (Allen.Rainey@dep.state.fl.us) (407-897-2929) concerning any possible asbestos issues pertaining to the project.

Water sample forms must indicate specific recommended sample locations and the file number above.
Permit expiration date is five years from the date of issuance.

FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION

A handwritten signature in black ink that reads "Richard S. Lott". The signature is written in a cursive style with a horizontal line through the middle of the letters.

Richard S. Lott, P.G., P.E.
Central District Drinking Water Program
Date: October 2, 2012

RSL/dav/dav

cc: jim.broome@ocfl.net; Chandler.wilson@hdrinc.com; Allen.Rainey@dep.state.fl.us